

IEC 61010-1			
Clause	Requirement + Test	Result - Remark	Verdict

4.4.2	TABLE: Summary of SINGLE FAULT CONDITIONS			Form A.1	P
Subclause	Title	Does not apply	Carried out	Comments	
4.4.2.1	SINGLE FAULT CONDITIONS not covered by 4.4.2.2 to 4.4.2.14	X		see Form A.2	
4.4.2.2	PROTECTIVE IMPEDANCE	X			
4.4.2.3	PROTECTIVE CONDUCTOR		X	see Form A.8	
4.4.2.4	Equipment or parts for short-term or intermittent operation	X			
4.4.2.5	Motors	X		Not employed.	
	– stopped while fully energized	X			
	– prevented from starting	X			
	– one phase interrupted (multi-phase)	X			
4.4.2.6	Capacitors	X			
4.4.2.7	MAINS transformers Attach drawing of MAINS transformers showing all protective devices (see Forms A.30 and A.31)	X		Not employed. (Approve SWPS is used.)	
4.4.2.8	Outputs		X	AC100V (AC outlet)	
4.4.2.9	Equipment for more than one supply	X			
4.4.2.10	Cooling – air holes closed – fans stopped – coolant stopped – loss of cooling liquid	X X X X	X X	Performed heating test.	
4.4.2.11	Heating devices – timer overridden – temperature controller overridden	X X X		Not employed.	
4.4.2.12	Insulation between circuits and parts	X			
4.4.2.13	Interlocks	X		Not employed.	
4.4.2.14	Voltage selectors	X		Not employed.	
List below all SINGLE FAULT CONDITIONS not covered by 4.4.2.2 to 4.4.2.14:					
Supplementary information: (see Form A.2 for details of tests) EUT: Sample Product					

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4.4	TABLE: Testing in SINGLE FAULT CONDITION – Results				Form A.2	P
Test subclause	Fault No.	Fault description	Td 4.4.3 (NOTE)	How was test terminated Comments	Meets 4.4.4	
4.4.2.1	1	Protective conductor interrupted	1 min.	Unit operated normally	P	
4.4.2.10	2	Continuous AC power	35 min	Temperature stabilized. No hazard, no damaged.	P	

NOTE Td = Test duration in hh:mm:ss
 Record dielectric strength test on Form A.14 and temperature tests on Form A.21.
 Record in the comments column for each test whether carried out during or after SINGLE FAULT CONDITION.

Supplementary information:



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5.1.3c)	TABLE: MAINS supply	Form A.3	F
	Marked rating.....:	AC100-240 V	—
	Phase	Single	—
	Frequency	50/60 Hz	—
	Current	- A	—
	Power	- W	—
	Power	20 VA	—

Test No.	Voltage V	Frequency Hz	Current A	Power in W	Power in VA	Comments
1	90	50	0.84	3.8	7.5	Reference only
	100		0.79	3.8	7.9	
	240		0.53	3.9	12.7	
	264		0.51	4.1	13.5	Reference only
2	90	60	0.86	3.9	7.7	Reference only
	100		0.81	3.9	8.1	
	240		0.55	4.1	13.0	
	264		0.53	4.1	13.8	Reference only

Note – Measurements are only required for marked ratings.

Supplementary information:

•LED Illuminator: Maximum intensity

•VA averages are 10.3VA on 50Hz, 10.55VA on 60Hz *Not including the above reference data.

The VA rating has to be within $\pm 20\%$ to the average on each frequency. *Cl. 5.1.3 c) of IEC 61010-1

$$12.36 \cong VA(10.3) \cong 8.24 \text{ (50Hz)}$$

$$12.66 \cong VA(10.55) \cong 8.44 \text{ (60Hz)}$$




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5.3	TABLE: Durability of markings		Form A.4	P	
Marking method (see NOTE)		Agent			
1) Adhesive label		A Water			
2) Ink printed		B Isopropyl alcohol 70%			
3) Laser marked		C (specify agent)			
4) Filmcoated (plastic foil control panel)		D (specify agent)			
5) Imprinted on plastic (moulded in)		E (specify agent)			
NOTE – Where applicable include print method, label material, ink or paint type, fixing method, adhesive and surface to which marking is fixed.					
Marking location		Marking method (see above)			
Identification (5.1.2)		1			
MAINS supply (5.1.3)		1			
Fuses (5.1.4)		1			
terminals and operating devices (5.1.5.2)		1			
Switches and circuit breakers (5.1.6)		N/A			
Double/reinforced equipment (5.1.7)		N/A			
Field wiring Terminal boxes (5.1.8)		N/A			
Warning marking (5.2)		1			
Battery charging (13.2.2)		N/A			
Method	Test agent	Remains legible	Label loose	Curled edges	Comments
		Verdict	Verdict	Verdict	
A	1	P	P	P	Suitable printings and materials for labelling.
A,	1	P	P	P	
Supplementary information:					
					

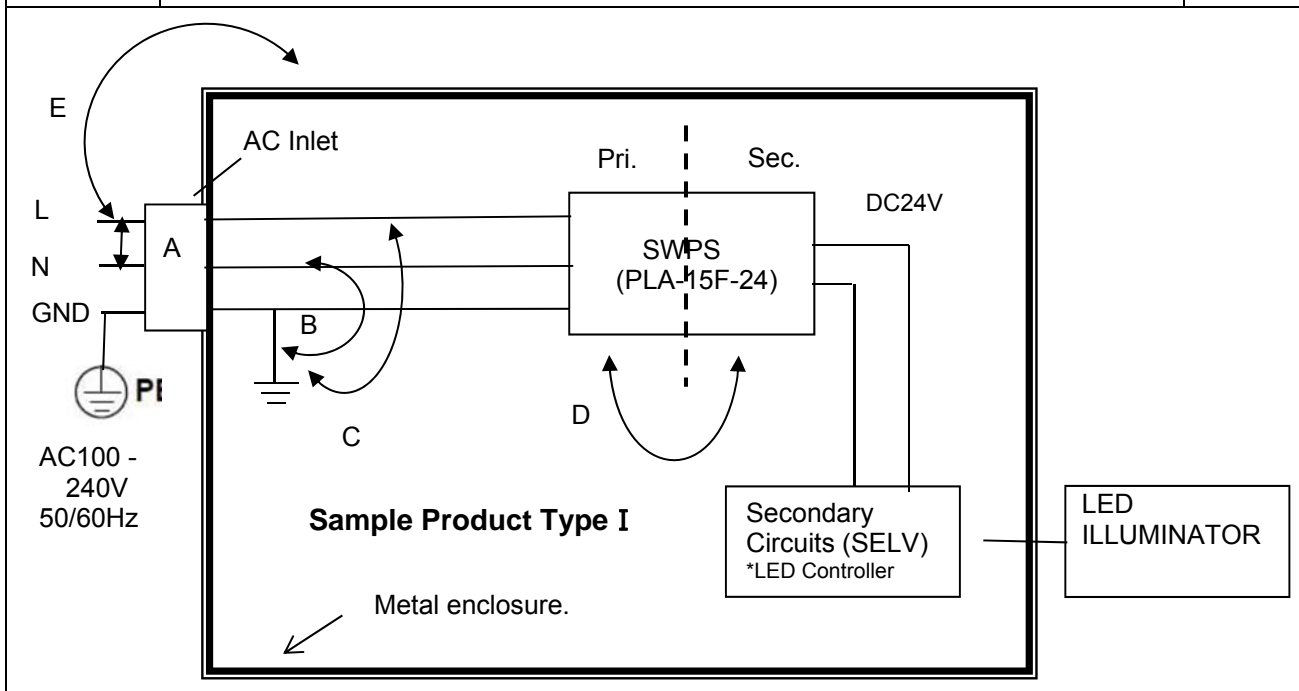
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6	TABLE: Protection against electric shock - Block diagram of system Form A.5	P
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Pollution degree : 2	Overvoltage category: II
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Location or description	Insulation type (NOTE 1)	Maximum working voltage (NOTE 2)	CREEPAGE Distance (NOTE 3)				CLEARANCE (NOTE 3) mm	Test voltage (NOTE 2) V	Comments
			PWB mm	CTI	Other mm	CTI			
A	BI	240Vrms	1.5	≥100	3.0	>100	1.5	1600Vac	Pass
B and C	BI	240Vrms	1.5	≥100	3.0	>100	1.5	1600Vac	Pass
D	RI or DI	240Vrms	3.0	≥100	6.0	>100	3.0	3200Vac	Not conducted

NOTE 1 – Type of insulation:
 BI = BASIC INSULATION
 DI = DOUBLE INSULATION
 PI = PROTECTIVE IMPEDANCE
 RI = Reinforced INSULATION
 SI = Supplementary INSULATION

NOTE 2 - Types of voltage
 Peak impulse test voltage (pulse)
 r.m.s.
 d.c.
 peak

NOTE 3 - INSTALLATION CATEGORIES (OVERVOLTAGE CATEGORIES) or POLLUTION DEGREES which differ from these should be shown under "Comments".

Supplementary Information: *SWPS: Switching Power Supply

- Withstanding test was not conducted on location "D" due to employing approved SWPS.
- Values for test voltage includes correction factor.
- Altitude: approx. 630m at the test Laboratory Correction Factor=1.064 according to Table 10.
 *Considered correction factor of test site.
 B.l. =1.5mm AC1500V (Table 5) $1500V \times 1.064 = 1596V \approx AC1600V$
 D.l. =3.0mm AC3000V (Table 5) $3000V \times 1.064 = 3192V \approx AC3200V$
- Regarding the test data of SWPS (approved), see the manufacturer's technical data.

Remarks;

- Correction factors of test site altitude → See Cl.6.8.1 Table 10 (Protection for voltage tests: General).
- Overvoltage category → See Annex K(.Insulation requirements no covered by 6.7)
- Test voltage → See Cl.6.7.2.1 (Solid insulation: General)
- CTI : Comparative Tracking Index (Cl.6.7.1.3)

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6.2	TABLE: List of ACCESSIBLE parts	Form A.6	P
6.1.2	Exceptions		—
6.2	Determination of ACCESSIBLE parts		—
Item	Description	Determination method (NOTE 5)	Exception under 6.1.2 (NOTE 4)
1	AC Inlet / Fuse	V	Employed approved parts
2	AC Outlet	V	Marked DANGER(High Voltage)
3	Enclosure	V	Enclosed metal material
4	DC Input Terminal	V	SELV

NOTE 1 – Test fingers and pins are to be applied without force unless a force is specified (see 6.2.2)
 NOTE 2 – Special consideration should be given to inadequate insulation and high voltage parts (see 6.2)
 NOTE 3 – Parts are considered to be ACCESSIBLE if they could be touched in the absence of any covering which is not considered to provide suitable insulation (see 6.4).
 NOTE 4 – Capacitor test may be required (see Form A.7).
 NOTE 5 – The determination methods are:
 V = visual; R = rigid test finger; J = jointed test finger; P3 = pin 3 mm diameter; P4 = pin 4 mm diameter.

Supplementary information:



Remarks:

·SELV: Safety Extra Low Voltage *See IEC 60950-1 Cl.1.2.8.8.
 See Cl.6.3.1 a) Levels in NORMAL CONDITION of Cl. Limit values for accessible parts.
 *Reference: See IEC 60950-1 Cl.1.2.8.6 (HAZARDOUS VOLTAGE: voltage exceeding 42.4V peak or DC60V).

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6	TABLE: Values in NORMAL CONDITION	Form A.7	P
6.1.2	Exceptions	11.2 Cleaning and decontamination	—
6.3.1	Values in NORMAL CONDITION (see NOTE 1)	11.3 Spillage	—
6.6.2	Terminals for external circuit	11.4 Overflow	—
6.10.3	Plugs and connections		—

Item (see Form A.6)	Voltage			Current				Capacitance		10 s / 5 s test (NOTE)			Comments
	V r.m.s.	V peak	V d.c.	Test circuit A1/A2/A3	mA r.m.s.	mA peak	mA d.c.	μC	mJ	V	μC	mJ	
3	230	--	--	A2	0.066	--	--	--	--	--	--	--	Accessible enclosure (Normal)
3	230	--	--	A2	0.067	--	--	--	--	--	--	--	Accessible enclosure (Revers)

NOTE – A 10 s test is specified in 6.1.2 a) b), A 5 s test is specified in 6.10.3. The capacitance level versus voltage below the limits given from figure 3 of IEC 61010-1.

Supplementary information:



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Clause	Requirement — Test	Result — Remark	Verdict
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6.3.2		TABLE: Values in SINGLE FAULT CONDITION										Form A.8	P
Item	Subclause and	Voltage			Transient (see NOTE)		Current			Capacitance	Comments		
(see Form A.6)	fault No. (see Form A.2)	V r.m.s.	V peak	V d.c.	V	s	Test circuit A1/A2/A3	mA r.m.s.	mA peak	mA d.c.		μF (see NOTE)	
3	1	230	--	--	--	--	A2	0.227	--	--	--	Accessible enclosure (Normal)	
3	1	230	--	--	--	--	A2	0.227	--	--	--	Accessible enclosure (Revers)	

NOTE – Transient voltages must be below the limits given from Figure 2 and the capacitance below the limits from figure 3 of IEC 61010-1.

Supplementary information:



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6.5.2.2	TABLE: Cross-sectional area of bonding conductors	Form A.9	P
CONDUCTOR LOCATION		CROSS-SECTIONAL AREA mm ²	VERDICT
Protective bonding conductor (Green/Yellow)		0.75mm ² (AWG18)	P

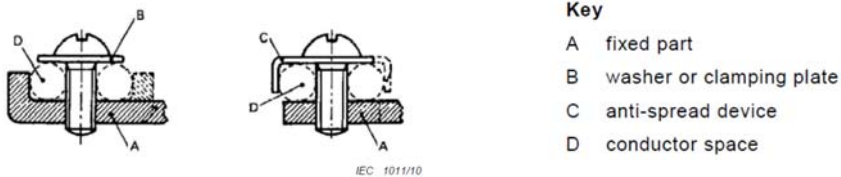
TABLE: Tighting torque test			
Conductor location	Size of screw	Tighting torque Nm	Verdict
Protective bonding conductor terminal screw on metal chassis	M4	Specified	P

Supplementary information:



Remarks:

· Integrity of protective bonding: See a) to k) of Cl. 6.5.2.2.



- Key**
- A fixed part
 - B washer or clamping plate
 - C anti-spread device
 - D conductor space

· Tightening torque for binding screw assemblies

Thread size mm	4,0	5,0	6,0	8,0	10,0
Tightening torque N·m	1,2	2,0	3,0	6,0	10,0

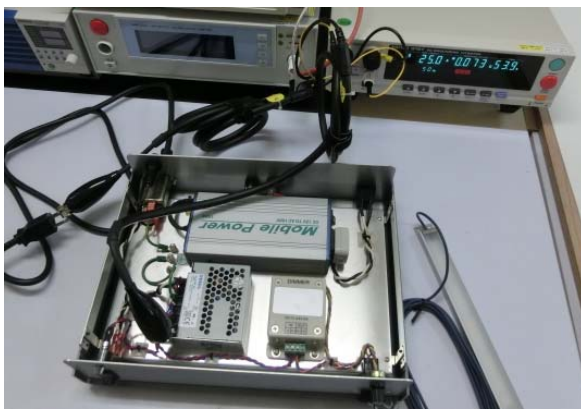
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6.5.2.4	TABLE: Bonding impedance of plug connected equipment	Form A.10	P	
ACCESSIBLE part under test	Test current A	Voltage attained after 1 min V (NOTE 2)	Calculated resistance (Maximum 0,1 or 0,2 Ω) Ω (NOTE 1)	Verdict
PE Terminal to AC Inlet (GND)	25	-	0.025	P
PE Terminal to GND(Case) on SWPS	25	-	0.020	P
GND(PE) on Power Cord to SWPS(Case)	25	-	0.070	Ref.

NOTE 1 – For none-detachable power cord the impedance between protective conductor plug pin of MAINS cord and each ACCESSIBLE part shall not exceed 0,2 Ohm.

Supplementary information:



Remarks:

· Impedance of PROTECTIVE BONDING of plug-connected equipment: See Cl. 6.5.2.4.

6.5.2.5	TABLE: Bonding impedance of permanently connected equipment	N/A	
ACCESSIBLE part under test	Test current A	Voltage attained after 1 min (maximum 10 V) V	Verdict

Supplementary information:

Remarks:

· Impedance of PROTECTIVE BONDING of PERMANENTLY CONNECTED EQUIPMENT: See Cl. 6.5.2.5.

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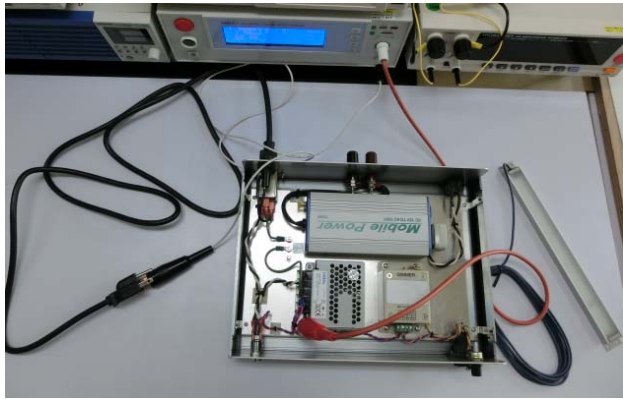
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Clause	Requirement — Test	Result — Remark	Verdict

6.8	TABLE: Dielectric strength tests	Form A.14	P
4.4.4.1 b)	Conformity after application of SINGLE FAULT CONDITIONS ¹		N/A
6.4	Primary means of protection ²		P
6.6	Connections to external circuits		N/A
6.7.	Insulation requirements ² (see Annex K)		P
6.10.2	Fitting of non-detachable MAINS supply cords ¹		N/A
9.2 a) 2)	Eliminating or reducing the sources of ignition within the equipment		N/A
9.4 c)	Limited-energy circuit		N/A
9.6.1	Overcurrent protection basic insulation between MAINS - parts		P

¹Record the fault, test or treatment applied before the dielectric strength test. ² Humidity preconditioning required.

Test site altitude..... :		630m		—		
Test voltage correction factor (see Table 10)..... :		1.064		—		
Location or references from Forms A.2 and A.5	Clause or sub-clause	Humidity Yes/No	Working voltage V	Test voltage r.m.s./peak/d.cV	Comments	Verdict
A	--	No	240Vrms	1600Vrms	Not required	N/A
B	--	No	240Vrms	1600Vrms	No breakdown	P
C	--	No	240Vrms	1600Vrms	No breakdown	P

Supplementary information:



Remarks;

- Primary means of protection: See Cl.6.4.
- Insulation requirements(CLEARANCES/ CREEPAGE DISTANCES) : See Cl.6.7.
- Overcurrent protection: See Cl.9.6.1.

*Equipment intended to be energized from a MAINS supply shall be protected by fuses, circuit breakers, thermal cut-outs, impedance limiting circuits or similar means, to provide protection against excessive current being drawn from the MAINS in case of a fault in the equipment.

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Clause	Requirement — Test	Result — Remark	Verdict

10.	TABLE : Temperature Measurements	Form A.21A	P
10.1	Surface temperature limits - NORMAL CONDITION and / or SINGLE FAULT CONDITION		P
10.2	Temperature of windings- NORMAL CONDITION and / or SINGLE FAULT CONDITION		N/A
10.3	Other temperature measurements		N/A

Operating conditions: **Normal operation (Connected with LED Illuminator)**

Frequency	50 Hz	Test room ambient temperature (ta)	27 °C
Voltage	264 V	Test duration	- h 30 min

Part / Location	t_m °C	t_c °C	t_{max} °C	Verdict	Comments
1. AC Inlet	27.8	40.8	70	P	Metal surface
2. Power Switch	28.7	41.7	80	P	Plastic
3. Fuse Holder	28.0	41.0	80	P	Plastic
4. SWPS	31.7	44.7	105	P	COCEL(PLA15F-24)
5. LED Controller	29.3	42.3	80	-	Around SWPS
6. LED Illuminator	31.6	44.6	80	P	Plastic
7. Rear Panel	27.7	40.7	70	P	Metal
8. Top Enclosure	27.9	40.9	70	P	Metal
9. Bottom Enclosure	27.8	40.8	70	P	Metal
10. Front Enclosure	28.2	41.2	70	P	Metal
11. Ambient (inside)	28.4	41.4	-	-	Around SWPS

NOTE 1 - t_m = measured temperature

$t_c = t_m$ corrected ($t_m - t_a + 40$ °C or max. RATED ambient)

t_{max} = maximum permitted temperature

NOTE 2 - see also 14.1 with reference to component operating conditions

NOTE 3 - Record values for NORMAL CONDITION and / or SINGLE FAULT CONDITION in this Form use additional form if necessary

NOTE 4 - see Form A.21B for details of winding temperature measurements

Supplementary information:

Heating test was performed without AC Inverter.

Maximum loading with LED maximum intensity during heating test.



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10.	TABLE : Temperature Measurements	Form A.21A	P
10.1	Surface temperature limits - NORMAL CONDITION and / or SINGLE FAULT CONDITION		P
10.2	Temperature of windings- NORMAL CONDITION and / or SINGLE FAULT CONDITION		N/A
10.3	Other temperature measurements		N/A

Operating conditions: Normal operation (Connected with LED Illuminator)			
Frequency	60 Hz	Test room ambient temperature (ta)	27 °C
Voltage	90 V	Test duration	- h 30 min

Part / Location	t_m °C	t_c °C	t_{max} °C	Verdict	Comments
1. AC Inlet	28.0	41.0	70	P	Metal surface
2. Power Switch	29.0	42.0	80	P	Plastic
3. Fuse Holder	28.1	41.1	80	P	Plastic
4. SWPS	31.1	44.1	105	P	COCEL(PLA15F-24)
5. LED Controller	29.8	42.8	80	-	Around SWPS
6. LED Illuminator	31.9	44.9	80	P	Plastic
7. Rear Panel	27.8	40.8	70	P	Metal
8. Top Enclosure	27.9	40.9	70	P	Metal
9. Bottom Enclosure	28.0	41.0	70	P	Metal
10. Front Enclosure	28.2	41.2	70	P	Metal
11. Ambient (inside)	28.4	41.4	-	-	Around SWPS

NOTE 1 - t_m = measured temperature
 t_c = t_m corrected ($t_m - t_a + 40$ °C or max. RATED ambient)
 t_{max} = maximum permitted temperature
 NOTE 2 - see also 14.1 with reference to component operating conditions
 NOTE 3 - Record values for NORMAL CONDITION and / or SINGLE FAULT CONDITION in this Form use additional form if necessary
 NOTE 4 - see Form A.21B for details of winding temperature measurements

Supplementary information:

Heating test was performed without AC Inverter.
 Maximum loading with LED maximum intensity during heating test.



Table 19 – Surface temperature limits in NORMAL CONDITION

Part	Limit °C
1 Outer surface of ENCLOSURE (unintentional contact)	
a) metal, uncoated or anodized	65
b) metal, coated (paint, non metallic)	80
c) plastics	85
d) glass and ceramics	80
e) small areas (<2 cm ²) that are not likely to be touched in NORMAL USE	100
2 Knobs and handles (NORMAL USE contact)	
a) metal	55
b) plastics	70
c) glass and ceramics	65
d) non-metallic parts that in NORMAL USE are held only for short periods (1 s – 4 s)	70

NOTE EN 563 gives information about the effect of the duration of contact.

Remarks;

· Equipment temperature limits and resistance to heat:
 See Cl.10.

Table 20 – Maximum temperatures for insulation material of windings

Class of insulation (see IEC 60085)	NORMAL CONDITION °C	SINGLE FAULT CONDITION °C
Class A	105	150
Class B	130	175
Class E	120	165
Class F	155	190
Class H	180	210

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10.	TABLE : Temperature Measurements			Form A.21A	P	
10.1	Surface temperature limits - NORMAL CONDITION and / or SINGLE FAULT CONDITION				P	
10.2	Temperature of windings- NORMAL CONDITION and / or SINGLE FAULT CONDITION				N/A	
10.3	Other temperature measurements				N/A	
Operating conditions: Abnormal operation *Closed air holes. (Connected with LED Illuminator)						
Frequency	50 Hz	Test room ambient temperature (ta)		27 °C		
Voltage	264 V	Test duration		- h 35 min		
Part / Location		t_m °C	t_c °C	t_{max} °C	Verdict	Comments
1. AC Inlet		27.8	40.8	70	P	Metal surface
2. Power Switch		28.9	41.9	80	P	Plastic
3. Fuse Holder		28.0	41.0	80	P	Plastic
4. SWPS		32.1	45.1	105	P	COCEL(PLA15F-24)
5. LED Controller		29.6	42.6	80	-	Around SWPS
6. LED Illuminator		31.1	44.1	80	P	Plastic
7. Rear Panel		27.6	40.6	70	P	Metal
8. Top Enclosure		27.7	40.7	70	P	Metal
9. Bottom Enclosure		27.9	40.9	70	P	Metal
10. Front Enclosure		28.1	41.1	70	P	Metal
11. Ambient (inside)		29.2	42.2	-	-	Around SWPS

NOTE 1 - t_m = measured temperature

$t_c = t_m$ corrected ($t_m - t_a + 40$ °C or max. RATED ambient)

t_{max} = maximum permitted temperature

NOTE 2 - see also 14.1 with reference to component operating conditions

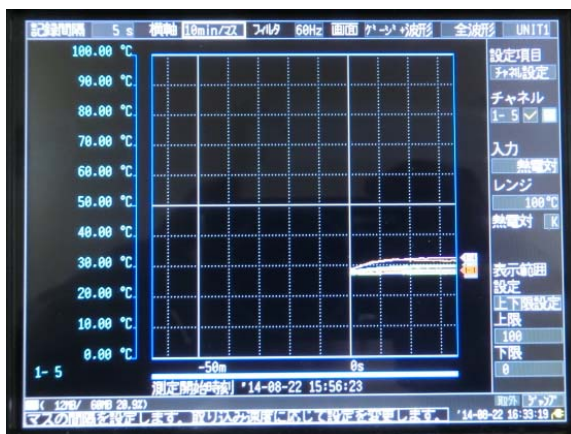
NOTE 3 - Record values for NORMAL CONDITION and / or SINGLE FAULT CONDITION in this Form use additional form if necessary

NOTE 4 - see Form A.21B for details of winding temperature measurements

Supplementary information:

Heating test was performed without AC Inverter.

Maximum loading with LED maximum intensity during heating test.



UNIT1				35m
1- 1	27.83 °C	1- 9	27.85 °C	
1- 2	28.91 °C	1-10	28.13 °C	
1- 3	27.97 °C	1-11	29.23 °C	
1- 4	32.08 °C	1-12	27.04 °C	
1- 5	29.60 °C	1-13	27.00 °C	
1- 6	31.13 °C	1-14	27.09 °C	
1- 7	27.59 °C	1-15	27.06 °C	
1- 8	27.74 °C			

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