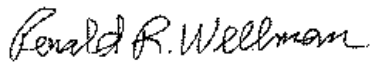

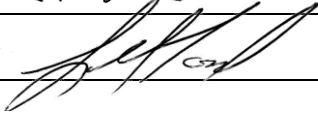

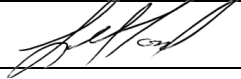

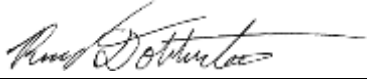


<p><b>TEST REPORT</b> <b>IEC 61010-1</b> <b>Safety requirements for electrical equipment for measurement, control, and laboratory use</b> <b>Part 1: General requirements</b> <i>(Limited evaluation to meet SEMI S2, paragraph 13.4)</i></p>	
Report Number.....:	102732084MPK-010
Date of issue.....:	May 17, 2017
Total number of pages.....:	48
Date of revision.....:	May 10, 2019
Total number of pages.....:	58
Applicant's name.....:	Trebor International
Address.....:	8100 South 1300 West West Jordan, Utah 84088 USA
Test specification:	
Standard.....:	IEC 61010-1:2010 (Third Edition) + Corr 1:2011 and Corr 2: 2013
Test procedure.....:	CER
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC61010_1J
Test item description.....:	DI Water Heater
Trade Mark.....:	Trebor
Manufacturer.....:	Trebor International
Model/Type reference.....:	NXT Series QTM2144480A00 QNXT080V208E1F, S/N QNXT40009
Ratings.....:	480 VAC, 50/60 Hz, 174A 208 VAC, 50/60 Hz, 245A

Testing procedure and testing location:		
<input type="checkbox"/> CB Testing Laboratory:	Intertek Testing Services NA, Inc.	
Laboratory location/ address.....:	1365 Adams Court, Menlo Park, CA 94025 USA	
Testing location/ address .....	Trebor International 8100 South 1300 West West Jordan, UT 84088	
Tested by (name + signature) .....	Ron Wellman	
	Steve Baldwin	
Approved by (name + signature).....:	Lawrence E. Todd	
Revised Testing location/ address .....	Trebor International 8100 South 1300 West West Jordan, UT 84088	
Revised by (name + signature) .....	Allan Cose	
Approved by (name + signature).....:	Lawrence E. Todd	
Revised Testing location/ address .....	Trebor International 8100 South 1300 West West Jordan, UT 84088	
Revised by (name + signature) .....	Daron Bell	
Approved by (name + signature).....:	Richard Dobberstein	

List of Attachments (including a total number of pages in each attachment)																
Document No.	Documents included / attached to this report (description)	Page No.														
Attachment 1	Test Data Package	46 (13)														
Summary of testing: Testing was conducted in situ at the Customer Manufacturing facility. Equipment construction was evaluated and passed all tests determined by the evaluation.																
Test Report History: This report may consist of more than one report and is valid only with additional or previous issued reports:																
Ref. No.	Item															
Tests performed (name of test and test clause): Refer to report Attachment 1 for test results.																
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Tests performed February 2019																
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TEST PERFORMED	PARAGRAPH															
Heater Control Lost	4.4.2.11															
Mains Supply Test	5.1.3c															
Temperature Limits Test	10.4															

Copy of marking plate:



Copy of marking plate (208V):



Photo of 208V system:



Test item particulars:	
Type of item .....	Laboratory Equipment
Description of equipment function .....	DI Water Heater
Connection to MAINS supply .....	Permanent
Overvoltage category .....	II
POLLUTION DEGREE .....	2
Means of protection.....	Class I (PE connected)
Environmental conditions.....	Normal
For use in wet locations .....	No
Equipment mobility.....	Fixed
Operating conditions .....	Continuous
Overall size of equipment (W x D x H) .....	800 mm (W) x 503 mm (D) x 1746 mm (H) 208V: 711 mm (W) x 686 mm (D) with fittings x 1915 mm (H) with eye bolts
Mass of equipment (kg) .....	188 kg (dry)
Marked degree of protection to IEC 60529 .....	N/A
Possible test case verdicts:	
- Test case does not apply to the test object.....	N/A (Not Applicable)
- Test object does meet the requirement .....	P (Pass)
- Test object does not meet the requirement .....	F (Fail)
Testing:	
Date of receipt of test item .....	2016-10-11 208V: 2019-02-11
Date (s) of performance of tests .....	2016-10-11 and 2016-11-17 208V: 2019-02-11 - 2019-02-13
Date (s) of performance of tests .....	2019-05-09
General remarks:	
<p>The test results presented in this report relate only to the object tested.  This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.  "(see ENCLOSURE #)" refers to additional information appended to the report.  "(see Form A.xx)" refers to a table appended to the report.  Bottom lines for measurement tables Form A.xx are optional if used as record.</p>	
Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
General product information:	
<p>Trebor's Quantum NXT Series Deionized (DI) water heater provides modular heating of DI water for a host system. The water heater is available in various power configurations to address water heating demand for the host system. The water heater uses a revolutionary heating technology to provide exceptional process purity and control. Heat is generated using resistive heating elements conducted to the fluid through quartz tubes using convective heat transfer. This conductive / convective heating method allows the heating element to operate at a much cooler temperature than IR heating systems and provides the basis for a responsive heating control system.</p>	

## Description of model differences:

The Quantum NXT Series is available in the following configurations:

CHART 1: CIRCUIT BREAKER SIZE (400VAC-480VAC)						
	VOLTAGE	Power	CURRENT DRAW	MCB	# OF MODULES	POWER PER MODULE
QNXT030V400xxx	400VAC	30kW	44A	60A	2	15kW
QNXT036V480xxx	480VAC	36kW	44A	60A	2	18kW
QNXT060V480xxx	480VAC	60kW	73A	100A	4	18kW
QNXT060V400xxx	400VAC	60kW	87A	125A	4	15Kw
QNXT072V480xxx	480VAC	72kW	87A	125A	4	18kW
QNXT090V400xxx	400VAC	90kW	131A	175A	6	15kW
QNXT108V480xxx	480VAC	108kW	131A	175A	6	18kW
QNXT120V400xxx	400VAC	120kW	174A	225A	8	15kW
QNXT144V480xxx	480VAC	144kW	174A	225A	8	18kW

The original report 102732084MPK-010 issued on May 17, 2017 was amended on May 10, 2019 under project number G102732084 to make the following technical changes:

Trebor International requested to add a Rev6 Booster Pump to the output of the Quantum NXT to increase output pressure. The Rev6 is based off the Levitronix BPS-600 IEC Certified pump, with the exception of a modified upper interface. In order to ensure the addition of this component falls within compliance to IEC 61010-1 and SEMI S2, limited testing was performed at the Trebor site in West Jordan, Utah to evaluate the pump's current draw on the system, as well as single fault testing to verify the pump does not fault to a non-compliant state.

## Description of special features.

(HV circuits, high pressure systems etc.) None

## Description of model differences:

The Quantum NXT Series is available in the following additional 208VAC configurations:

CHART 2: CIRCUIT BREAKER SIZE (208VAC)						
	VOLTAGE	Power	CURRENT DRAW	MCB	# OF MODULES	POWER PER MODULE
QNXT020V208xxx	208VAC	20kW	65A	100A	2	10kW
QNXT040V208xxx	208VAC	40kW	125A	175A	4	10kW
QNXT060V208xxx	208VAC	60kW	185A	225A	6	10kW
QNXT080V208xxx	208VAC	80kW	245A	325A	8	10kW

Description of special features.

Model numbers in the QNXT series are determined using the following information.

The first four characters indicate the model series: QNXT

The next three characters indicate the power level in kW

Available options in the 208V range are 020, 040, 060, and 080

The eighth character is always "V"

The next three characters indicate the voltage rating: 208, 400, or 480

The twelfth character is either "E", "S", "D", "A", or "C" and indicate the communication style

E: STD ENET;

S: Add SERIAL;

D: Add DIGITAL I/O;

A: Add Serial & Digital I/O;

C: custom

The thirteenth character indicates the number of DIW outlets: 1, 2, 3, 4, or C (for custom)

The final character indicates the option of feet/seismic characteristic

F: Std feet

L: Leveling casters

S: Seismic bracket (feet)

B: Seismic bracket (casters)

C: custom

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
4	TESTS		P
4.4	Testing in SINGLE FAULT CONDITIONS		—
4.4.1	Fault tests	Limited single fault testing performed for limited SEMI S2, 13.4 evaluation on 208V system. Equipment operation at the time of 480V evaluation was limited to the available facility environmental conditions.	P
4.4.2	Application of SINGLE FAULT CONDITIONS	Refer to 4.4.1.	N/A
4.4.2.1	SINGLE FAULT CONDITIONS not covered by 4.4.2.2 to 4.4.2.14	Refer to 4.4.1.	—
4.4.2.2	PROTECTIVE IMPEDANCE	Equipment does not rely on protective impedance for safety.	N/A
4.4.2.3	PROTECTIVE CONDUCTOR	Equipment is permanently connected.	N/A
4.4.2.4	Equipment or parts for short-term or intermittent operation	Equipment operates continuously.	N/A
4.4.2.5	Motors	No motors used on equipment.	—
	– stopped while fully energized		N/A
	– prevented from starting		N/A
	– one phase interrupted (multi-phase)		N/A
4.4.2.6	Capacitors	No motor start/run capacitors used on equipment. Listed roughing pump is used and not part of evaluation.	N/A
4.4.2.7	MAINS transformers	Switching mode power supplies evaluated to IEC/EN 60950-1.	N/A
4.4.2.7.2	Short circuit		N/A
4.4.2.7.3	Overload		N/A
4.4.2.8	Outputs	Equipment has no external outputs.	N/A
4.4.2.9	Equipment for more than one supply	Equipment uses single source supply.	N/A
4.4.2.10	Cooling	Equipment does use a cooling system - fans.	—
	– air holes closed		N/A
	– fans stopped	Test terminated by interlock operation.	P
	– coolant stopped		N/A
	– loss of cooling liquid		N/A
4.4.2.11	Heating devices	Loss of control tested. Heaters use temperature controllers. Heater power circuit is protected by a thermal switch.	P
	– timer overridden	No timers used.	N/A



IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– temperature controller overridden	Thermal runaway is limited by thermal switch which turns heater power off when water heater temperature reaches 270°C.	P
4.4.2.12	Insulation between circuits and parts	Basic insulation is used.	N/A
4.4.2.13	Interlocks	Interlocked panels require the use of a tool to open.	N/A
4.4.2.14	Voltage selectors	Equipment does not use voltage selectors.	N/A
4.4.3	Duration of tests		—
4.4.4	Conformity after application of fault conditions	Refer to Clause 4.4.1.	N/A

5	MARKING AND DOCUMENTATION		P
5.1.1	Required equipment markings	Markings for mains supply are adhered to the equipment.	—
	– visible from the exterior; or	Markings are visible from the front and rear of the equipment.	P
	– visible after removing cover or opening door	Markings are on fixed covers.	N/A
	– visible after removal from a rack or panel		N/A
	Not put on parts which can be removed by an operator		P
	Letter symbols (IEC 60027) used	Electrical quantities for Voltage (V), Frequency (Hz) and Current (A).	P
	Graphic symbols (IEC 61010-1: Table 1) used	Symbols 6 and 12 are used on the equipment.	P
5.1.2	Identification		P
	Equipment is identified by:		—
	a) Manufacturer's or supplier's name or trademark	Trebor International.	P
	b) Model number, name or other means	QTM2144V480A00-X QNXT080V208E1F (208V model evaluated).	P
	Manufacturing location identified	8100 South 1300 West West Jordan, Utah 84088 USA.	P
5.1.3	MAINS supply		P
	Equipment is marked as follows:		—
	a) Nature of supply:		—
	1) a.c. RATED MAINS frequency or range of frequencies .....	50/60 Hz.	—
	2) d.c. with symbol 1 .....	AC rated.	—
	b) RATED supply voltage(s) or range .....	480 VAC 208 VAC	—

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	c) Max. RATED power (W or VA) or input current ....	174A 245A (208V, 80kW model)	—
	The marked value not less than 90 % of the maximum value	Refer to Mains Supply Test Data.	P
	If more than one voltage range:	Single nominal voltage.	—
	Separate values marked; or		N/A
	Values differ by less than 20 %		N/A
	d) OPERATOR-set for different RATED supply voltages:	No operator-setting of different supply voltages.	—
	Indicates the equipment set voltage		N/A
	Portable equipment indication is visible from the exterior		N/A
	Changing the setting changes the indication		N/A
	e) Accessory MAINS socket-outlets accepting standard MAINS plugs are marked:	No accessory outlets	—
	With the voltage if it is different from the MAINS supply		—
	For use only with specific equipment		N/A
	If not marked for specific equipment it is marked with:		—
	The maximum rated current or power; or		N/A
	Symbol 14 with full details in the documentation		N/A
5.1.4	Fuses	Fuses not used.	N/A
	Operator replaceable fuse marking (see also 5.4.5).....		—
5.1.5	TERMINALS, connections and operating devices	All terminal labelling is accurately labelled for the appropriate hazards.	P
5.1.5.1	General		—
	Where necessary for safety, indication of purpose of TERMINALS, connectors, controls and indicators marked	Protective conductor terminal marked as Ground.	P
	If insufficient space, symbol 14 used		N/A
	Push-buttons and actuators of emergency stop devices and indicators:	Emergency Off device is used.	—
	– used only to indicate a warning of danger; or		N/A
	– the need for urgent action		N/A
	– coloured red	Actuator is colored red.	N/A
	– coded as specified in IEC 60073		N/A
	Supplementary means of coding provided, if meaning of colour relates (see IEC 60073):		—
	– to safety of persons; or		N/A
	– safety of the environment		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.5.2	TERMINALS		—
	MAINS supply TERMINAL identified	Marked on main Circuit breaker.	P
	Other TERMINAL marking:		—
	a) FUNCTIONAL EARTH TERMINALS (symbol 5 used)	Equipment does not use functional earth terminals.	N/A
	b) PROTECTIVE CONDUCTOR TERMINALS:		—
	Symbol 6 is placed close to or on the TERMINAL; or	Protective conductor terminal is identified with symbol 6 and labelled on chassis next to terminal.	P
	Part of appliance inlet	Permanently connected equipment.	N/A
	c) TERMINALS of control circuits (symbol 7 used)	Equipment does not use control circuit terminals.	N/A
	d) HAZARDOUS LIVE TERMINALS supplied from the interior	Equipment does not use hazardous live terminals supplied from the interior.	N/A
	Standard MAINS socket outlet; or		N/A
	RATINGS marked; or		N/A
	Symbol 14 used		N/A
5.1.6	Switches and circuit breakers	Equipment uses a circuit breaker as the main disconnect.	P
	If disconnecting device, off position clearly marked	Off position is clearly marked.	P
	If push-button used as power supply switch:		—
	– symbol 9 and 15 used for on-position	Not a push-button switch.	N/A
	– symbol 10 and 16 used for off-position		N/A
	– pair of symbols 9, 15 and 10, 16 close together		N/A
5.1.7	Equipment protected by DOUBLE INSULATION or REINFORCED INSULATION	Equipment evaluated for Basic Insulation only.	N/A
	Protected throughout (symbol 11 used)		N/A
	Only partially protected (symbol 11 not used)		N/A
5.1.8	Field-wiring TERMINAL boxes	Equipment does not use field wiring boxes.	N/A
	If TERMINAL or ENCLOSURE exceeds 60 °C:		—
	Cable temperature RATING marked .....		—
	Marking visible before and during connection or beside TERMINAL		N/A
5.2	Warning markings	Warnings use symbol 12, 13.	P
	Visible when ready for NORMAL USE	Visible in Normal Use.	P
	Are near or on applicable parts	Near applicable parts.	P
	Symbols and text correct dimensions and colour:		—

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	a) symbols min 2,75 mm and text 1,5 mm high and contrasting in colour with background	Symbols used correctly sized and text height >1.5mm. Black text on yellow, white, or orange background.	P
	b) symbols and text moulded, stamped or engraved in material min. 2,0 mm high and 0,5 mm depth or raised if not contrasting in colour	Warning text is printed on laminated labels.	N/A
	If necessary marked with symbol 14	Symbol 14 not used.	N/A
	Statement to isolate or disconnect if access by using a tool to HAZARDOUS LIVE parts is permitted	An operator is not permitted to gain access, using a tool, to a part which is in normal use may be hazardous live.	N/A
5.3	Durability of markings	All markings are laminated labels.	P
	The required markings remain clear and legible in NORMAL USE		P
5.4	Documentation	Installation, Operation, Software, and Maintenance Manual provided with the equipment. 208V models: Installation, Operation, and Maintenance Manual provided with the equipment.	P
5.4.1	General	IFU: MQNXT REV A .	P
	Equipment is accompanied by documentation for safety purposes for operator or responsible body	MQNXT REV A Section 1.	P
	Safety documentation for service personnel authorized by the manufacturer	MQNXT REV A Section 2.	P
	Documentation necessary for safe operation is provided in printed media or in electronic media if available at any time	Manual is in electronic format.	P
	Documentation includes:		—
	a) intended use	MQNXT REV A Section 1.	P
	b) technical specification	MQNXT REV A Section 2.5.	P
	c) name and address of manufacturer or supplier	MQNXT REV A Section 9.	P
	d) information specified in 5.4.2 to 5.4.6	MQNXT REV A Section 1,3,7.	P
	e) information to mitigate residual RISK (see also subclause 17)		N/A
	f) accessories for safe operation of the equipment specified	MQNXT REV A Section 2.	P
	g) guidance provided to check correct function of the equipment, if incorrect reading may cause a HAZARD from harmful or corrosive substances of HAZARDOUS live parts		N/A
	h) instructions for lifting and carrying	MQNXT REV A Section 3.	P

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Warning statements and a clear explanation of warning symbols:	MQNXT REV A Section 2,3.	—
	– provided in the documentation; or	Refer IFU MQNXT REV A Section 2,3.	P
	– information is marked on the equipment	Marked on equipment.	P
5.4.2	Equipment ratings		P
	Documentation includes:		—
	a) Supply voltage or voltage range .....	MQNXT REV A Section 2.5.	—
	Frequency or frequency range .....	MQNXT REV A Section 2.5.	—
	Power or current rating .....	MQNXT REV A Section 2.5.	—
	b) Description of all input and output connections in accordance to 6.6.1 a)	MQNXT REV A Section 3.3.	P
	c) RATING of insulation of external circuits in accordance to 6.6.1 b)	External circuits not used.	N/A
	d) Statement of the range of environmental conditions (see 1.4)	MQNXT REV A Section 2.5.	P
	e) Degree of protection (IEC 60529)	Not IP rated.	N/A
	f) If impact rating less than 5 J:	No impact rating specified.	—
	IK code in accordance to IEC 62262 marked; or		N/A
	symbol 14 of table 1 marked, with		N/A
	RATED energy level and test method stated		N/A
5.4.3	Equipment installation	MQNXT REV A Section 3.	P
	Documentation includes instructions for:		—
	a) assembly, location and mounting requirements	MQNXT REV A Section 3.	P
	b) protective earthing		N/A
	c) connections to supply	MQNXT REV A Section 3.3.	P
	d) PERMANENTLY CONNECTED EQUIPMENT:		—
	1) Supply wiring requirements	Marked on nameplate.	P
	2) If external switch or circuit-breaker, requirements and location recommendation		N/A
	e) ventilation requirements	208 Vdc not required.	P
	f) special services (e. g. air, cooling liquid)	IFU MQNXT Rev A Section 2.5..	P
	g) instructions relating to sound level		N/A
5.4.4	Equipment operation	IFU MQNXT Rev A Section 2,3,4,5	P
	Instructions for use include:		—
	a) identification and description of operating controls	IFU MQNXT Rev A Section 2,3,4,5.	P

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) positioning for disconnection	IFU MQNXT Rev A Section 2,3,	N/A
			P
	c) instructions for interconnection		N/A
	d) specification of intermittent operation limits		N/A
	e) explanation of symbols used	IFU MQNXT Rev A Section 2,	P
	f) replacement of consumable materials	No consumable materials.	N/A
	g) cleaning and decontamination	None required.	N/A
	h) listing of any poisonous or injurious gases and quantities	None used.	N/A
	i) RISK reduction procedures relating to flammable liquids (see 9.5)	No such liquid used.	N/A
	j) RISK reduction procedures relating burn from surfaces permitted to exceed limits of 10.1		N/A
	Additional precautions for IEC 60950 conforming equipment in regard to moistures and liquids		N/A
	A statement about protection impairment if used in a manner not specified by the manufacturer		P
5.4.5	Equipment maintenance and Service		P
	Instructions for RESPONSIBLE BODY include:		—
	Instructions sufficient in detail permitting safe maintenance and inspection and continued safety:	IFU MQNXT Rev A Section 2,4,5,7.	—
	Instruction against the use of detachable MAINS supply cord with inadequate rating	No detachable cords used.	N/A
	Specific battery type of user replaceable batteries	No batteries used.	N/A
	Any manufacturer specified parts		N/A
	Rating and characteristics of fuses	No user replaceable fuses.	N/A
	Instructions include following subjects permitting safe servicing and continued safety:	IFU MQNXT Rev A Section 2,3,4.	—
	a) product specific RISKS may affect service personnel		P
	b) protective measures for these RISKS		P
	c) verification of the safe state after repair		P
5.4.6	Integration into systems or effects resulting from special conditions		N/A
	Aspects described in documentation		N/A
6	PROTECTION AGAINST ELECTRIC SHOCK		P
6.1	General		P
6.1.1	Requirements		P

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Protection against electric shock maintained in NORMAL CONDITION and SINGLE FAULT CONDITION	See 6.4 and 6.5.	P
	ACCESSIBLE parts not HAZARDOUS LIVE	See 6.2 and 6.3.	P
	Voltage, current, charge or energy below the limits in NORMAL CONDITION and in SINGLE FAULT CONDITION between:		—
	ACCESSIBLE parts and earth	See 6.2 and 6.3 .	P
	two ACCESSIBLE parts on same piece of the equipment within a distance of 1,8 m	Equipment accessible parts are all within 1.8 m	P
	Conformity is checked by the determination of 6.2 and 6.3 followed by the tests of 6.4 to 6.11	Equipment evaluated under normal use conditions only.	P
6.1.2	Exceptions	No exceptions identified.	N/A
	Following HAZARDOUS LIVE parts may be ACCESSIBLE to an OPERATOR:		—
	a) parts of lamps and lamp sockets after lamp removal	Not used in equipment.	N/A
	b) parts to be replaced by OPERATOR only by the use of tool and warning marking	No required parts to be replaced by the operator under operating conditions.	N/A
	Those parts not HAZARDOUS LIVE 10 s after interruption of supply		N/A
	Capacitance test if charge is received from internal capacitor	Equipment is permanently connected.	N/A
6.2	Determination of ACCESSIBLE parts		P
6.2.1	General		P
	Unless obvious, determination of ACCESSIBLE parts as specified in 6.2.2 to 6.2.4	Visual inspection used to determine accessible parts.	P
6.2.2	Examination		—
	– with jointed test finger (as specified B.2)		N/A
	– with rigid test finger (as specified B.1) and a force of 10 N		N/A
6.2.3	Openings above parts that are HAZARDOUS LIVE		—
	– test pin with length of 100 mm and 4 mm in diameter applied	No openings above live parts.	N/A
6.2.4	Openings for pre-set controls	No openings for pre-set controls.	N/A
	– test pin with length of 100 mm and 3 mm in diameter applied	Equipment does not use openings for pre-set controls.	N/A
6.3	Limit values for ACCESSIBLE parts		P
6.3.1	Levels in NORMAL CONDITION	Protective earth bonding and basic insulation system used to protect accessible parts from becoming hazardous live.	—

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	a) Voltage limits less than 33 V r.m.s. and 46,7 V peak or 70 V d.c.	Hazardous live parts are not accessible under normal use conditions.	P
	for WET LOCATIONS voltage limits less than 16 V r.m.s. and 22,6 V peak or 35 V d.c.	Equipment not for use in wet locations.	N/A
	Voltages are not HAZARDOUS LIVE the levels of:		—
	b) Current less than 0,5 mA r.m.s. for sinusoidal, 0,7 mA peak non-sinusoidal or mixed frequencies or 2 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz	Hazardous live parts are not accessible under normal use conditions.	N/A
	for WET LOCATIONS measuring circuit A.4 used	Equipment not for use in wet locations.	N/A
	70 mA r.m.s. when measured with circuit A.3 for higher frequencies	Hazardous live parts are not accessible under normal use conditions.	N/A
	or		—
	c) Levels of capacitive charge or energy less:		—
	1) 45 $\mu$ C for voltages up to 15 kV peak or d.c. or line A of Figure 3	Hazardous live parts are not accessible under normal use conditions.	N/A
	2) 350 mJ stored energy for voltages above 15 kV peak or d.c.		N/A
6.3.2	Levels in SINGLE FAULT CONDITION	Single fault testing not performed for limited SEMI S2, 13.4 evaluation. Equipment operation at the time of evaluation was limited to the available facility environmental conditions.	—
	a) Voltage limits less than 55 V r.m.s. and 78 V peak or 140 V d.c.		N/A
	for WET LOCATIONS voltage limits less than 33 V r.m.s. and 46,7 V peak or 70 V d.c.		N/A
	Voltages are not HAZARDOUS LIVE the levels of:		—
	b) Current less than 3,5 mA r.m.s. for sinusoidal, 5 mA peak non-sinusoidal or mixed frequencies or 15 mA d.c. when measured with measuring circuit A.1 or A.2 if less than 100 Hz		N/A
	for WET LOCATIONS measuring circuit A.4 used		N/A
	500 mA r.m.s. when measured with circuit A.3 for higher frequencies		N/A
	or		—
	c) Levels of capacitive charge or energy less line B of Figure 3		N/A
6.4	Primary means of protection		P



IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.4.1	ACCESSIBLE parts prevented from being HAZARDOUS LIVE by one or more of following means:		—
	a) ENCLOSURES OR PROTECTIVE BARRIERS (see 6.4.2)	Enclosures are grounded metal and do meet the requirements for basic insulation.	P
	b) BASIC INSULATION (see 6.4.3)	Primary wiring and components use basic insulation.	P
	c) Impedance (see 6.4.4)	Impedance is not used as a primary means of protection.	N/A
6.4.2	ENCLOSURES OR PROTECTIVE BARRIERS		—
	– meet rigidity requirements of 8.1	Enclosures are constructed of metal.	N/A
	– meet requirements for BASIC INSULATION, if protection is provided by insulation	Enclosures do not provide protection by insulation.	N/A
	– meet requirements of 6.7 for CREEPAGE and – CLEARANCES between ACCESSIBLE parts and – HAZARDOUS live parts, if protection is provided by – limited access	Protection is provided by limited access and creepage and clearances confirmed by voltage test.	P
6.4.3	BASIC INSULATION		—
	– meet CLEARANCE, CREEPAGE DISTANCE and solid – insulation requirements of 6.7	Refer to Clause 6.7	P
6.4.4	Impedance		—
	Impedance used as primary means of protection meets all of following requirements:	Impedance not used as a primary means of protection	—
	a) limits current or voltage to level of 6.3.2		N/A
	b) RATED for maximum WORKING VOLTAGE and the amount of power it will dissipate		N/A
	c) CLEARANCE, CREEPAGE DISTANCE between terminations of the impedance meet requirements of BASIC INSULATION of 6.7		N/A
6.5	Additional means of protection in case of SINGLE FAULT CONDITION		P
6.5.1	ACCESSIBLE parts are prevented from becoming HAZARDOUS live by the primary means of protection and supplemented by one of:		—
	a) PROTECTIVE BONDING (see 6.5.2)	Used as an additional means of protection to basic insulation.	P
	b) SUPPLEMENTARY INSULATION (see 6.5.3)	Not relied on as an additional means of protection from electric shock.	N/A
	c) automatic disconnection of the supply (see 6.5.5)		N/A
	d) current- or voltage-limiting device (see 6.5.6)		N/A
	Alternatively one of the single means of protection is used:		—
	e) REINFORCED INSULATION (see 6.5.3)		N/A
	f) PROTECTIVE IMPEDANCE (see 6.5.4)		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.5.2	PROTECTIVE BONDING		P
6.5.2.1	ACCESSIBLE conductive parts, may become HAZARDOUS LIVE in SINGLE FAULT CONDITION:		—
	Bonded to the PROTECTIVE CONDUCTOR TERMINAL; or	Accessible conductive parts are bonded to the protective conductor terminal.	P
	Separated by conductive screen or barrier bonded to PROTECTIVE CONDUCTOR TERMINAL		N/A
6.5.2.2	Integrity of PROTECTIVE BONDING		—
	a) PROTECTIVE BONDING consists of directly connected structural parts or discrete conductors or both; and withstands thermal and dynamic stresses	Protective bonding is directly connected to structural parts and using discrete conductors.	P
	b) Soldered connections:	Connections are not soldered.	—
	Independently secured against loosening		N/A
	Not used for other purposes		N/A
	c) Screw connections are secured	Screw connections are secured.	P
	d) PROTECTIVE BONDING not interrupted; or	Removable parts do not interrupt protective bonding.	P
	exempted as removable part carries MAINS SUPPLY input connection		N/A
	e) Any movable PROTECTIVE BONDING connection specifically designed, and meets 6.5.2.4	Equipment does not use moveable conductive connections.	N/A
	f) No external metal braid of cables used (not regarded as PROTECTIVE BONDING)	Equipment does not use external metal braids of cables.	N/A
	g) IF MAINS SUPPLY passes through:		—
	Means provided for passing protective conductor;		N/A
	Impedance meets 6.5.2.4		N/A
	h) Protective conductors bare or insulated, if insulated, green/yellow	Protective conductors are insulated and colored green or green/yellow.	P
	Exceptions:		—
	1) earthing braids;	Earthing braids not used.	N/A
	2) internal protective conductors etc.;	Green or green/yellow colored insulated wire is used. Conductor is easily identifiable.	P
	Green/yellow not used for other purposes	Green/yellow not otherwise used.	P
	TERMINAL suitable for connection of a PROTECTIVE CONDUCTOR, and meets 6.5.2.3	Equipment uses protective conductor terminal.	P
6.5.2.3	PROTECTIVE CONDUCTOR TERMINAL		—
	a) Contact surfaces are metal	Contact surfaces are metal.	P
	b) Appliance inlet used	Equipment is permanently connected.	N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	c) For rewirable cords and PERMANENTLY CONNECTED EQUIPMENT, PROTECTIVE CONDUCTOR TERMINAL is close to MAINS supply TERMINALS	Protective conductor terminal is close to mains supply.	P
	d) If no MAINS supply is required, any PROTECTIVE CONDUCTOR TERMINAL:	Mains supply connection is required.	—
	Is near terminals of circuit for which protective earthing is necessary		N/A
	External if other terminals external		N/A
	e) Equivalent current-carrying capacity to MAINS supply TERMINALS	Protective conductor terminal has equivalent current-carrying capacity to mains supply terminals.	P
	f) If plug-in, makes first and breaks last	Equipment is permanently connected.	N/A
	g) If also used for other bonding purposes, PROTECTIVE CONDUCTOR:		—
	Applied first;	Protective conductor is secured independently from other bonding conductors and is unlikely to be disconnected during servicing.	P
	Secured independently;		P
	Unlikely to be removed by servicing		P
	h) PROTECTIVE CONDUCTOR of measuring circuit:	Equipment does not use protective conductor for measuring circuits.	—
	1) Current RATING equivalent to measuring circuit TERMINAL;		N/A
	2) PROTECTIVE BONDING: not interrupted by any switch or interrupting device		N/A
	i) FUNCTIONAL EARTH TERMINALS allow independent connection	Equipment does not use functional earth terminals.	N/A
	j) If a binding screw used for PROTECTIVE CONDUCTOR TERMINAL:	Binding screw not used.	—
	Suitable size for bond wire		N/A
	Not smaller than M 4		N/A
	At least 3 turns of screw engaged		N/A
	Passes tightening torque test		N/A
	k) Contact pressure not capable being reduced by deformation of materials	Bonding terminals rated for application.	P
6.5.2.4	Impedance of PROTECTIVE BONDING of plug-connected equipment	Equipment is permanently connected. See 6.5.2.5.	—
	Impedance between PROTECTIVE CONDUCTOR TERMINAL and each ACCESSIBLE part where PROTECTIVE BONDING is specified, is:		—
	– less than 0,1 Ohm; or		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	– less than 0,2 Ohm if equipment is provided with non-detachable cord		N/A
6.5.2.5	Bonding impedance of PERMANENTLY CONNECTED EQUIPMENT	Refer to Grounding Continuity Test data.	—
6.5.2.6	Transformer PROTECTIVE BONDING screen	Equipment does not use transformer protective bonding screen.	—
	Transformer provided with screen for PROTECTIVE BONDING:		—
	screen bonding consists of directly connected structural parts or discrete conductors or both; and withstands thermal and dynamic stresses (see 6.5.2.2 a )		N/A
	screen bonding with soldered connection (see 6.5.2.2 b ) is:		N/A
	– Independently secured against loosening		N/A
	– Not used for other purposes		N/A
6.5.3	SUPPLEMENTARY and REINFORCED INSULATION	Equipment does not use supplementary or reinforced insulation.	N/A
	Meet CLEARANCE, CREEPAGE DISTANCE and solid insulation requirements of 6.7		N/A
6.5.4	PROTECTIVE IMPEDANCE	Equipment does not use protective impedance.	N/A
	Limits current or voltage to level of 6.3.1 in NORMAL and to level of 6.3.2 in SINGLE FAULT CONDITION		N/A
	CLEARANCE, CREEPAGE DISTANCE between terminations of the impedance meet requirements of DOUBLE or REINFORCED INSULATION of 6.7		N/A
	The PROTECTIVE IMPEDANCE consists of one or more of the following:		—
	a) appropriate single component suitable for safety and reliability for protection, it is:		—
	1) RATED twice the maximum WORKING VOLTAGE		N/A
	2) resistor RATED for twice the power dissipation for maximum WORKING VOLTAGE		N/A
	b) combination of components		N/A
	Single electronic device not used as PROTECTIVE IMPEDANCE		N/A
6.5.5	Automatic disconnection of the supply		P
	a) RATED to disconnect the load within time specified in Figure 2	Listed Circuit Breaker used.	P
	b) RATED for the maximum load conditions of the equipment	Rated 225A 208V: rated 400A, trip setting 325A.	P

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.5.6	Current- or voltage-limiting devices	Equipment does not use current or voltage limiting devices for protection against electric shock.	N/A
	Device complies with all of:		—
	a) RATED to limit the current or voltage to the level of 6.3.2		N/A
	b) RATED for the maximum WORKING VOLTAGE; and		N/A
	RATED for the maximum operational current if applicable		N/A
	c) CLEARANCE, CREEPAGE DISTANCE between terminations of the impedance meet requirements of SUPPLEMENTARY INSULATION of 6.7		N/A
6.6	Connections to external circuits	Equipment does not have connections to external circuits.	N/A
6.6.1	Connections do not cause ACCESSIBLE parts of the following to become HAZARDOUS LIVE in NORMAL CONDITION or SINGLE FAULT CONDITION:		—
	– the external circuits		N/A
	– the equipment		N/A
	Protection achieved by separation of circuits; or		N/A
	short circuit of separation does not cause a HAZARD		N/A
	Instructions or markings for each terminal include:		—
	a) RATED conditions for TERMINAL		N/A
	b) Required RATING of external circuit insulation		N/A
6.6.2	TERMINALS for external circuits		N/A
	TERMINALS which receive a charge from an internal capacitor are not HAZARDOUS LIVE after 10 s of interrupting supply connection		N/A
6.6.3	Circuits with terminals which are HAZARDOUS LIVE		N/A
	These circuits are:		—
	Not connected to ACCESSIBLE conductive parts; or		N/A
	Connected to ACCESSIBLE conductive parts, but are not MAINS CIRCUITS and have one TERMINAL contact at earth potential		N/A
	No ACCESSIBLE conductive parts are HAZARDOUS LIVE		N/A
6.6.4	ACCESSIBLE terminals for stranded conductors		N/A
	No RISK of accidental contact because:		—
	– Located or shielded		N/A
	– Self-evident or marked whether or not connected to ACCESSIBLE conductive parts		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	ACCESSIBLE TERMINALS will not work loose		N/A
6.7	Insulation requirements		P
6.7.1	The nature of insulation		—
6.7.1.1	Insulation between ACCESSIBLE parts or between separate circuits consist of CLEARANCES, CREEPAGE DISTANCES and solid insulation if provided as protection against a HAZARD	Insulation performance verified by field dielectric withstand test.	P
6.7.1.2	CLEARANCES		—
	Required CLEARANCES reflecting factors of 6.7.1.1	Clearances not evaluated. Dielectric withstand test used to verify acceptable clearances in equipment.	P
	Equipment rated for operating altitude greater than 2000 m correction factor of Table 3 of 61010-1 applied	Equipment not rated for altitudes above 2000 m.	N/A
6.7.1.3	CREEPAGE DISTANCES		—
	Required CREEPAGE DISTANCES reflecting factors of 6.7.1.1 a) to d)	Creepage distances not evaluated as Dielectric withstand test used to verify acceptable creepage distances in equipment.	P
	CTI material group reflected by requirements		N/A
	CTI test performed		N/A
6.7.1.4	Solid insulation	Wiring and components in mains circuits are UL listed or recognized.	—
	Required solid insulation reflecting factors of 6.7.1.1 a) to d)		N/A
6.7.1.5	Requirements for insulation according to type of circuit	Insulation of primary circuits verified by field dielectric withstand test.	—
	a) 6.7.2 MAINS circuits of OVERVOLTAGE CATEGORY II up to nominal supply voltage of 300 V	For equipment rated for 480V Annex K applies. For equipment rated for 208V, 6.7.2 applies: Test voltage 2280 VDC, for 60 sec.	P
	b) 6.7.3 secondary circuits separated from circuits defined in a) by transformer	Secondary circuits are separated from mains circuits by a listed switching mode power supply.	N/A
	c) K.1 MAINS circuits of OVERVOLTAGE CATEGORY III and IV or OVERVOLTAGE CATEGORY II over 300 V	For equipment which is Overvoltage Category II with a nominal supply voltage of 480 VAC. Test voltage 2210 VAC, for 60 sec.	P
	d) K.2 secondary circuits separated from circuits defined in c) by transformer		N/A
	e) K.3 circuits having one or more of:		—
	1) maximum TRANSIENT OVERVOLTAGE is limited to known level below the level of MAINS CIRCUIT		N/A
	2) maximum TRANSIENT OVERVOLTAGE above the level of MAINS CIRCUIT		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	3) WORKING VOLTAGE is the sum of more than one circuit or a mixed voltage		N/A
	4) WORKING VOLTAGE includes recurring peak voltage, may include non-sinusoidal or non-periodic waveform		N/A
	5) WORKING VOLTAGE with a frequency above 30 kHz		N/A
6.7.2	Insulation for MAINS CIRCUITS of OVERVOLTAGE CATEGORY II with a nominal supply voltage up to 300 V	For equipment rated for 208V, 6.7.2 applies: Test voltage 2280 VDC, for 60 sec.	P
6.7.2.1	CLEARANCES and CREEPAGE DISTANCES		—
	Values for MAINS CIRCUITS of Table 4 are met		N/A
	Coatings to achieve reduction to POLLUTION DEGREE 1 comply with requirements of Annex H		N/A
6.7.2.2	Solid insulation		—
6.7.2.2.1	Withstands electrical and mechanical stresses in normal use and all RATED environmental conditions of 1.4		N/A
	Equipment passed voltage tests of 6.8.3 with values of Table 5		P
	Complies as applicable:		—
	a) ENCLOSURE or PROTECTIVE BARRIER of Clause 8		N/A
	b) moulded and potted parts requirements of 6.7.2.2.2		N/A
	c) inner layers of printed wiring boards requirements of 6.7.2.2.3		N/A
	d) thin-film insulation requirements of 6.7.2.2.4		N/A
6.7.2.2.2	Moulded and potted parts		—
	Conductors between same two layers are separated by at least 0,4 mm after moulding is completed		N/A
6.7.2.2.3	Inner insulating layers of printed wiring boards	Equipment not evaluated for inner insulation layers of printed wiring boards Integral to certified electronics or passed end product hipot testing.	—
	Separated by at least 0,4 mm between same two layers		N/A
	REINFORCED INSULATION have adequate electric strength; one of following methods used:		—
	a) thickness of insulation is at least 0,4 mm		N/A
	b) insulation is assembled of minimum two separate layers, each RATED for test voltage of Table 5 for BASIC INSULATION		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	c) insulation is assembled of minimum two separate layers, where the combination is rated for test voltage of Table 5 for REINFORCED INSULATION		N/A
6.7.2.2.4	Thin-film insulation	Equipment not evaluated for thin-film insulation Integral to certified electronics or passed end product hipot testing.	—
	Conductors between same two layers are separated by applicable CLEARANCES and CREEPAGE DISTANCE of 6.7.2.1		N/A
	REINFORCED INSULATION have adequate electric strength; one of following methods used:		—
	a) thickness through the insulation at least 0,4 mm		N/A
	b) insulation is assembled of min two separate layers, each RATED for test voltage of Table 5 for BASIC INSULATION		N/A
	c) insulation is assembled of min three separate layers, where the combination of two layers passed voltage tests of 6.8.3 with values of Table 5 for REINFORCED INSULATION		N/A
6.7.3	Insulation for secondary circuits derived from MAINS CIRCUITS of OVERVOLTAGE CATEGORY II up to 300 V	limited SEMI S2, 13.4 evaluation, therefore, secondary circuits insulation not evaluated.	N/A
6.7.3.1	Secondary circuits where separation from MAINS CIRCUITS is achieved by a transformer providing:		—
	– REINFORCED INSULATION		N/A
	– DOUBLE INSULATION		N/A
	– screen connected to the PROTECTIVE CONDUCTOR TERMINAL		N/A
6.7.3.2	CLEARANCES		—
	a) meet the values of Table 6 for BASIC INSULATION and SUPPLEMENTARY INSULATION; or		N/A
	twice the values of Table 6 for REINFORCED INSULATION		N/A
	or		—
	b) pass the voltage tests of 6.8 with values of Table 6;		—
	with following adjustments:		—
	1) values for reinforced insulation are 1,6 times the values for basic insulation		N/A
	2) if operating altitude is greater than 2000 m .....values of CLEARANCES multiplied with factor of Table 3		N/A
	3) minimum CLEARANCE is 0,2 mm for POLLUTION DEGREE 2 and 0,8 mm for POLLUTION DEGREE 3		N/A



IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
6.7.3.3	CREEPAGE DISTANCES		—
	Based on WORKING VOLTAGE meets the values of Table 7 for BASIC and SUPPLEMENTARY INSULATION		N/A
	Values for REINFORCED INSULATION are twice the values of BASIC INSULATION		N/A
	Coatings to achieve reduction to POLLUTION DEGREE 1 comply with requirements of Annex H		N/A
6.7.3.4	Solid insulation	Equipment not evaluated for solid insulation	—
6.7.3.4.1	Withstands electrical and mechanical stresses in normal use and all RATED environmental conditions of 1.4		—
	a) Equipment passed voltage test of 6.8.3.1 for 5 s with VALUES of Table 6 for BASIC and SUPPLEMENTARY INSULATION		N/A
	values for REINFORCED INSULATION are 1,6 times the values of BASIC INSULATION		N/A
	b) if WORKING VOLTAGE exceeds 300 V, equipment passed voltage test of 6.8.3.1 for 1 min with a test voltage of 1,5 times working voltage for BASIC or SUPPLEMENTARY INSULATION		N/A
	value for REINFORCED INSULATION are twice the WORKING VOLTAGE		N/A
	Complies as applicable:		—
	1) ENCLOSURE or PROTECTIVE BARRIER of Clause 8		N/A
	2) moulded and potted parts requirements of 6.7.3.4.2		N/A
	3) inner layers of printed wiring boards requirements of 6.7.3.4.3		N/A
	4) thin-film insulation requirements of 6.7.3.4.4		N/A
6.7.3.4.2	Moulded and potted parts	Equipment not evaluated for moulded or potted parts	—
	Conductors between same two layers are separated by applicable distances of Table 8		N/A
6.7.3.4.3	Inner insulation layers of printed wiring boards	Equipment not evaluated for inner insulation layers of printed wiring boards	—
	Separated by at least by applicable distances of Table 8 between same two layers		N/A
	REINFORCED INSULATION have adequate electric strength; one of following methods used:		—
	a) thickness at least applicable distance of Table 8		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) insulation is assembled of minimum two separate layers, each RATED for test voltage of Table 6 for BASIC INSULATION		N/A
	c) insulation is assembled of min two separate layers, where the combination is RATED for 1,6 times the test voltage of Table 6		N/A
6.7.3.4.4	Thin-film insulation	Equipment not evaluated for thin-film insulation	—
	Conductors between same two layers are separated by applicable CLEARANCES and CREEPAGE DISTANCE of 6.7.3.2 and 6.7.3.3		N/A
	REINFORCED INSULATION have adequate electric strength; one of following methods used:		—
	a) thickness at least applicable distance of Table 8		N/A
	b) insulation is assembled of min. two separate layers, each RATED for test voltage of Table 6 for BASIC INSULATION		N/A
	c) insulation is assembled of min. three separate layers, where the combination of two layers passed voltage tests with 1,6 time values of Table 6:		—
	a.c. test of 6.8.3.1; or		N/A
	d.c. test of 6.8.3.2 for circuits stressed only by d.c. voltages		N/A
6.8	Procedure for dielectric strength tests	Equipment was tested at 2210 Vac [2280VDC for 208V system] for 1 minute. Humidity pre-conditioning not performed for limited SEMI S2, 13.4 evaluation.	P
6.9	Constructional requirements for protection against electric shock		P
6.9.1	If a failure could cause a HAZARD:		—
	a) security of wiring connections	Wiring is secured with screws.	P
	b) screws securing removable covers	Screws are secure away from hazardous live parts.	P
	c) accidental loosening	Wiring and screws are secured.	P
	d) CLEARANCES and CREEPAGE DISTANCES not reduced below the values of basic insulation by loosening of parts or wires	Wiring and screws are secured so wiring and parts do not become loose that can reduce creepage and clearance distances.	P
6.9.2	Insulating materials		P
	Material not to be used for safety relevant insulation:		—
	a) easily damaged materials not used	Not used in equipment.	P

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) non-impregnated hygroscopic materials not used	Not used in equipment.	P
6.9.3	Colour coding		P
	Green-and-yellow insulation shall not be used except:		—
	a) protective earth conductors;	Protective earth conductors use green/yellow insulation.	P
	b) PROTECTIVE BONDING conductors;	Protective Bonding conductors use green/yellow insulation.	P
	c) potential equalization conductors;	Potential equalization conductors not used in equipment.	N/A
	d) functional earth conductors	Functional earth conductors not used in equipment.	N/A
6.10	Connection to MAINS supply source and connections between parts of equipment	Equipment is permanently connected. Mains supply cord not supplied with equipment.	N/A
6.10.1	MAINS supply cords		—
	RATED for maximum equipment current (see 5.1.3 c)		N/A
	Cable complies with IEC 60227 or IEC 60245		N/A
	Heat-resistant if likely to contact hot parts		N/A
	Temperature RATING (cord and inlet) .....		—
	Green/yellow used only for connection to PROTECTIVE CONDUCTOR TERMINALS		N/A
	Detachable cords with IEC 60320 MAINS connectors:		—
	Conform to IEC 60799; or		N/A
	Have the current RATING of the MAINS connector		N/A
6.10.2	Fitting of non-detachable MAINS supply cords	None provided.	—
6.10.2.1	Cord entry		—
	a) inlet or bushing with a smoothly rounded opening; or		N/A
	b) insulated cord guard protruding >5 D (diameter)		N/A
6.10.2.2	Cord anchorage		—
	Protective earth conductor is the last to take the strain		N/A
	a) cord is not clamped by direct pressure from a screw		N/A
	b) knots are not used		N/A
	c) cannot push the cord into the equipment to cause a HAZARD		N/A
	d) no failure of cord insulation in anchorage with metal parts		N/A
	e) not to be loosened without a tool		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	f) cord replacement does not cause a HAZARD and method of strain relief is clear		N/A
	Push-pull and or torque test		N/A
6.10.3	Plugs and connectors	Equipment is permanently connected. Mains supply cord not supplied with equipment.	N/A
	MAINS supply plugs, connectors etc., conform with relevant specifications		N/A
	If equipment supplied at voltages below 6.3.2.a) or from a sole source:		—
	Plugs of supply cords do not fit MAINS sockets above rated SUPPLY voltage		N/A
	MAINS type plugs used only for connection to MAINS supply		N/A
	Plug pins which receive a charge from an internal capacitor		N/A
	Accessory MAINS socket outlets:		—
	a) marking if accepts a standard MAINS supply plug (see 5.1.3e)		N/A
	b) input has a protective earth conductor if outlet has EARTH TERMINAL CONTACT		N/A
6.11	Disconnection from supply source	Equipment uses a circuit breaker for disconnection from the supply source.	P
6.11.1	Disconnects all current-carrying conductors	Circuit breaker disconnects all ungrounded conductors.	P
6.11.2	Exceptions	No exceptions for the equipment.	N/A
6.11.3	Requirements according to type of equipment		—
6.11.3.1	PERMANENTLY CONNECTED EQUIPMENT and multi-phase equipment	Equipment is permanently connected, 3 phase.	P
	Employs switch or circuit-breaker	Equipment employs a circuit breaker that is part of the equipment.	P
	If switch or circuit-breaker is not part of the equipment, documentation requires:		—
	a) switch or circuit-breaker to be included in building installation		N/A
	b) suitable location easily reached		N/A
	c) marking as disconnecting for the equipment		N/A
6.11.3.2	Single-phase cord-connected equipment	Equipment is permanently connected.	N/A
	Equipment is provided with one of the following:		—
	a) switch or circuit-breaker		N/A
	b) appliance coupler (disconnectable without tool)		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	c) separable plug (without locking device)		N/A
6.11.4	Disconnecting devices	Equipment uses a circuit breaker as the disconnecting device.	P
6.11.4.1	Disconnecting device part of equipment	The disconnecting device is part of the equipment.	P
	Electrically close to the SUPPLY	The disconnecting device is electrically close to the supply.	P
	Power-consuming components not electrically located between the supply source and the disconnecting device		P
	Except electromagnetic interference suppression circuits permitted to be located on the supply side of the disconnecting device	Electromagnetic interference suppression circuits are not used between the supply and the mains disconnecting device.	N/A
6.11.4.2	Switches and circuit-breakers	Equipment uses a circuit breaker as the disconnecting device.	P
	When used as disconnection device:		—
	Meets applicable parts of IEC 60947-1 and IEC 60947-3	Circuit breaker is UL listed, IEC 60947-2 compliant as isolation device.	P
	Marked to indicate function .....	Marked to indicate function.	—
	Not incorporated in MAINS cord	Circuit breaker is not part of the MAINS cord.	P
	Does not interrupt PROTECTIVE EARTH CONDUCTOR	Circuit breaker does not interrupt PROTECTIVE EARTH CONDUCTOR	P
6.11.4.3	Appliance couplers and plugs	Appliance couplers or plugs not used as the disconnecting device.	N/A
	Where an appliance coupler or separable plug is used as the disconnecting device (see 6.11.3.2):		—
	Readily identifiable and easily reached by the operator		N/A
	Single-phase portable equipment cord length not more than 3 m		N/A
	PROTECTIVE EARTH CONDUCTOR connected first and disconnected last		N/A

7	PROTECTION AGAINST MECHANICAL HAZARDS		P
7.1	Equipment does not cause a mechanical HAZARD in NORMAL nor in SINGLE FAULT CONDITION		P
	Conformity is checked by 7.2 to 7.7		P
7.2	Sharp edges	Equipment has no sharp edges.	P
	Easily touched parts are smooth and rounded	Enclosure edges are smooth and rounded.	P
	Do not cause injury during NORMAL USE and		P

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Do not cause injury during SINGLE FAULT CONDITION	No single fault tests performed for limited SEMI S2, 13.4 evaluation. Enclosure edges are expected to remain smooth and rounded during the life of the equipment. Reasonably foreseeable single fault conditions not likely to cause sharp edges.	P
7.3	Moving parts		P
7.3.1	HAZARDS from moving parts limited to a tolerable level with the conditions specified in 7.3.2 and 7.3.5	Moving parts of the equipment are limited to cooling fans only and are enclosed behind physical barriers, which require the use of a tool to remove them.	P
	RISK assessment in accordance with 7.3.3 carried out		N/A
7.3.2	Exceptions		N/A
	Access to HAZARDOUS moving parts permitted under following circumstances:		—
	a) obviously intended to operate on parts or materials external of the equipment		N/A
	inadvertent touching of moving parts minimized by equipment design (e.g. guards or handles)		N/A
	b) If OPERATOR access is unavoidable outside NORMAL USE following precautions have been taken:		—
	1) access requires TOOL		N/A
	2) statement about training in the instructions		N/A
	3) warning markings on covers prohibiting access by untrained OPERATORS		N/A
	or symbol 14 with full details in documentation		N/A
7.3.3	RISK assessment for mechanical HAZARDS to body parts	Access to moving parts is physically guarded under normal use.	N/A
	RISK is reduced to a tolerable level by protective measures as specified in table 12	Table 12 not used to assess risk.	N/A
	Minimum protective measures:		—
	A. Low level measures		N/A
	B. Moderate measures		N/A
	C. Stringent measures		N/A
7.3.4	Limitation of force and pressure	Limitations of force and pressure not used to assess risk.	N/A
	Following levels are met in NORMAL and SINGLE FAULT CONDITION:		—
	Continuous contact pressure below 50 N / cm <sup>2</sup> with force below 150 N		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Temporary force below 250 N for an area at least of 3 cm <sup>2</sup> for a maximum duration of 0,75 s		N/A
7.3.5	Gap limitations between moving parts	Gap limitations between moving parts not used to assess risk	N/A
7.3.5.1	Access normally allowed	Access normally prevented.	—
	If levels of 7.3.4 exceeded and body part may be inserted minimum gap as specified in table 13 assured in NORMAL and in SINGLE FAULT CONDITION		N/A
7.3.5.2	Access normally prevented	Access normally prevented.	—
	Maximum gap as specified in table 14 assured in NORMAL and in SINGLE FAULT CONDITION		N/A
7.4	Stability	Equipment maintains stability.	P
	Equipment not secured to building structure is physical stable	Equipment is physically stable when not secured to the building structure.	P
	Stability maintained after opening of drawers etc. by automatic means, or	Opening equipment doors does not impair stability.	P
	warning marking requires the application of means		N/A
	Compliance checked by following tests as applicable:		—
	a) 10° tilt test for other than handheld equipment	Equipment documentation includes installation procedures to seismically secure the equipment to the building structure. Intertek witnessed tilt test on 208V model – 15.9°.	P
	b) multi-directional force test for equipment exceeds height of 1 m and mass of 25 kg		N/A
	c) downward force test for floor-standing equipment	No horizontal working surfaces.	N/A
	d) overload test with 4 times maximum load for castor or support that supports greatest load	Equipment documentation includes installation procedures to seismically secure the equipment to the building structure.	N/A
	e) castor or support that supports greatest load removed from equipment		N/A
7.5	Provisions for lifting and carrying	Equipment fitted with lifting eyes.	P
7.5.1	Equipment more than 18 kg :	Equipment weighs more than 18kg.	—
	Has means for lifting or carrying; or	Equipment fitted with lifting eyes that are shown in the documents.	P
	Directions in documentation		N/A
7.5.2	Handles and grips		—
	Handles or grips withstand four times weight	Handles not used for lifting.	N/A
7.5.3	Lifting devices and supporting parts		—
	RATED for maximum load; or	Lifting eyes rated for the maximum load.	P

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	tested with four times maximum static load		N/A
7.6	Wall mounting	Equipment is not wall mountable.	N/A
	Mounting brackets withstand four times weight		N/A
7.7	Expelled parts		P
	Equipment contains or limits the energy	Moving parts of the equipment are limited to cooling fans only and are enclosed behind physical barriers, which require the use of a tool to remove them. Pressurized parts similarly enclosed.	P
	Protection not removable without the aid of a tool		P

8	RESISTANCE TO MECHANICAL STRESSES		P
8.1	Equipment does not cause a HAZARD when subjected to mechanical stresses in NORMAL USE	Equipment enclosure is constructed of metal with adequate strength and rigidity.	P
	Normal protection level is 5 J	5 J is the default energy level for the equipment enclosure.	P
	Levels below 5 J but not less than 1 J are acceptable if all of following criteria are met:		—
	a) lower level justified by RISK assessment of manufacturer		N/A
	b) equipment installed in its intended application is not easily touched		N/A
	c) only occasional access during NORMAL USE		N/A
	d) IK code in accordance to IEC 62262 marked or symbol 14 used with full information in the documentation		N/A
	for non-metallic ENCLOSURES rated below 2 °C ambient temperature value chosen for minimum RATED temperature		N/A
	impact energies between IK values, the IK code marked for nearest lower value		N/A
	Conformity is checked by performing following tests:		—
	1) static test of 8.2.1	Enclosures are made of rigid metal panels.	N/A
	2) impact test of 8.2.2 with 5 J except for HAND-HELD EQUIPMENT		N/A
	if impact energy not selected to 5 J alternate method of IEC 62262 used		N/A
	3) drop test of 8.3.1 or 8.3.2 except for FIXED EQUIPMENT and equipment with mass over 100 kg	Mass of equipment exceeds 100kg.	N/A
	Equipment RATED with an impact rating of IK 08 that obviously meets the criteria	Equipment enclosure not specified to have an impact rating of IK 08.	N/A



IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	After the tests inspection with following results:	Enclosures are made of rigid metal panels.	—
	– HAZARDOUS LIVE parts above the limits of 6.3.2 not ACCESSIBLE		N/A
	– insulation pass the voltage tests of 6.8		N/A
	i) no leaks of corrosive and harmful substances		N/A
	ii) ENCLOSURE shows no cracks resulting in a HAZARD		N/A
	iii) CLEARANCES not less than their permitted values		N/A
	iv) insulation of internal wiring remains undamaged		N/A
	v) PROTECTIVE BARRIERS not damaged or loosened		N/A
	vi) No moving parts exposed, except permitted by 7.3		N/A
	vii) no damage which could cause spread of fire		N/A
8.2	ENCLOSURE rigidity test		N/A
8.2.1	Static test	limited SEMI S2, 13.4 evaluation. Test not performed but the enclosures are made of rigid metal panels. It is expected that the results of this test would pass and integrity of safeguards would remain in place after the test.	N/A
	– 30 N with 12 mm rod to each part of ENCLOSURE		N/A
	– in case of doubt test conducted at maximum RATED ambient temperature		N/A
8.2.2	Impact test	Refer to 8.2.1.	N/A
	Impact applied to any part of ENCLOSURE causing a HAZARD if damaged		N/A
	Impact energy level and corresponding IK code .....		—
	Non-metallic ENCLOSURES cooled to minimum RATED ambient temperature if below 2 °C		N/A
8.3	Drop test	Equipment is >100kg.	N/A
8.3.1	Other than HAND-HELD and DIRECT-PLUG-IN EQUIPMENT		N/A
	Tests conducted with a drop height or angle of .....		—
8.3.2	HAND-HELD and DIRECT-PLUG-IN EQUIPMENT	Not hand held or direct plug in.	—
	Non-metallic ENCLOSURES cooled to minimum RATED ambient temperature if below 2 °C		N/A
	Drop test conducted with an height of 1 m		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
9	PROTECTION AGAINST THE SPREAD OF FIRE		P
9.1	No spread of fire in NORMAL and SINGLE FAULT CONDITION	Normal conditions evaluated Single fault conditions evaluated.	P
	MAINS supplied equipment meets requirements of 9.6 additionally	Equipment is protected by a circuit breaker.	P
	Conformity is checked by minimum one or a combination of the following (see Figure 11):		—
	a) SINGLE FAULT test of 4.4; or	Fans stopped, controller overridden.	P
	b) Application of 9.2 (eliminating or reducing the sources of ignition); or	Ignition sources not evaluated.	N/A
	c) Application of 9.3 (containment of fire within the equipment)	Sources of ignition are enclosed in fire enclosures.	P
9.2	Eliminating or reducing the sources of ignition within the equipment	Ignition sources not evaluated	N/A
	a) 1) Limited-energy circuit (see 9.4); or		N/A
	b) 2) BASIC INSULATION provided for parts of different potential; or		N/A
	Bridging the insulation does not cause ignition		N/A
	c) Surface temperature of liquids and parts (see 9.5)		N/A
	d) No ignition in circuits designed to produce heat		N/A
9.3	Containment of the fire within the equipment, should it occur	Equipment uses enclosure construction to protect against the spread of fire.	P
9.3.1	Spread of fire outside equipment reduced to a tolerable level if:		—
	a) Energizing of the equipment is controlled by an OPERATOR held switch	Energizing of equipment is not controlled by an operator held switch.	N/A
	b) ENCLOSURE is conform with constructional requirements of 9.3.2; and	Equipment uses enclosure construction to protect against the spread of fire.	P
	Requirements of 9.5 are met	Equipment does not use flammable liquids.	N/A
9.3.2	Constructional requirements		—
	a) Connectors and insulating material have flammability classification V-2 or better	Connectors are recognized components.	P
	b) Insulated wires and cables are flame retardant (VW-1 or equivalent)	Recognized insulated wiring is used by the equipment .	P
	c) ENCLOSURE meets following requirements:		—

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	1) Bottom and sides in arc of 5 ° (see Figure 13) to non-limited circuits (9.4) meets:	No enclosure openings are within an arc of 5 ° to Non-limited energy circuits or openings are blocked by fan body.	—
	i) no openings; or		N/A
	ii) perforated as specified in table 16; or		N/A
	iii) metal screen with a mesh; or		N/A
	iv) baffles as specified in Figure 12		N/A
	2) Material of ENCLOSURE and any baffle or flame barrier is made of:		—
	Metal (except magnesium); or	Enclosure is made of metal.	P
	Non-metallic materials have flammability classification V-1 or better		N/A
	3) ENCLOSURE and any baffle or flame barrier have adequate rigidity	Metal enclosures are adequately rigid.	P
9.4	Limited-energy circuit	Protection against the spread of fire does not rely on the use of limited energy circuits.	N/A
	a) Potential not more than 30 r.m.s. and 42,4 V peak, or 60 V dc		N/A
	b) Current limited by one of following means:		—
	1) Inherently or by impedance (see table 17); or		N/A
	2) Overcurrent protective device (see table 18); or		N/A
	3) A regulating network limits also in SINGLE FAULT CONDITION (see table 17)		N/A
	c) Is separated by at least BASIC INSULATION		N/A
	Fuse or a nonadjustable electromechanical device is used		N/A
9.5	Requirements for equipment containing or using flammable liquids	Equipment does not operate with flammable liquids.	N/A
	Flammable liquids contained in or specified for use with equipment do not cause spread of fire		N/A
	RISK is reduced to a tolerable level:		—
	a) The temperature of surface or parts in contact with flammable liquids is 25 °C below fire point		N/A
	b) The quantity of liquid is limited		N/A
	c) Flames are contained within the equipment		N/A
	Detailed instructions for RISK-reduction provided		N/A
9.6	Overcurrent protection		P
9.6.1	MAINS supplied equipment protected	Circuit breaker is used as the overcurrent protection device.	P

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	BASIC INSULATION between MAINS parts of opposite polarity provided	Basic insulation between ungrounded conductors.	P
	Devices not in the protective conductor	Overcurrent protection device is not placed in the protective conductor.	P
	Fuses or single-pole circuit-breakers not fitted in neutral (multi-phase)	Single-pole circuit-breakers not fitted in neutrals.	P
9.6.2	PERMANENTLY CONNECTED EQUIPMENT	Equipment is permanently connected.	P
	Overcurrent protection device:	225A circuit breaker – 480V, 144kW 325A circuit breaker – 208V, 80kW.	—
	Fitted within the equipment; or	Fitted within the equipment.	P
	Specified in manufacturer's instructions		N/A
9.6.3	Other equipment		—
	Protection within the equipment	Overcurrent protection is within the equipment.	P

10	EQUIPMENT TEMPERATURE LIMITS AND RESISTANCE TO HEAT		P
10.1	Surface temperature limits for protection against burns	Refer to Temperature Limits Test Data.	P
	Easily touched surfaces within the limits in NORMAL and in SINGLE FAULT CONDITION:	Equipment evaluated under normal conditions and single fault conditions.	—
	– at an specified ambient temperature of 40 °C	Evaluation done at room ambient.	N/A
	– for equipment rated above 40 °C ambient temperature limits not exceeded raised by the difference to 40 °C		N/A
	Heated surfaces necessary for functional reasons exceeding specified values:	Equipment does not use heated surfaces for functional reasons	—
	– Are recognizable as such by appearance or function; or		N/A
	– Are marked with symbol 13		N/A
	– Guards are not removable without tool		N/A
10.2	Temperatures of windings	Listed power supplies used in equipment. No power transformers used.	N/A
	Limits not exceeded in:		—
	NORMAL CONDITION		N/A
	SINGLE FAULT CONDITION		N/A
10.3	Other temperature measurements	No other measurements applicable.	N/A
	Following measurements conducted if applicable:		—
	a) Value of 60 °C of field-wiring terminal box not exceeded		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	b) Surface of flammable liquids and parts in contact with this liquids		N/A
	c) Surface of non-metallic ENCLOSURES		N/A
	d) Parts made of insulating material supporting parts connected to MAINS supply		N/A
	e) Terminals carrying a current more than 0,5 A		N/A
10.4	Conduct of temperature tests	Equipment was tested at the Manufacturer's facility	P
10.4.1	Tests conducted under reference test conditions and manufacturer's instructions		P
10.4.2	Temperature measurement of heating equipment	Equipment was tested at the Manufacturer's facility.	N/A
	Tests conducted in test corner		N/A
10.4.3	Equipment intended for installation in a cabinet or wall	Equipment is not installed in a cabinet or wall.	N/A
	Equipment built in as specified in installation instructions		N/A
10.5	Resistance to heat		P
10.5.1	Integrity of CLEARANCE and CREEPAGE DISTANCES	Limited SEMI S2, 13.4 evaluation, insulation of primary circuits verified by field dielectric withstand test.	P
10.5.2	Non-metallic ENCLOSURES	Non-metallic enclosures not used as fire enclosures.	N/A
	Within 10 min after treatment:		—
	Equipment subjected to suitable stresses of 8.2 and 8.3 complying with criteria of 8.1	Non-metallic enclosures not used as fire enclosures.	N/A
10.5.3	Insulating material	Equipment wiring and terminal insulation are UL recognized.	P
	a) Parts supporting parts connected to MAINS supply		N/A
	b) TERMINALS carrying a current more than 0,5 A		N/A
	Examination of material data; or		N/A
	in case of doubt:		N/A
	1) Ball pressure test; or		N/A
	2) Vicat softening test of ISO 306		N/A
11	PROTECTION AGAINST HAZARDS FROM FLUIDS		P
11.1	Protection to OPERATORS and surrounding area provided by EQUIPMENT	Equipment heats DI water which is circulated through the system by an external source. Clean Dry Air is used to actuate valves.	P
	All fluids specified by manufacturer considered	No additional fluids considered.	N/A
11.2	Cleaning	Cleaning not specified or required.	N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
11.3	Spillage	Equipment does not require filling of reservoirs.	N/A
11.4	Overflow	Equipment does not require filling of reservoirs.	N/A
11.5	Battery electrolyte	No batteries used.	N/A
	Battery electrolyte leakage presents no HAZARD		N/A
11.6	Specially protected equipment	Equipment does not have an IEC 60529 rating.	N/A
11.7	Fluid pressure and leakage		P
11.7.1	Maximum pressure .....	480V: 100 psi (CDA) 208V: 45-75 psig CDA, 15-60 psig DIW.	—
	Maximum pressure of any part does not exceed P <sub>RATED</sub>	Tubing is rated for twice the maximum working pressure.	P
11.7.2	Leakage and rupture at high pressure		—
	Fluid-containing parts subjected to hydraulic test if ...		—
	a) product of pressure and volume > 200 kPa; and		N/A
	b) pressure > 50 kPa		N/A
	Parts of refrigerating systems meets pressure-related requirements of IEC 60335-24 or IEC 60335-2-89	Refrigerants not used.	N/A
11.7.3	Leakage from low-pressure parts	Gases pressures are greater than 50 kPa.	N/A
11.7.4	Overpressure safety device	Equipment does use an overpressure safety device.	P
	Does not operate in NORMAL USE	Does not operate in NORMAL USE.	P
	a) Connected as close as possible to parts intended to be protected	Connected at source.	P
	b) Easy access for inspection, maintenance and repair	Easily accessed from rear of system.	P
	c) Adjustment only with TOOL	Tool required to adjust.	P
	d) No discharge towards person	Discharge through drain line	P
	e) No HAZARD from deposit of discharged material	Discharge directed so as to not cause a hazard.	P
	f) Adequate discharge capacity	Discharge to facility drain.	P
	No shut-off valve between overpressure safety device and protected parts	No shut off valve.	P
12	PROTECTION AGAINST RADIATION, INCLUDING LASER SOURCES, AND AGAINST SONIC AND ULTRASONIC PRESSURE		P
12.1	Equipment provides protection	Equipment does not use lasers or produce radiation.	N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
12.2	Equipment producing ionizing radiation	Equipment does not produce ionizing radiation.	N/A
12.2.1	Ionizing radiation		N/A
12.2.1.1	Equipment meets the following requirements:		—
	a) if intended to emit radiation meets requirements of 12.2.1.2; or		N/A
	tested, classified and marked in accordance to IEC 60405		N/A
	b) if only emits stray radiation meets requirements of 12.2.1.3		N/A
12.2.1.2	Equipment intended to emit radiation	Equipment is not intended to produce radiation.	—
	Effective dose rate of radiation measured .....		—
	If dose rate exceeds 5 $\mu\text{Sv/h}$ marked with the following:		—
	a) symbol 17 (ISO 361)		N/A
	b) abbreviations of the radionuclides .....		—
	c) with maximum dose at 1 m; or .....		—
	with dose rate value between 1 $\mu\text{Sv/h}$ and 5 $\mu\text{Sv/h}$ in m .....		—
12.2.1.3	Equipment not intended to emit radiation		—
	Limit for unintended stray radiation of 1 $\mu\text{Sv/h}$ at any easily reached point kept .....		—
12.2.2	Accelerated electrons	Equipment does not produce accelerated electrons.	—
	Compartments opened only by the use of a TOOL		N/A
12.3	Ultraviolet (UV) radiation	Equipment does not produce UV radiation.	N/A
	No unintentional HAZARDOUS escape of UV radiation:		—
	– checked by inspection; and		N/A
	– evaluation of RISK assessment documentation		N/A
12.4	Microwave radiation	Equipment does not produce microwave radiation.	N/A
	Power density does not exceed 10 $\text{W/m}^2$ .....		N/A
12.5	Sonic and ultrasonic pressure	Equipment produces sonic pressure from cooling fans and water rush.	P
12.5.1	Sound level		—
	No HAZARDOUS sound emission	Worst case measured sound pressure level was below 80 dB(A).	P

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Maximum sound pressure level measured and calculated for maximum sound power level as specified in ISO 3746 or ISO 9614-1	Measured sound pressure level was 69.2 dB(A) from the rear of the 480V equipment, 78.7 dB(A) (uncorrected) from the right side of the 208V equipment.	P
	Instruction describes measures for protection		N/A
12.5.2	Ultrasonic pressure	Equipment does not produce ultrasonic pressure.	N/A
	Equipment not intended to emit ultrasound does not exceed limit of 110 dB between 20 kHz and 100 kHz		N/A
	Equipment intended to emit ultrasound:		N/A
	Outside useful beam does not exceed limit of 110 dB between 20 kHz and 100 kHz		N/A
	If inside useful beam above values exceeded:		—
	Marked with Symbol 14 of table 1		N/A
	and following information in the documentation:		—
	a) dimensions of useful beam		N/A
	b) area where ultrasonic pressure exceed 110 dB		N/A
	c) maximum sound pressure inside beam area		N/A
12.6	Laser sources	Equipment does not contains laser sources.	N/A
	Equipment meets requirements of IEC 60825-1		N/A

13	PROTECTION AGAINST LIBERATED GASES AND SUBSTANCES, EXPLOSION AND IMPLOSION		P
13.1	Poisonous and injurious gases and substances	Equipment does not use poisonous or injurious gases or substances.	N/A
	No poisonous or injurious gases or substances liberated in NORMAL CONDITION		N/A
	Attached data/test reports demonstrate conformity		N/A
13.2	Explosion and implosion	Clean Dry Air (CDA) and De-ionized Water (DIW) is supplied to equipment controlled by a pressure regulator. Lines and devices are adequately rated for the maximum rated pressure and temperature marked on the equipment.	P
13.2.1	Components		P
	Components liable to explode:		—
	Pressure release device provided; or	Over pressure release device provided.	P



IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Apparatus incorporates operator protection (see also 7.7)	Pressurized parts are enclosed behind physical barriers and are rated for the maximum marked supply pressure..	P
	Pressure release device:	See 11.7.4.	—
	Discharge without danger		N/A
	Cannot be obstructed		N/A
13.2.2	Batteries and battery charging	The equipment does not contain Operator replaceable batteries.	—
	If explosion or fire HAZARD could occur:		—
	Protection incorporated in the equipment; or		N/A
	Instructions specify batteries with built-in protection		N/A
	In case of wrong type of battery used:		—
	No HAZARD; or		N/A
	Warning by marking and within instructions		N/A
	Equipment with means to charge rechargeable batteries:		—
	Warning against the charging of non-rechargeable batteries; and		N/A
	Type of rechargeable battery indicated; or		N/A
	Symbol 14 used		N/A
	Battery compartment design		N/A
	Single component failure		N/A
	Polarity reversal test		N/A
13.2.3	Implosion of cathode ray tubes	Equipment does not use cathode ray tubes.	N/A
	If maximum face dimensions > 160 mm.....		—
	Intrinsically protected and correctly mounted; or		N/A
	ENCLOSURE provides protection:		N/A
	If non-intrinsically protected:		—
	Screen not removable without TOOL		N/A
	If glass screen, not in contact with surface of tube		N/A

14	COMPONENTS AND SUBASSEMBLIES		P
14.1	Where safety is involved, components and subassemblies meet relevant requirements	Components relied upon for safety are either listed or recognized by a Nationally Recognized Testing Laboratory (NRTL)	P
14.2	Motors	No motors used in equipment.	N/A
14.2.1	Motor temperatures		N/A
	Does not present a HAZARD when stopped or prevented from starting; or		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Protected by over-temperature or thermal protection device conform with 14.3		N/A
14.2.2	Series excitation motors	No series excitation motors provided.	N/A
	Connected direct to device, if overspeeding causes a HAZARD		N/A
14.3	Overtemperature protection devices	Over temperature protection devices are NRTL recognized.	P
	Devices operating in a SINGLE FAULT CONDITION		N/A
	a) Reliable function is ensured		N/A
	b) RATED to interrupt maximum current and voltage		N/A
	c) Does not operate in NORMAL USE		N/A
	If self-resetting device used to prevent a HAZARD, protected part requires intervention before restarting	Intervention is required to reset heating.	P
14.4	Fuse holders	Fuse holders not used.	N/A
	No access to HAZARDOUS LIVE parts		N/A
14.5	MAINS voltage selecting devices	Equipment does not use voltage selecting devices.	N/A
	Accidental change not possible		N/A
14.6	MAINS transformers tested outside equipment	Switching mode power supply transformers are recognized components and not tested outside of equipment.	N/A
14.7	Printed circuit boards	Equipment uses recognized components with V-1 or better material.	P
	Data shows conformity with V-1 of IEC 60695-11-10 or better; or		N/A
	Test shows conformity with V-1 of IEC 60695-11-10 or better		N/A
	Not applicable for printed wiring boards with limited-energy circuits (9.4)		N/A
14.8	Circuits or components used as TRANSIENT OVERVOLTAGE limiting devices	No components used as transient overvoltage limiting devices.	N/A
	Test conducted between each pair of MAINS SUPPLY TERMINALS		N/A
	No HAZARD resulting from rupture or overheating of the component:		—
	– no bridging of safety relevant insulation		N/A
	– no heat to other parts above the self-ignition points		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
15	PROTECTION BY INTERLOCKS		P
15.1	Interlocks are designed to remove a HAZARD before OPERATOR exposed	Equipment interlocks were tested by the manufacturer and test results were reviewed or witnessed by Intertek.	P
15.2	Prevention of reactivation	Manual reset required.	P
15.3	Reliability		P
	Single fault unlikely to occur; or	Single fault unlikely; OR	P
	Cannot cause a HAZARD	Likely single faults do not cause a hazard.	P

16	HAZARDS RESULTING FROM APPLICATION		N/A
16.1	REASONABLY FORESEEABLE MISUSE	Software allows temperature settings above maximum recommended, and pressure settings below minimum recommended.	P
	No HAZARDS arising from settings not intended and not described in the instructions	Tested misuse settings.	P
	Other cases of REASONABLY FORESEEABLE MISUSE addressed by RISK assessment		N/A
16.2	Ergonomic aspects	Ergonomic factors within acceptable limits.	P
	Factors giving rise to a HAZARD the RISK assessment is reflecting those aspects:		—
	a) limitation of body dimensions		N/A
	b) displays and indicators		N/A
	c) accessibility and conventions of controls		N/A
	d) arrangement of TERMINALS		N/A

17	RISK ASSESSMENT		N/A
	RISK assessment conducted, if HAZARD might arise and not covered by Clauses 6 to 16	No foreseeable hazard due to compliance with Clauses 6 to 16.	N/A
	TOLERABLE RISK achieved by iterative documented process covering the following:		—
	a) RISK analysis		N/A
	Identifies HAZARDS and estimates RISK		N/A
	b) RISK evaluation		N/A
	Plan to judge acceptability of resulting RISK level based on the estimated severity and likelihood of a RISK		N/A
	c) RISK reduction		N/A
	Initial RISK reduced by counter measures;		N/A

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Repeated RISK evaluation without new RISKS introduced		N/A
	RISKS remaining after RISK assessment addressed in instructions to RESPONSIBLE BODY:		—
	Information contained how to mitigate these RISKS		N/A
	Following principles in methods of RISK reduction applied by manufacturer in given order:		—
	1) RISKS eliminated or reduced as far as possible		N/A
	2) Protective measures taken for RISKS that cannot be eliminated		N/A
	3) User information about residual RISK due to any defect of the protective measures		N/A
	Indication of particular training is required		N/A
	Specification of the need for personal protective equipment		N/A
	Conformity checked by evaluation of the RISK assessment documentation		N/A

ANNEX F	ROUTINE TESTS		N/A
	Manufacturer's declaration	Performed by Manufacturer when required.	N/A

ANNEX H	QUALIFICATION OF CONFORMAL COATINGS FOR PROTECTION AGAINST POLLUTION		N/A
H.1	General	Conformal coatings not used.	N/A
	Conformal coatings meet the requirements of Clause H.2 and H.3.		N/A
H.2	Technical properties		N/A
	Technical properties of conformal coatings are suitable for the intended application. In particular:		—
	a) Manufacturer indicate that it is a coating for PWBs;		N/A
	b) RATED operating temperature include the temperature range of the indicated application;		N/A
	c) CTI, insulation resistance and dielectric strength are suitable for the intended application;		N/A
	d) Coating have adequate UV resistance, if it is exposed to sunlight;		N/A
	e) Flammability RATING of the coating is at least the required flammability RATING of the applied PWB.		N/A
H.3	Qualification of coatings		N/A


IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict
	Coating complies with the conformity requirements.		N/A
ANNEX K	INSULATION REQUIREMENTS NOT COVERED BY CLAUSE 6.7	Equipment insulation requirements are covered by Annex K.	P

Company:	Trebor International	Evaluator	Ron Wellman
Project #:	G102732084	Reviewer:	Larry Todd
Name & model:	NXT Series DI Water Heater Model: QTM2144480A00	Date:	
Manufacturer:	Trebor International	Sample Condition:	Production Unit
Inspection site:	8100 South 1300 West, West Jordan, Utah 84088 USA		
Standard(s):	IEC/EN 61010-1 Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements 3rd Edition		

### Tests Conducted

TEST	STANDARD	SECTION	Pass (P) Fail (F) Not Completed (NC)
Grounding Continuity	IEC 61010-1: 3rd Edition	6.5.2.5	P
Mains Supply	IEC 61010-1: 3rd Edition	5.1.3 c	P
Dielectric Withstand	IEC 61010-1: 3rd Edition	6.8.3.1	P
Temperature Limits	IEC 61010-1: 3rd Edition	10.4	P
Sound Level	IEC 61010-1: 3rd Edition	12.5.1	P

Item	Type of Measurement	Make/Model	Serial/Asset Number	Calibration Date	Calibration Due Date	Validation
1	Temperature	Fluke 561	GS3-1750	08-Jan-2016	08-Jan-2017	Y
2	Ground Continuity	Vitrek V74	ITS-01311	12-Apr-2016	12-Apr-2017	Y
3	Voltage	Fluke 381	GS3-1749	08-Jan-2016	08-Jan-2017	Y
4	Current	Fluke 381	GS3-1749	08-Jan-2016	08-Jan-2017	Y
5	Sound Pressure	Casella CEL-62X	ITS-01216	29FEB2016	28FEB2017	Y

TESTED BY:	Ron Wellman	REVIEWED BY:	Lawrence Todd
	<i>Ronald R. Wellman</i>		


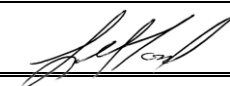
**Statement on Measurement Uncertainty:** Specific measurement uncertainty calculations are not necessary under the following provision: All measurements in this data packet are taken with instruments that meet the minimum tolerances established in current CTL decisions

Company:	Trebor International	Evaluator	Allan Cose
Project #:	G102732084	Reviewer:	Lawrence E. Todd
Name & model:	QNXT Series DI Water Heater Model: QNXT080V208E1F	Date:	March 28, 2019
Manufacturer:	Trebor International	Sample Condition:	Production Unit
Inspection site:	8100 South 1300 West, West Jordan, Utah 84088 USA		
Standard(s):	IEC/EN 61010-1 Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements 3rd Edition		

Tests Conducted 2019-02-12 through 2019-02-13  
Retest of Abnormal Test occurred on May 9, 2019

TEST	STANDARD	SECTION	Pass (P) Fail (F) Not Completed (NC)
Grounding Continuity	IEC 61010-1: 3rd Edition	6.5.2.5	P
Mains Supply	IEC 61010-1: 3rd Edition	5.1.3 c	P
Dielectric Withstand	IEC 61010-1: 3rd Edition	6.8.3.1	P
Temperature Limits	IEC 61010-1: 3rd Edition	10.4	P
Heater Control Lost	IEC 61010-1: 3rd Edition	4.4.2.11	P
Sound Level	IEC 61010-1: 3rd Edition	12.5.1	P

Item	Type of Measurement	Make/ Model No.	Asset Number	Calibration		Test Equipment Validation (Y/N)
				Interval	Due Date	
1	DMM – Voltage, Current	Fluke / 87	9127	1 year	9/04/2019	Y
2	AC Current Probe	Fluke / 80i-400A	1347	1 year	10/9/2019	Y
3	Temperature Meter	Fluke / 62 Max IR	1134	1 year	9/12/2019	Y
4	Atmospheric conditions	Control Co / Hygrometer- Thermometer	0322	3 year	1/12/2020	y
5	Sound Level Meter, Type 1	CEL / CEL-620A2 Sound Level Meter	1181	1 year	1/30/2020	Y
6	Acoustic Calibrator	CEL / CEL-110/2	0738	1 year	1/14/2020	Y
7	Tape Measure	Workforce 16 ft	1057	1 year	11/14/2020	y
8	Ground, Dielectric, Insulation Resistance, Leakage Current	Dranetz / DranEST III	1079	1 year	1/09/2020	y

TESTED BY:	Allan Cose	REVIEWED BY:	Lawrence E. Todd
			

**Statement on Measurement Uncertainty:** Specific measurement uncertainty calculations are not necessary under the following provision: All measurements in this data packet are taken with instruments that meet the minimum tolerances established in current CTL decisions

Grounding Continuity Test (Clause 6.5.2.5)PASS

Method: The circuit supplying the equipment shall be checked to determine that grounding continuity exists between the equipment grounding conductor of the building supply and all the accessible dead-metal parts of the equipment that might become energized in the event of a fault. Each section of the equipment shall also be tested for electrical continuity between sections.

Passing Criteria: The impedance/resistance shall not exceed 0.1  $\Omega$  within the test duration or continuity is verified.

Results:

Location - Ground to:	Test Current (A)	Test Duration (Seconds)	Measured Impedance ( $\Omega$ )*
Chassis	30	120	0.056
Front Panel Door	30	120	0.062
Component Panel	30	120	0.041

\*The ground bond tester automatically calculates the impedance.

## CONCLUSIONS:

The measured values do not exceed 0.1  $\Omega$  and continuity exists between the dead metal parts and the equipment ground bonding terminal.

Date	11/17/2016	Ron Wellman	<i>Ronald R. Wellman</i>
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Results: Testing of the 208VAC model

Location - Ground to:	Test Current (A)	Test Duration (Seconds)	Measured Impedance ( $\Omega$ )*
Chassis – back plane	25	5	0.000
Front Panel Door	25	5	0.000
Component Panel	25	5	0.000

\*The ground bond tester automatically calculates the impedance.

## CONCLUSIONS:

The measured values do not exceed 0.1  $\Omega$  and continuity exists between the dead metal parts and the equipment ground bonding terminal.

Date	2/12/2019	Allan Cose	<i>All Cose</i>
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Mains Supply Test (Clause 5.1.3c)

PASS

Method: The equipment is connected to the supply branch circuit(s) and operated at maximum design load. Measurement of the full load current are taken at the load side of all branch circuits supplying power to the equipment, when possible.

Results: Values must be consistent with the nameplate ratings. Components and wiring must be properly rated and sized for the measured values of voltage and input current.

The following values were recorded:

Operating Condition	Current (Amperes)	Voltage (Volts)
Maximum (Heaters full on)	L1: 158.4	L1-L2: 491.0
	L2: 158.8	L1-L3: 489.5
	L3: 158.5	L2-L3: 490.6

Equipment is rated 480 VAC, 50/60 Hz, 174 A.



Quantum NXT Nameplates

The following values were recorded for the 208V model.

Operating Condition	Current (Amperes)	Voltage (Volts)
Maximum	L1: 158.4	L1 - L2: 491.0
	L2: 158.8	L1 - L3: 489.5
	L3: 158.5	L2 - L3: 490.0

Equipment is rated 208VAC, 50/60 Hz, 325A

CONCLUSION

The measured values do not exceed the marked ratings by more than 10%.

Date	10/11/2016	Ron Wellman	<i>Ronald R. Wellman</i>
Date	2/12/2019	Allan Cose	<i>Allan Cose</i>

On May 9, 2019 Trebor International requested to add a pump system (referred to as the Rev6 pump) to assist with the evacuation of DIW from the system. The Input test was conducted on 50VDC, 16A rated pump. The Pump was test independently while connected to a DC supply.

The following values were recorded for the 50VDC Rev6 Pump.

Operating Condition	Current (Amperes)	Voltage (Volts)
Maximum	L1: 8.2	L1 - L2: 48.5VDC
	L2: 7.3	

Equipment is rated 50VDC, 16A

CONCLUSION

The measured values do not exceed the marked ratings by more than 10%.

Date	5/9/2019	Daron Bell	
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Dielectric Withstand Test (Clause 6.8)PASS

Method: For field testing a test potential of 2210 VAC shall be applied between circuits shown in the table below for 60 seconds. The equipment is tested immediately following shutdown after achieving normal operating temperature with all switches and circuit breakers in the closed position. The test shall be permitted to be made on individual sections of the machine.

Passing Criteria: There shall be no evidence of arcing, Failure indication in test apparatus shall not occur.


## RESULTS:

There was no indication of dielectric breakdown or arc-over.

Location	Test Voltage	Dielectric Breakdown?
L1 to Ground	2210 VAC	No
L2 to Ground	2210 VAC	No
L3 to Ground	2210 VAC	No

## CONCLUSIONS:

As there was no breakdown or arc over, the test results were acceptable.

Date	11/17/2016	Ron Wellman	
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Dielectric Withstand Test (Clause 6.8)PASS

Method: For field testing a test potential of 1500 VAC or its DC equivalent shall be applied between 208VAC supply circuits, shown in the table below, for 60 seconds. The equipment is tested immediately following shutdown after achieving normal operating temperature with all switches and circuit breakers in the closed position. The test shall be permitted to be made on individual sections of the machine.

Passing Criteria: There shall be no evidence of arcing, Failure indication in test apparatus shall not occur.

## RESULTS:

There was no indication of dielectric breakdown or arc-over.

The following values were recorded for the 208V model.

Location	Test Voltage	Dielectric Breakdown?
L1, L2, L3 to Ground, outer 4 contactors closed	2280 VDC	No
L1, L2, L3 to Ground, inner 4 contactors closed	2240 VDC	No

## CONCLUSIONS:

As there was no breakdown or arc over, the test results were acceptable.

Date	2/12/2019	Allan Cose	<i>Allan Cose</i>
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Temperature Limits Test (Clause 10.4)

PASS

Method: The equipment is connected to the supply branch circuit. The unit is operated until thermal stabilization occurs prior to testing.

Passing Criteria: Easily touched surfaces shall not exceed the values of Table 19 below in normal condition at normal ambient temperature of approximately 20 °C for this evaluation, or the maximum rated ambient temperature, whichever is higher. Readings show highest temperature reached.

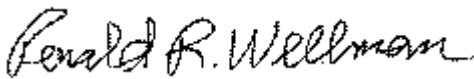
Part		Limit °C
Outer Surface of enclosure (unintentional contact)	Metal, uncoated or anodized	65
	Metal, coated (paint, non-metallic)	80
	plastics	85
	Glass and ceramics	80
	Small areas (<2 cm <sup>2</sup> ) that are not likely to be touched in normal use	100
Knobs & Handles (normal use contact)	Metallic	55
	Plastics	70
	Glass and ceramics	65
	Non-metallic parts that in normal use are held only for short periods (1s – 4s)	70

If easily touched heated surfaces are necessary for functional reasons, they are permitted to exceed the above limits if they are recognizable as such by appearance or function or are marked with symbol 13 of Table 1.

Surfaces protected by guards that prevent them from being touched accidentally are not considered to be easily touched surfaces, provided the guards can only be removed with a tool.


Results: Measured surfaces did not exceed 65°C

Location / Description	Temperature (°C)	Location / Description	Temperature (°C)
Ambient	23.6	Right Side Enclosure	47.3
Main Disconnect Handle	26.8	Left Side Enclosure	52.1
Reset Button	30.2	Rear Enclosure	47.1
EMO Actuator	29.2	DI Water In	24.8
Touch Screen	33.1	DI Water Out	49.0
Front Enclosure Door	34.2	CDA In	25.0

Date	10/11/2016	Ron Wellman	
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The following values were recorded for the 208V model.

Location / Description	Temperature (°C)	Location / Description	Temperature (°C)
Ambient	20.2		
Main disconnect	22.7	Front Enclosure Door	30.0
Reset button	23.2	Right side enclosure	51.5
EMO	24.4	Left side enclosure	46.5
Touchscreen	28.4	Rear enclosure	44.1
DIW In	20.6		
DIW Out	90.3		
CDA In	22.1		
Interior – components, front		Interior – components, rear	
MCB1	30.3	Heaters, left column	91.9, 92.5, 86.9, 90.6
10AWG wires	53.8	Heaters, right column	80.8, 80.0, 82.7, 81.0
Filter	35.4	Top tube	86.4
Relays	45.6	Heater cable trunk	54.5
TLMs	29.8		
E-Net switch	35.6		
CBs	59.0		
Contactors	57.7		
Fans	33.8		
SSRs*	78.6, 124.1, 69.8		
SSRs (2/13/19)	64.0		

Date	2/12/2019	Allan Cose	
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On May 9, 2019 Trebor International requested to add a pump system (referred to as the Rev6 pump) to assist with the evacuation of DIW from the system. This pump was allowed to run in a single fault condition with the temperature monitored until stabilization. It was found to obtain a temperature of 27.2 degrees Celsius.

Date	5/9/2019	Daron Bell	
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## ABNORMAL TEST DATA SHEET

## Heater Control Lost - Clause 4.4.2.11

## METHOD:

Heaters or other circuits which, under any reasonably foreseeable single fault condition, are capable of causing abnormal temperatures that create a hazardous condition with an unacceptable level of risk should be provided with over temperature protection to detect these abnormally elevated temperatures and interrupt the source of energy driving them. Equivalent means of protection are acceptable.

Intertek performed a temperature test on the 208V system on February 12, 2019 at West Jordan, Utah to verify the surface temperature of the system and components during abnormal operation does not result in thermal burns or equipment damage. The test was performed using a calibrated infrared temperature probe and multimeter using the method specified in Section 22.13 of SEMI S22. Refer to Attachment Sixteen, Summary of Test Equipment and Calibration Data.

The system was connected, as intended, to a 208 VAC, three phase, 60 Hz source of power and operated at maximum normal load for sufficient time to come up to maximum normal temperature. Each of the following single fault conditions was then applied, one at a time: a) 100% Power Commanded; b) Fans Off; c) Loss of Control (PLC set High). Temperatures were measured on the locations listed below. Temperatures were recorded after the final result – thermal equilibrium or activation of a protective device – was achieved.

## RESULTS:

Location / Description	Temperature (°C)	Result
Ambient	22.4	
a) 100% Power Commanded: 15 lpm		
Right side enclosure, upper rear	54.4	Overtemperature control tripped within 2 minutes
b) Fans Off; 95°C, 80.4% power, 14.5 lpm		
Ambient	20.4	
Right side enclosure, upper rear	56.3	At 8:45 minutes Overtemperature alarm set power to 0%
SSR	79.0	Tripped Heat Sink overtemperature switch
b) Loss of Control (PLC set High); 2.0 lpm, 16 psi, 19% power indicated		
Ambient	19.9	
Right side enclosure, upper rear	36.4	0:45 minutes: alarm; 1:10 minutes Heaters trip off, OPR valve opened, ~188°C DI Water out temperature indicated at Monitor; ~ 3 minutes PVC fitting burst in facility outlet line.

CONCLUSIONS:

The measured temperatures did not exceed the temperature ratings of the components and the surface temperatures did not exceed the limits of Table 1 of SEMI S2. Overtemperature devices operated as expected. However, output DIW temperatures under Loss of Control single fault condition exceeded the notified temperature for output DIW line fittings. The label on the equipment and the information in the documentation should identify a higher rating temperature for the facility DIW output lines and fittings, to correspond with results from this test.

Date	2/12/2019	Allan Cose	<i>Allan Cose</i>
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Intertek performed a temperature test on the 208V system on May 9, 2019 at West Jordan, Utah to verify the surface temperature of the system and components during abnormal operation does not result in thermal burns or equipment damage. The test was performed using a calibrated EL Thermocouple Data Logger and multimeter using the method specified in Section 22.13 of SEMI S22. Refer to Attachment Sixteen, Summary of Test Equipment and Calibration Data.

The system was connected, as intended, to a 208 VAC, three phase, 60 Hz source of power and operated at maximum normal load for sufficient time to come up to maximum normal temperature. Each of the following single fault conditions was then applied, one at a time: a) Loss of Control (PLC set High)., b) Loss of Control (SSR bypassed). Temperatures were measured on the DIW exhaust port. Temperatures were recorded after the final result – thermal equilibrium or activation of a protective device – was achieved.

RESULTS:

Location / Description	Temperature (°C)	Result
PLC Set High	66.0	Pass
SSR Bypass	76.0	Pass

CONCLUSIONS:

The measured temperatures did not exceed the temperature ratings of the components and the surface temperatures did not exceed the limits of Table 1 of SEMI S2. The temperatures also fell below the marked thermal warning and therefore is acceptable.

Date	5/10/2019	Daron Bell	<i>Daron R. Bell</i>
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Sound Level Test (Clause 12.5.1)PASS

## METHOD:

Sound level readings (A-weighted scale, slow meter response) are taken for each of the four sides of the equipment to determine the resulting sound pressure level. The measurements were taken at approximately 1 meter away from the system (where permissible) and at a height of 1.5 meters to represent standing operators.

The system was located in an area with other noise sources that were operating at the time of the test. The background corrected sound pressure level is determined by application of the correction factors listed below.

Background Noise Level Correction Factor Table.


Difference between system sound pressure level (SPL) and background SPL dB(A)	Correction to be subtracted from the SPL measured with the noise source operating to obtain the SPL due to noise source alone dB(A)
3	3.0
4	2.5
5	1.7
6	1.3
7	1.0
8	0.8
9	0.6
10	0.4

## RESULTS:

Location	Distance from System (m)	Height from floor (m)	Background noise dB(A)	Sound Pressure Level Readings dB(A)	Background corrected SPL dB(A)
Left Side	1.0	1.5	62.0	66.2	64.5
Front	1.0	1.5	62.5	64.2	61.2
Rear	0.7	1.5	63.2	69.2	67.9
Right Side	0.25	1.5	63.9	69.0	67.7

## CONCLUSIONS:

Based on the sound pressure level survey results, there is no need for additional noise controls.

Date	10/11/2016	Ron Wellman	
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Sound Pressure Level Test Data for Main System – 208V

Location	Distance from System (m)	Height from floor (m)	Background noise dB(A)	Sound Pressure Level Readings dB(A)	Background corrected SPL dB(A)
Front	1.0	1.5	73.4	71.6	68.6
Left Side	1.0	1.5	73.4	74.1	71.1
Right Side*	1.0	1.5	73.4	78.7	77.0
Rear	1.0	1.5	73.4	74.7	71.7

\*Noise generating devices (flow box) within 2 meters of system

CONCLUSIONS:

Based on the sound pressure level survey results, there is no need for additional noise controls.

Date	2/12/2019	Allan Cose	<i>Allan Cose</i>
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