



91/1464/RVN

RESULT OF VOTING ON NEW WORK ITEM PROPOSAL (RVN)

PROJECT NUMBER:

IEC 61189-5-504 ED1

DATE OF CIRCULATION:

2017-09-22

REFERENCE NUMBER OF THE NP:

91/1353A/NP

IEC TC 91 : ELECTRONICS ASSEMBLY TECHNOLOGY

SECRETARIAT:

Japan

SECRETARY:

Mr Masahide Okamoto

CHAIR:

Mr Chris Hunt

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:

FUNCTIONS CONCERNED:

 EMC ENVIRONMENT QUALITY ASSURANCE SAFETY

TITLE OF PROPOSAL:

Future IEC 61189-5-504 Ed.1: Test methods for electrical materials, interconnection structures and assemblies - Part 5-504: General test methods for materials and assemblies - Process ionic contamination testing (PICT)

APPROVAL

P-MEMBERS VOTING	P-MEMBERS APPROVING	P-MEMBERS NOT APPROVING	APPROVAL %	CRITERIA	RESULT
11	11	0	100	>=66.7%	APPROVED

PARTICIPATION

NUMBER OF P-MEMBERS	P-MEMBERS APPROVING AND PARTICIPATING	CRITERIA	RESULT
12	5	≥4 (if ≤16) ≥5 (if ≥17)	APPROVED

UNDER THE VOTING CRITERIA FOR THE ACCEPTANCE OF NEW WORK ITEM PROPOSALS (SEE ISO/IEC DIRECTIVES, PART 1, 2.3.5),

- THE PROPOSAL IS NOT APPROVED
- THE PROPOSAL IS APPROVED AND THE NEW WORK ITEM HAS BEEN INTRODUCED IN THE PROGRAMME OF WORK UNDER THE FOLLOWING TITLE:

Test methods for electrical materials, interconnection structures and assemblies - Part 5-504: General test methods for materials and assemblies - Process ionic contamination testing (PICT)

DRAFT WILL BE

 DISTRIBUTED AS A CD DISTRIBUTED AS A CDV

PROPOSED TARGET DATE FOR SUBMISSION OF A

CD: 2017-11-30

CDV: 2018-10-31

FDIS: 2019-06-28

IS: 2019-11-29

NOTE FROM TC/SC OFFICERS:

THE PROJECT IS ASSIGNED TO PROJECT TEAM/WORKING GROUP: WG 3			
TITLE: Measuring and test methods for electronics assemblies			
TASK: Development of measuring and test methods specific to surface mounting technology and not covered by other technical committees of the IEC.			
PROJECT LEADER			
LAST NAME:	FIRST NAME:	E-MAIL:	COUNTRY:
Hunt	Chris	chris.hunt@gen3systems.com	United Kingdom
EXPERTS			
LAST NAME:	FIRST NAME:	E-MAIL:	COUNTRY:
Welzel	Udo	udo.welzel@de.bosch.com	Germany
Hagio	Koichi	ingm003@k7.dion.ne.jp	Japan
Pascal	Oberndorff	pascal.oberndorff@nxp.com	Netherlands
Graham	Naisbitt	GKN@GEN3SYSTEMS.COM	United Kingdom
Jorgensen	Chris	ChrisJorgensen@ipc.org	United States of America
DATE OF FIRST MEETING:	2017-10-17	PLACE OF FIRST MEETING:	London, UK

Voting Result on 91/1353A/NP

Circulation Date: 2016-03-25
Closing Date: 2016-05-20

Future IEC 61189-5-504 Ed.1: Test methods for electrical materials, interconnection structures and assemblies - Part 5-504: General test methods for materials and assemblies - Process ionic contamination testing (PICT)

Country	Status	Vote	CD	CDV	Participation	Comments	Received
Austria	O	Y	Y		N	-	2016-05-04
Belgium	P	Y	Y		N	-	2016-05-10
Brazil	O	A			N	-	2016-05-20
China	P	Y	Y		N	-	2016-05-19
Finland	P	Y	Y		N	-	2016-04-18
France	O	A			N	-	2016-05-12
Germany	P	Y	Y		Y	-	2016-05-19
Greece	-	Y		Y	N	-	2016-05-20
India	P	A			N	-	2016-05-04
Italy	P	Y	Y		N	-	2016-05-04
Japan	P	Y	Y		Y	-	2016-05-19
Korea, Republic of	P	Y	Y		N	-	2016-04-21
Netherlands	P	Y	Y		Y	-	2016-05-19
Portugal	O	A			N	-	2016-05-20
Qatar	-	Y	Y		N	-	2016-05-18
Russian Federation	P	Y	Y		N	-	2016-05-11
Slovenia	O	A			N	-	2016-05-19
United Kingdom	P	Y	Y		Y	Y	2016-05-20
United States of America	P	Y	Y		Y	-	2016-05-17

Approval

P-Members Voting	P-Members Approving	Approval %	Criteria	Result
11	11	100	>50%	APPROVED

Participation

Number of P-Members	P-Members approving and participating	Criteria	Result
12	5	>=4 (if <= 16) >= 5 (if >= 17)	APPROVED

Notes

The final result of voting will be indicated in the Report of Voting (RVN), as P-members have the possibility to nominate an expert one month after the closing date -- complete information in AC/172/2000

Approving: Does the National Committee approve the addition of the new proposal to the program of work of the committee [Yes/No] ?

Only votes received from P-members before the closing date are counted in determining the decision.

P-members not voting: (0)

CD/CDV: Does the National Committee agree with direct submission of the draft accompanying the proposal as a Committee Draft/Committee Draft for Voting [Y if Yes] ?

Participation : Is the National Committee prepared to participate in the development of the project [Yes/No] ? (Only those voting in favour of the proposal itself have their willingness to participate considered as part of the final decision.)

Acceptance criteria for TS/IS:

approval of the work item by a simple majority of the P-members voting
at least 4 P-members in the case of a committee with 16 or fewer P-members, or at least 5 P-members in the case of committees with 17 or more P-members, have nominated or confirmed the name of an expert and approved the new work item proposal

*Comments rejected because they were not submitted in the IEC Comment form.

**Vote rejected due to lack of justification statement.

Experts: Document 91/1353A/NP		
Country: DE		
First name	Last name	Email
Udo	Welzel	udo.welzel@de.bosch.com
Country: GB		
First name	Last name	Email
Naisbitt	Graham	GKN@GEN3SYSTEMS.COM
Country: JP		
First name	Last name	Email
Koichi	Hagio	ingm003@k7.dion.ne.jp
Country: NL		
First name	Last name	Email
Oberndorff	Pascal	pascal.oberndorff@nxp.com
Country: US		
First name	Last name	Email
Chris	Jorgensen	ChrisJorgensen@ipc.org

Date	Document	Project Nr.
	91/1353A/NP	

MB/NC	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment	Comments	Proposed change	Observations of the secretariat
GB1	5 128			ge	Reference should not be made to PICT.	Delete (PICT)	No?
GB2	9-10 130 to 135	1 Scope		te	The scope states the purpose of the spec is to determine the proportion of soluble ionics that are within acceptable limits, etc. But this method is not necessarily capable of identifying small areas of concentrated ionics that can cause failure due to the possible dilution of these ionics from the overall "inspected" area.	Change to: ... it is intended to identify changes in ionic residues that might indicate a change in some material or processing that could cause a failure.	Needs discussion. Refer to Line 176/177 where this issue is explained in detail.
GB3	24 154 and 155	32		ed	IEC 60068-2-20:2008, IEC 60068-2-58 and IEC 61190-1-3 are not listed in the Normative References.	Add IEC 60068-2-20:2008, IEC 60068-2-58 and IEC 61190-1-3 to the Normative References list.	Accepted
GB4	28 159	4		te	The word "weight" is missing.	Re-word to "...equivalence of sodium chloride (NaCl) weight per unit area..."	Not accepted but changed to "mass"
GB5	35 167	4		te	"Finger salts" is too much of a generic term.	Delete "Finger salts"	Not accepted. It is part of General Description.
GB6	48 171	4		ge	"Conductance" should be "Conductivity"	Re-word to "Conductivity measurements..."	Accepted
GB7	57 192	4		ge	"conductivities" should be "conductivity"	Re-word to "...ionic conductivity does not..."	Accepted
GB8	66 219	6.1		te	Some test facilities use 10/90 v/v Propan-2-ol/De-ionised water to increase the level of organic residue removal.	Consider adding this test solution mix as an alternative option.	Not accepted. This is not a cleanliness test. Furthermore there are safety risks with a 10/90 mixture.
GB9	192 & 201 & 216 334	7.4		te	There is mention of a maximum test time but what about a minimum test time?	Consider adding a minimum test time.	Needs discussion. Refer to 7.4.2 and A.1.4.2 Leaching effects.
GB10	240 352	7.4.2		ge	The phrase "Such time extension is not recommended..." appears to contradict the previous phrase "...the test duration may need to be extended."	Re-word to state "...the test duration typically needs to be extended."	Accepted

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GB11	222 362 & 363	7.4.3		ge	The test solution volume or, more likely, the exposed surface area of the test solution in the test chamber should be kept to a minimum to minimise the influence of CO2.	Re-word to state " <i>Hence the test solution volume must be of a minimum size...</i> "	Accepted. Reference is made to 6.3 as a caveat
GB12	242 387 & 388	8.2		ed	IEC 61189-5-501, IPC-TM-650 2.3.6.7, IPC 9202 and IPC 9203 are not listed in the Normative References.	Add IEC 61189-5-501, IPC-TM-650 2.3.6.7, IPC 9202 and IPC 9203 to the Normative References list.	Accepted
GB13	244 385 to 391	8.2 method 2		te	The paragraph states that a pass/fail value is determined by running the test on samples that have passed SIR testing. However, samples that pass SIR testing are not likely to be at the "edge" of failing (they are likely to be very "clean"). This could result in the determination of a pass/fail value that is too conservative, resulting in false failures in later testing. Also such samples may not represent the actual board/assembly properly.	No change is proposed since it may not be possible to correlate the results of SIR testing on a test board to the cleanliness of an actual assembly.	Needs discussion
GB14	264 & 266 410 to 421	A.1.2		ge	What is DI Water Correction?	Change to " <i>DI water Conductivity Correction</i> "	Accepted with modification
GB15	324 464 to 468	A.1.4.2		te	Why is there specific mention of bromine (Br) flame retardants?	Delete " <i>...bromine (Br) flame retardants included</i> "	Needs discussion but reworded as requested.
GB16	340-346 490 to 493		Annex B	ed	The wording is in the "second-person". This is not appropriate for such a document.	Re-word to state " <i>A sample of >10 printed circuit boards, electrical or electronic components or printed circuit assemblies shall be taken out of the production line at the point where ionic contamination is to be measured. Run the test and record the results. As with any statistical measure, the more samples tested, the more accurate the Pass / Fail will be.</i> <p><i>Once all of the tests are complete, calculate the average (mean) result by adding all the results together and dividing by the number of results taken.</i>"</p>	Accepted

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GB17	348 498 to 513	Annex B		te	It mentions to calculate a pass/fail criteria using the mean and twice the standard deviation. But using two SD rather than 3 or more will result in a theoretical failure rate of about 2.5%, statistically speaking.	Use mean plus three sigma.	Accepted
GB18	350 500		Annex B	ge	Reference should not be made to PICT.	Delete PICT	Accepted
GB19	383 545		Annex B	ge	Reference should not be made to PICT.	Delete PICT	Accepted
GB20	385 548 to 550		Annex B	ge	Reference should not be made to the equipment software.	Re-word to state <i>“Both methods will produce a Pass / Fail value that can be used so that future tests will quickly...”</i>	Accepted
GB21	394 552 to 555		Annex B	ge	Reference should not be made to PICT.	Delete PICT	Accepted
GB22	various			ed	There are numerous editorial changes that need to be made to the document to ensure consistency of terminology, correct use of ISO units of measurement, formatting and capitalisation of letters.		Noted

Late comments from US NC

MB/NC	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment	Comments	Proposed change	Observations of the secretariat
US1	None	Title instructions		Ed	There should be an additional space between "standard" and "or"		
US2	None	Purpose and Justification	Para a)	Ed	"reason" should be "reasons"		
US3	8 131	Scope	1	Ed	The "is" after "test method" is redundant.	Remove second "is".	Accepted
US4	8-12 130 to 136	Scope	1	Te	We believe the scope is too broad as stated. The IPC is working to change ionic contamination testing from product acceptance to process monitoring. We believe that this IEC test method should focus on process monitoring and the question of establishing what is or is not "acceptable" to other documents.	Suggest changing to: "This This part of IEC 61189-5 is a test method is designed to determine the proportion of soluble ionic residues present upon a circuit board, electronic component or assembly to extracted surface area for the purposes of process control. Such residues can adversely impact electrical performance. The change in extract solution conductivity is used to monitor the amount of soluble ionic residues present.	Not accepted
US5	8-9	Scope	1	Te	Need to define the denominator of the proportion - namely, the "soluble ionic residues ... or assembly to surface area"	Change incorporated above.	accepted
US6	27 156 to 196	General Description	1	Ed	The term "alcohol" can apply to a number of chemicals and this method is specific to isopropanol. The IUPAC preferred term is 2-Propanol.	Recommend changing to 2-Propanol throughout the document. Also recommend that the first instance of 2-Propanol have the CAS number as a following parenthetical, just for clarity.	Accepted modification to Propan-2-ol that is then fully described in 6.1.2. I will investigate CAS numbering and where these might appear in the document.
US7	27 156 to 196	General Description		Ed	We occasionally get the question of what grade/purity of 2-Propanol should be used.	Recommend you specify "Technical Grade or higher" in the first instance.	Not accepted. The Propan-2-ol is always purified by the test instrument. Our own experiments showed no appreciable difference.

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US8	27-28 156 to 196	General Description	1	Ed	The present IUPAC practice is to not capitalize chemical salts.	Recommend changing Sodium Chloride to sodium chloride throughout the document.	Accepted
US9	32-33 156 to 196	General Description	3	Ed	The grammar is awkward here.	Recommend: Ionic residues emanate from multiple processes during the manufacturing of electronic boards, components, and assemblies, such as plating, lead tinning, and soldering.	Accepted and revised
US10	36 156 to 196	General Description		Te	The statement is true only if the ionic material is soluble.	Recommend changing first sentence to: "When a soluble ionic contaminant..."	Not accepted
US11	38-39 156 to 196			Te	While this is true of an ion specific test, such as ion chromatography, it is not true for ROSE testing. Recommend this line be removed as too many people believe that NaCl equivalence means that much sodium chloride is on the board.	If this line is left in, recommend it be amended to: "... the type/amount of contamination (e.g. from ion chromatography) are also known"	Not accepted
US12	48 193			Ed	You are not really measuring the concentration of an ionic salt and this wording will still leave too many people thinking there is NaCl on the board.	Recommend changing to "Conductance measurements can then be used to baseline the conductivity of an unknown ionic salt extracted into a solution."	Needs discussion
US13	54 200			Ed	"Sample" could be clarified.	Recommend changing to "sample under test".	Accepted
US14	55 201			Ed	"equivalent" should be "equivalence"	Recommend changing to "equivalence".	Accepted
US15	57 203			Ed	Statement needs to be narrowed to this test method specifically.	Recommend changing to "Measurements of ionic conductivities, taken via this test method, do not differentiate between ionic species, they simply measure conductivity that can be related to the total amounts of ionic material present in the test solution".	Accepted

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US16	67 219			Ed	Need a period at the end of the sentence.		Accepted
US17	67 219			Te	These two different solutions yield different test numbers. We believe there are far more people doing 75/25 than 50/50. This method should point to 75/25 as preferred.	Recommend changing the sentence to have 75/25 first and add (preferred) after 75/25.	Redrafted to the following: Ionic soils can be dissociated in water, and the conductance measured to give an indication of the contaminate level. The test solution however is more than just water, it contains propan-2-ol, a non-polar liquid that aids the dissolution of the soil, and as a non-ionic hydrophilic solvent, its presence does not influence the reading except insofar as it "dilutes" the water bearing the dissociated ions. The test employs a test solution that comprises a specific ratio of 50% v/v Propan-2-ol and 50% v/v De-ionised water or 75% v/v Propan-2-ol and 25% v/v De-ionised water. The 50:50 mixed solution is an optimal compromise between the sensitivity and the solvency when using immersion test methods. The 75-25 mixed solution with the higher alcohol content will reduce sensitivity but increase solvency and vice versa in respect to water.
US18	69-73 221 to 225			Te	I have a problem with this paragraph. It makes it sound as if isopropanol is doing all the work. In reality, your soils will be a mixture of polar and non-polar, so you need polar and non-polar solvents.	Recommend changing to: "Ionic soils may be polar or non-polar in nature, requiring an extract solution that is both polar (water) and non-polar (2-Propanol) to move them into solution. It is the presence"	Accepted
US19	75 227			Te	Where is the data that says 50/50 is better? This is largely an opinion statement. It essentially points the uninitiated user to the 50/50 when 75/25 is more frequently used.		Not accepted. Where the US Def STD differed from the UK MOD-Std was on this very point. There is widespread use of 50:50 around the World for over 40 years.

MB/NC	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment	Comments	Proposed change	Observations of the secretariat
US20	89 211			Te	It should be pointed out somewhere in this section that the two different solutions will provide different values. For process monitoring, that is fine, but presents problems if you start comparing to other test instruments.	Recommend you add a paragraph at the end of 6.1 reading: "The 75-25 mixture is the more commonly used. The 75-25 and 50-50 mixtures will result in different values, so ionic contamination readings from one mixture should not be compared to readings from a different mixture."	Not accepted. This is not a cleanliness test. However, an addition is added to the CD draft in Appendix A: "The conductivity results from the test solution at a ratio of 50% v/v Propan-2-ol and 50% v/v De-ionised water will be different to those obtained from a 75% v/v Propan-2-ol and 25% v/v De-ionised water."
US21	83 213			Te	Can the alternative 64.5 megohm-cm values be listed as a parenthetical? Many US water systems are megohm-cm based.		The metric will be checked and the document corrected accordingly.
US22	86-87 213 & 391			Te	It should be pointed out here that DI water gains conductivity as carbon dioxide is absorbed into the solution.	Recommend adding the following: "Carbon dioxide from the atmosphere can rapidly increase the conductivity of the test solution".	Not accepted. This is covered in section 7.4.3
US23	89 261			Te	As suggested earlier, this should be changed to be more specific. We have seen the wrong alcohols used before. To be consistent, 2-Propanol should be used throughout the document and not use the IPA synonym.	Recommend changing to: 6.1.2 2-Propanol (CAS 67-63-0)	Not accepted. Refer to 6.1.2 where this is clarified
US24	94 266			Ed	"Calibration" should not be capitalized. Also, most chemical control systems require an expiration date that must be adhered to.	Recommend adding "The calibration solution shall be marked with an expiration date and shall not be used beyond the expiration date".	Accepted
US25	98 272			Ed	Need a period at the end of the sentence		Accepted
US26	98 272			Te	Where does the 1cm ² :100 mL come from, and does this ratio hold for all present ionic cleanliness testers? This value of 100 mL for every square centimetre seems very high. When doing ion chromatography, we usually recommend 0.5 mL for ever square centimetre of surface. The value of 100 mL seems like it would swamp out any ionic signal.		Accepted. This should have read 10 mL not 100 mL
US27	404 275			Ed		Recommend using "minimize" instead of "offset"	Accepted, but using minimise not minimize

MB/NC	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment	Comments	Proposed change	Observations of the secretariat
US28	406 281			Te	Should this value be related in microsiemens as that is the unit for conductivity used elsewhere, perhaps with the megohm-cm value in parentheses?		The metric will be checked and the document corrected accordingly.
US29	406 281			Te	Most present machines clean to levels much higher than this before starting. Older machines have a "deadband" issue where it might clean to levels much higher than the "zero point" and so be less accurate during testing. For this method, is there some minimum level that ALL machines should reach before starting the test? The only place that this value is found is for the manual ROSE test and I don't think we want to perpetuate that use.		Not accepted. This is a process control test not a cleanliness test.
US30	408 283	Recirculating Pump		Ed	Is "flame proofed" a standard IEC term? In the US, it would be termed "explosion proof".	Recommend changing to "explosion proof".	Document revised with: The test solution is re-circulated by using a pump that shall comply with IEC 60079-7
US31	440 283	Recirculating Pump		Te	What is the origin of the re-circulation requirement of "not less than 6 times/minute"? This is not found in the IPC ROSE test methods at present. Can all present ionic cleanliness testers meet this requirement or only certain makes / models? Second, since you make this a "shall" item, how is a user of the test method to verify this? If I am an auditor and I ask the operator how do they know that the solution is being recirculated at least 6 times, how do they answer?		Accepted. This has been removed.
US32	445-447 298 to 300	Measurement Cell		Te	This is an issue for the equipment designers, not part of the method itself. The user/operator has no control over this. Recommend moving this portion, and all other machine design related questions to an Annex. Can all present ionic cleanliness testers meet this requirement or only certain makes / models?		Accepted. Revised to: The measurement system shall have an accuracy of $\pm 0,05 \mu\text{S}/\text{cm}$. The instrument should be capable of avoiding polarisation effects between electrodes as might occur when using DC test currents. Equally, error signals caused by both DC and AC currents should be avoided to ensure optimum accuracy at low conductivity values.

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US33	422 305	Test Procedure		Te	Why is Closed Loop preferred? The manufacturers of Open Loop systems would disagree.	If you are going to use this nomenclature then recommend you change to : Closed Loop (often called the Static Method" Open Loop (often called the Dynamic Method".	Not accepted. As explained in 7.4.2: "As this (open loop) technique accumulates data, the test duration may need to be extended. There is a risk of the leaching of desirable ions by the de-ionised solution on the test specimen."
US34	426-428 309 to 311		7.1	Te	How sensitive is this method to what kind of resins are used? DI cartridges vary as you go around the world, some good, some crappy. Are you allowed to specify a target manufacturer and model number and use "or equivalent" to the end? And is this statement true for all present testers or only certain makes and models? And the pre-determined level is one set for the machine and will vary between machines. As such it should be in your "Design Annex". You may also wish to point out that if it takes a long time to reach that pre-determined starting point, that the ion beds are probably exhausted and need to be changed.		Not accepted. The caveat regarding time to regenerate is covered in 7.3.3.
US35	443 326		7.1	Ed	For both of these methods, you show how the solution flows, but you don't indicate how the data is gathered.	Recommend you add the following paragraph: "The instrument monitors the conductivity of the solution with time as conductivity rises".	Not accepted. Refer to Annex A.
US36	455 339		7.2	Ed		Recommend adding a paragraph here: "The instrument monitors solution conductivity, integrating the total amount over time".	Not accepted. Refer to Annex A.
US37	457-458 340 to 341		7.3	Te	Checking the IPA levels once per day assumes only one shift per day. Should this be once per work shift or is your intent that once a day is sufficient? Also, if my system is well controlled, and I have SPC data that shows I only have to measure concentration every 3 days, can I do so?	Recommend changing to: The percent alcohol concentration shall be verified at the start of each work shift (see 7.3.2). The solution mixture shall be adjusted until it is within the specified concentration.	Accepted. Section 7.3 states: The Specific Gravity and Temperature of the test solution shall be checked at least once per working shift before using the system.

MB/NC	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment	Comments	Proposed change	Observations of the secretariat
US38	464 344		7.3.1	Ed	Same comments as above related to units and the machine dependency of the starting value.		Accepted
US39	464-467 347 to 349		7.3.2	Te	Can this section be expanded to tell users how to do this properly? This is frequently done wrong.	Recommend changing to: "Fill the test solution to the height specified by the equipment manufacturer and allow solution to settle. Place a calibrated hydrometer in the test solution until it comes to equilibrium. Read the specific gravity at the lowest part of the solution meniscus. A solution of 75% 2-Propanol should have a specific gravity of 0.8585 ± 0.020 at 20C. A solution of 50% 2-Propanol should have a specific gravity of $0,921 \pm 0,020$ at 20C. Insert a calibrated thermometer into the test solution and read the temperature to the nearest 0.5C. Use the charts in Figures 5 or 6 to determine if 2-Propanol or deionized water should be added to the solution composition to bring it into compliance. If the measured specific gravity is within the bands indicated in Figures 5 and 6, no additions are necessary.	Accepted
US40	478 361		7.3.3	Ed	The last "and" should be "in". Also, do you want to force a single calibration solution concentration or will this be another machine dependent element?	Recommend changing to: The calibration solution concentration shall be specified by the equipment manufacturer. The calibration solution is typically 0.1 % by weight of sodium chloride in deionized water.	Accepted
US41	480-484 361 to 367		7.3.3	Te	I think you need to be more specific and add that there is a return to the starting point each time. An operator could read this and think to inject 3 doses in one run. Think about the operator who knows nothing about chemistry, only running the machine. Also, it would be helpful here to have a table of how much to inject for various Test Cell sizes. Instrument manuals get lost.	Recommend changing to read: Cycle the instrument to the pre-test starting condition. Inject the appropriate amount of calibration solution (see Table ___) into the test cell. Run the measurement cycle for ___ minutes and log the result. Repeat this process three times. All readings shall be 1.00 ± 0.5 uS/cm ² .	Accepted. Refer to A.1.6 Calibration.

MB/NC	Line number (e.g. 17)	Clause/ Subclause (e.g. 3.1)	Paragraph/ Figure/ Table/ (e.g. Table 1)	Type of comment	Comments	Proposed change	Observations of the secretariat
US42	480-484 361 to 367		7.3.3	Te	Also, what is the operator to do if the instrument is not in the specified range? Having expended DI columns may mean it takes a long time to get back to the zero point, but what if you still cannot get within calibration?	Recommend adding" If the instrument does not read conductivity of the calibration solution, as specified by the equipment manufacturer, the instrument cannot be used until it has been brought into calibration".	Accepted. Refer to A.1.6 Calibration.
US43	484 362		7.3.3	Te	Is a simple average here enough? I could have readings of 0, 1.5, and 1.5 and be good? Should not all readings fall within the specified band?	See above recommended change.	Accepted. Refer to A.1.6 Calibration.
US44	488-489 382 to 387		7.4	Te	You're ducking the issue of how to measure surface area. It is not an issue for process control as long as you are consistent, but if being used for product acceptance, then it is an issue. You need to put some boundaries on this, especially for the percentage to add for components. You may wish to tackle this in an Annex. I have always counseled that the industry standard is length x width x 2, plus 10% for assemblies. Length x width x 2 for bare boards. This has been extensively debated in IPC committees without resolution (so far).	Recommend changing to: Unless the true surface area is known (from CAD data), measure the length and width of the test specimen in centimetres. For unpopulated printed boards, the surface area is length x width x 2. For populated printed assemblies, the surface area is length x width x 2, plus 10%.	Not accepted. This is process control not a cleanliness test.
US45	487 381		7.4	Te		Recommend that you add a statement: "All assemblies should be handled with gloved hands (e.g. nitrile gloves) to prevent contamination, and with suitable precautions against electrostatic discharge (ESD)."	Accepted
US46	492 386		7.4	Te	You need to nail the test time parameter down. What is the minimum and maximum test time? Since, in general, ionic values rise with time, if I am a savvy operator, I will run the machine as short a time as I am allowed to get my product to pass. Recommend you set a minimum of 10 minutes, and not to exceed 15 minutes. Also, what do you do if you see that the ionic values are steadily increasing with time and will clearly go much higher even after 15 minutes?	Recommend changing to: The test time shall be a minimum of 10 minutes and a maximum of 15 minutes. At the end of the test period, the conductivity level shall be recorded. If the instrument has an auto-terminate function, the test may be auto-terminated if the readings are unchanged for 3 minutes.	Not accepted

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					Also, some current test equipment uses an autoterminate function, that the test can stop if the ionic value is unchanged for X minutes. Will that be allowed? If so, then your Design Annex should address the algorithm by which auto-termination is done.		
US47	200 393		7.4.1	Te	Regarding the "<1 second". Is this true of all instruments? What data exists that says you have to have a measurement frequency this fast? Is there a value that it should not be greater than? This is an instrument design function, beyond the control of the operator. Again, this kind of thing should be in an annex on equipment design.		Accepted
US48	203 397		7.4.1	Te	Are all the different formulae equally valid? Again, something for the Design Annex		Not accepted
US49	204 398		7.4.1	Ed	What is the triple bar symbol before NaCl? Is this symbol to represent NaCl equivalence? If so, it needs to be better defined earlier in the document. The standard nomenclature is ug/cm2 of NaCl equivalence.		Not accepted
US50	205 399		7.4.2	Ed	Same general comments as found for the Closed Loop section.		Not accepted
US51	240 400		7.4.2	Ed	"may need to be extended". To what, till the value no longer changes? I find this paragraph confusing and an operator would find it more so. In the first case, you say you might have to do it, but in the next sentence indicate that it is not a good idea.	Recommend you change to the following: Test durations longer than 15 minutes may result in ionic materials being leached from the assembly substrates, such as laminate or solder mask, and so test times longer than 15 minutes are not recommended. However, if steadily rising levels of ionic residues are observed throughout the test, with the trend clearly rising beyond the 15 minute time limit, this may indicate an underlying problem in the solder mask or laminate material. In such cases, the test time should be increased until the value no longer changes for 5 minutes.	Not accepted. Already modified in response to UK comment in Annex A.1.4.2

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US52	249 412		7.4.3	Te	CO2 absorption rate is a function of surface area, not total volume, so this becomes equipment dependent. In the equipment I have seen the volume increases much more quickly than the surface area, so I would think that test solution size would typically be inversely related to CO2 concentration (effect) in the sample.		Not accepted
US53	223 416		7.4.3	Ed	“minimum size”. Not sure what is being referred to here. I think you mean to say that either the test article should be of maximum size (to increase the signal) or that the test solution volume should be at a minimum. Secondly, how do you separate out the CO2 or pollutant effects from the test article effects? Your formulas later don't take this into account.	Recommend changing to: To minimize the effects from the atmosphere, it is desirable to keep the test solution volume and exposed surface area low, while maximizing the test sample size.	Accepted with modification.
US54	228 Figure 7		Figure 7	Ed	You don't define anywhere what the User, MIL, or Def lines in your chart refer to.	Add those definitions.	Accepted with modification these lines have been removed.
US55	234 432		8.1	Ed	“form” should be “from”	Change form to from.	Accepted
US56	239 438		8.2	Te	In our estimation, this is beyond the scope of a process control or process monitoring method. In our estimation, determining what is or is not an acceptable level of ionic material belongs in a higher level specification, not this one. THAT document, not this one, would establish how you establish a qualified process and how you set the upper control limit. Secondly, that higher level specification would also delineate what you do in case the UCL is exceeded, not in the test method. This will depend a great deal on the manufacturer's contract and the quality system being used. You can't anticipate that here.	Recommend dropping 8.2 from the test method.	Accepted with modification: First characterize the board or assembly process by an independent quantitative method such as SIR / ECM test method IEC 61189-5-501 or IPC-TM-650 2.3.6.7 together with IPC 9202 and IPC 9203.

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US57	250 450		A.1	Te	I think it is critical that we include discussion of detection limits somewhere in this document. Perhaps in this section. Possibly even suggesting a method for its determination. I have always been using a simple regression analysis, where various concentrations of known NaCl are added, then the line is extrapolated until it intersects the x Axis. (sorry if I missed any reference to this in the document but a doubt I have).		Not accepted. 7.3.3 is sufficient to characterise the sensitivity of the instrument.
US58	333 554		Annex B	Te	Again, I think this example, of how you set an upper control limit is not appropriate here. This should be done by a higher level document. What you should have here is how you take an apparent reading from the test instrument and correct that reading such that your test method yields a corrected value. What you do with a set of corrected values is beyond the scope of a test method. Also, your figure 10 has Def, MIL and USER, without ever indicating what that means.		Not accepted
US59	340 561	Annex B	Method 1	Ed	For the sample size of 10 boards: Is this relying on a pre-qualified or historically acceptable process? Should these be from the same lot, same day, same equipment set, etc? A tricky company could try to induce as much variation as possible at this point to create very broad pass/fail criteria.		Not accepted
US60	348 569	Annex B	Method 1	Ed	What is the statistical basis for using 2 sigma and is your data "assumed" to be normal? As before, what is "acceptable" depends on a higher level specification.		Not accepted. However, this has been altered according to UK and DE comments to 3-Sigma.
US61	375 711	Annex B	Method 2	Ed	Same general comments here as for method 2. We realize this is an example, but how were the 0.35 and 0.45 values chosen. Again, determining acceptability		Not accepted

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					is done elsewhere. Here, if my SIR showed 0.4 to be acceptable, how do I know 0.45 is acceptable? My SIR testing would have to show where “unacceptable” lies.		
US62	407 749	Bibliography			And what are your bibliographic references?		Accepted