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ACBEL POLYTECH INC.

Approval Sheet

Model No. : FSM005 Option 00AG
MKT Model No. : R1CA2202E Option T00A
Hardware Rev. : A00
Software Rev. : APM12V0006

Customer : PCICASE UK LTD
Customer PN : PIZ2200R-95-ACB-S1



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Date: 2025/05/12

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Specification



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R1C Series 2000W

Power Module Specification

Model Number: R1CA2202E-TSeries

AcBel PN: FSM005-Series

80Plus Titanium Compliant

Note: Outward Airflow

Rev: S02(Release)

Prepared by PM	Prepared by EE	Reviewed by ME	Reviewed by FW	Approved by EE Leader
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1 Revision Log

DATE	SECTION	REVISION	ISSUE / DESCRIPTION
2021/06/29		S00	Draft release
2021/12/01	2.1	S01(Draft1)	12V Standby Max current 3A to 3.0A
2021/12/01	4.1	S01(Draft1)	Peak current delay time
2021/12/01	5.2.1	S01(Draft1)	OCP point, add OCP3 & SCP, change delay time
2021/12/01	6	S01(Draft1)	Present Pull up "P" change to "S"
2022/02/08	3.13	S01(Draft2)	Define 2.2KV CM and 2.2KV DM for design margin.
2022/02/08	11.2	S01(Draft2)	Define EMC requirement EN55035.
2022/02/08	4.1	S01(Draft2)	Define peak current point.
2022/02/08	3.14	S01(Draft2)	Define EMI requirement EN55035.
2022/02/09	11.1	S01(Draft3)	Define Safety Mark UKCA
2022/06/15	6.13	S01(Draft4)	LED indicator
2022/06/15	8.1	S01(Draft4)	PMBus spec, follow Acbel CRPS PMBus
2022/06/20	11.1	S01(Draft5)	Safety Mark from CCC change to CQC
2022/06/22	4.1	S01(Draft6)	Update output load table to match sec. 5.2.1
2022/07/13	13	S01(Draft7)	Update Section13 RoHS Compliance
2022/08/01	6.2	S01(Release)	Update PWOK Circuit
2022/09/26	1	S02 (Draft1)	Update Revision
2022/09/26	11.1	S02 (Draft1)	Define Safety Mark KC 、BIS
2022/12/07	5.1	S02 (Draft2)	Update release conditions for Bulk OVP latch behavior
2022/12/07	6.14	S02 (Release)	Update SMBAlert timing description.



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2 Scope

This specification establishes the requirements for a custom “1U” form factor, 2000 Watts output, active power factor corrected, and wide-range power supply. Also, the approximate dimensions are 73.5mm (W) x 185mm (D) x 40mm (H). The power supply will be used in N+1 redundant (load share, and N=3) and must contain appropriate Oring devices on all outputs. The number of PSU would be limited to four.

2.1 Power Supply Overview

Application	Sever System	
AC Input & DC input	100-127VAC 200-240VAC 240VDC	
Power Factor Correction	Active	
Output Power	2000 Watts maximum continuous	
EMC Classification	EN61000-4-5 2KV common mode, 2KV Differential mode	
EFT	2KV meet criteria B(TBD), 1KV meet criteria A	
Outputs	12.2V Main Output (12.2V _{OUT})	12V Standby (V _{SB})
Nominal Output Voltage	12.20 V	12.00 V
Voltage Regulation	11.6V~12.8V	11.4V~12.6V
Minimum Operating Current	1 A	0 A
Maximum Operating Current	148 A(200-207Vac)	3.0 A
	155 A(208-219Vac)	
	164 A(220-240Vac)	
	164 A(200-240Vac) UL-COVERD AREA only	

Table. 1



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3 AC Input Requirements

3.1 Input Conditions

AC input Parameter	Minimum	Nominal	Maximum	Unit
Low Line V_{IN}	90	100-127	140	$V_{AC, RMS}$
High Line V_{IN}	180	200-240	264	$V_{AC, RMS}$
Frequency f_{AC}	47	50/60	63	Hz
I_{IN}			12A (200-240V _{AC}) UL-COVERD AREA only 12A (100-127V _{AC}) Not for China & Korea 10A (200-240V _{AC})	$A_{AC, RMS}$
V_{BROWN_IN}	81	85	89	$V_{AC, RMS}$
V_{BROWN_OUT}	70	75	80	$V_{AC, RMS}$
V_{IN_OVP}	300			$V_{AC, RMS}$

DC input Parameter	Minimum	Nominal	Maximum	Unit
V_{IN}	180	240	300	V_{DC}
I_{IN}			10A (240V _{dc})	A_{DC}
V_{BROWN_IN}	171	175	179	V_{DC}
V_{BROWN_OUT}	160	165	170	V_{DC}
V_{IN_OVP}	310			V_{DC}

Table2

Note:

1. The standby output may continue to operate when input voltage below turn-off range.
2. Due to the C14 Inlet current limit, max Brown-in / Brown-Out loading should become 80% of rated load.(TBD)
3. The I_{in} is specified when the V_{in} at nominal condition.
4. The AC voltage considering CF=1.1 & 1.6 should meet the turn on/off point as above. Due to many waveforms have same C.F result, so the all C.F setting in this specification is based on Chroma.

3.2 Input Fuse

A normal-fast-blow, Fuse must be placed in the single line fuse on the line/hot wire of the AC input. AC inrush does not cause the ac line fuse to blow under any condition. All protection circuits in the power supply do not cause the ac fuse to blow unless a component in the power supply has failed.

3.3 Harmonic Current and Power Factor Correction

The power supply shall incorporate universal power input with active power factor corrections, which shall reduce line harmonics in accordance with the EN61000-3-2 and JEIDA MITI standards.

The power factor lists as below:

Load	10%	20%	50%	100%
P.F. _{MIN}	0.90	0.96	0.98	0.99

Tested at 200V_{AC} - 240 V_{AC} / 50Hz & 60Hz, 115V_{AC} / 60Hz, measurement environment shall comply with 80+ or energy star regulation, and take the worst result from one of both.



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3.4 Input Connector

The AC input receptacle shall be an IEC-320 type C14 capable of at least UL 15A, IEC 10A. This connector is located at the front side of power supply. There is a retainer to fix the line cord to avoid accident disconnection.

3.5 AC Line Isolation Requirements

The power supply shall meet all safety agency requirements for dielectric strength. Additionally, power supply vendor must provide Intel with written confirmation of dielectric withstand test which includes: voltage level, duration of test and identification detailing how each power supply is marked to indicate dielectric withstand test had been completed successfully. Transformers' isolation between primary and secondary windings must comply with the 3000V_{AC} (4242V_{DC}) dielectric strength criteria. If the working voltage between primary and secondary dictates a higher dielectric strength test voltage the highest test voltage should be used. In addition the insulation system must comply with reinforced insulation per safety standard IEC 950. Separation between the primary and secondary circuits, and primary to ground circuits, must comply with the IEC 950 spacing requirements.

3.6 AC Line Dropout / Hold up time

An AC line dropout is defined to be when the AC input drops to 0V_{AC} at any phase of the AC line for any length of time. During an AC dropout the power supply must meet dynamic voltage regulation requirements. An AC line dropout of any duration shall not cause tripping of control signals or protection circuits. If the AC dropout lasts longer than the holdup time the power supply should recover and meet all turn on requirements after AC recover. The power supply shall meet the AC dropout requirement over rated AC voltages and frequencies. A dropout of the AC line for any duration shall not cause damage to the power supply.

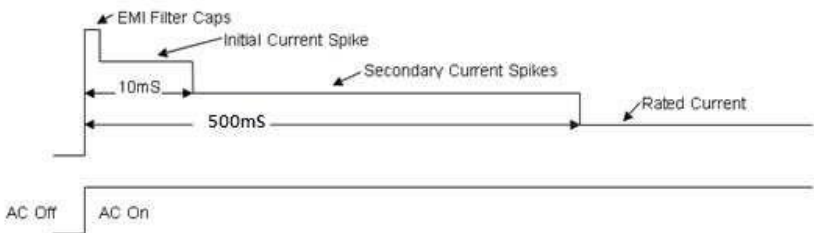
Loading during AC dropout / holdup	Holdup time / Dropout duration
0% to 100% of rated load	10 mS

3.7 AC Line V_{SB} Hold-up time

The V_{SB} output voltage should stay in regulation under its full load (static or dynamic) during an AC dropout of 70 mSec min (= V_{SB} holdup time) whether the power supply is in ON or OFF state (PSON asserted or de-asserted).

3.8 Inrush Current

The power supply shall provide circuitry to limit the turn-on inrush current on any initial current surge or spike of 10ms or less will not exceed 35A peak. Any additional inrush current surges or spikes in the form of AC cycles or multiple AC cycles greater than 10ms, and less than 500ms, must not exceed 35A peak. After 1.2 Sec the AC input current must meet the requirements in section 3.1.





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Notes:

1. The inrush current due to the EMI filter capacitors can be ignored.
2. All internal components (including the fuse, bulk rectifiers and surge limiting device) must be able to withstand the surge current without damage the power supply.
3. The inrush limiting circuitry shall be designed such that if the active bypass circuitry is not functional the remaining circuitry shall not cause any smoke/flame potential safety issue.
4. The inrush current must meet at cold / warm start.
5. For the time less than line drop output, the inrush current may exceed than 35A, the I^2T of input current at this condition shall be less than I^2T of first inrush current.
6. For the repetitive ON/OFF inrush current performance, the minimize period is 10 sec, the AC available duty is 30% of 10sec. (TBD)

3.9 Efficiency

The Power supply shall meet 80plus Titanium efficiency requirement at 230V_{AC}.

Loading Efficiency	10% of max Load	20% of max Load	50% of max Load	100% of max Load
230Vac	90%	94%	96%	91%

Note:

1. Fan loading is not included for efficiency measurements. Efficiency to be measured at 20-25°C after supply has run for 30 minutes.

3.10 Line Disturbance

The following requirements for “Line Disturbances” should be over the complete load, temperature of the power supply unless specified otherwise.

Item	Sag	Input Voltage	Input Frequency	Performance Criteria
0 - 1/2 cycle ^{note 1}	95%	Nominal AC Voltage Ranges	50 / 60 Hz	No loss of function or performance
> 1 AC cycle	> 30%	Nominal AC voltage Ranges	50 / 60 Hz	Loss of function acceptable, self-recoverable.

Item	Surge	Input Voltage	Input Frequency	Performance Criteria
Continuous	10%	Nominal AC voltage Ranges	50 / 60Hz	No loss of function or performance
0 - 1/2 cycle ^{note 1}	30%	Mid-point of Nominal AC voltage Ranges	50 / 60Hz	No loss of function or performance

- Note:**
1. during 0-1/2 cycle test condition as above, the load should be set to maximum (follow holdup time requirement) and minimum load.
 2. The power supply may power off under these conditions, it must be capable of restarting, either automatically or under program control after the disturbance.
 3. When test condition included high line to low line range, Maximum Load should be the rated current of the lower voltage range. If the output current larger than rated current of the lower voltage range, power supply may latch off due to output over current protection.



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3.11 I_{THD}

This test shall be measured at 115V_{AC} @ 60 Hz, 200-240V_{AC} and 50 / 60 Hz

Load	>5%, <=10%	>10%, <20%	>=20%	>=40%	>=50%
$I_{THD, MAX}$	20%	15%	10%	8%	5%

3.12 Leakage Current

Maximum input leakage current at 264 V_{AC}, 50Hz, shall not exceed 0.875 mA

3.13 AC Line Transient, Compliant with EMC Standard

Power supply shall operate within specifications under the followings conditions:

- Transients as defined in IEC61000-4-4, Electrical Fast Transients standard, criteria A, up to 1 KV at AC line.
- Transients as defined in IEC61000-4-5, Electrical Surge standard, impedance 2ohm and criteria A.
Common mode 2.0KV
Differential mode 2.0 KV
Note: The Power supply shall test to 2.2kV CM and 2.2kV DM for design margin
- Power supply shall comply with IEC61000-4-2, Electrostatic Discharge standard, criteria A, up to 8 KV with contact, 15 KV with air discharge.
- Power supply shall meet all the transient requirements for the CE mark designation.

3.14 EMI

The power supply shall comply with FCC 、 EN55032 (CISPR32)/EN55035 Class A for conducted and radiated emissions. It must comply at 100 - 120, 200 - 240VAC / 50Hz with 6dB margin as minimum.

3.15 Voltage Interruptions

The power supply shall comply with the limits defined in EN55024: 1998/A1: 2001/A2: 2003 using the IEC 61000-4-11: Second Edition: 2004-03 test standard and performance criteria C defined in Annex B of CISPR 24.

Performance criteria C, Temporary loss of function is allowed provided the function is self-recoverable or can be restored by the operation of the controls.



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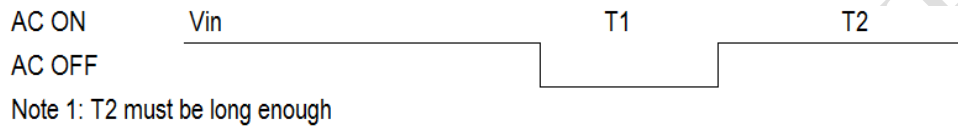
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3.16 Power Recovery

The power supply shall recover automatically after an AC power failure. AC power failure is defined to be any loss of AC power that exceeds the dropout criteria. (follow section 3.10)

Auto restart conditions are tested from –40% to –100% AC under voltage conditions for time intervals (T1) ranging from 25 mS to 2 Sec (Max. Load) or 4 Sec (Min. Load) as below matrix table(TBD). For each time interval, all of the under voltage conditions listed will be tested. These tests are performed at both the lowest and highest nominal operating AC voltages of the power supply, the output load setting shall consider Max and Min load conditions, the available AC duration (T2) on each drop cycle shall be greater than $T_{AC_ON_DELAY}$ as specified in section 6.14.



Max. or Min. Load		25ms	40ms	60ms	90ms	130ms	200ms	280ms	400ms	600ms	900ms	1.3S	1.65S	2S	2.4S	2.9S	3.1S	3.45S	4S
Lowest or Highest Nominal Line condition	-40%																		
	-50%																		
	-60%																		
	-70%																		
	-80%																		
	-90%																		
	-100%																		

Table. 5

Note: When test condition included high line to low line range, Maximum Load should be the rated current of the lower voltage range. If the output current larger than rated current of the lower voltage range, power supply may latch off due to output over current protection.



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4 DC Output Requirements

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4.1 Output Load and Status Regulation

The following table provides a summary of specifications for each individual output. The Output voltage must meet the following table under section 3.1, section 4.1 & section 9.1 condition.

Parameter	VAC Rating	Power Rating	Min Current	Max Current Rating	10 Sec Peak Current	50 mSec Peak Current	1 mSec Peak Current	Voltage Regulation
12.2V main (100-127V _{AC})	115 V _{AC}	1000 W	0 A	82 A	114 A	123 A	131 A	11.2V~13V
12.2V main (200-240V _{AC})	230 V _{AC}	2000W	0 A	164 A	229 A	246 A	262 A	
12V _{SB} ¹	--	36 W	0 A	3.0 A	--	--	--	11.2V~13V

Notes:

1. If PSU run at over max load continuously may be trig OTP.
2. Power supply must protect itself in case system doesn't take any action to reduce load based on SMBAlert# signal asserting.

4.2 Standby Output

The V_{SB} output shall be present when an AC input greater than the power supply turn on voltage is applied. There should be load sharing in the standby rail.

4.3 Ripple /Noise

The following output ripple/noise requirements will be met throughout the load ranges specified in section 4.1 and under all input voltage conditions specified in section 3.1 and temperature condition specified in section 9.1.

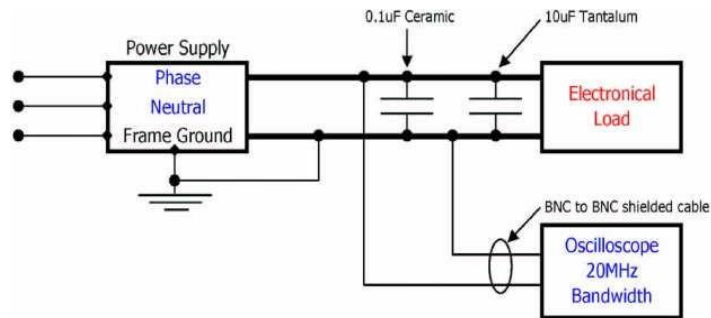
Outputs	Maximum	Capacitive Load
V _{SB}	120 mV _{PK-PK}	1000uF.
12.2V _{OUT}	120 mV _{PK-PK}	2200uF.



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Notes:

1. Output ripple & noise should be measured at the pins of the mating output connector.
2. Connect the probe with the input tip and ground as short as possible.
3. Output ripple & noise measured with only PS capacitance plus 10 uF Tantalum and 0.1uF Ceramic capacitor.
4. Ripple & noise are defined as periodic or random signals over the frequency band of 20MHz.
5. To help reduce switching ripple further, an additional 2,200 μ F low ESR electrolytic capacitor may be placed in parallel.

4.4 Dynamic Regulation

The output voltage shall remain within the limits specification in section 4.1 Voltage Regulation for the step loading and within the limit specification in below table for the capacitive loading. The load transient repetition rate shall be tested between 50 Hz and 5 kHz at duty cycles ranging from 10% - 90%.

The load transient repetition rate is only a test specification. The step load may occur anywhere within the Min Load 1A to the Max Load show in below table. During 12.2V_{OUT} output load changes from minimum to maximum or maximum to minimum, the power supply must not shutdown. The capacitor in here is defined as low ESR capacitor, the OS-CON Cap is recommended.

Outputs ¹	Step Load Size	Slew Rate	Test Capacitor load
12.2V _{OUT}	60%	2.5A/uS	2000 uF
V _{SB}	50%	2.5A/uS	1000 uF

Note:

1. For step load 0% to 100%, slew rate 2.5A/us , should be have cap load 8800uF, 12.2Vout can meet 11.2V~13V.
2. During load transient from 0A to 100% load (or Master/Active inner short in CR Mode) with 8800uF cap, 12.2VDC output voltage no bellow 11.2V~13V

4.5 Audible Noise

No abnormal audible noise is allowed to be generated by the power supply.

4.6 Immune Voltage

The PSU should be immune to any residual voltage placed on its outputs (typically a leakage voltage through the system from standby output) up to 500 mV. There shall be no additional heat generated, nor stressing of any internal components with this voltage applied to any individual or all outputs simultaneously. It also should not trip the protection circuits during turn on.

The residual voltage at the power supply outputs for no load condition shall not exceed 100 mV when AC voltage is applied and the PSON# signal is de-asserted.



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4.7 Capacitive Loading

The PSU will be able to power up and operate normally with the capacitive load on system side; the power supply shall be stable and meet all requirements with the following capacitive loadings for all system applications. The capacitor in here is defined as low ESR capacitor, the OS-CON Cap is recommended, and normal AL electrical capacitor shall not be applied.

Outputs	MIN	MAX	Units
V_{SB}	10	3,100	uF
12.2V _{OUT}	2000	36000	uF

4.8 Turn on/off Overshoot & Undershoot

During the turn-on or turn-off stage, the output voltage including the standby output, under any of the conditions specified in section 4.1 and temperature section 9.1, capacitive loading section 4.7 will less than 10% above the nominal voltage and will settle into the regulation band within 20 mSec.

The output voltage undershoot during turn-off of any of the output, including the Standby output, under any of the condition specified in section 4.1 and temperature section 9.1, capacitive loading section 4.7 shall not exceed than 0.3V

There must be a smooth and continuous ramp of each output voltage from 10% to 95% of its final set point within the regulation band. No voltage of opposite direction will be present on any output during turn-on or turn-off stage.

4.9 Grounding

The output ground of the pins of the power supply provides the output power return path. The output connector ground pins shall be connected to the safety ground (power supply enclosure). This grounding should be well designed to ensure passing the max allowed Common Mode Noise levels.

4.10 No Load Condition

This condition shall not trip any failure circuitry shutdown or cause any permanently damaged to the power supply. Also, the power supply shall normal operate when the power supply is turn on or when the power supply is already on at no load condition.

When the power supply is subsequently loaded, it must begin to regulate and source current without fault.

4.11 Close Loop Stability

The power supply shall be unconditionally stable under all line/load condition including capacitive load. A minimum of 45 degrees phase margin and -10dB gain margin is required.

The power supply manufacturer shall provide proof of the unit's closed-loop stability with local sensing through the submission of Bode plots.

Bode Plot documentation will have Phase and Gain margin data, line and load conditions, as well as the oscillator injection level. For verification purposes the plots will have the method of test and injection points clearly documented on a current schematic. Stability plots need to be provided at both the upper and lower operating temperature limits.



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4.12 Remote Sense

Differential (Single ended) remote sense is to be provided for the designated remote sense outputs. The remote sense must be able to compensate for the defined system output voltage drop over the system output resistance (after the output connector).

The remote sense lines must be protected such that if only the remote sense is connected to the load, or there is a short across the remote sense, the power supply is not damaged.

Note: Make sure the drop compensation is included in determining OV limits.

4.13 Common Mode Noise

The Common Mode Noise on any output shall not exceed 350 mV_{PK-PK} over the frequency band of 20 MHz.

1. The measurement shall be made across a 100 Ω resistor between each of DC outputs, including ground at the DC power connector and chassis ground (power subsystem enclosure).
2. The test set-up shall use a FET probe such as Tektronix model P6046 or equivalent

4.14 Hot Swap Requirement

Hot swapping a power supply is the process of inserting and extracting a power supply from an operating system. During this process, the output voltage shall remain within the regulation limits specified in section 4.1 with capacitive load specified in section 4.7. The hot swap test must be conducted when the system is operating under static, dynamic condition and zero loading condition.

The power supply should use a latching mechanism to prevent insertion and extraction of the power supply when AC power cord is inserted into the power supply.

4.15 Output Isolation

All outputs have an isolating device to isolate the power supply from the system power during a power supply failure or during a hot swap operation. This device is located in power supply. This device is an oring diode or functional equivalent.

4.16 Soft Starting

The Power Supply shall contain control circuit which provides monotonic soft start for its outputs without overstress of the AC line or any power supply components at any specified AC line or load conditions.

4.17 Force Load Share

The 12.2V_{OUT} main output will have active load sharing. The output will share within 5% at 20% - 100% load, 10% at 10 - 20% load. The failure of a power supply should not affect the load sharing or output voltages of the other supplies still operating and does not cause these outputs to go out of regulation in the system.

The power supplies must be able to load share with up to 4 power supplies in parallel and operate in a hot-swap/redundant N+0, N+1 or N+N configurations.

The V_{SB} standby output can be passive sharing. The V_{SB} of power supplies are connected together in the system, so that a failure or hot swap of a redundant power supply does not cause these outputs to go output of regulation in the system.



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4.18 Load Share Signal Characteristics

The load share signal is only for the 12.2V_{OUT} load function. The load share signal characteristics shall follow the table as below. The delay from output voltages in regulation to load share active with maximum load of one power supply and 2 power supplied in parallel is 100 mSec maximum.

Item	Description	Min	Nominal	Max
V _{SHARE} ; I _{OUT} =Max	Voltage of load share bus at specified maximum output current	7.76 V	8.0 V	8.24 V
$\Delta V_{SHARE} / \Delta I_{OUT}$; I _{OUT} > 1A	Slope of load share bus voltage with changing load		8.00 / I _{MAX} V/A	
I _{SHARE} sink; V _{SHARE} = 4.00V	Amount of current the load share bus output from each power supply sources.			0.5 mA
I _{SHARE} source V _{SHARE} = 4.00V	Amount of current the load share bus output from each power supply sinks.	4 mA		

4.19 DC Connector and Pin Assignment

Pin No.	Pin Name	Pin Type	Pin Length	Description
A1~A9 B1~B9	GND	12.2V _{OUT} main & V _{SB} Return	Long	12.2V _{OUT} main & V _{SB} Return
A10~A18 B10~B18	12.2V _{OUT}	12.2V _{OUT} main output	Standard	12.2V _{OUT} main output
A19	SDA	I / O	Short	SMBus / PMBus Data
A20	SCL	I / O	Short	SMBus / PMBus Clock
A21	PSON	Input	Short	Active low; 12.2V _{OUT} main output on/off control
A22	SMBAlert#	Output	Short	Active low; I ² C alert signal (interrupt)
A23	RETURN Sense	Analog Input	Standard	12.2V _{OUT} main output Remote Sense -
A24	12.2V _{OUT} Remote Sense	Analog Input	Standard	12.2V _{OUT} main output remote sense +
A25	PWOK	Output	Standard	Active high; indicate 12.2V _{OUT} main is valid
B19	A0	Input	Standard	PMBus address 0
B20	A1	Input	Standard	PMBus address 1
B21	12V Standby V _{SB}	Aux Power	Standard	Standby voltage
B22	Smart Redundant Bus	I / O	Short	Cold Redundancy Bus ¹
B23	12.2V _{OUT} Load Share Bus	Analog Output	Standard	12.2V _{OUT} main output load current sharing
B24	Present	Output	Short	Power Supply Present
B25	Vin_GOOD	Output	Standard	Indicate AC Voltage is existence and with operating range

1: Refer to the Spec. of CRPS Common Requirements specification

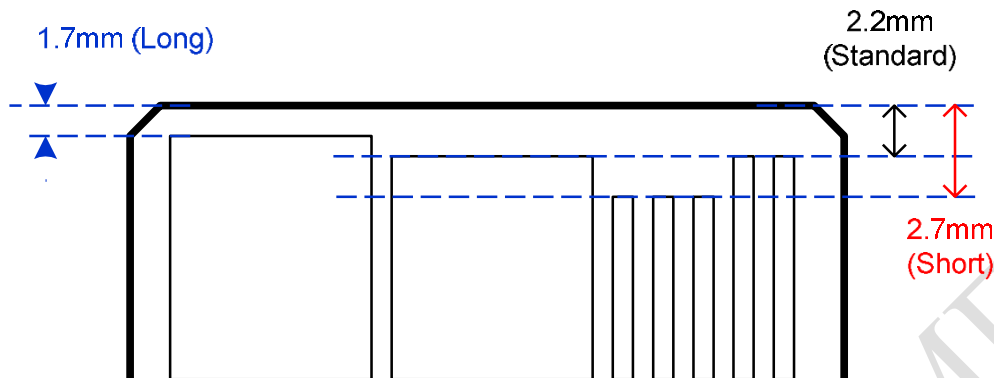


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Pin length definition is illustrated on below:

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4.20 Handle Retention

The power supply shall have a handle to assist extraction. The module shall be able to be inserted and extracted without the assistance of tools. The power supply shall have a latch which retains the power supply into the system and prevents the power supply from being inserted or extracted from the system when the AC power cord is pulled into the power supply.

The handle shall protect the operator from any burn hazard and be designed plastic handle or equivalent material.

4.21 LED Identification

The power supply shall use a bi-color LED; Amber [λ : 607-613 nm] & Green [λ : 562-568 nm]. Both LEDs luminance are 300~1100 cd/m².

5 Protection Requirements

5.1 Primary Protection

The supply must have internal primary over current protection. A normal blow (fast blow), high-breaking-capacity fuse must be placed in the line side of the input circuit. This fuse is not to be considered replaceable for purposes of determining power supply reliability and life as specified in Section 10.1.

If any component on the line side of the fuse is shorted or opened, it shall not cause a fire or any other safety risk.

Note: PFC OVP is re-try mode *3 time + latch mode finally if PFC OV failure continuously. Based on robust design, PSU will auto-recover when Vin is greater than 2 seconds of Brown-in condition and OVP status is cleared.

5.2 Secondary Protection

5.2.1 Current Limit & Power Protection (OCP & OPP)

The power supply shall have current limit to prevent the outputs from exceeding the values shown in table below. If the current limits are exceeded the power supply shall shutdown and latch off. The latch will be cleared by either an AC power interruption or toggle PSON signal. The power supply shall not be damaged from repeated power cycling in this condition. The power supply shall support Over Power



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Protection (OPP) level low enough to protect the power supply running in this mode for repeated 100 μ S durations at a 1% duty cycle. +12V_{SB} will be auto-recovered after removing OCP limit.

Outputs	Status	Unit		Trip timing min		SMBAlert Mode
		Min.	Max.	SMBAlert	OC fault	
+12VSB	OCP (shutdown, recover)	3.5 A	5 A		100ms	-
+12.2Vout (High line)	OC Warning1 (SMBAlert#)	180 A	196 A	20s		1. SMBAlert will be asserted within asserting time. Afterward, SMBAlert is latched for 100ms and will be reset by PSU itself. 2. If power shut down, SMBAlert will keep latching until AC power cycle on/off or PS_ON cycle on/off or reset by operation command.
	OCP1 (shutdown, latch)	196 A	229 A	10s	Alert+2ms	
	OCP2 (shutdown, latch)	229 A	246 A	50ms	Alert+2ms	
	OCP3 (shutdown, latch)	246 A	262 A	1ms	Alert+2ms	
	OPP (shutdown, latch)	262 A	278 A	200us	Alert+2ms	
	SCP (shutdown, latch)	>278 A		Immediately shut down		
+12.2Vout (Low line)	OC Warning1 (SMBAlert#)	90 A	98 A	20s		
	OCP1 (shutdown, latch)	98 A	114 A	10s	Alert+2ms	
	OCP2 (shutdown, latch)	114 A	123 A	50ms	Alert+2ms	
	OCP3 (shutdown, latch)	123 A	131 A	1ms	Alert+2ms	
	OPP (shutdown, latch)	131 A	139 A	200us	Alert+2ms	
	SCP (shutdown, latch)	>139 A		Immediately shut down		

Note: If PSU operate in repetitive transient load and peak load levels means the average power above 100% of rating, Power supply may shut down due to OTP.



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5.2.2 Over and Under Voltage Protection

Outputs	Under Voltage		Over Voltage		Unit
	Minimum	Maximum	Minimum	Maximum	
V_{SB}	10	11	13.5	14.5	V
$12.2V_{OUT}$	10	11	13.5	14.5	V

Notes:

1. The above OV/UV test will be satisfied throughout AC input in section 3.1 and the entire operating temperature range in section 9.1
2. Standby output shall not latch off due to an under/over voltage condition.
3. A fault on any output other than Standby will not cause the Standby to turn off. Also, that fault on Standby will cause the other outputs to turn off but not latch off.
4. The power supply will provide latch mode except for Standby output.

5.2.3 Short Circuit Protection

A short circuit is considered to be resistance of 45mohms or less, applied to any output during start-up or while running will not cause any damage to the power supply (connectors, components, PCB traces, etc.). The power supply shuts down and latches off for short on main outputs but recovers upon PS_ON assertion or AC toggle.

When the Standby output V_{SB} is shorted the output may go into “hiccup mode”, and all outputs shuts down upon a short circuit of the V_{SB} . When the short is removed on V_{SB} , the power supply shall recover automatically.

5.2.4 Reset after Shutdown

If the power supply latches into a shutdown state due to a fault condition on any output, the power supply will return to normal operation only after the fault has been removed and the power supply has been AC Input- cycled or toggled PS_ON. The PSU cannot be reset until the OTP and fan fault recovery level released. Both methods of resetting the power supply shall be designed into the supply so that the user may choose which method to use.

Reset can be accomplished in one of three ways as below:

- a) Removing AC input power, waiting for Standby output to drop below 1.0V, then reapplying AC power. The time it takes for Standby output to drop below 1.0V shall not exceed 15 seconds.
- b) Cycling the state of PS_ON from on to off to on. The minimum cycle time will be 100 mSec.
- c) Reset status by operation command.

5.2.5 Over Temperature Protection

The power supply will be protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the PSU will shut down. When the power supply temperature drops to within specified limits, the power supply shall restore power automatically.

The OTP circuit must have built in hysteresis such that the power supply will not oscillate on and off due to temperature recovering condition. The OTP trip level shall have a minimum of 5 °C of ambient temperature hysteresis.



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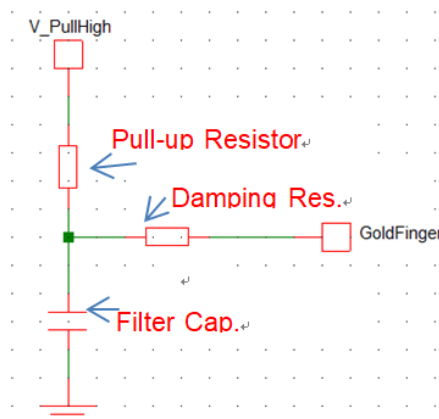
6 Signal Requirement

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This requirement shall be met throughout the load regulation condition specified in section 4.1, under all input voltage condition specified in section 3.1 and temperature condition specified in section 9.1.



Pin	Pin Name	Pin Type (I/O/A)	Pull-up location	Pull-up Res. on system (Ω)	Pull-up Res. On PSU (Ω)	Filter Cap. Pin to GND	Damping Resistance (Ω)	Pull-up Vol. (V)
A19	SDA	I / O	P	--	10k	10 pF	20	3.3
A20	SCL	I / O	P	--	10k	10 pF	20	3.3
A21	PSON#	I	P	--	10k	N.A	N.A	3.3
A22	SMBAlert#	O	S	10k	N.A	N.A	N.A	3.3
A25	PWOK	O	P	--	34	N.A	N.A	3.3
B19	A0	I	P	--	10k	N.A	N.A	3.3
B20	A1	I	P	--	10k	N.A	N.A	3.3
B22	Smart Redundant Bus	I / O	P	--	--	--	--	3.3
B23	12.2V _{OUT} Load Share Bus	A	--	--	N.A	N.A	N.A	N.A
B24	Present	O	S	--	N.A	N.A	100	GND
B25	VIN_GOOD#	O	P	--	1k	N.A	0	3.3

A: Analog, O: Output, I: Input, P: PSU, S: System.



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6.1 PSON#

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The PSON signal is required to remotely turn on/off the power supply. PSON is an active low signal that turn on the main power rails. When this signal is not pulled low by the system, or left open, the outputs turn off.

The power supply shall provide an internal pull-up to high. The power supply shall also provide de-bounce circuitry on PSON to prevent it from oscillating On/Off at startup when activated by mechanical switch.

Provisions for de-bouncing will be included in the PSON circuitry to prevent the power supply from oscillating on/off at startup.

Signal type	Accepts an open collector/drain input from the system Pull-up to internal 3.3V located in power supply	
PSON =Low	PSU ON	
PSON = Open or High	PSU OFF	
	MIN	MAX
Logic level low (PSU ON)	0 V	1 V
Logic level high (PSU OFF)	2.0 V	3.46 V
Source current, $V_{PSON} = \text{low}$		4 mA
Power up delay: $T_{PSON_ON_DELAY}$	5 mSec	400 mSec
Power off delay: $T_{PSON_OFF_DELAY}$		5 mSec
PSON rise and fall time		100uS

PSON signal should be logic level low (PSU ON) when the voltage between 0V ~ 1V, and become logic level high (PSU OFF) when the voltage between 2.0V ~ 3.46V. So the signal may become logic level low when the voltage little larger than 1V, and become logic level high when the voltage little smaller than 2.0V.

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6.2 Power Good (PWOK or P_GOOD)

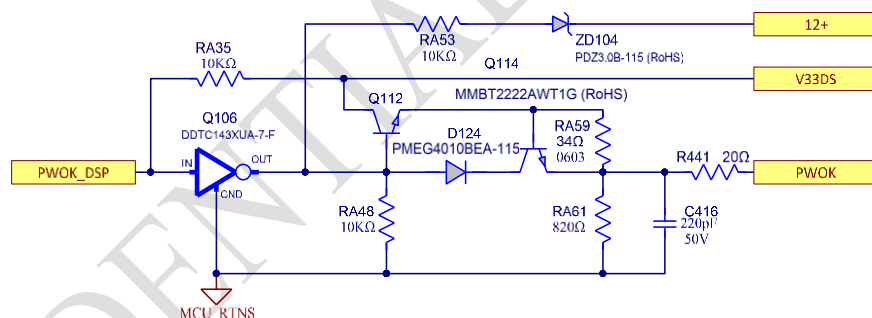
This signal should be asserted high by the power supply to indicate that all outputs are within the regulation thresholds listed in section 4.1. Conversely, this signal should be de-asserted to a low state when any of the DC outputs voltage falls below its under voltage threshold, or when mains power has been removed for a time sufficiently long so that power supply operation can't be guaranteed.

This signal must be driven low at least 1ms before any of the outputs go out of regulation. Also, that will be defined and selected for inclusion from any variation of the following three items:

A.) AC Power Loss ; B.) Fan Failure ; C) Over Temperature

This signal will have an internal pull-up resistor to internal 3.3V sources.

Signal type	Pull-up to internal 3.3V.	
PWOK or P_Good = High	DC Outputs O.K.	
PWOK or P_Good = Low	DC Outputs N.G.	
	Minimum	Maximum
Logical Level Low, I _{SINK} = 400 uA	0 V	0.4V
Logical Level High, I _{SOURCE} = 200 uA	2.4V	3.46V
Sink current, PWOK = low		400 uA
Source current, PWOK = high		2 mA
PWOK delay: T _{PWOK_ON}	100 mSec	500 mSec
Power down delay: T _{PWOK_OFF}	1 mSec	
PWOK or P_Good Rise & Fall Time		100 uSec



PWOK Output Circuit

6.3 PRESENT#

This pin will be tied to Standby return through a resistor. System side should have a pull-up resistor which limits the max current 4mA to go through from this signal pin to the power supply.



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6.4 Load Share Signal

This input / output will allow two or more power supplies to share output current between them.

If one of the supplies fails the remaining supplies must pick up the entire load without any of the outputs dropping out of regulation. A defective supply that is connected to the output voltage bus will not have adverse effect on the operation of the remaining function supplies.

12.2V Total Load (12VSB no load)	Number of supplies	V _{LS} (V) Minimum	V _{LS} (V) Nominal	V _{LS} (V) Maximum
100%	2	3.8	4	4.2
50%	2	1.8	2	2.2
20%	2	0.64	0.8	0.96
100%	1	7.76	8	8.24
50%	1	3.8	4	4.2
20%	1	1.4	1.6	1.8
0%	1	0	0	0.3

6.5 Sharing Accuracy

12.2V_{OUT} output should share load tolerance the average output current from full load to 20% load.

12.2V Total Load (12VSB no load)	Sharing Accuracy
20 - 100%	± 5%
10 - 20%	± 10%

Note

- 1: Sharing accuracy is not measured under transient conditions, but under transient conditions a false over current fault must not occur.
- 2: Current sharing is not required power on of the outputs until the PWOK signal is asserted. (All outputs are valid)



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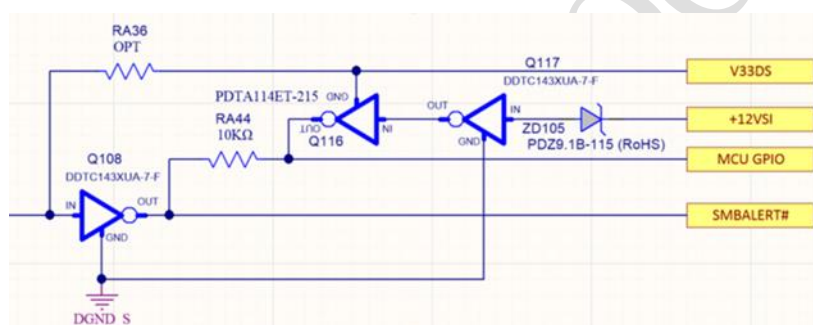
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6.6 SMBAlert#

This signal indicates that the power supply is experiencing a problem that the user should investigate. This shall be asserted due to Critical events or Warning events. The signal shall activate in the case of critical component temperature reached a warning threshold, over-current. This signal may also indicate the power supply is reaching its end of life or is operating in an environment exceeding the specified limits.

Signal type	Open collector / drain output from power supply. Pull-up to 3.3 V located in system	
SMBAlert = High	OK	
SMBAlert = low	Power Alert to system	
	Minimum	Maximum
Logical Level Low, $I_{SINK} = 4 \text{ mA}$	0 V	0.4 V
Logical Level High, $I_{SINK} = 50 \text{ uA}$	2.0 V	3.46 V
Sink current, Alert# = low		4 mA
Sink current, Alert# = high		50 uA
Alert# fall time		10 uSec



SMBAlert Circuit

6.7 Address_A0 / A1

This signal is defined by end user system for PMBus communication, to allocate address of power supply unit in particular slot location.

This signal has an internal resistor to internal 3.3 V located in power supply.

Signal type	10kohm Pull-up to internal 3.3 V located in power supply	
Adress_A0/A1 = high	Address 1	
Adress_A0/A1 = low	Address 0	
	Minimum	Maximum
Logical Level Low	0 V	0.8 V
Logical Level High	2.0 V	3.46 V



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6.8 PMBus CLOCK_SCL & DATA_SDA

SCL is the SMBus clock input to the supply,

SDA is the bi-directional SMBus data path to /from the supply.

Both have a pull-up resistors to 3.3 V internal located in power supply. The weak pull-up must be diode isolated to prevent an unpowered/ faulted supply from loading the signal. It must be designed to not glitch bus during hot plug and unplugging.

The main pull-up resistors are provided by the system and may be connected to 3.3V or 5V. The PMBus operation frequency is 100 kHz.

It shall conform to SMBus V2.0 signaling protocol standards. And this specification is based on the PMBus specification parts I and II, revision 1.2.

Note:

All I²C devices will be powered from the outside of the standby Oring-device. This will allow the status to be read from a supply that is not powered on, or has some other fault.

Some types of protection must be provided so a fault within the supply does not take down the bus.

6.9 REMOTE SENSE + / REMOTE SENSE -

These signals are analog Input / Output 12.2VOUT Main Voltage Sense. Both are analog input / output voltage sense lines to compensate for power path voltage drop. These low level analog signals should be isolated from digital circuit noise.

If the REMOTE SENSE+ is shorted to DC_RETURN, the main 12.2VOUT output shall go over-voltage and the power supply will shut down.

The Power Supply must be able to compensate for up to 200mV of IR drop measured between the Power Supply connector output and the point of load where the remote sense lines are connected.

6.10 Smart Redundant Bus, CR#

This signal should be connected together at system board for smart redundant function.

Please refer to the PMBus specification for detail.

6.11 VIN_GOOD

This signal is an output to indicate AC power is existence and is within operation range. It should act from high to low level within 2 mS only for Vin drops out to zero and input voltage brown-out events.

Signal type	Pull-up 1k ohm to internal 3.3 V located in power supply	
VIN_GOOD = High	Input voltage is in operating range	
VIN_GOOD = low	Input voltage is out of operating range	
	Minimum	Maximum
Logical Level Low, I _{SINK} = 4 mA	0 V	0.4 V
Logical Level High, I _{SOURCE} = 50 uA	2.0 V	3.46 V
Sink current, VIN_GOOD #=low		1 mA
Source current, VIN_GOOD #=high		0.3 mA
VIN_GOOD # rise and fall time		400 uSec



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6.12 Standby Turn-off

Following removal of AC power, the Standby output will remain at its steady state value until such time as it begins to decrease in voltage. The decrease will be monotonic in nature dropping to 0.5 V or less. There will be no other perturbations of this voltage at, or following, removal of AC power.

6.13 LED indicators

The power supply may have a single Bi-color (Green-Amber) Configuration.

Power Supply Condition	LED State
Output ON and OK	GREEN
No AC power to all power supplies.	OFF
AC present / Only V_{SB} on (PS off) or PS in Smart redundant state / Off line mode	1 Hz Blink GREEN
Power supply warning events where the power supply continues to operate; high temp, high power, high current, slow fan, UV. (include standby mode)	1 Hz Blink Amber
Power supply critical event causing a shutdown; failure, OCP, OVP, Fan Fail (include standby mode)	AMBER
AC cord unplugged or AC power lost; with a second power supply in parallel still with AC input power.	AMBER
Power supply FW updating	2 Hz Blink GREEN

6.14 Timing

These are the timing requirements for the power supply operation. All outputs must rise monotonically. Table below shows the timing requirements for the power supply being turned on and off via the AC input, with PS_ON held low and the PS_ON signal, with the AC input applied.

ITEM	DESCRIPTION	MIN	MAX	UNITS
$T_{V_{SB_RISE}}$	Standby voltage rise time for V_{SB}	1	25	mSec
$T_{12V_{OUT_RISE}}$	Output voltage rise time for 12.2V _{OUT}	1	70	mSec
$T_{V_{SB_ON_DELAY}}$	Delay from AC being applied to 12V _{SB} being within regulation.	--	1500	mSec
$T_{AC_ON_DELAY}$	Delay from AC being applied to 12.2V _{OUT} output voltage being within regulation.	--	3000	mSec
$T_{12V_{OUT_HOLDUP}}$	Time 12.2V _{OUT} output voltage stay within regulation after loss of AC with specified load on section 3.6.	11	--	mSec
T_{PWOK_HOLDUP}	Delay from loss of AC to de-assertion of PWOK with specified load on section 3.6.	10	--	mSec
$T_{PS_{ON_ON_DELAY}}$	Delay from PS_ON# active to output voltages within regulation limits.	5	400	mSec
$T_{PS_{ON_PWOK}}$	Delay from PS_ON# deactivate to PWOK being de-asserted.	--	5	mSec
T_{PWOK_ON}	Delay from output voltages within regulation limits to PWOK asserted at turn on.	100	500	mSec
T_{PWOK_OFF}	Delay from PWOK de-asserted to output voltages dropping out of regulation limits.	1	--	mSec
T_{PWOK_LOW}	Duration of PWOK being in the de-asserted state during an off/on cycle using AC or the PS_ON signal.	100	--	mSec
$T_{V_{SB_12V_{OUT}}}$	Delay from V_{SB} being in regulation to 12.2V _{OUT} output voltage being in regulation at AC turn on.	50	1000	mSec
$T_{V_{SB_HOLDUP}}$	Time the V_{SB} standby voltage stays within regulation after loss of AC.	70	--	mSec



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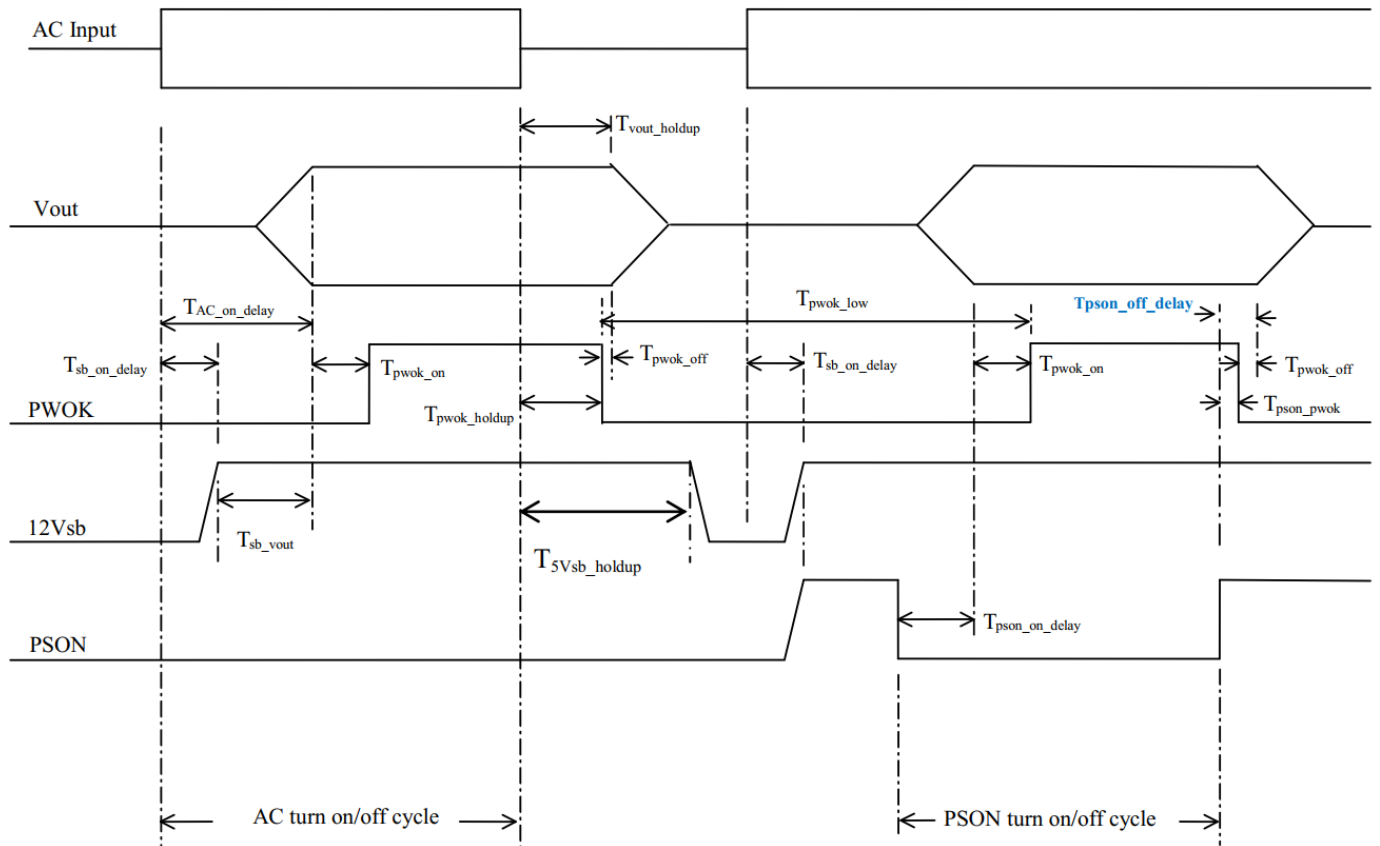
T_{12Voff_12Vsb off}

Time 12VSB stay within regulation after 12.2V turn off(out regulation)

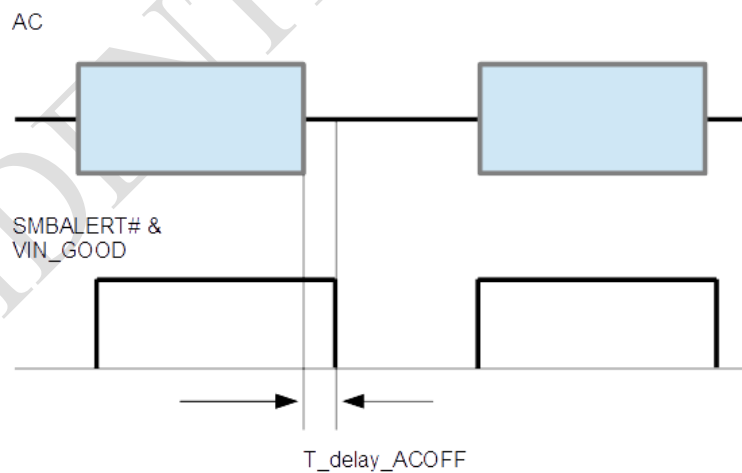
5

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mSec



The SMBAlert# and VIN_GOOD signals shall be active in 2 mSec after AC drop output to zero is happened.



7 Additional Requirements

7.1 Fan Speed Control

The power supply shall incorporate a 40 x 28 mm fan for cooling the power supply when installed in the system. The airflow direction shall be from the card edge connector side to the AC inlet side of the power supply (DC->AC) or opposite direction (AC->DC). The Fan speed control must have close loop algorithm based on both the critical component temperature and the ambient temperature (Inlet temperature). Thus ensure the PSU Fan will always ramp to maximum speed under any condition to protect the power supply from overheating. These conditions include high ambient temperatures; loading, AC input, and airflow impedance.

Anti-reverse fan is needed. PSU Fan can get back to normal from 6000 rpm reverse rotating condition, w/o event log occurred.



7.2 OTP

The power supply shall incorporate a thermal shutdown feature that turns off all outputs (except Standby output) When an over temperature condition occurs, the power supply will not be damaged and will automatically restart when the over temp condition no longer exists. Hysteresis shall be employed to prevent a frequent toggling on and off of the outputs.

The location of the OTP sensor should be on the component(s) most likely to overheat in the event of an abnormal ambient temperature or a blockage of airflow.

In normal operation the OTP cannot activate when the power supply is operated in any of the specified operating conditions of sections 3.1, 4.1, and 9.1.

The OTP must be driven low before or at the same time that PWOK is driven low. PWOK must be low for at least 1mSec before the main outputs go out of regulation.

7.3 FAN FAIL

The fan(s) are running or the supply is in Standby mode, If there is a fan fault per section 6.12, the PSU is off and the PWOK must be low for at least 1mS before the main outputs go out of regulation,

FAN FAIL on 12.2V rail will be latched and is reset per section 5.2.4, the Standby output shall auto recovery when fault is removed(TBD), after fan fault event is removed and the frequency of Fan TACH signal reaches back the setting point accordingly to load.

The PSU should not damage when the airflow is block, but it's can be trigger OTP.



8 PMBus

8.1 PMBus requirement

PMBus spec, follow Acbel CRPS PMBus spec.

8.1.1 Accuracy for V_{IN} , I_{IN} , P_{IN} , $12V_{OUT}$, I_{OUT} , P_{OUT}

Required Accuracy

	0% - 5% Load	5% - 10% Load	>10% - 20% Load	> 20% - 100% Load
PIN / EIN	+/-10W or +/-10% whichever is greater when $P_{in} \leq 10W$, report 10W	+/-10W or +/-5% whichever is greater	+/- 5%	+/- 2%
VIN	+/- 5%	+/- 5%	+/- 5%	+/- 2%
IIN	+/-0.2A or +/-10% whichever is greater when $I_{in} < 0.2A$, report 0.2A	+/-0.2A or +/-10% whichever is greater	+/- 5%	+/-2%
FAN	Speed<25000 rpm, accuracy +/-500rpm ; Speed>25000 rpm, accuracy+/-5%			
12.2VOUT	+/-5%	+/-5%	+/- 5%	+/- 2%
IOUT	+/-1A or +/-10% whichever is greater when $I_{out} < 1A$, report 1A	+/-1A or +/-10% whichever is greater	+/- 5%	+/- 2%
POUT	+/-10W or +/-10% whichever is greater when $P_{out} \leq 7W$, report 7W	+/-10W or +/-5% whichever is greater	+/- 5%	+/- 2%
Ambient Temperature	+/- 3°C			

Note1: Accuracy should meet 100-120Vac/200-240Vac

8.1.2 Smart Redundancy

This signal should be connected together at system board for smart redundant function. Please refer to the PMBus specification for detail

8.1.3 Black Box

The power supply shall save the latest PMBus data and other pertinent data into nonvolatile memory when a critical event shuts down the power supply. This data shall be accessible via the SMBus interface with an external source providing power to the V_{SB} output.

8.1.4 System on-Line Bootloader

The power supply shall have the capability to update its firmware via the PMBus interface while it is in standby mode. This FW can be updated when in the system and in standby mode and outside the system with power applied to the V_{SB} pins.



9 Environmental Requirements

9.1 Temperature

9.1.1 Normal Operating Ambient (At Sea Level)

Minimum: -5 °C

Maximum: + 55 °C,

The system side shall provide at least 12.5 CFM(TBD) to PSU when the PSU Fan runs at full speed condition.

Ambient	55 deg C
Low Line(W)	1000W
High Line(W)	2000W
Typ. OTW (C)	61
Typ. OTP (C)	65

9.1.2 Non-Operating Ambient (At Sea Level)

Minimum: - 40 °C

Maximum: + 70 °C

Maximum rate of change is 20 °C /hr.

9.2 Humidity

9.2.1 Operating

Up to 85% relative humidity. (Non-Condensing)

9.2.2 Non-Operating

Up to 95% relative humidity. (Non-Condensing)

9.3 Altitude

9.3.1 Operating

- 50 to 10,000 feet (3,048 meters). 5,000 meter is preferred.

NOTE:

1. The system ambient supports 55 °C at 950 m (3000 feet) Altitude.
2. Maximum operating temperature is de-rated 1 °C per 125 m above 950 m, If over this condition then may be trig OTP



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9.3.2 None-Operating

-50 to 50,000 feet (15,240 meters)

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9.4 Thermal shock (none-operating)

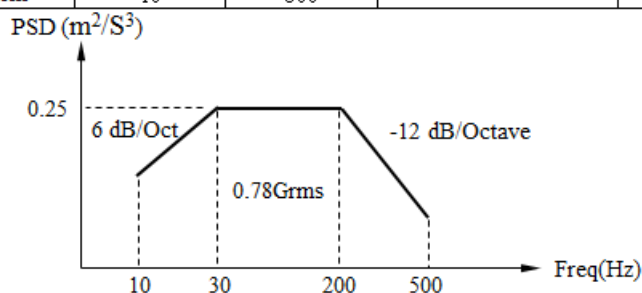
Non-operating: -40 °C to +70 °C, 50 cycles, 30 °C/min. ≥ transition time ≥ 15 °C/min., duration of exposure to temperature extremes for each half cycle shall be 30 minutes.

9.5 Vibration

Unpackaged Vibration

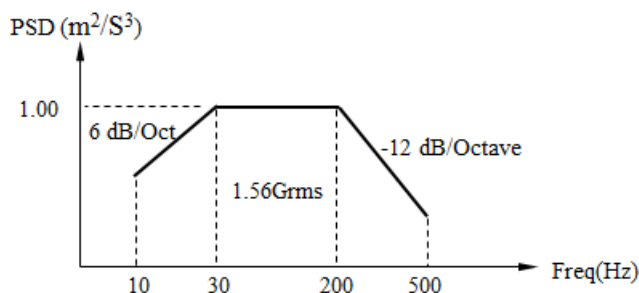
OP Vibration

Vibration Type	Start(Hz)	End(Hz)	Peak(G)	Grms	Apply side	Duration(min)/axes
Random	10	500	-	0.78	3 axes	30



NOP Vibration

Vibration Type	Start(Hz)	End(Hz)	Peak(G)	Grms	Apply side	Duration(min)/axes
Random	10	500	-	1.56	3 axes	30



9.6 Mechanical Shock

Unpackaged Shock

OP Shock	Shock Type	Peak(G)	Velocity Change(m/s)	Duration(ms)	Apply side
	Half-Sine	10	-	6	50 shocks on each faces
NOP Shock	Shock Type	Peak(G)	Velocity Change(m/s)	Duration(ms)	Apply side
	Half-Sine	30	-	18	3 shocks on each faces

10 Reliability

10.1 Reliability

Unless otherwise specified, all section 9.0 analyses will be conducted in accordance with the parametric listed below:

The reliability requirements are based on the following product usage/application conditions.

AC Input Voltage Range	Refer to Section 3.1
DC Output Load	100% Maximum of rate output load
Temperature Range	Refer to Section 9.1
Relative Humidity	44% $\pm$ 10% Non-condensing
Altitude	Sea Level
CMTBF	250K Hours @ 100% Load and 55°C
Minimum Operating Life	5 Years @ 80% Load and 40 °C

10.2 E-Cap. Life

All used electrolytic caps must have a usefully life time which exceeds 43,800Hours at 80% load and normal input and 40°C power supply ambient temperature.

10.3 Burn-in

100% of all engineer stage units (development units) will be burned-in for 24 hours before shipment.

The Burn-In profile will be:

Ambient temperature will be (maximum temp. – 5°C) with $\pm$ 5°C ambient tolerance.

All units subjected to burn-in will be at 90~100% of rated load(s). If loading the individual outputs at 90% exceeds the power supply's output rating the loads can be decreased until the power rating of the supply is not exceeded.

Condition 1, All units subjected to burn-in will be exposed to full load condition for 12 hours under low nominal line condition.

Condition 2, All units subjected to burn-in will be exposed to full load to 5 sec power on and 5 sec power off for 1000 sec under low nominal line condition.

Condition 3, All units subjected to burn-in will be exposed to full load condition for 12 hour with ½ hour power on and off.

50% of the units subjected to burn-in will have an AC input of low nominal line condition; 50% of the units will have an AC input of high nominal line condition.

10.4 Component De-rating



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The component de-rating is designed to satisfy the IPC9592B Class I.

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11 EMC and Safety Requirements

The power supply must comply with all regulatory requirements for its intended geographical market. Depending on the chosen market, regulatory requirements may vary. Although a power supply can be designed for worldwide compliance, there may be cost factors that drive different versions of supplies for different geographically targeted markets. The power supply meets below standard, and the mark.

11.1 Safety Mark and Standards

The power supply will have the following safety approvals with most current editions:

- A) UL 62368-1/ CSA 62368 Edition 2/3/ FCC (USA/Canada)
- B) TUV EN62368 Edition 2/3 (Europe)
- C) CB IEC60950-1/ IEC62368 Edition 2/3 (International)
- D) CE – Low Voltage Directive 2006/95/EC (Europe)
- E) BSMI (Taiwan)
- F) CQC (China)
- G) UKCA(England)
- H) KC(Korea)
- I) BIS(India)

11.2 EMI Requirement

The power supply meet EMI standard as below, need margin 6dB

EN55032 Class A.

EN55035 Class A.

CISPR32 Class A.

FCC Class A.

11.3 Hi-pot

The power supply unit must pass a 2550 V_{DC} Residual Voltage test between primary to chassis ground. All production units must pass a 2550 V_{DC} Hi-Pot test between primary to chassis ground or follow safety agency requirement. The voltage must be ramped up to 2550 within 2.0S and it must be maintained at that level for a minimum of 1 sec. without failure, arc and breakdown or it must comply with safety requirement.

Test voltage	DC
Specify test voltage of Vdc	2550VDC
Current Sensitivity or Current Trip Setting	100uAdc
Ramp-Up Time	2S
Dwell time	1S
RAMP-HI	OFF
Arc fail	ON
Arc sense	5

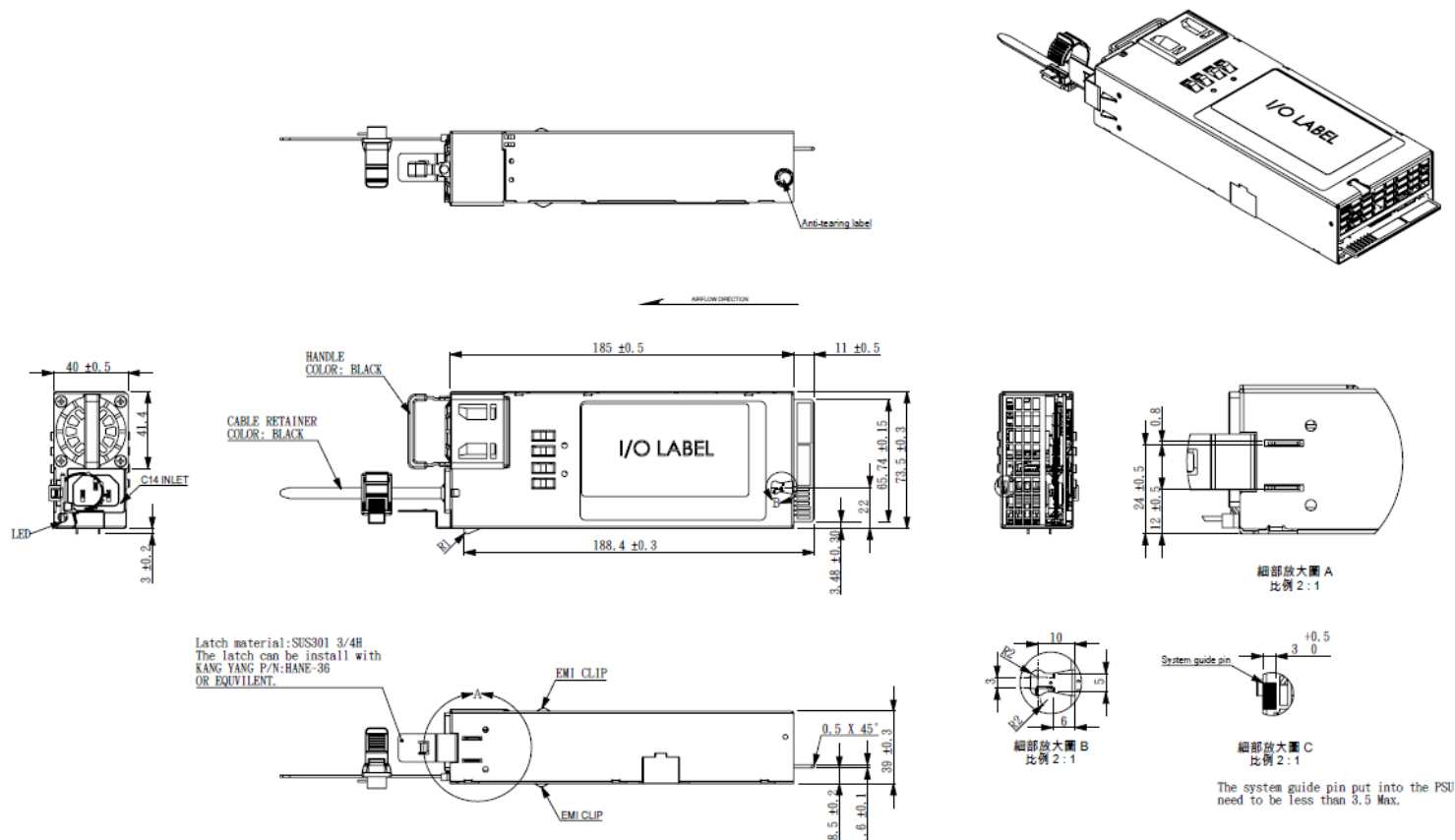


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12 Mechanical Drawing (TBD)



NOTE:
Above drawing is for reference only, detail dimension should refer to independent mechanical drawing.

13 RoHS Compliance

Products listed below that are manufactured by AcBel are in compliance with Directive 2011/65/EU, 2015/863/EU.



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Mechanical Outline Drawing

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
M	NOTES :														M
L	1. POWER SUPPLY MUST CONFIRM TO CUSTOMER'S SPEC FSM005-930G														L
K	2. ENCLOSURE MATERIAL : (ELECTRO-GALVANIZED STEEL SHEET) 30g/30g PERSIDE AND MUST MEET GENERAL SPEC. FOR ELECTRO-GALVANIZED STEEL SHEET (JIS G3313 AND ANTI-FINGER PRINTED). 72 HOURS MINIMUM WHITE RUST PROTECTION IN SALT SPRAY (ASTM B117), MATERIAL MUST MEET DC RESISTANCE 0.1 OHMS MAX. FOR ELECTRICAL CONDUCTIVITY REQUIREMENTS. 機殼材質:(電鍍入鋅鋼板)雙面電鍍規格為 30g/30g. 必須符合一般鍍鋅鋼板的規範(JIS G3313 AND ANTI-FINGER PRINTED). 至少72小時鹽霧防鏽處理 (ASTM B117),材料阻抗需小於0.1 OHMS MAX.														K
J	3. ALL EXPOSED EDGES MUST MEET HANDLING REQUIREMENTS SPECIFIED IN UL 1439 AND MUST NOT CUT THROUGH THE FIRST LAYER OF THE TESTER. 所有可能被觸碰的邊緣必須符合 UL1439觸摸安全需求,不可以刮傷檢測者(使用者)的皮膚.														J
H	4. OPENING IN CHASSIS FOR CABLES TO BE FORMED OR GROMMETED AND SEALED TO PREVENT AIR LEAKAGE AND TO PROTECT CABLES FROM DAMAGE. CABLES TO BE STRAIN RELIEVED. 輸出線材孔需反摺或設計扣環型式來保護線材,且需避免漏風的情形.線材需消除應力.														H
G	5. GROUND SYMBOL $\oplus$ LOCATED TO BE PERMANENTLY MARKED NEAR PRIMARY GROUND CONNECTION. 接地符號需永久的位於一次側接地處.														G
F	6. BARCODE LABEL, WARNING LABEL AND INFORMATION LABEL LOCATED ON NOTED SURFACE. BEFORE ADHERING LABELS, SHEETMETAL SURFACE MUST BE FREE OF ANY GREASE, OIL AND DIRT SHEETMETAL SURFACE MUST BE FREE OF ANY GREASE, OIL AND DIRT. 標籤黏貼的位置如圖示.在黏貼前,金屬表面必須沒有任何的油污,油,或是塵土.														F
E	7. THESE MATERIAL/PART/ASSEMBLY MUST COMPLY TO ACBEL SPEC "CRITERIA FOR ENVIRONMENT-RELATED SUBSTANCES" . 材質/零件/製程均必須符合康舒"環境管理物質規範".														E
D	8. DO NOT ALLOW SCRATCH ON THE SURFACE. EXTRUDE PORTION SHOULD PREVENT THE DAMAGE OF THE ZINC PLATED LAYER AND OXIDATION. 表面不允許刮傷,擠出部份也必須預防電鍍層有氧化現象.														D
C	9. THE MANUFACTURER SHALL NOTIFY API PRIOR TO CHANGES IN MANUFACTURING LOCATION 製造商如需變更製造地,需事先通知API .														C
B	10. COVER , CHASSIS & SIDE PANEL MUST BE THE SAME COLOR UNLESS OTHERWISE SPECIFIED. 除非有特別指示,否則上蓋、下蓋、邊嵌板必須顏色一致														B
A	11. NET WEIGHT: 875 GRAMS±3% 淨重 : 875克 ±3%														A
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

12. SCREW THREAD MUST BE WITHSTAND THE FOLLOWING TORQUE INDICATED :

M3 * 0.5	_____	12Kgf－cm	(MIN)
M3.5 * 0.6	_____	15kgf－cm	(MIN)
#6－32	_____	12Kgf－cm	(MIN)

螺紋鎖付扭轉抗力需大於下列數值:

M3 * 0.5	_____	12Kgf－cm	(MIN)
M3.5 * 0.6	_____	15kgf－cm	(MIN)
#6－32	_____	12Kgf－cm	(MIN)

13. STUD AND CLINCH NUT MUST BE FLUSH ON THE NOTED SURFACE

WHICH MUST BE CONFORM TO THE FOLLOWING TORQUE INDICATED :

THREAD CODE	SHEET THICKNES (MM)	SHEET MATERIAL	
		COLD－ROLLED SHEET	
		PUSHOUT (Kg MIN)	TORQUE－OUT (Kgf－CM MIN)
M3*0.5	0.8~1.0	47	15
#6－32		50	18
M4*0.7		50	30

鉚接螺栓或螺帽,需符合下表扭力值:

螺紋編號	板厚 (毫米)	鋼板材質	
		冷軋鋼板	
		推出抗力 (Kg MIN)	扭轉抗力 (Kgf－CM MIN)
M3*0.5	0.8~1.0	47	15
#6－32		50	18
M4*0.7		50	30

14. $\textcircled{\text{FAI}}_{\text{XX}}$ FAI IS THE CRITICAL DIMENSION. FOR EVERY SHIPMENT,MUST FULLY INSPECT

THREE SAMPLE PARTS AND PROVIDE

$\textcircled{\text{FAI}}_{\text{XX}}$ FAI 尺寸為設計之重點尺寸,每次出貨前須量測3PCS 並提供報告,須合格,

方可出貨.

$\textcircled{\text{CPK}}_{\text{XX}}$ CPK IS THE DIMENSION PRODUCED BY STATISTICAL PROCESS

CONTROL.FOR EVERY SHIPMENT,MUST FULLY INSPECT THIRTY SAMPLE
PARTS AND PROVIDE A REPORT,

$\textcircled{\text{CPK}}_{\text{XX}}$ CPK 表示該(尺寸/位置)為製程管控尺寸,供應商每次出貨前須量測並

提供 30 PSC CPK 報告,須合格,方可出貨.

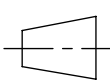
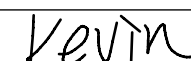
15. THE APPEARANCE OF THE FAN IS ONLY FOR REFERENCE

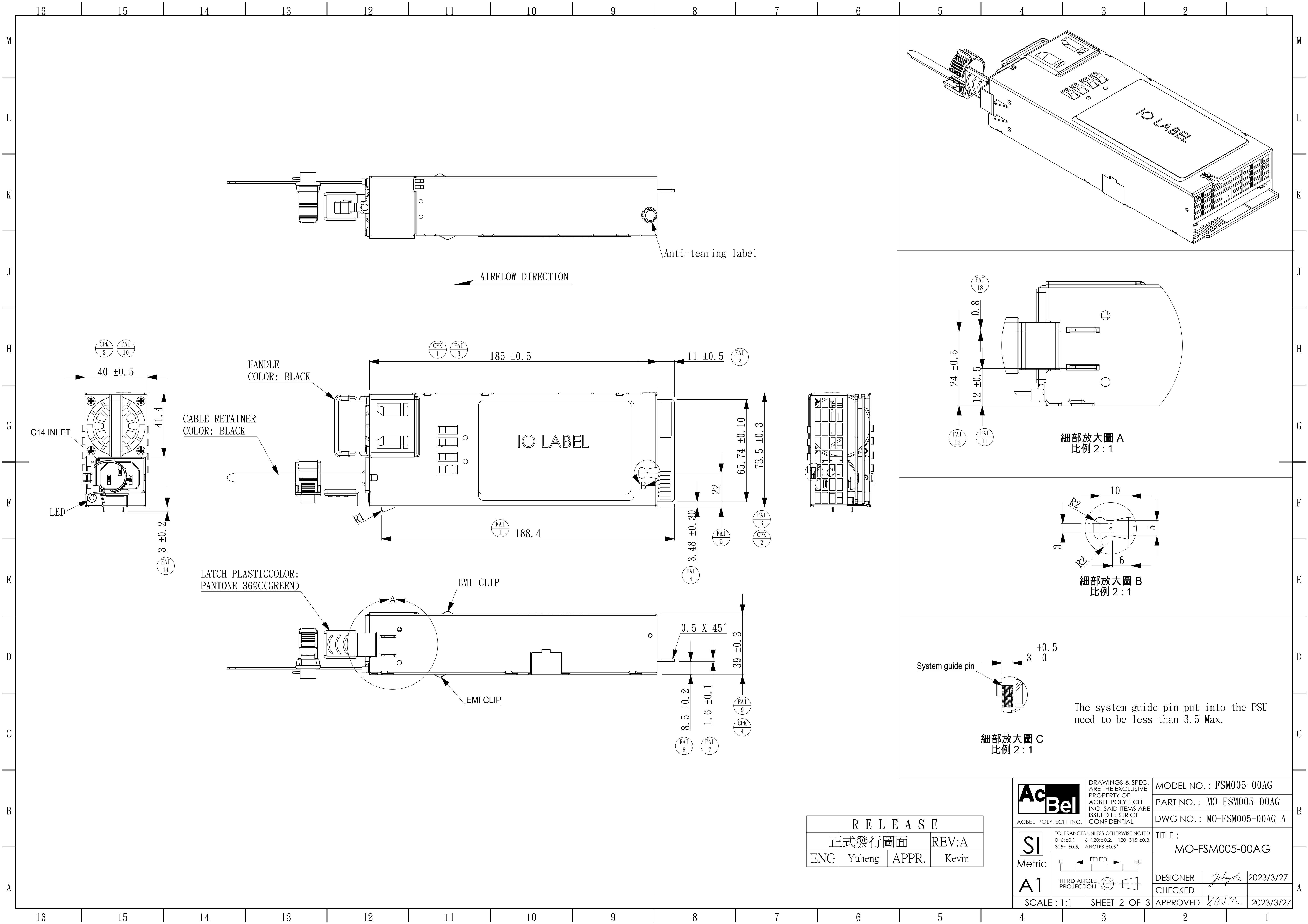
風扇的外觀以實際樣品為準

16. FOR REFERENCE ONLY.SUBJECT TO ACTUAL PRODUCT

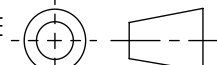
僅供參考. 以實物為準

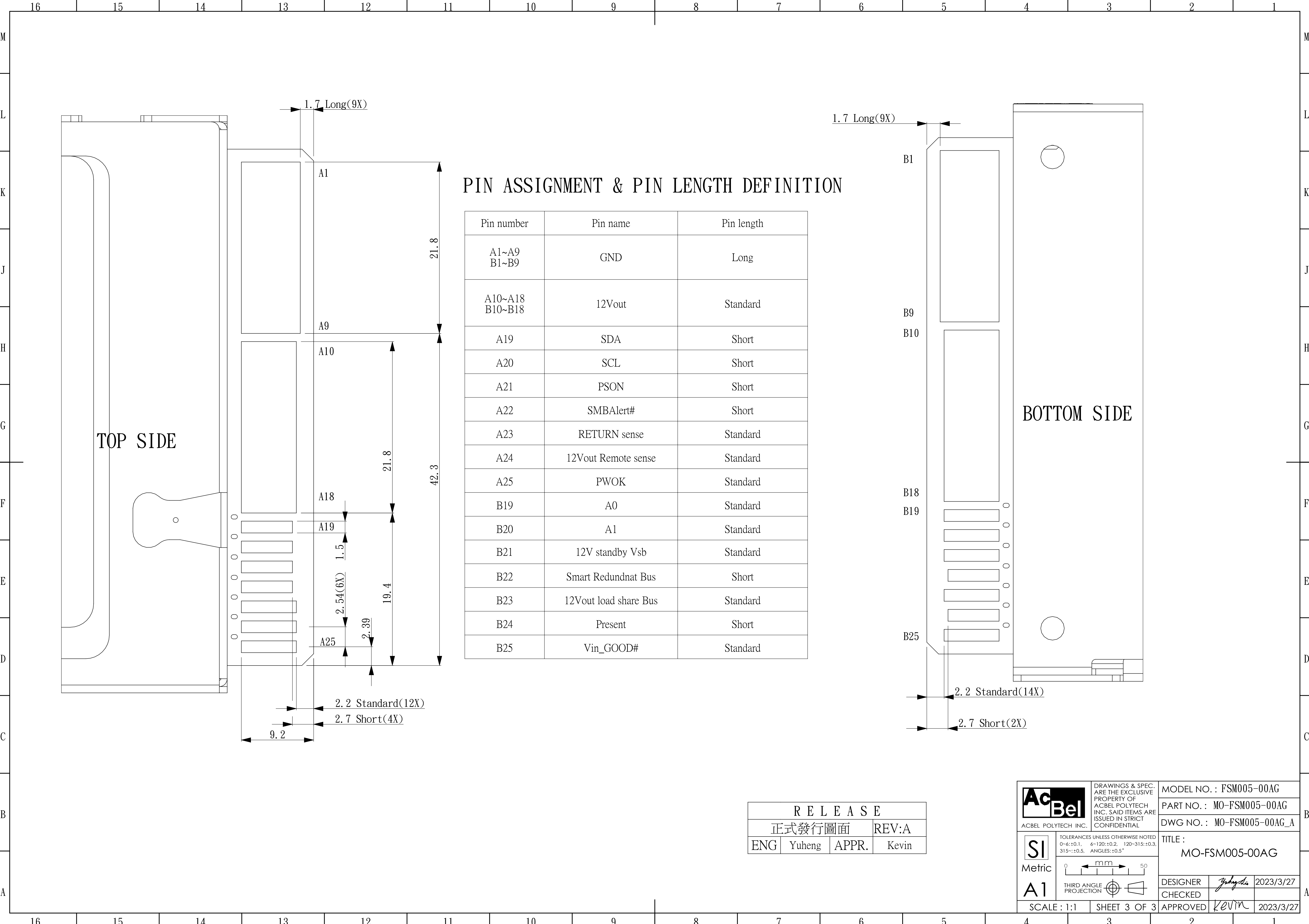
R E L E A S E			
正式發行圖面			REV:A
ENG	Yuheng	APPR.	Kevin

A	RELEASE	Yuheng	2023/03/27
01	PRELIMINARY	Yuheng	2022/03/26
REV	DESCRIPTION	BY	DATE
 ACBEL POLYTECH INC. DRAWINGS & SPEC. ARE THE EXCLUSIVE PROPERTY OF ACBEL POLYTECH INC. SAID ITEMS ARE ISSUED IN STRICT CONFIDENTIAL		MODEL NO. : FSM005-00AG	
		PART NO. : MO-FSM005-00AG	
		DWG NO. : MO-FSM005-00AG_A	
SI Metric A1 TOLERANCES UNLESS OTHERWISE NOTED 0-6:±0.1, 6-120:±0.2, 120-315:±0.3, 315-∞:±0.5. ANGLES:±0.5° 0 mm 50 THIRD ANGLE PROJECTION 		TITLE : MO-FSM005-00AG	
SCALE : 1:1		DESIGNER	 2023/3/27
SHEET 1 OF 3		CHECKED	
		APPROVED	 2023/3/27



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SI Metric A1		TOLERANCES UNLESS OTHERWISE NOTED 0~6:±0.1, 6~120:±0.2, 120~315:±0.3, 315~:±0.5, ANGLES:±0.5° THIRD ANGLE PROJECTION 		PART NO. : MO-FSM005-00AG	
				DWG NO. : MO-FSM005-00AG_A	
				TITLE : MO-FSM005-00AG	
SCALE : 1:1		SHEET 2 OF 3		DESIGNER	Yuheng Liu 2023/3/27
				CHECKED	Kevin 2023/3/27
				APPROVED	Kevin 2023/3/27



PIN ASSIGNMENT & PIN LENGTH DEFINITION

Pin number	Pin name	Pin length
A1~A9 B1~B9	GND	Long
A10~A18 B10~B18	12Vout	Standard
A19	SDA	Short
A20	SCL	Short
A21	PSON	Short
A22	SMBAlert#	Short
A23	RETURN sense	Standard
A24	12Vout Remote sense	Standard
A25	PWOK	Standard
B19	A0	Standard
B20	A1	Standard
B21	12V standby Vsb	Standard
B22	Smart Redundnat Bus	Short
B23	12Vout load share Bus	Standard
B24	Present	Short
B25	Vin_GOOD#	Standard

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SI

Metric

A1

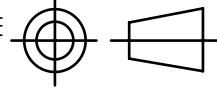
TOLERANCES UNLESS OTHERWISE NOTED
0-6:±0.1, 6-120:±0.2, 120-315:±0.3,
315-∞:±0.5, ANGLES:±0.5°

0

50

mm

THIRD ANGLE
PROJECTION



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MODEL NO. : FSM005-00AG

PART NO. : MO-FSM005-00AG

DWG NO. : MO-FSM005-00AG_A

TITLE :
MO-FSM005-00AG

DESIGNER

CHECKED

APPROVED



2023/3/27

2023/3/27



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I/O Label Drawing

	1	2	3	4	5	6	7	8	
A	NOTE: 1 UNIT : MM 單位 : 毫米		12	REV: REV printed rules ("S1"printed : 0S1 ; "S2"printed : 0S2 ; "A"printed : A00) 版本列印規則 (S1印 : 0S1 ; S2印 : 0S2 ; A印 : A00)					A
B	2 MATERIAL (材料): 2.1 FACE STOCK(底材): WHITE POLYESTER FILM, (白麥拉) THICKNESS = 0.05 MM(厚度=0.05毫米) 2.2 ADHESIVE(背膠): THICKNESS = 0.035 MM(厚度=0.035毫米) PRESSURE SENSITIVE ACRYLIC(壓花膠) 2.3 BACKED WITH RELEASE LINER(背面附離型紙) 2.4 LABEL TO BE AFFIXED TO AND MAXIMUM TEMPERATURE RATING:GALVANIZED STEEL 100 °C 貼紙所貼附之材質與最大耐溫等級: 鍍鋅鋼,100 °C 2.5 MATERIAL MUST BE UL RECOGNIZED AND COMPLY TO UL 969 STANDARD 材質必須符合UL認證,並且遵從969標準		13	SN BARCODE FORMAT: CODE128/CPI:13.64 THE NARROW ELEMENT DIMENSION(X DIIMENSION) SHOULD WITHIN RANGE OF 0.170MM(0.0067INCH) 條碼格式 : CODE 128/ CPI 13.64 寬/窄比 : 0.17毫米(0.0067英吋) NNN YYWW SSSSSS PPPG X ZZZZZZ API MODEL NAME(EXAMPLE : 若機種為FSM005-00AG則印製"FSM005"於此六個欄位) MFG FACTORY CODE(東莞康舒印: B ; 東莞康展印: T ; 武漢康舒印: W ; 淡水康舒印: D) ID CODE (Ex:若機種為FSM005-00AG印"00AG") SERIAL NO 000001~999999 DATE CODE(YY:YEAR WW:WEEK FOR EXAMPLE:2018 27TH WEEK 則此四欄位為"1827") API REVISION CONTROL CODE(S1印:0S1 ; S2印:0S2 ; A印:A00)					B
C	3 LABEL MUST BE MADE BY A UL RECOGNIZED AND CSA APPROVED VENDOR. 貼紙之製造商必須是UL與CSA所認證 4 FAI  , CPK  , "  " CRITICAL DIMENSION SYMBOL, SUPPLIER MUST INSPECT THIS DIMENSION FOR EVERY SHIPMENT FAI  , CPK  , "  " 表示該(尺寸/位置)為設計的重點尺寸, 廠商每次出貨前必須檢驗合格方可出貨 5 THIS MATERIALS/PARTS/ASSEMBLIES MUST COMPLY TO ACBEL SPEC "CRITERIA FOR ENVIRONMENT- RELATED SUBSTANCES" 零件/材料/製程皆須符合康舒"環境物質的規範"		14	DATAMATRIX CODE PRINTED RULES: 二維條碼列印規則: XXXXXXXXXPPPP;NNNYYWWSSSSSSOOOOXOOOOOO;YYMMDD;XXXXXXXXXX FRU (參照FRU自印原則) 生產日期 (例 : 2021年3月26日生產則印"210326") SN (參照SN自印原則) OPTION(EX:T00A) MODEL(EX:R1CA2202E)					C
D	6 CHARACTER HEIGHT : 2 MM ,UNLESS OTHERWISE SPECIFIED.圖面未標示之字體高度皆為 2毫米 7 ALL PRODUCTS MUST BE THE SAME AS ENGINEERING APPROVAL SAMPLE ANY HARD TOOLING MODIFICATION MUST BE APPROVED BY ACBEL MECHANICAL ENGINEERING SECTION 所有產品必須與認可的樣品一致,任何的修改都必須經由 康舒機構工程師同意及認可 8 PRINTED COLOR(列印顏色) : BLACK(黑色)-TEXT(文字), GRAPHICS(圖形),LOGO(標誌) IMAGE(圖像), SURROUND SHAPE(外圍圖形) WHITE(白色)- BACKGROUND (背景)		15	OPTION printed rules: OPTION 列印規則: 機種尾碼(FSM005-00AG印00A) 效率等級(Titanium印T;Platium印P; Gold印G)					D
E	9 LABEL MUST CONTAIN THE VENDOR'S ID MARK LOCATED IN THE AREA INDICATED. ID MARK LETTER HEIGHT TO BE 1.5MM 貼紙必須印製廠商代碼 , 代碼字高為1.5毫米		16	FRU PRINTED RULES FRU列印規則 : APM12 FW REVISION (印 : A0000 ; A0001 ; A0002 ...Z9999) TYP MINOR REVISION (印 : 1 ; 2 ; 3 ...) TYP MAJOR REVISION (印 : 1 ; 2 ; 3 ...) TYP (PMBUS印 : PM ; SMBUS印 : SM ; EEPROM印 : EP) API(API印:A)					E
F	10 ACBEL FACTORY CODE : A) ACBEL-TAIWAN: MADE IN TAIWAN ROC, NONE MARK B) ACBEL-DONGGUAN: MADE IN CHINA , USE "B" MARK C) ACBEL MANILA: MADE IN PHILIPPINES , USE "C" MARK 康舒製造廠的標記: A)康舒台灣廠 : 在台灣製造的不用標記 B)康舒塘廈廠 : 在中國大陸製造的使用"B"標記 C)康舒馬尼拉廠 : 在菲律賓製造的使用"C"標記 11 MODEL NAME & REV & CUSTOMER ID & SN BARCODE & FW REV ,ACBEL PRINTED 型號 & 版本 & 客戶識別碼 & SN 條碼 & 軟體版本,由康舒自印		17	WARNING LABEL PRINTED COLOR: 警告符號顏色定義: PMC BlackC黑色 - 文字、圖形、圖像、標誌 PMC 108C 黃色 - 背 					F
	1	2	3	4	5	6	7	8	

RELEASE	
正式發行圖面	REV:B
ENG.Yuheng	APPR.

SCALE 1:1	SHEET 1 OF 2
-----------	--------------

ACBEL POLYTECH INC.	DRAWINGS & SPEC. ARE THE EXCLUSIVE PROPERTY OF ACBEL POLYTECH INC. SAID ITEMS ARE ISSUED IN STRICT CONFIDENTIAL	MODEL NO. : FSM005-00AG
PART NO. : A01AAA-8895ATE		TITLE : I/O LABEL
DWG NO. : A01AAA-8895ATE_B		
DESIGNER	Yuheng	
CHECKED		
APPROVED		

1		2		3		4		5		6		7		8			
A		B		C		D		E		F		A		B			
 DETAIL A SCALE ENLARGED COLOR:BLACK		 DETAIL B SCALE ENLARGED COLOR:BLACK		 PRINTED COLOR: BLACK 80 PLUS LABEL COLOR: PANTONE PMS: 444 RGB:123,135,130		 200-240V~, 50/60Hz 10A ZU10349-22004 R-R-API-R1CA2202E 컴퓨터용 전원공급장치 Mfr.Name:AcBel Electronic(DongGuan)Co.,Ltd A/S: 070-7094-0600 FSM005/FSM044/R1CA2202E /R1CA2202H 系列的KC EMC certificate ID 都使用R-R-API-R1CA2202E 代表		6		7		8					
 E131875(B) DETAIL E ACBEL 加工廠代號 ACBEL -中國 大陸東莞廠造符號為(B) ACBEL -台灣 台灣淡水廠造符號不印製 ACBEL -菲律賓 菲律賓馬尼拉廠造符號為(C)		 DETAIL F SCALE ENLARGED COLOR:BLACK		 警告符號顏色定義: PMC BlackC黑色 - 文字、圖形、圖像、標誌 PMC 108C 黃色 - 背		 IS 13252 (Part 1)/ IEC 60950-1 R-41196150 www.bis.gov.in DETAIL D SCALE ENLARGED Font: Arial Size: 6											
C		D		E		F		G		H		I		J			
12		15		16		17		18		19		20		21			
MODEL/OPTION/REV/FRU/FW REV 請與業務或PM確認 範例型號:R1CA2202E 或R1CA2202H		Switching Power Supply 开关电源(交換式電源供應器) MODEL 型号(型號):		QR Code		IS 13252 (Part 1)/ IEC 60950-1		UKCA		R33567 RoHS		AcBel Polytech (UK) Limited 9 Royal Crescent Glasgow G3 7SP		OPTION: REV: FRU:			
AC INPUT / 交流輸入/(交流輸入): 100-127V~, 50/60Hz 12A (非中国地区使用/非中國地區使用/Not for China) 200-240V~, 50/60Hz 10A OR (或) 240V === 10A		DC OUTPUT/ 直流輸出/(直流輸出): +12.2V === 82A +12 Vsb === 3.0A +12.2V === 148A +12 Vsb === 3.0A +12.2V === 155A +12 Vsb === 3.0A +12.2V === 164A +12 Vsb === 3.0A		Maximum Output Power=1000W at 100-127V-Input 在100V-127V-輸入電壓下,最大輸出功率為1000瓦 在100V-127V-輸入電壓下,最大輸出功率為1000瓦 Maximum Output Power=1800W at 200-207V-Input 在200V-207V-輸入電壓下,最大輸出功率為1800瓦 在200V-207V-輸入電壓下,最大輸出功率為1800瓦 Maximum Output Power=1900W at 208-219V-Input 在208V-219V-輸入電壓下,最大輸出功率為1900瓦 在208V-219V-輸入電壓下,最大輸出功率為1900瓦 Maximum Output Power=2000W at 220-240V- Or 240V === Input 在220V-240V-或240V === 輸入電壓下,最大輸出功率為2000瓦 在220V-240V-或240V === 輸入電壓下,最大輸出功率為2000瓦		R-41196150 www.bis.gov.in		TÜVRheinland ZERTIFIZIERT		Regelmäßige Produktions- überwachung Sicherheit Bauart geprüft www.tuv.com ID 1111254198		200-240V~, 50/60Hz 10A ZU10349-22004 R-R-API-R1CA2202E 컴퓨터용 전원공급장치 Mfr.Name:AcBel Electronic(DongGuan)Co.,Ltd A/S: 070-7094-0600		HIPOT CONT OK		80 PLUS TITANIUM 230V	
AC INPUT/ 交流輸入/ 交流輸入:200-240V-50/60Hz 12A DC OUTPUT/ 直流輸出/直流輸出:+12.2V === 164A +12Vsb === 3A Max. OUTPUT POWER/最大輸出功率/最大輸出功率:2000W(瓦) (FOR UL-COVERED AREA/適用於UL认证所涵蓋的地区/適用於UL認證所涵蓋的地區)		NNNNYVWSSSSSPPGXZZZZZ		警告:為避免電磁干擾,本產品不應安裝或使用於住宅環境。 警告: 在居住環境中,運行此設備可能會造成無線電干擾。		AcBel Polytech Inc. MADE IN CHINA 中国制造(中國製造)XX		(2:1) 放大圖面200% 一維碼與二維碼為廠內套印		9		60 ±0.2		CPK 02 FAI 02			
虛線不列印		13		53		13		13		13		13		13			
F		G		H		I		J		K		L		M			
RELEASE 正式發行圖面 ENG.Yuheng APPR.		REV:B		SCALE: 1:1		SHEET 2 OF 2		APPROVED		DESIGNER Yuheng 2024/1/2		CHECKED		APPROVED			
1		2		3		4		5		6		7		8			



Switching Power Supply
开关电源(交換式電源供應器)
MODEL 型号(型號): R1CA2202E



OPTION: T00A REV: A00 FRU: APM12V0006

AC INPUT / 交流輸入/(交流輸入):

100-127V~, 50/60Hz 12A (非中國地區使用/非中國地區使用/Not for China)

200-240V~, 50/60Hz 10A OR (或)

240V === 10A

DC OUTPUT / 直流輸出/(直流輸出):

+12.2V === 82A Maximum Output Power=1000W at 100-127V-Input
在100V-127V-輸入電壓下, 最大輸出功率為1000瓦

+12 Vsb === 3.0A
在100V-127V-輸入電壓下, 最大輸出功率為1000瓦

+12.2V === 148A Maximum Output Power=1800W at 200-207V-Input
在200V-207V-輸入電壓下, 最大輸出功率為1800瓦

+12 Vsb === 3.0A
在200V-207V-輸入電壓下, 最大輸出功率為1800瓦

+12.2V === 155A Maximum Output Power=1900W at 208-219V-Input
在208V-219V-輸入電壓下, 最大輸出功率為1900瓦

+12 Vsb === 3.0A
在208V-219V-輸入電壓下, 最大輸出功率為1900瓦

+12.2V === 164A Maximum Output Power=2000W at 220-240V- Or 240V === Input
在220V-240V-或240V === 輸入電壓下, 最大輸出功率為2000瓦

+12 Vsb === 3.0A
在220V-240V-或240V === 輸入電壓下, 最大輸出功率為2000瓦

AC INPUT/ 交流輸入/ 交流輸入: 200-240V-50/60Hz 12A

DC OUTPUT/ 直流輸出/ 直流輸出: +12.2V === 164A +12Vsb === 3A

Max. OUTPUT POWER/最大輸出功率/最大輸出功率: 2000W(瓦)

(FOR UL-COVERED AREA/適用於UL認證所涵蓋的地區/適用於UL認證所涵蓋的地區)

IS 13252 (Part 1)/
IEC 60950-1



R-41196150
www.bis.gov.in



Regelmäßige
Produktions-
überwachung
Sicherheit
Bewert geprüft

www.tuv.com
ID 1111254198



200-240V~, 50/60Hz 10A
ZU10349-22004
R-R-API-R1CA2202E
컴퓨터용 전원공급장치
Mfr Name: AcBel Electronics(DongGuan)Co., Ltd
A/S: 070-7094-0600



This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) this device must accept any interference received,
including interference that may cause undesired operation.



警告: 為避免電磁干擾, 本產品不應安裝或用於住宅環境。

警告:
在居住環境中, 運行此設備可能會造成電磁干擾。



A00240300043500AGBFSM005

AcBel Polytech Inc.

MADE IN CHINA 中國製造 (中國製造)TR

Fan Source list		
Item	Manufacturer	PN
1st Source	Asia Vital Componemts	DBPU0428B2UY070
3st Source	Protechnic Electric	MGT4012DB-W28 (I)(3063900)
4st Source	Protechnic Electric	MGT4012DB-W28 (I)(E202503022)

AVC:DBPU0428B2UY070



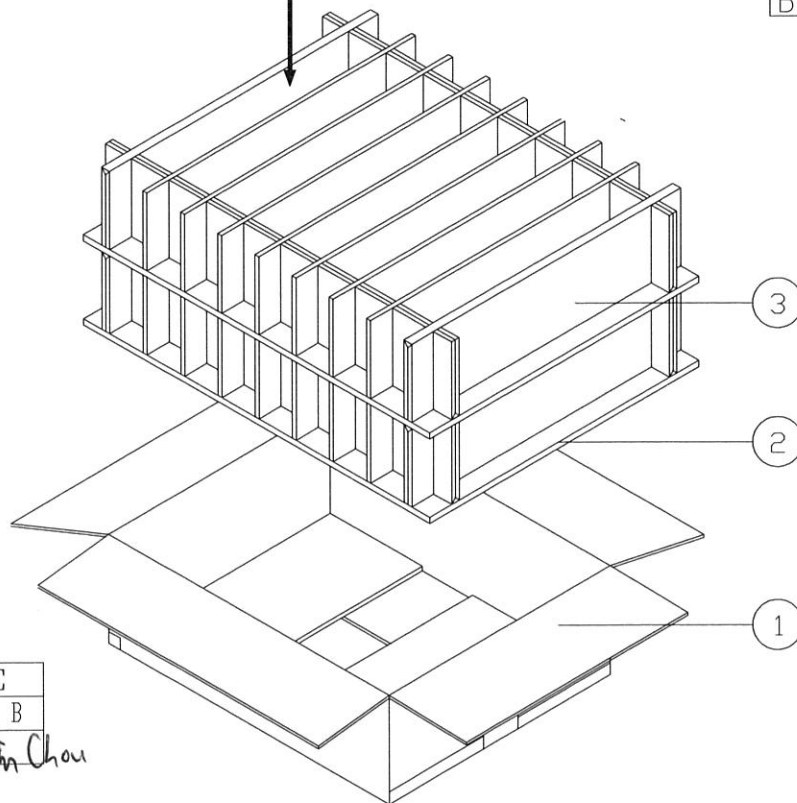
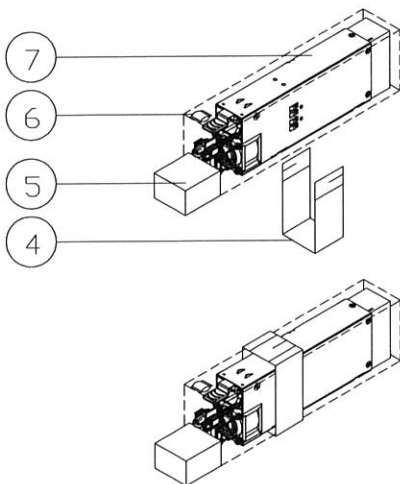
PROTECHNIC:MGT4012DB-W28



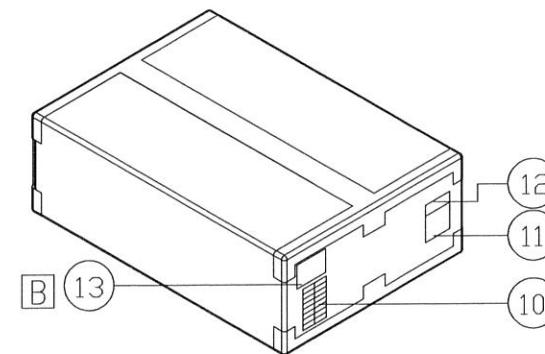
Carton Drawing

Unit-package instruction (單體包裝說明):

- Don't attach the tape on PE bag's sealing place.
(塑膠袋封口不要貼膠布。)
- The position of desiccant is allowed to adjust.
(乾燥劑位置允許調整。)
- The unit drawing is for reference only.
(圖示單體僅為示意。)



Note: 1. 16 units/ carton (16台/箱)



The position of serial number labels is allowed to adjust.
(序號標籤位置允許調整。)

The carton label (X01H00-2136I & X01H00-2161I) should be attached before shipment. And it is controlled by sales. (紙箱標籤 X01H00-2136I & X01H00-2161I 於出貨前貼,此紙箱標籤完全由業務控管。)

NO.	Q'TY	PART NO.	DESCRIPTION
13	1	X01H00-2161I	COMPAL CARTON LABEL
12	1	X01H00-2136I	CARTON LABEL
11	1	X01H00-1749I	CARTON LABEL
10	16	X01H00-2035I	S/N BARCODE LABEL
9	16	X1008-E7186I	ANTISTATIC EPE BOARD
8	16	R1008-B9411I	ANTISTATIC PE BAG
7	16	FSM005-00AG	POWER SUPPLY
6	16	X1008-T9555I	DESICCATIVE
5	16	R1008-E7991IA	EPE BOARD
4	16	X1008-C1923I	KRAFT PAPER
3	2	X1008-C2543I-SA	PARTITION ASSEMBLY
2	3	X1008-C2523I	PAPER BOARD
1	1	X1008-C1958I	CARTON

ACBEL		MODEL NO. FSM005-00AG	
ACBEL POLYTECH INC.		PART NO. CA-FSM005-00AG	
		DWG. NO : CA-FSM005-00AG_B	
TITLE :		CARTON ASS'Y	
		FOR FSM005-00AG	
DESIGNER	SUM	1/11/24	
CHECKED	Justin	1/11/24	
APPROVED			

REV	DESCRIPTION	BY	DATE
A	RELEASE	SUM	11/21/22
B	ADD COMPAL LABEL	SUM	1/11/24

RELEASE			
正式發行圖面		REV: B	
ENG.	Sum Jian	APPR.	Justin Chau

The requirement of labels and instructions: (標籤與說明書要求:)

a. The carton labels are always facing outwards. (紙箱標籤一律朝外。)

b. If there is any instruction in packaging BOM, please place it in the first carton.
(如果包裝 BOM 中有說明書, 請放置第一個紙箱中。)

B c. The carton label (X01H00-2136I & X01H00-2161I) should be attached before shipment. And it is controlled by sales. (紙箱標籤 X01H00-2136I & X01H00-2161I 於出貨前貼, 此紙箱標籤完全由業務控管。)

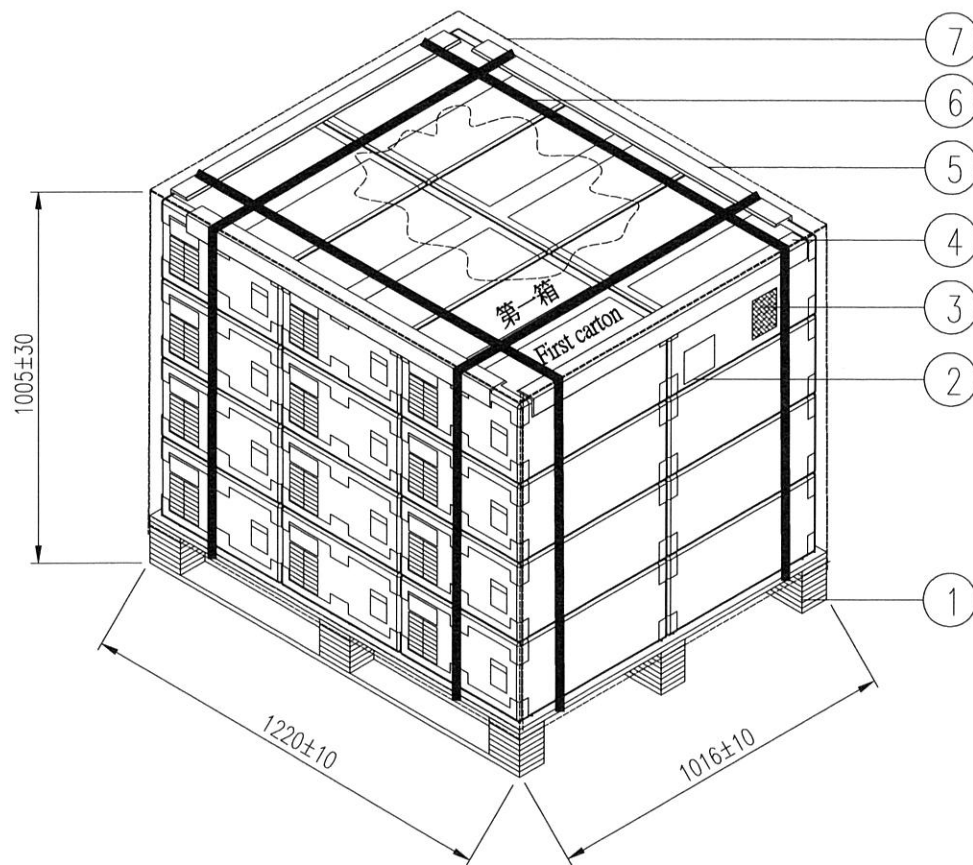
Notes: 1. 16 units/ carton (16台/箱)

2. 6 cartons/ layer (6箱/層)

3. 4 layers/ pallet (4層/棧板)

4. 384 units/ pallet (384台/棧板)

R E L E A S E			
正式發行圖面			REV: B
ENG.	<i>Sam Jian</i>	APPR.	<i>Justin Chou</i>



7	50M	X1008-8064I	PE FILM
6	20M	X1008-T9998I	PET PLASTIC STRIP
5	2	X1008-C8851I	EDGE PROTECTOR
4	2	X1008-C8852I	EDGE PROTECTOR
3	2	X01C32-1198I	SHIPPING LABEL
2	2	X01G50-0012I	WARNING LABEL
1	1	X1008-P9789I	PALLET
NO.	Q'TY	PART NO.	DESCRIPTION
AcBel ACBEL POLYTECH INC.			MODEL NO. FSM005-00AG
			PART NO. PA-FSM005-00AG
			DWG. NO : PA-FSM005-00AG_B
SI Metric A3			TITLE PALLET ASS'Y FOR FSM005-00AG
0 25 mm THIRD ANGLE PROJECTION			DESIGNER SUM 1/11/'24
SCALE NONE SHEET 1 OF 1			CHECKED <i>Justin</i> 1/11/24
			APPROVED <i>Justin</i> 1/11/24



康舒科技

ACBEL POLYTECH INC.

Safety

**IECEE**

TM

Ref. Certif. No.

JPTUV-135064-A3/M3

**IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT
(IECEE) CB SCHEME****CB TEST CERTIFICATE**

Product

Switching Power Supply

Name and address of the applicant

Acbel Polytech Inc.
No. 159,
Sec. 3, Danjin Rd., Tamsui Dist., New Taipei City 251
Taiwan

Name and address of the manufacturer

Acbel Polytech Inc.
No. 159,
Sec. 3, Danjin Rd., Tamsui Dist., New Taipei City 251
Taiwan

Name and address of the factory

See additional page(s)

Ratings and principal characteristics

Input : AC 100-127V; 50/60Hz; 12A, AC 200-240V; 50/60Hz; 10A
or DC 240V; 10A; Class I
Output: refer to the test report

Trademark (if any)

AcBel

Customer's Testing Facility (CTF) Stage used

CTF Stage 1

Model / Type Ref.

FSM005, R1CA2202E, FSM044, R1CA2202H
FSM010, R1CA2162D, FSM043, R1CA2162EAdditional information (if necessary may
also be reported on page 2)For model differences, refer to the test report.
Re-issue of JPTUV-135064-A3/M2 dated 2023-01-06,
due to third modification.A sample of the product was tested and
found to be in conformity withIEC 62368-1:2018
See Test Report for National DifferencesAs shown in the Test Report Ref. No. which
forms part of this Certificate

CN22DGTU 007

This CB Test Certificate is issued by the National Certification Body

**TÜVRheinland®**TÜV Rheinland Japan Ltd.
Global Technology Assessment Center
4-25-2 Kita-Yamata, Tsuzuki-ku
Yokohama 224-0021, Japan
Phone + 81 45 914-3888
Fax + 81 45 914-3354
Mail: info@jpn.tuv.com
Web : www.tuv.com

Date: 2023-01-09

Signature:

Dipl.-Ing. F. Stoelzel

1. AcBel Polytech(Philippines) INC.
No. 2 Tagaytay Ridge Drive,
Carmelray Industrial Park II,
Km. 54 National Highway
Calamba City, Laguna 4027, Philippines
2. ACBEL ELECTRONIC (WUHAN) CO., LTD
No. 1, DuTai North Road
Economic Development Zone
XianTao City, HuBei Province
P.R. China
3. Acbel Electronic (Dong Guan)
Co., Ltd.
No. 17-28, Horng Yeh Road, Horng
Yeh Ind. District, Tang Xia Town
Dongguan, Guangdong 523710, P.R. China
4. Acbel Polytech Inc.
No. 159,
Sec. 3, Danjin Rd., Tamsui Dist.,
New Taipei City 251
Taiwan

Additional information (if necessary)

Report Ref. No. : CN22DGTU 007

Date: 2023-01-09

Signature:



Dipl.-Ing. F. Stoelzel

NOTICE OF COMPLETION
AND
AUTHORIZATION TO APPLY THE UL MARK



2023-02-15

Mr. Nat Liu
ACBEL POLYTECH INC
No.159 Sec 3 Danjin Rd
TamSui District
New Taipei, 251, TW

Your Reference: 4790648628
Our Reference: File E131875, Vol. X7, Sec. A6132 Order: 14584538
Project: 4790648628
Project Scope: Switching Power Supply, Models FSM005, R1CA2202E, FSM010, R1CA2162D, FSM043, R1CA2162E, FSM044, R1CA2202H, Modify.

Dear Mr. Nat Liu:

UL has completed the investigation under the above project and confirmed compliance of your product(s) with UL requirements. We appreciate that you have a choice of certification providers and thank you for choosing UL.

This letter temporarily supplements the UL Follow-Up Services Procedure and serves as authorization to apply the UL Mark at the factory location(s) identified on the Authorization Page of UL File E131875, Volume X7. You are required to send a copy of this letter to all manufacturing locations authorized under UL File [E131875](#), Vol. [X7](#), Sec. [A6132](#).

The Follow-Up Services Procedure covering your product(s) will typically be provided by UL within 10 business days. Any information and documentation provided to you involving the UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Products that bear the UL Mark must be identical to those submitted to UL for evaluation and certification and must comply with the Follow-Up Services Procedure covering your product(s). Additional requirements related to the responsibilities of the Applicant and Manufacturer can be found under **Additional Resources** at <https://www.ul.com/fus>.

A UL certification is a valuable marketing tool meaning your product or company has successfully met stringent requirements. We encourage you to use your UL Mark and certification in your marketing activities. You can find information on how to accurately promote your UL certification at <https://www.ul.com/marketing>.

If you have any questions, please contact me or any of our customer service representatives. And, congratulations again on your achievement!

Sincerely,

Richard Peng
Engineer
Underwriters Laboratories Taiwan Co., Ltd.
Richard.Peng@ul.com

Deborah Jennings-Conner
VP Regulatory Services
UL LLC
Deborah.Jennings-Conner@ul.com

Acbel Polytech Inc.
Mr. Kenny Lin

Date : 24.11.2022
Our ref. : WYP ZTW1
Your ref.: T220797/Leon Chen

No. 159,
Sec. 3, Danjin Rd., Tamsui Dist.,
New Taipei City 251
Taiwan

Ref : R TÜV-Bauart-Zeichen o. Akkred. Nr.

Type of Equipment : Switching Power Supply
Model Designation : See Certificate
Certificate No. : R 50543977 0002
Report No. : CN22EWF0 002

Dear Mr. Kenny Lin,

The above specified equipment has been tested and found to be in
accordance with the relevant requirements.

Please find enclosed your certificate as specified above.

If cancellation of the certificate is submitted by 15 November in a
given year, no fee will be charged for the following year.

The certificate is issued with the reservation that the license holder
applies all information required in § 6 of the ProdSG related to name
and address of the manufacturer or his authorized representative /
importer, including their respective contact addresses on the product
prior to marketing of the product in the European Economic Area.
In case you have a change regarding your involved local representative
for the certificate, please inform us in due time.

With kind regards,

Certification Body



Dipl.-Ing. F. Stoelzel

Enclosure

TÜV RHEINLAND TAIWAN LTD.

11F., No. 758, Sec. 4, Bade Rd.,
Songshan Dist., Taipei City 105,
Taiwan
Tel. (02) 2172-7000
Fax (02) 2172-1322
<http://www.tuv.com>

NEW TAIPEI BRANCH:
No. 458-18 & 458-19,
Sec. 2, Fenliao Rd., Linkou Dist.,
New Taipei City 244,
Taiwan
Tel. (02) 2172-1000
Fax (02) 2172-1322

TAICHUNG BRANCH:
3F., No. 497, Zhongming South Rd.,
West Dist., Taichung City 403,
Taiwan
Tel. (02) 2172-7000
Fax (02) 2172-1322

KAOHSIUNG BRANCH:
27F.-3, No.80, Minzu 1st Rd.,
Sanmin Dist., Kaohsiung City 807,
Taiwan
Tel. (07) 262-6000
Fax (07) 380-0577

Zertifikat

Certificate



Zertifikat Nr. Certificate No.
R 50543977

Blatt Sheet
0002

Ihr Zeichen Client Reference
T220797/Leon Chen

Unser Zeichen Our Reference
ZTW1-WYP-CN22EWF0 002

Ausstellungsdatum Date of Issue
24.11.2022 (day/mo/yr)

Genehmigungsinhaber License Holder
Acbel Polytech Inc.
No. 159,
Sec. 3, Danjin Rd., Tamsui Dist.,
New Taipei City 251
Taiwan

Fertigungsstätte Manufacturing Plant
Refer to latest revision
of the annex list of factories

Prüfzeichen Test Mark



Regelmäßige
Produktions-
überwachung
Sicherheit
Bauart geprüft

www.tuv.com
ID 1111254198

Geprüft nach Tested acc. to
EN IEC 62368-1:2020+A11

Zertifiziertes Produkt (Geräteidentifikation)
Certified Product (Product Identification)

Lizenzentgelte - Einheit
License Fee - Unit

Einbauschaltnetzteil (Switching Power Supply)

Ergänzung für Bezeichnung : 1) FSM005, R1CA2202E
(Addition for Type Designation) 2) FSM010, R1CA2162D

Bezeichnung : 1) FSM044, R1CA2202H (AcBel)
(Type Designation) 2) FSM043, R1CA2162E (AcBel)

ANLAGE (Appendix): 1

Dem Zertifikat liegt unsere Prüf- und Zertifizierungsordnung zugrunde und es bestätigt die Konformität des Produktes mit den oben genannten Standards und Prüfgrundlagen. Zusätzliche Anforderungen in Ländern, in denen das Produkt in Verkehr gebracht werden soll, müssen zusätzlich betrachtet werden. Die Herstellung des zertifizierten Produktes wird überwacht.
This certificate is based on our Testing and Certification Regulation and states the conformity of the product with the standards and testing requirements as indicated above. Any additional requirements in countries where the product is going to be marketed have to be considered additionally. The manufacturing of the certified product is subject to surveillance.

TÜV Rheinland LGA Products GmbH, Tillystraße 2, 90431 Nürnberg

http://www.tuv.com/safety E-mail: markcheck@tuv.com
Fax: +49 221 806-3935



Zertifizierungsstelle

Dipl.-Ing. F. Stöelzel

經濟部標準檢驗局

BUREAU OF STANDARDS, METROLOGY AND INSPECTION,
MINISTRY OF ECONOMIC AFFAIRS



商品驗證登錄證書

CERTIFICATE OF THE REGISTRATION OF PRODUCT CERTIFICATION

證書號碼： CI331065679021

Certificate No.

案件類別： 99

Classification Code.

茲據

康舒科技股份有限公司

申請驗證登錄，經審查結果符合規

定，准予登錄並使用商品安全標章及識別號碼：

R33567

。其登錄事項如下：

The application made by

for Registration of Product

Certification has been reviewed and found to be in compliance with related regulations. Therefore, registration is granted with the

Product Safety Mark and the Identification No.

R33567

. Details of the registration are follows :

申請人：康舒科技股份有限公司

Applicant

統一編號：12341051

Uniform No.

地址：臺北市松山區南京東路五段99號11樓

Address

生產廠場：詳如附表

Factory

廠址：詳如附表

Factory Address

商品種類名稱：

Type/name of product

商品分類號列：8504.40.91.00.7-A

C.C.C Code

中文名稱：交換式電源供應器

Chinese name

英文名稱：Switching Power Supply

English name

型式：FSM005

Type

系列型式：FSM010, FSM043, FSM044, R1CA2162D, R1CA2162E, R1CA2202E, R1CA2202H(以下空白)

Series of the type

依據標準：CNS15598-1 (109年06月)、CNS15936 (105年09月)、符合CNS 15663第5節「

Standards 含有標示」規定 (102年版)

標準檢驗局發證 (發證地址：100臺北市中正區濟南路1段4號)

This certificate is issued by the BSMI. (No.4, Sec. 1, Jinan Rd., Zhongzheng Dist., Taipei City 100, Taiwan)

本證書以電子文件行之，所載內容若有不符之處，以標準檢驗局系統登錄資料為主，查詢證書
資料網址：<https://civil.bsmi.gov.tw>

登錄日期：中華民國 111 年 08 月 03 日

Registration Date 2022 (year) 08 (month) 03 (day)

本證書有效期限至 117 年 08 月 02 日

Expiration Date 2028 (year) 08 (month) 02 (day)

發證日期：中華民國 114 年 07 月 14 日

Date of issue 2025 (year) 07 (month) 14 (day)

註1：持本證書進口驗證登錄商品時，進口人須與本證書名義人相同。

註2：次年度商品驗證登錄年費繳納期限為當年11月30日，逾期未繳納者，經限期繳納屆期未繳納，即依商品檢
驗法第42條第7款規定廢止驗證登錄，並自次年度1月1日起生效。

註3：本證書僅代表完成檢驗程序，不作為其他(如產地)證明。



經濟部標準檢驗局
BUREAU OF STANDARDS, METROLOGY AND INSPECTION,
MINISTRY OF ECONOMIC AFFAIRS

商品驗證登錄證書
CERTIFICATE OF THE REGISTRATION OF PRODUCT CERTIFICATION

證書號碼： CI331065679021
Certificate No.

案件類別： 99
Classification Code.

生產廠場： 1. 康舒科技股份有限公司
Factory： 新北市淡水區淡金路三段159號

2. Acbel Polytech (Philippines) Inc.
No. 2, Tagaytay Ridge Drive, Carmelray Industrial Park
II, Km 54 National Highway, Calamba City, Laguna
Philippines 4027
3. ACBEL ELECTRONIC (WUHAN) CO., LTD
No. 1, DuTai North Road, Economic Development Zone,
XianTao City, HuBei Province, People's Republic Of
China
4. 康舒電子(東莞)有限公司
中國廣東省東莞市塘廈鎮宏業工業區(宏業大道)17-28號

(以下空白)





产品认证证书

证书编号: CQC22001354040

发证日期: 2022 年 08 月 04 日

有效期至: 2028 年 04 月 13 日

委托人名称 康舒科技股份有限公司
及注册地址 台北市松山区南京东路 5 段 99 号 11 楼

制造商名称 康舒科技股份有限公司
及注册地址 台北市松山区南京东路 5 段 99 号 11 楼

生产企业名称 康舒电子(东莞)有限公司
及生产地址 中国广东省东莞市塘厦镇宏业工业区宏业大道 17-28 号

产品名称和系列、规格、型号 开关电源
FSM005, R1CA2202E: 交流输入:200-240V~, 50/60Hz, 10A 或直流输入:240Vdc, 10A. 直流输出: +12.2Vdc, 148A MAX.; +12 Vsb, 3.0A MAX. 在 200-207V 输入电压下, 最大输出功率为 1800 瓦; 直流输出: +12.2Vdc, 155A MAX.; +12 Vsb, 3.0A MAX. 在 208-219V 输入电压下, 最大输出功率为 1900 瓦; 直流输出: +12.2Vdc, 164A MAX.; +12 Vsb, 3.0A MAX. 在 220-240V 或 240Vdc 输入电压下, 最大输出功率为 2000 瓦 (仅适用于海拔 5000 米及以下)(不带电线组件销售)

产品标准和技术要求 GB 17625.1-2012; GB 4943.1-2011; GB/T 9254.1-2021(Class A)

认证模式 产品型式试验+获证后监督

上述产品符合 CQC12-045670-2015 认证规则的要求, 特发此证。
证书有效期内本证书的有效性依据发证机构的定期监督获得保持。

可通过扫描下方二维码或登录国家认监委网站 (www.cnca.gov.cn) 查验证书信息



签发:

谢肇煦



中国质量认证中心





CERTIFICATE OF PRODUCT CERTIFICATION

CERTIFICATE NO.: CQC22001354040

Valid from: Aug.04,2022

Valid until: Apr.13,2028

NAME AND REGISTERED ADDRESS OF THE APPLICANT Acbel Polytech Inc.
11F., No.99, Sec. 5, Nan-King E. Road, Sungshan Chiu, Taipei, Taiwan, Province Of China.

NAME AND REGISTERED ADDRESS OF THE MANUFACTURER Acbel Polytech Inc.
11F., No.99, Sec. 5, Nan-King E. Road, Sungshan Chiu, Taipei, Taiwan, Province Of China.

NAME AND LOCATION OF THE FACTORY Acbel Electronic (Dong Guan) Co., Ltd.
No. 17-28, Horng Yeh Road, Horng Yeh Industrial District, Tang Xia Town, Dong Guan City, Guang Dong Province, China

PRODUCT NAME, MODEL AND SPECIFICATION SWITCHING POWER SUPPLY
FSM005, R1CA2202E: AC Input:200-240V~, 50/60Hz,10Aor DC Input:240Vdc, 10A. DC Output: +12.2Vdc, 148A MAX.; +12 Vsb, 3.0A MAX Maximum Output Power=1800W at 200-207V Input.; DC Output: +12.2Vdc, 155A MAX.; +12 Vsb, 3.0A MAX Maximum Output Power=1900W at 208-219V Input.; DC Output: +12.2Vdc, 164A MAX.; +12 Vsb, 3.0A MAX Maximum Output Power=2000W at 200-240V or 240Vdc Input. (Sale without cord set, Altitude up to 5000m)

THE STANDARDS AND TECHNICAL REQUIREMENTS FOR THE PRODUCTS GB 17625.1-2012;GB 4943.1-2011;GB/T 9254.1-2021(Class A)

TYPE OF CERTIFICATION SCHEMES Type Testing of Product + Follow up Factory Inspection

This is to certify that the above mentioned product(s) complies with the requirements of certification rules of CQC12-045670-2015.
The validity of the certificate is subject to positive result of the regular follow up inspection by issuing certification body until the expiry date.

The certificate information is available through the QR code below or CNCA's website: www.cnca.gov.cn



SIGNATURE:

谢肇煦



CHINA QUALITY CERTIFICATION CENTRE



CE Declaration of Conformity

For the following equipment :

Product :	Switching Power Supply
Type Designation :	FSM005,R1CA2202E,FSM010,R1CA2162D, FSM044,R1CA2202H,FSM043,R1CA2162E
Trademark :	AcBel
Manufacturer's Name :	ACBEL POLYTECH INC.
Manufacturer's Address :	No. 159, Sec. 3, Danjin Rd., Tamsui Dist., New Taipei City, Taiwan

Herewith confirmed to comply with the following legal requirements set out in the Official Journal of the European Union. Products sold in the European Economic Area (EEA) have been assessed to meet high safety, health and environmental protection requirements.

- | | |
|--|--|
| ☒ Low-Voltage Directive
2014/35/EU : | EN IEC 62368-1:2020+A11:2020 |
| ☒ EMC Directive 2014/30/EU : | EN 55032:2015+A11:2020 ; EN 55035:2017+A11:2020 ;
EN 61000-3-2:2014 ; EN 61000-3-3:2013 |
| ☐ ErP directive Commission
Regulation (EU) 2019/1782 : | EN 50563:2011/A1:2013 |
| ☒ RoHS Directive 2011/65/EU
and (EU) 2015/863 : | EN IEC 63000:2018 |
| ☒ Additional information : | DECISION No 768/2008/EC |

Responsible for making this declaration is the :

- ☒ Manufacturer
☐ Authorized representative established within the EU
☐ Authorized representative established within the EU (if applicable) :

Company Name : _____

Company Address : _____

Person responsible for making this declaration

Name, Surname : Paul Huang

Position / Title : Safety Supervisor / Acbel Polytech Inc.

Taipei, Taiwan
Place

2023-01-13
Date


Legal Signature

UK Declaration of Conformity

For the following equipment :

Product :	Switching Power Supply
Type Designation :	FSM005,R1CA2202E,FSM010,R1CA2162D, FSM044,R1CA2202H,FSM043,R1CA2162E
Trademark :	AcBel
Manufacturer's Name :	ACBEL POLYTECH INC.
Manufacturer's Address :	No.159, Sec. 3, Danjin Rd., Tamsui Dist., New Taipei City, Taiwan

Herewith confirmed to comply with the following legal requirements. Products sold in the Great Britain (GB) have been assessed to meet high safety, health and environmental protection requirements.

- | | | |
|-------------------------------------|---|--|
| ☒ | Electrical Equipment
(Safety) Regulations 2016 : | BS EN IEC 62368-1:2020+A11:2020 |
| ☒ | Electromagnetic Compatibility
Regulations 2016 : | BS EN 55032:2015+A11:2020 ;
BS EN 55035:2017+A11:2020 ;
BS EN IEC 61000-3-2:2019+A1:2021 ;
BS EN 61000-3-3:2013+A2:2021 |
| ☐ | The Ecodesign for Energy-Related
Products and Energy Information
(Amendment) (EU Exit)
Regulations 2019 : | BS EN 50563:2011/A1:2013 |
| ☒ | The Restriction of the Use of
Certain Hazardous Substances in
Electrical and Electronic
Equipment Regulations 2012 : | BS EN IEC 63000:2018 |

Responsible for making this declaration is the :

- ☒ Manufacturer
- ☐ Authorized representative established within the UK
- ☐ Authorized representative established within the UK (if applicable) :

Company Name : _____

Company Address : _____

Person responsible for making this declaration

Name, Surname : Paul Huang

Position / Title : Safety Supervisor / Acbel Polytech Inc.

Taipei, Taiwan
Place

2023-01-13
Date


Legal Signature

접 수 번 호 : 22-073991-01-1
(Receipt No.)



안전확인신고 증명서

Confirmation Letter of Declaration

신 고 번 호 : ZU10349-22004
(Application No.)

신 고 회 사 명 : Acbel Electronic (Dong Guan)
(Applicant)

주 소 : No.17-28 (Hong Yeh Rd) Hong Yeh Industrial District, Tang Xia
(Address) Town, Dongguan, Guangdong, China

제 품 명 : 컴퓨터용 전원공급장치(Switching Power Supply)
(Product)

기 본 모 델 명 : FSM005
(Basic Model)

파 생 모 델 명 : See the attachment 2
(Series Model)

정격/안전기준상의 모델구분 : Input: 100-127 V~, 50/60 Hz, 12 A;
(Rating) 200-240 V~, 50/60 Hz, 10 A; 240 Vdc, 10 A;
Output: 첨부 1. 참조

안 전 기 준 : KC62368-1(2021-08)
(Standard)

본 확인신고는 제 조 국 명 : 중국
제조업자 명 : Acbel Electronic (Dong Guan)
제조공장의 주소 : No.17-28 (Hong Yeh Rd) Hong Yeh Industrial District, Tang Xia T
own, Dongguan, Guangdong, China
의 제품에만 해당함

「전기용품 및 생활용품 안전관리법 시행규칙」 제28조제1항, 같은 조 제3항, 제29조제2항 또는 제34조제2항에 따라
안전확인신고 증명서를 발급합니다.

We issue this Confirmation Letter of Declaration of the Safety Confirmation for the above appliance in accordance
with the Article 28(1), 28(3), 29(2) or 34(2) of the Enforcement Rule of the Electrical Appliances and Consumer
Products Safety Control Act.

2022 년 12 월 13 일
Year month day

한국산업기술시험원
KOREA TESTING LABORATORY



※ 이 신고증명서는 「전기용품 및 생활용품 안전관리법」에 따른 제품의 안전성 확인에 한정된 것이며, 그 밖의 다른 법률이 적용되는
제품의 경우에는 해당 법률에 따라 추가로 인증·허가 등을 받아야 합니다.

첨부서류

1. 전기용품의 안전관리부품 및 재질목록(List of Critical Components)(전기용품에 한정한다)
2. 기본모델·파생모델의 내용(Description of the basic and series model)
3. 안전확인신고 내용의 변경 현황(Revisions Status)

□ 첨부 1 : 전기용품의 안전관리부품 및 재질목록
List of Critical Components

부품명(회로기호) Component(Part no.)	제조사(상표명) Manufacturer(Brand)	모델명(형식) Model(Type)	정격 또는 특성 Rating or Characteristics	인증마크 Tested by
Inlet	SHENG MING ENTERPRISE CO LTD (WINTRON ENTERPRISE CO LTD)	S14-202	10 A, 250 Vac; 10 A, 310 Vdc	VDE
(Alternate)	HCR Electronics Co., Ltd.	SK01-08	10 A, 250 Vac; 10 A, 300 Vdc	ENEC
(Alternate)	HCR Electronics Co., Ltd.	SK01-05	10 A, 250 Vac/ 10 A, 250 Vdc,	ENEC
(Alternate)	SHENG MING ENTERPRISE CO LTD (WINTRON ENTERPRISE CO LTD)	S14-102	10 A, 250 Vac; 10 A, 310 Vdc	VDE
Fuse (F101)	Hollyland Co Ltd	5HF/5HF(P)	F20 AL, 420 Vac/Vdc	TUV
(Alternate)	Littelfuse Inc (Littelfuse Ltd, Suzhou Littelfuse OVS Ltd, Littelfuse B V)	487 Series	F20 AL, 420 Vac/Vdc	TUV
(Alternate)	Conquer Electronics Co Ltd	UBF-A	F20 AL, 420 Vac/Vdc	TUV
X-Cap. (C103, C106, C107) C103, C106, C107 max. 1 uF (Optional)	Arcotronics Italia SPA	R.46	250 Vac min., 110 °C	ENEC
(Alternate)	Hua Jung Components Co Ltd	MKP	250 Vac min., 110 °C	ENEC
(Alternate)	Strong Capacitor Co. Ltd.	MPX	250 Vac min., 110 °C	VDE
(Alternate)	ZHUHAI SUNG HO ELECTRONICS CO LTD	CMPP	250 Vac min., 105 °C	VDE
(Alternate)	Carli Electronics Co Ltd	MPX	250 Vac min., 100 °C	ENEC
(Alternate)	SHENZHEN SURONG CAPACITORS CO LTD	MPX/MKP	250 Vac min., 100 °C	VDE

부품명(회로기호) Component(Part no.)	제조사(상표명) Manufacturer(Brand)	모델명(형식) Model(Type)	정격 또는 특성 Rating or Characteristics	인증마크 Tested by
Y-Cap. (C101,C102,C104, C105) (C90,C89) C101, C102, C104, C105 max. 3300 pF, C90, C89 max. 470 pF (Optional)	Murata Mfg Co Ltd	RA	250 Vac min., 125 °C (Y1)	VDE
(Alternate)	TDK Corporation	CD	250 Vac min., 125 °C (Y1)	VDE
(Alternate)	TDK Corporation	CS	250 Vac min., 125 °C (Y2)	VDE
(Alternate)	Walsin Technology Corp (Pan Overseas Electronic Co Ltd)	AH	250 Vac min., 125 °C(Y1)	VDE
(Alternate)	Walsin Technology Corp (Pan Overseas Electronic Co Ltd)	AC	250 Vac min., 125 °C (Y2)	VDE
(Alternate)	Success Electronics Co Ltd	SE	250 Vac min., 125 °C (Y1)	VDE
(Alternate)	Success Electronics Co Ltd	SB	250 Vac min., 125 °C (Y1 or Y2)	VDE
Bridge-Cap. (C130) C130 max. 1500 pF (Optional)	SICHUAN TERUIXIANG TECHNOLOGY INTERNATIONAL CO.,LTD	TRX series	250 Vac min., 125 °C	VDE
(Alternate)	Murata Mfg Co Ltd	EA	250 Vac min., 125 °C (Y1)	VDE
Varistor (MOV101) (Optional)	Thinking Electronic Industrial Co Ltd (Wujin Thinking Electronic Co Ltd)	TVR10yyy-D series (yyy: 471, 511, 561, 621, 681, 751, 821, 911, 102, 112)	300, 320, 350, 395, 420, 465, 510, 550, 625, 680 Vac, 40/85/56 6KV/3KA pulse test passed (coating V-0)	VDE
(Alternate)	Thinking Electronic Industrial Co Ltd (Wujin Thinking Electronic Co Ltd)	TVRxyyyy series (xx: 14, 20; yyy: 471, 511, 561, 621, 681, 751, 821, 911, 102, 112)	300, 320, 350, 395, 420, 465, 510, 550, 625, 680 Vac, 40/85/56 6KV/3KA pulse test passed (coating V-0)	VDE

부품명(회로기호) Component(Part no.)	제조사(상표명) Manufacturer(Brand)	모델명(형식) Model(Type)	정격 또는 특성 Rating or Characteristics	인증마크 Tested by
(Alternate)	Joyin Co. Ltd	xxSyyyK (xx: 10, 14, 20; yyy: 471, 511, 561, 621, 681, 751, 781, 821, 911, 102, 112)	300, 320, 350, 385, 420, 460, 485, 510, 550, 625, 680 Vac; 40/85/56 6KV/3KA pulse test passed (coating V-0)	VDE
(Alternate)	Joyin Co. Ltd	xxNyyyK (xx: 10, 14, 20; yyy: 471, 511, 561, 621, 681, 751, 781, 821, 911, 102, 112, 182)	300, 320, 350, 385, 420, 460, 485, 510, 550, 625, 680, 1000 Vac; 40/85/56 6KV/3KA pulse test passed (coating V-0)	VDE
Isolator IC (M102)	Texas Instruments Tucson Corp	UCC21540ADWKR, UCC21540DWKR, UCC21540DWR, UCC21520DWR	Reinforced insulation	VDE
Isolator IC (M117)	Texas Instruments Tucson Corp	ISO7841DWR, ISO7741DWR	Reinforced insulation	VDE
(Alternate)	Silicon Laboratories Inc	SI8641ED-B-IS	Reinforced insulation	VDE
Isolator IC (M201)	POWER INTEGRATIONS	INN3xyzC; where x = 1, 2, 6; y = 6, 7; and z = 2 to 8	Reinforced insulation	VDE
Discharge Resistor (RHV101, RHV102)	RALEC TECHNOLOGY (KUNSHAN) CO., LTD.	RTV06 series	1/4 W, 165 kΩ	UL
(Alternate)	Yageo Corp	RV1206 series	1/4 W, 165 kΩ	UL
(Alternate)	WALSIN TECHNOLOGY CORPORATION	WF12N	1/4 W, 165 kΩ	UL
Relay (REL01) (optional)	Good Sky Electric Co. Ltd.	GQ-SH-112DM2F	250 Vac, 16A	TUV
(Alternate)	XIAMEN HONGFA ELECTROACOUST IC CO LTD	HF32FV-16	250 Vac, 16A	VDE
Choke (L101)	AcBel Polytech Inc.(API)	21W67	130 °C min.	--
Choke (L102)	AcBel Polytech Inc.(API)	21W68	130 °C min.	--
Choke (L103)	AcBel Polytech Inc.(API)	21W66	130 °C min.	--
Choke (CT101)	AcBel Polytech Inc.(API)	25S08	130 °C min.	--
Choke (L107)	AcBel Polytech Inc.(API)	21W72	130 °C min.	--

부품명(회로기호) Component(Part no.)	제조사(상표명) Manufacturer(Brand)	모델명(형식) Model(Type)	정격 또는 특성 Rating or Characteristics	인증마크 Tested by
Choke (T701)	AcBel Polytech Inc.(API)	25S05	130 °C min.	--
Transformer (PCB5) (for FSM005)	AcBel Polytech Inc.(API)	R90000-9161I	Class F	Accepted by TÜV Rheinland
Transformer (PCB5) (for FSM010)	AcBel Polytech Inc.(API)	R90000-9151I	Class F	Accepted by TÜV Rheinland
Transformer (T201)	AcBel Polytech Inc.(API)	25S04	Class B	Accepted by TÜV Rheinland
Fan	Asia Vital Components Co.,Ltd.	DBPU0428B2UY070	12 V, 3.5 A, 38.87 CFM	VDE, TUV
(Alternate)	Nidec Taiwan Corporation	W40S12BS3P5-57T08A1	12 V, 3.15 A, 37.8 CFM	VDE, TUV
(Alternate)	Sunonwealth Electric Machine Industry Co., Ltd.	XF40281BX-Q021	12 V, 3.0 A, 38.6 CFM	VDE, TUV
(Alternate)	Dongguan Protechnic Electric Co., Ltd.	MGT4012DB-W28	12 V, 4.0 A, 38.86 CFM	VDE, TUV
PCB (PCB1, PCB2, PCB5)	Shenzhen Mankun Electronics Co Ltd	MK-M	V-0, 130 °C	UL
(Alternate)	GUANG DONG ELLINGTON ELECTRONICS TECHNOLOGY CO LTD	ETM02	V-0, 130 °C	UL
(Alternate)	Treasure Shantou Electronic Technologic Company Ltd	T-M1	V-0, 130 °C	UL
(Alternate)	Palwonn Electronics (Shenzhen) Co Ltd	NP-155F, NP-175F, NPG0150N, S1000H, S1150G	V-0, 130 °C	UL
Metal Enclosure	Interchangeable	Interchangeable	0.8 mm min.	--

부품명(회로기호) Component(Part no.)	제조사(상표명) Manufacturer(Brand)	모델명(형식) Model(Type)	정격 또는 특성 Rating or Characteristics	인증마크 Tested by
☐ 유의사항 (Attention) : 1. 안전관리부품은 전기적인 안전에 직접적인 영향을 주는 부품으로서 안전인증기관이 정기공장검사 시 확인 관리 하는 사항입니다. 따라서 상기목록에 기재된 사항을 변경하거나 또는 복수등재를 원하시는 경우는 안전인증기관에 인증변경신청을 하여야 합니다. <i>As the "Critical components" are parts in directly related with safety, these components shall be checked during a factory inspection by the certification body. In case of applying multiple listing or changing the items above, the certification revision shall be applied.</i> 2. 인증변경신청 없이 임의로 변경하는 경우는, 전기용품 및 생활용품 안전관리법 시행규칙 제 21 조제 1 항 또는 제 38 조제 1 항 규정에 의한 안전인증 취소 혹은 안전확인신고 효력상실 사유가 됨을 유의하시기 바랍니다. <i>The Safety Certification will be cancelled under the Article 21(1), 38(1) of the Enforcement Rule of the Electrical appliances and Consumer Products Safety Control Act if the contents of the Certification is altered without our authorization.</i>				

FP511-04

□ 첨부 2 : 기본모델 · 파생모델의 내용
Description of the basic and series model

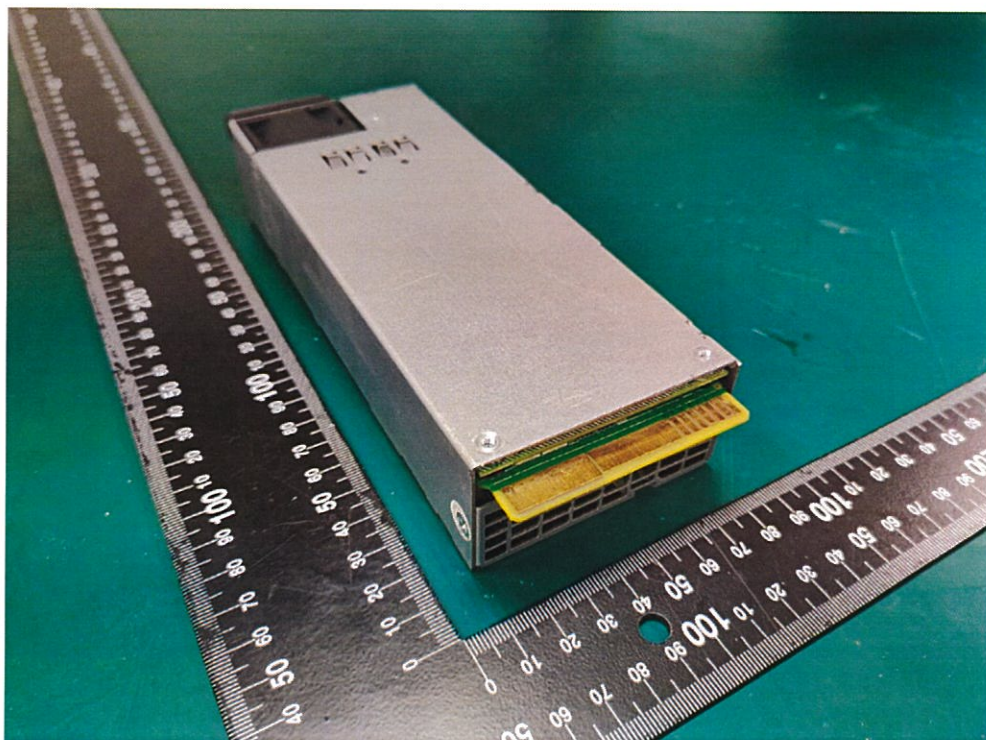
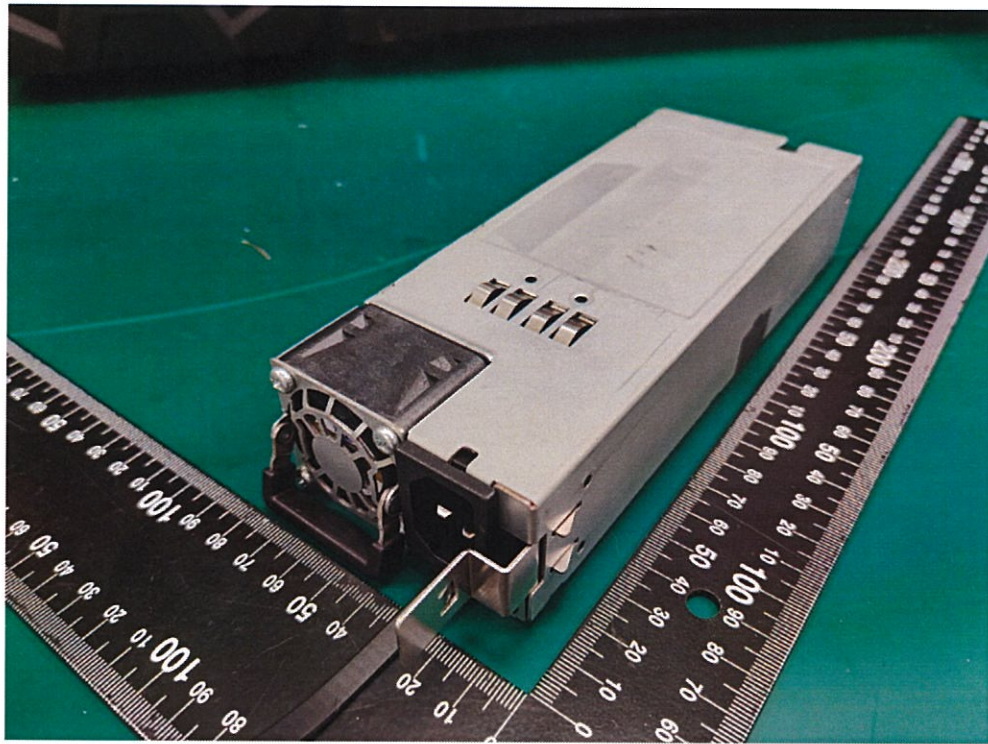
파생모델명 Derivative model	기본모델과의 차이점 Differences between the basic and derivative model(s)
R1CA2202E	It is identical to basic model except for model designation.
FSM044	It is identical to basic model except for model designation, DC fan airflow direction.
R1CA2202H	It is identical to basic model except for model designation, DC fan airflow direction.
FSM010	It is identical to basic model except for model designation, output rating, transformer of PCB5.
R1CA2162D	It is identical to basic model except for model designation, output rating, transformer of PCB5.
FSM043	It is identical to basic model except for model designation, output rating, transformer of PCB5, DC fan airflow direction.
R1CA2162E	It is identical to basic model except for model designation, output rating, transformer of PCB5, DC fan airflow direction.
제품특기사항 및 시험조건 Remarks & Test conditions	
1. Review Ref. No.: 22-073991-01-2 - TUV Ref. No.: P00892786 2. Product Description: - Measured Power Consumption: 2189 W - Insulation Class: Class I - Protection against Ingress of water: IPX0 - Mass of Equipment: 885 g - DC Output : For 220-240 Vac or 240 Vdc : +12.2 V/ 164 A Max. & +12 Vsb/ 3.0 A Max., Maximum Output Power= 2000 W; For 208-219 Vac : +12.2 V/ 155 A Max. & +12 Vsb/ 3.0 A Max., Maximum Output Power= 1900 W; For 200-207 Vac : +12.2 V/ 148 A Max. & +12 Vsb/ 3.0 A Max., Maximum Output Power= 1800 W; For 100-127 Vac : +12.2 V/ 82 A Max. & +12 Vsb/ 3.0 A Max., Maximum Output Power= 1000 W;	
□ 본 제품의 검토내용에 관하여 의문사항이 있으시면 아래 연락처로 문의하시기 바랍니다. 검토 담당자 : 고객지원본부 인증융합평가센터 장 재용 / 02-8601-137 □ If you have any question on product review, please contact the person below : Job holder: Customer Support Division, Certification Convergence Evaluation Center, J.Y. Jang / +82 2 860-1137	

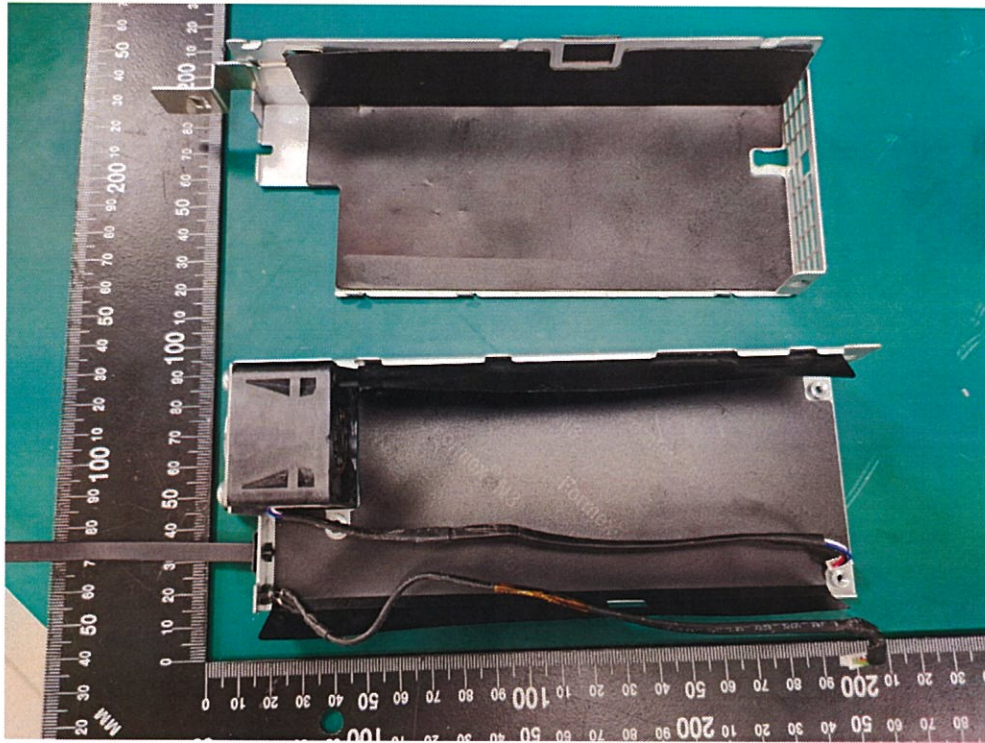
☐ 첨부 3 : 안전확인신고 내용의 변경 현황
Revisions Status

변경발급 내용 Contents of Certificate Revisions
Not applicable

FP511-06

☐ 첨부 : 제품사진
Photographs





방송통신기자재등의 적합등록 필증

Registration of Broadcasting and Communication Equipments

상호 또는 성명 Trade Name or Registrant	ACBEL POLYTECH INC.
기자재명칭(제품명칭) Equipment Name	Switching Power Supply
기기부호/추가 기기부호 Equipment code /Additional Equipment code	IMI
기본모델명 Basic Model	FSM005
파생모델명 Series Model	FSM010, R1CA2162E, R1CA2202E, FSM043, R1CA2202H, R1CA2162D, FSM044
등록번호 Registration No.	R-R-API-R1CA2202E
제조사/제조국가 Manufacturer/Country of	ACBEL POLYTECH INC., ACBEL ELECTRONIC (WUHAN) CO., LTD, Acbel Electronic (Dong Guan) Co., Ltd., Acbel Polytech (Philippines) INC./대만, 중국, 필리핀
등록연월일 Date of Registration	2023-03-14
기타 Others	

위 기자재는 「전파법」 제58조의2 제3항에 따라 등록되었음을 증명합니다.

It is verified that foregoing equipment has been registered under the Clause 3, Article 58-2 of Radio Waves Act.

2023년(Year) 03월(Month) 15일(Day)

국립전파연구원장



Director General of National Radio Research Agency

※ 적합등록 방송통신기자재는 반드시 "적합성평가표시" 를 부착하여 유통하여야 합니다.
위반시 과태료 처분 및 등록이 취소될 수 있습니다.





Our Ref: REGISTRATION/CRS 2021-3957/R-41196150

Date:15-02-2023

Inclusion Id: 65273

Subject :Inclusion of Additional Model(s)

MANUFACTURING UNIT :	Acbel Electronics (Dong Guan) Co Ltd HORNG YEH INDUSTRIAL DISTRICT TANG XIA TOWN DONGGUAN GUANGDONG CHINA GUANGDONG,China-0 Andy_zhou@apitech.com.tw 8676987915950	
-------------------------	---	--

Dear Sir,

1. This has reference to your request for inclusion of models of "**Standalone Switch Mode Power Supplies (SMPS)**" as per IS 13252(Part 1):2010/ IEC 60950-1 : 2005 in Licence No. **R-41196150** already granted to you which is valid upto 19-07-2023.

2. It is intimated that the additional Models as per details given below have been agreed to be included in your scope of Licence. **R-41196150 w.e.f. 15-02-2023:**

Product Category	Standalone Switch Mode Power Supplies (SMPS)
Product Name	Standalone Switch Mode Power Supplies (SMPS)
IS No.	IS 13252(Part 1):2010/ IEC 60950-1 : 2005
Brand (As Declared by Manufacturer):	AcBel
Inclusion of Additional Models (w.e.f. 15-02-2023)	R1CA2202E,R1CA2202H,R1CA2801H,R1CA2801L
Factory Address	HORNG YEH INDUSTRIAL DISTRICT TANG XIA TOWN DONGGUAN GUANGDONG CHINA GUANGDONG,China-0

3. Other terms and conditions of the licence shall remain same.

4. This letter is being issued with the approval of competent authority.

Kindly acknowledge receipt of this letter.

Thanking you,

Yours faithfully,
(Deepti Budiya)
Granting Authority
Telfax : +91-11-23230856
E-mail: registration@bis.gov.in

Note: This is a system generated letter. Hence signature is not required.
To verify authentication of letter, kindly scan the QR code on this letter.

For details information on BIS, consult the e-BIS Portal (www.manakonline.in).
Please use BIS CARE APP for verification of ISI-marked goods and hallmarked gold jewellery.



भारतीय मानक ब्यूरो

(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)

BUREAU OF INDIAN STANDARDS

(Ministry of Consumer Affairs, Food & Public Distribution,
Govt. of India)

मानक भवन, 9 बहादुर शाह जफर मार्ग, नई दिल्ली - 110002
Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi - 110002
दूरभाष/Phone: +91-11-23230856/2323010131/23233375/23239402
ई-मेल/E-mail: registration@bis.gov.in
वेबसाइट/Website: <https://bis.gov.in/>, <https://www.crsbis.in/BIS/>

Our Ref: REGISTRATION /CRS-2021-3957/R-41196150

Dated: 2023-06-02
18:17:20

RENEWAL ID : 20576

Subject : RENEWAL OF LICENCE R-41196150 AS PER IS 13252(Part 1):2010/ IEC 60950-1 : 2005

Acbel Electronics (Dong Guan) Co Ltd
HORNG YEH INDUSTRIAL DISTRICT TANG XIA TOWN DONGGUAN GUANGDONG CHINA
GUANGDONG, China, 0



Dear Sir/Madam,

With reference to your online application dated 02-06-2023 for renewal of the above mentioned licence; this is to inform you that the same has been renewed from **20-07-2023** to **19-07-2026**.

It may be noted that the said licence granted under clause (b) of sub section (2) of section 13 of the Act shall *expire* at the end of the period for which it is granted unless renewed or its renewal is deferred. You are, therefore, requested to apply for next renewal to BIS within three months before the expiration of the licence.

Thanking you.

Yours faithfully,

Registration Department
Bureau of Indian Standards,
9, Bahadur Shah Zafar Marg,
New Delhi-110002.
Telfax : +91-11-23230856
E-mail: registration@bis.gov.in

Note: This is a system generated letter. Hence signature is not required.
To verify authentication of letter, kindly scan the QR code on this letter.

For details information on BIS, consult the e-BIS Portal (www.manakonline.in).
Please use BIS CARE APP for verification of ISI-marked goods and hallmarked gold jewellery.

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: EN 55032:2015 +A11:2020 / BS EN 55032:2015 +A11:2020, Class A
EN 61000-3-2:2014 / BS EN 61000-3-2:2014, Class A
EN IEC 61000-3-2:2019+A1:2021 / BS EN IEC 61000-3-2:2019+A1:2021, Class A
EN 61000-3-3:2013+A2:2021 / BS EN 61000-3-3:2013+A2:2021
EN 55035:2017 +A11:2020 / BS EN 55035:2017 +A11:2020

Report No.: CEBEDU-WTW-P22060391A

Product: Switching Power Supply

Brand: AcBel

Model No.: FSM043, FSM044

Series Model: FSM005, R1CA2202E, FSM010, R1CA2162D, R1CA2162E, R1CA2202H

Received Date: 2022/11/15

Test Date: 2022/11/16 ~ 2022/11/23

Issued Date: 2023/1/10

Applicant: AcBel Polytech Inc.

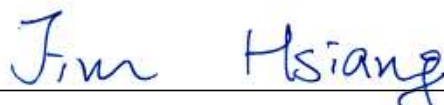
Address: No.159, Sec. 3, Danjin Rd., Danshui Dist., New Taipei City 251, Taiwan (R.O.C.)

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Approved by:


Jim Hsiang / Associate Technical Manager

Date:

2023/1/10

This test report consists of 64 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The test results in the report only apply to the tested sample. The test results in this report are traceable to the national or international standards.



Prepared by : Ivy Lin / Specialist

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Release Control Record

Issue No.	Description	Date Issued
CEBEDI-WTW-P22060391A	Original release.	2023/1/10

1 Certificate

Product: Switching Power Supply

Brand: AcBel

Test Model: FSM043, FSM044

Series Model: FSM005, R1CA2202E, FSM010, R1CA2162D, R1CA2162E, R1CA2202H

Sample Status: Engineering sample

Applicant: AcBel Polytech Inc.

Test Date: 2022/11/16 ~ 2022/11/23

Standard: EN 55032:2015 +A11:2020 / BS EN 55032:2015 +A11:2020, Class A
EN 61000-3-2:2014 / BS EN 61000-3-2:2014, Class A
EN IEC 61000-3-2:2019 +A1:2021 / BS EN IEC 61000-3-2:2019+A1:2021 Class A
EN 61000-3-3:2013+A2:2021 / BS EN 61000-3-3:2013+A2:2021
EN 55035:2017 +A11:2020 / BS EN 55035:2017 +A11:2020

Measurement procedure: EN 61000-4-2:2009 / IEC 61000-4-2:2008 ED. 2.0
BS EN 61000-4-2:2009
EN 61000-4-3:2006 +A1:2008 +A2:2010 / IEC 61000-4-3:2010 ED. 3.2
BS EN 61000-4-3:2006 +A1:2008 +A2:2010
EN IEC 61000-4-3:2020 / IEC 61000-4-3:2020 ED. 4.0
BS EN IEC 61000-4-3:2020
EN 61000-4-4:2012 / IEC 61000-4-4:2012 ED. 3.0
BS EN 61000-4-4:2012
EN 61000-4-5:2014 +A1:2017 / IEC 61000-4-5:2017 ED. 3.1
BS EN 61000-4-5:2014 +A1:2017
EN 61000-4-6:2014 +AC:2015 / IEC 61000-4-6:2013 ED. 4.0
BS EN 61000-4-6:2014 +AC:2015
EN 61000-4-8:2010 / IEC 61000-4-8:2009 ED. 2.0
BS EN 61000-4-8:2010
EN 61000-4-11:2004 +A1: 2017 / IEC 61000-4-11:2017 ED. 2.1
BS EN 61000-4-11:2004 +A1: 2017
EN IEC 61000-4-11:2020 / IEC 61000-4-11:2020 ED. 3.0
BS EN IEC 61000-4-11:2020

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

2 Summary of Test Results

The test items that the EUT need to perform in accordance with its interfaces, evaluated functions are as follows:

Standard	Test Item	Result	Remark
EN 55032	Conducted Emissions from Power Ports	Pass	Minimum passing Class A margin is -7.16 dB at 19.07813 MHz
EN 55032	Radiated Emissions up to 1 GHz	Pass	Minimum passing Class A margin is -3.20 dB at 150.92 MHz
EN 61000-3-2 EN IEC 61000-3-2	Harmonic Current Measurement	Pass	Meets Class A Limit
EN 61000-3-3	Voltage Fluctuations and Flicker Measurement	Pass	$P_{st} \leq 1.00$ $d_{max} \leq 4.00\%$ $P_{it} \leq 0.65$ $d_c \leq 3.30\%$ $T_{max} \leq 500$ ms
IEC 61000-4-2	Electrostatic Discharges (ESD)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-3	Radio Frequency Electromagnetic Field (RS)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-4	Fast Transients Common Mode (EFT)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-5	Surges	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-6	Radio Frequency Common Mode (CS)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-8	Power Frequency Magnetic Field (PFMF)	Pass	For EN 55035 Performance Criteria A
IEC 61000-4-11	Voltage Dips and Interruptions (DIP)	Pass	For EN 55035 For Voltage Dips: < 5% Residual, 0.5 cycle Performance Criteria A 70% Residual, 25 cycle Performance Criteria B For Voltage Interruptions: < 5% Residual, 250 cycle Performance Criteria B

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Performance Criteria

General Performance Criteria

These criteria shall be used during the testing of primary functions where no specified in the normative annexes of EN 55035 is applicable.

Performance criterion A

The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion B

During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test.

After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.

If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

Performance criterion C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed.

Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

Product Specific Performance criteria for network functions

Equipment that provides these functions transmits and receives data through ports such as an analogue/digital data port. The networking functions are just like network switching and routing ; data transmission ; supervisory...etc.

The particular performance criteria which are specified in the normative annexes of CISPR 35/ EN 55035 take precedence over the corresponding parts of the general performance criteria.

Performance criterion A

Where relevant, during the application of the test the network function shall, as a minimum, operate ensuring that:

- established connections shall be maintained throughout the application of the test;
- no change of operational state or corruption of stored data occurs;
- no increase in error rate above the figure defined by the manufacturer occurs. The manufacturer should select the most appropriate performance measurement criteria for the product or system, for example bit error rate, block error rate;
- no request for retry above the figure defined by the manufacturer;
- the data transmission rate does not reduce below the figure defined by the manufacturer;
- no protocol failure occurs;
- other verifications are described in F.3.3.1 of CISPR 35/ EN 55035.

Performance criterion B

Established connections shall be maintained throughout the test, or shall self-recover in a way and timescale that is imperceptible to the user.

The error rate, request for retry and data transmission rates may be degraded during the application of the test. Degradation of the performance as described in criterion A is permitted, provided that the normal operation of the EUT is self-recoverable to the condition established prior to the application of the test.

Where required, as defined in Clause 5 of CISPR 35/ EN 55035, the acceptable operation of the function shall be verified at the completion of the test as described in Table H.1 of CISPR 35/ EN 55035, by confirming the following:

- the EUT's ability to establish a connection,
- the EUT's ability to clear a connection.

During surge testing disconnection is allowed on the analogue/digital data port being tested.

If the EUT is a supervisory equipment, it shall not impact the normal operation of the network being monitored. In addition, any supervisory functions impacted during the period of the test shall return to the state prior to the test. Elements to consider include: alarms, signalling lamps, printer output, network traffic rates, network monitoring.

Performance criterion C

Degradation of performance as described in criteria A and B is permitted provided that the normal operation of the EUT is self-recoverable to the condition immediately before the application of the test, or can be restored after the test by the operator.

Product Specific Performance Criteria for xDSL

The particular performance criteria which are specified in the normative annexes of CISPR 35/ EN 55035 take precedence over the corresponding parts of the general performance criteria.

Performance criterion A

Applicable for the test requirement defined in table clause 2.1 of EN 55035

During the swept frequency test the established connection shall be maintained throughout the testing and the information transferred without any additional reproducible errors or loss of synchronisation. If a degradation in performance is observed and the system is adaptive, for example has the capability to automatically retrain in the presence of an interfering signal, then for conducted immunity tests only, the following procedure shall be followed:

- a) For each range of interfering frequencies in which degradation in performance is observed, three frequencies (beginning, middle and end) shall be identified.
- b) At each of the frequencies identified in step a), the interfering signal shall be turned on and the system is allowed to retrain.
- c) If the system is able to retrain and then functions correctly for a dwell time of at least 60 seconds without any additional reproducible errors or loss of synchronisation, then the performance level of the system is considered acceptable.
- d) The frequencies identified in step a) and the data rates achieved in step b) shall be recorded in the test report.

Applicable for the test requirement defined in table clause 2.2 of EN 55035

It is important that the modems are able to train in the presence of repetitive impulsive noise and minimize disruption to the end-user where a repetitive impulsive noise source starts after the link has synchronized. Therefore the following procedure and performance criteria shall apply.

The manufacturer shall select the class of impulsive noise protection (INP) to be used for the immunity test and should state this information in the technical documentation and in the test report. The maximum delay shall be set to 8 ms.

In the absence of impulsive noise: The modem shall operate without retraining at its target noise margin with a bit rate value depending on the line attenuation and the stationary noise being present on the line. (The actual value will be between the minimum and maximum bit rate values programmed in the port).

The impulsive noise source shall then be applied at the required test level.

With the impulsive noise applied: The modem shall operate without retraining and without SES at the bit rate established prior to the application of the impulsive noise. No extra CRC errors shall occur due to the impulsive noise. After the test, the noise margin value shall return to the target noise margin.

Performance criterion B

Applicable for the test requirement defined in table clause 2.3 of EN 55035

Modems shall withstand the occurrence of isolated impulsive noise events. The performance criteria defined in below Table shall be applied.

Impulse duration (ms)	Performance criteria
0.24	The application of the impulse shall not cause the xDSL link to lose synchronisation. No CRC errors are permitted.
10	The application of the 5 impulses shall result in less than 75 CRC errors and shall not cause the link to lose synchronisation.
300	The application of the impulse shall not cause the xDSL link to lose synchronisation.

Applicable for the test requirements defined in table clauses 2.5 and 4.5 of EN 55035

For application of this test to the xDSL port, a repetition rate of 100 kHz (burst length 0.75 ms) shall be used.

Degradation of the performance as described in criterion A is permitted in that errors are acceptable during the application of the test. However the application of the test shall not cause the system to lose the established connection or re-train. At the cessation of the test the system shall operate in the condition established prior to the application of the test without user intervention.

After the application of the EFT/B tests to the xDSL or AC mains port, the CRC error count shall not have increased by more than 600 when compared to the count prior to the application of the test.

Performance criterion C

Degradation of the performance as described in criteria A and B is permitted provided that the normal operation of the EUT is self-recoverable to the condition established prior to application of the test or can be restored after the test by the operator.

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Specification	Expanded Uncertainty (k=2) (±)	Maximum allowable uncertainty (±)
Conducted Emissions from Power Ports	9 kHz ~ 30 MHz	3.00 dB	3.4 dB (U_{CISPR})
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	3m: 5.44 dB 10m: 4.02 dB	6.3 dB (U_{CISPR})

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.3 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	Switching Power Supply
Brand	AcBel
Test Model	FSM043, FSM044
Series Model	FSM005, R1CA2202E, FSM010, R1CA2162D, R1CA2162E, R1CA2202H
Model Difference	Refer to note as below
Sample Status	Engineering sample
Operating Software	N/A
Power Supply Rating	Refer to note as below
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

- This report is issued as a supplementary report to BV CPS report no.: CEBEDU-WTW-P22060391. The differences compared with the original report are listed as below. Therefore, the EUT is re-tested in this report.
 - ♦ Add new PCB_type B (collocate Inlet (on board) and Inlet (with wired))
 - ♦ Add new models for air blow backward
- The EUT is a Switching Power Supply (AC/DC 3-pin) and it has several models, which are identical to each other except for the following: (Additional model as shaded area)

Model	Rating	Transformer PCB5
FSM005, R1CA2202E	Input: 100-127V~, 50/60Hz, 12A 200-240V~, 50/60Hz, 10A OR 240Vdc, 10A Output: FOR 200-240V~: +12.2V/164A & +12Vsb/3A Max. OUTPUT POWER:2000W For 220-240V~ OR 240Vdc: +12.2V/164A Max. & +12Vsb/ 3.0A Max Maximum Output Power=2000W For 208-219V~: +12.2V/155A Max. & +12Vsb/3.0A Max. Maximum Output Power=1900W For 200-207V~: +12.2V/148A Max. & +12Vsb/3.0A Max. Maximum Output Power=1800W For 100-127V~: +12.2V/82A Max. & +12Vsb/3.0A Max. Maximum Output Power=1000W	R90000-91611
FSM010, R1CA2162D	Input: 100-127V~, 50/60Hz, 12A 200-240V~, 50/60Hz, 10A OR 240Vdc, 10A Output: For 200-240V~ and 240Vdc: +12.2V/132A Max. & +12Vsb/3.0A Max. Maximum Output Power=1600W For 100-127V~: +12.2V/82A Max. & +12Vsb/3.0A Max. Maximum Output Power=1000W	R90000-91511

Model	Rating	Transformer PCB5
FSM043, R1CA2162E	Input: 100-127V~, 50/60Hz, 12A 200-240V~, 50/60Hz, 10A OR 240Vdc, 10A Output: +12.2V/82A MAX., 12Vsb/3.0A Max. Maximum Output Power=1000W at 100-127V~ input +12.2V/132A MAX., 12Vsb/3.0A Max. Maximum Output Power=1600W at 200-240V~ or 240Vdc input	R90000-9151I
FSM044, R1CA2202H	Input: 100-127V~, 50/60Hz, 12A 200-240V~, 50/60Hz, 10A OR 240Vdc, 10A Output: +12.2V/82A & +12Vsb/3A Maximum Output Power= 1000W at 100-127V~ input +12.2V/148A & +12Vsb/3A Maximum Output Power= 1800W at 200-207V~ input +12.2V/155A Max. & +12Vsb/3.0A Max. Maximum Output Power= 1900W at 208-219V~ input +12.2V/164A Max. & +12Vsb/ 3.0A Max Maximum Output Power=2000W at 220-240V~ OR 240Vdc input	R90000-9161I

During the test, **Model: FSM043, FSM044** were selected as the representative models for the test.

3.2 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 50-80kHz, provided by AcBel Polytech Inc., for detailed internal source, please refer to the manufacturer's specifications.

3.3 Features of EUT

The tests reported herein were performed according to the method specified by AcBel Polytech Inc., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

Please refer to appendix of the report if the applicant has provided additional descriptions of the EUT.

3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT has been pre-tested under following test modes.

Test Condition	
Mode	Conducted Emissions from Power Ports
1	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
2	EUT_FSM044 with full load + Input Power(230 Vac, 50 Hz)
Note: The worst case is that mode 1 is shown in bold.	
Mode	Radiated Emissions up to 1 GHz
1	EUT_FSM043 with full load + Input Power(240 Vdc)
2	EUT_FSM044 with full load + Input Power(240 Vdc)
3	EUT_FSM043 with full load + Input Power(110 Vac, 60 Hz)
4	EUT_FSM043 with full load + Input Power(220 Vac, 60 Hz)
5	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Notes:	
1. There are both standby mode and normal mode to be pre-tested then normal mode has the highest emission value.	
2. There are DC 240 V, AC 230V/50Hz, AC 220V/60Hz and AC 110V/60Hz to be pre-tested then AC 110V/60Hz has the highest emission value.	
3. The worst case is that mode 3 is shown in bold.	

Test modes are presented in the report as below.

Test Condition	
Mode	Conducted Emissions from Power Ports
A	EUT_FSM043 with full load + Input Power(110 Vac, 60 Hz)
B	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Mode	Radiated Emissions up to 1 GHz
A	EUT_FSM043 with full load + Input Power(110 Vac, 60 Hz)
Mode	Harmonic Current Measurement
A	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Mode	Voltage Fluctuations and Flicker Measurement
A	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Mode	Electrostatic Discharges (ESD)
A	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Mode	Radio Frequency Electromagnetic Field (RS)
A	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Mode	Fast Transients Common Mode (EFT)
A	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Mode	Surges
A	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Mode	Radio Frequency Common Mode (CS)
A	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Mode	Power Frequency Magnetic Field (PFMF)
A	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)
Mode	Voltage Dips and Interruptions (DIP)
A	EUT_FSM043 with full load + Input Power(230 Vac, 50 Hz)

3.5 Test Program Used and Operation Descriptions

For Emission tests (Harmonic & Flicker excluded)

Connected a resistor load with EUT and installed load and EUT into a metal case and then set the EUT under full resistor load.

For Harmonic, Flicker tests

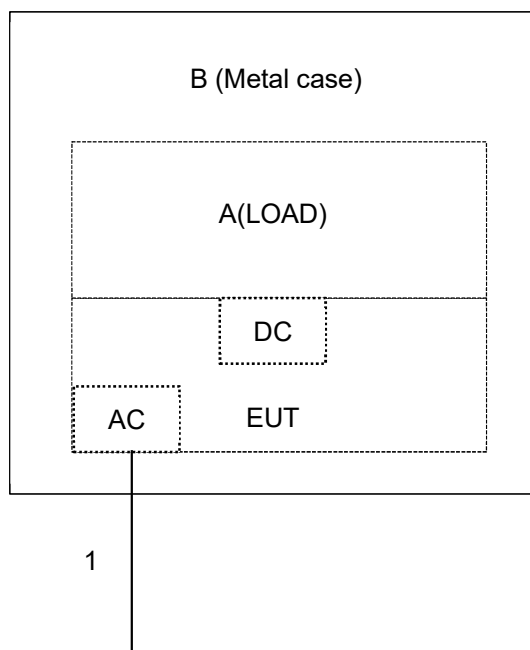
Connected a resistor load to DC output port of EUT to make EUT have maximum power consumption, and installed both of them into a metal case.

For Immunity tests

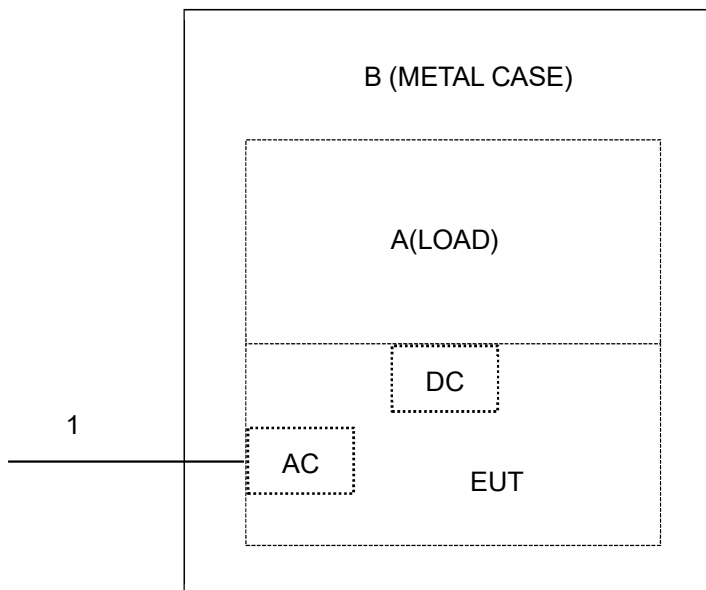
Connected a resistor load to DC output port of EUT to make EUT have maximum power consumption and installed both of them into a metal case then multimeter was used to monitor voltage of output.

3.6 Connection Diagram of EUT and Peripheral Devices

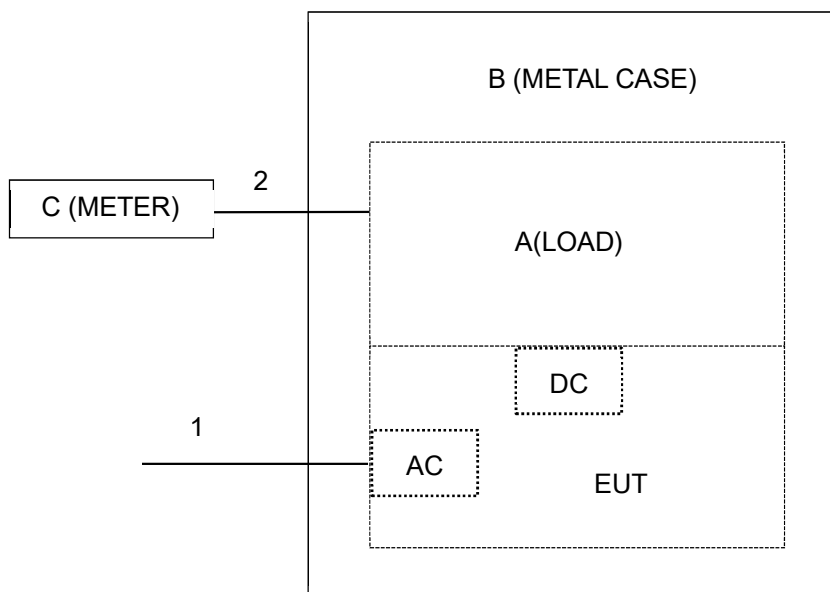
For Emission tests (Harmonic & Flicker excluded)



For Harmonic, Flicker tests



For Immunity tests



3.7 Configuration of Peripheral Devices and Cable Connections

For Emission tests (Harmonic & Flicker excluded)

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	LOAD	N/A	N/A	N/A	N/A	Supplied by applicant
B	METAL CASE	N/A	N/A	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	AC/DC power(3pin) cable	1	1.8	No	0	Provided by Lab

For Harmonic, Flicker, Immunity tests

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	LOAD	N/A	N/A	N/A	N/A	Supplied by applicant
B	METAL CASE	N/A	N/A	N/A	N/A	Supplied by applicant
C	METER	YFE	YF-370A	N/A	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	AC power(3pin) cable	1	1.8	No	0	Provided by Lab
2	DC power cable	1	1	No	0	Provided by Lab

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 Conducted Emissions from Power Ports

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
50 ohm terminal LYNICS	0900510	E1-011285	2022/9/19	2023/9/18
		E1-011286	2022/9/19	2023/9/18
50 Ohms Terminator LYNICS	0900510	E1-01-305	2022/2/9	2023/2/8
Attenuator STI	STI02-2200-10	NO.3	2022/10/21	2023/10/20
Coupling/Dcoupling Network Schwarzbeck	CDNE-M2	00097	2022/6/1	2023/5/31
	CDNE-M3	00091	2022/6/1	2023/5/31
Coupling/Dcoupling Network TESEQ	CDN A201A	44601	2021/12/22	2022/12/21
DC LISN R&S	ESH3-Z6	100219	2022/8/2	2023/8/1
		844950/018	2022/8/2	2023/8/1
DC LISN Schwarzbeck	NNLK 8121	8121-808	2022/4/29	2023/4/28
Isolation Transformer Erika Fiedler	D-65396	017	2022/9/8	2023/9/7
LISN EMCO	3825/2	9204-1964	2022/6/17	2023/6/16
		9504-2359	2022/8/2	2023/8/1
LISN R&S	ENV216	101195	2022/8/1	2023/7/31
		101196	2022/5/24	2023/5/23
		101197	2022/7/5	2023/7/4
LISN Schwarzbeck	NNLK 8121	8121-731	2022/5/26	2023/5/25
		8121-00759	2022/8/18	2023/8/17
	NNLK8129	8129229	2022/6/8	2023/6/7
Receiver R&S	ESCI	100412	2022/8/22	2023/8/21
RF Coaxial Cable Commate	5D-FB	Cable-CO3-01	2022/9/14	2023/9/13
Software BVADT	Cond_V7.3.7.4	N/A	N/A	N/A
TEST RECEIVER ROHDE & SCHWARZ	ESCS 30	100288	2022/1/4	2023/1/3

Notes:

1. The test was performed in Linkou Conduction 3.
2. The VCCI Site Registration No. C-10274.
3. Tested Date: 2022/11/16

4.2 Radiated Emissions up to 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bi-log Broadband Antenna Schwarzbeck	VULB9168	9168-1213	2022/10/20	2023/10/19
		9168-1214	2022/10/20	2023/10/19
Coupling/Dcoupling Network Schwarzbeck	CDNE-M2	00097	2022/6/1	2023/5/31
	CDNE-M3	00091	2022/6/1	2023/5/31
Pre_Amplifier EMCI	EMC9135	980326	2022/2/17	2023/2/16
		980327	2022/2/17	2023/2/16
RF Coaxial Cable JYEBAO	LMR-600	Cable-CH8-01	2022/9/23	2023/9/22
		Cable-CH8-02	2022/9/23	2023/9/22
RF Coaxial Cable Pacific	8D-FB	Cable-CH8-03	2022/9/23	2023/9/22
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Test Receiver R&S	ESR3	102983	2022/5/30	2023/5/29
		102984	2022/6/10	2023/6/9
Tower Max Full.	MF7802	MF780208105	N/A	N/A
Turn Table & Tower Max Full.	MF7802	MF7802121	N/A	N/A

Notes:

1. The test was performed in Linkou 10M Chamber (Chamber 8). The test site validated date: 2022/8/27 (NSA).
2. The VCCI Site Registration No. R-12946.
3. Tested Date: 2022/11/19

4.3 Harmonic Current Measurement

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Harmonics and Flicker Analyzer TESEQ	PROFLINE 2105	1632A00983&1639A01863	2022/6/8	2023/6/7
Software	CTS 4	N/A	N/A	N/A

Notes:

1. The test was performed in Linkou EMS Room No.1.
2. Tested Date: 2022/11/22

4.4 Voltage Fluctuations and Flicker Measurement

Refer to section 4.3 to get information of the instruments.

4.5 Electrostatic Discharges (ESD)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Electronic Discharge Simulator Noiseken	ESS-2000	ESS0382041	2022/10/7	2023/10/6
ESD Generator EM Test	Dito//DM-150/330//DM- 150/330-rfci	P1315117252/P1317117852	2022/7/7	2023/7/6
ESD Simulator KeyTek	MZ15/EC	0504259	2022/11/8	2023/11/7
ESD Simulator TESEQ	NSG 438	1364	2021/12/16	2022/12/15

Notes:

1. The test was performed in Linkou ESD Room No.03.
2. Tested Date: 2022/11/22

4.6 Radio Frequency Electromagnetic Field (RS)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Amplifier TESEQ	CBA 1G-150	T44220	N/A	N/A
Amplifier TESTQ	AS1860-50	S-5944/1	N/A	N/A
	CBA 3G-050	T44345	N/A	N/A
Audio analyzer R&S	UPV	104565	2022/5/10	2023/5/9
Band pass filter B&K	WH3278	N/A	2022/6/5	2023/6/4
CHANCE MOST Compact Full Anechoic Chamber (7x3x3 m)	N/A	N/A	2022/1/18	2023/1/17
Ear Simulator Telephonometry B&K	4185	2553594	N/A	N/A
Electric Field Probe ETS-Lindgren	HI-6105	00212757	2021/12/21	2022/12/20
Power Meter BOONTON	4232A	94901	2022/6/6	2023/6/5
Power Sensor BOONTON	51011-EMC	32807	2022/6/6	2023/6/5
Pressure-field Microphone B&K	4192	2735408	2022/4/26	2023/4/25
RF Generator TESEQ	ITS 6006	37543	2022/5/10	2023/5/9
RS antenna schwarzbeck mess-elektronik	STLP 9129	9129068	N/A	N/A
Software BVADT	BV ADT_ABMS_ V7.4.3	N/A	N/A	N/A
Software BVADT	RS_V7.6	N/A	N/A	N/A
Two channel microphone conditioning amplifier B&K	2690 A OS2	2645274	2022/6/5	2023/6/4
Wireless Connection Tester R&S	CMW270	101075	2022/4/18	2023/4/17

Notes:

1. The test was performed in Linkou RS Room No.1.
2. Tested Date: 2022/11/22

4.7 Fast Transients Common Mode (EFT)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Burst generator Haefely	PEFT 4010	154954	2022/3/29	2023/3/28

Notes:

1. The test was performed in Linkou EFT Room.
2. Tested Date: 2022/11/23

4.8 Surges

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Coupling Decoupling Network TESEQ	CDN HSS-2	41009	2022/4/18	2023/4/17
EMC Immunity Tester EMC PARTNER	TRANSIENT 2000	622	2022/3/7	2023/3/6
Modular Impulse Generator EMC-Partner	MIG0603IN3 IEC-ANSI	352	2022/8/2	2023/8/1

Notes:

1. The test was performed in Linkou EMS Room No.1.
2. Tested Date: 2022/11/22

4.9 Radio Frequency Common Mode (CS)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Amplifier AR	75A250AM1	306331	N/A	N/A
Audio analyzer R&S	UPV	104565	2022/5/10	2023/5/9
CDN FCC	FCC-801-M5-50A	100018	2022/1/18	2023/1/17
CDN TESEQ	CDN S200	53490	2022/2/24	2023/2/23
	CDN S400	52115	2022/2/24	2023/2/23
CDN Calibration Kit TESEQ	CDN T8S	29459	2022/2/22	2023/2/21
CDN M2-16Amp FCC	FCC-801-M2-16A	01047	2022/2/23	2023/2/22
Coupling Decoupling Network TESEQ	CDN M432S	56519	2022/2/23	2023/2/22
	CDN S751A	56435	2022/2/21	2023/2/20
		56436	2022/2/22	2023/2/21
	CDN ST08A	56525	2022/2/21	2023/2/20
		56527	2022/2/21	2023/2/20
	CDN T2A-10	54942	2022/2/22	2023/2/21
	CDN T8-10	40376	2022/2/22	2023/2/21
	CDN T8-230	56641	2022/2/22	2023/2/21
		56642	2022/2/22	2023/2/21
		56643	2022/2/22	2023/2/21
	CDN T800	34428	2022/2/22	2023/2/21
	CDN T400A	49918	2022/2/23	2023/2/22
Coupling/Dcoupling Network EM TEST	CDN M1/32A	306508	2022/2/23	2023/2/22
Coupling/Dcoupling Network TESEQ	CDN M232	37702	2022/2/23	2023/2/22
	CDN M332	41256	2022/2/23	2023/2/22
		41258	2022/2/23	2023/2/22
Current Clamp FCC	F-120-9A	361	2022/8/17	2023/8/16

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Digital Sweep Function Generator Topward	8120	984801	N/A	N/A
Ear Simulator Telephonometry B&K	4185	2553594	N/A	N/A
FCC EM Injection Clamp FCC	F-203I-23mm	455	N/A	N/A
Mouth Simulator B&K	4227	2630632	N/A	N/A
POWER AMPLIFIER B&K	2716C	2610979	N/A	N/A
Power Meter R & S	NRVD	837794/040	2022/10/18	2023/10/17
Power Sensor R & S	NRV-Z5	837878/039	2022/10/18	2023/10/17
R&S SML03 S.G R&S	SML03	101801	2022/1/11	2023/1/10
Software BVADT	ABMS_ V7.4.3	N/A	N/A	N/A
Software BVADT	CS_V7.4.2	N/A	N/A	N/A
Wireless Connection Tester R&S	CMW270	101075	2022/4/18	2023/4/17

Notes:

1. The test was performed in Linkou CS Room No.1.
2. Tested Date: 2022/11/22

4.10 Power Frequency Magnetic Field (PFMF)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
F.W.BELL 4190 Gaussmeter F.W. Bell	4190	0743043	2022/4/13	2023/4/12
Magnetic Field Test System Haefely Trench AG	MAG 100	083794-06	N/A	N/A

Notes:

1. The test was performed in Linkou EMS Room No.1.
2. Tested Date: 2022/11/22

4.11 Voltage Dips and Interruptions (DIP)

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Harmonics and Flicker Analyzer TESEQ	PROFLINE 2105	1632A00983&1639A01863	2022/6/8	2023/6/7
Software	WIN2120	N/A	N/A	N/A

Notes:

1. The test was performed in Linkou EMS Room No.1.
2. Tested Date: 2022/11/22

5 Limits of Test Items

5.1 Conducted Emissions from Power Ports

Frequency (MHz)	Class A (dB μ V)		Class B (dB μ V)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Notes: 1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

5.2 Radiated Emissions up to 1 GHz

Frequency (MHz)	Class A Quasi-peak (dBuV/m)		Class B Quasi-peak (dBuV/m)	
	at 3m	at 10m	at 3m	at 10m
30 - 230	50	40	40	30
230 - 1000	57	47	47	37

For radiated emissions from FM receivers only (Measurement Facility: OATS/SAC)

Frequency (MHz)	Fundamental (dBuV/m)		Harmonics (dBuV/m)	
	at 3m	at 10m	at 3m	at 10m
30 - 230	60	50	52	42
230 - 300	60	50	52	42
300 - 1000	60	50	56	46

Notes: 1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
 3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

5.3 Harmonic Current Measurement

Limits for Class A equipment		Limits for Class D equipment		
Harmonic Order n	Max. permissible harmonics current A	Harmonic Order n	Max. permissible harmonics current per watt mA/W	Max. permissible harmonics current A
Odd harmonics		Odd Harmonics only		
3	2.30	3	3.4	2.30
5	1.14	5	1.9	1.14
7	0.77	7	1.0	0.77
9	0.40	9	0.5	0.40
11	0.33	11	0.35	0.33
13	0.21	13	0.30	0.21
$15 \leq n \leq 39$	$0.15 \times 15/n$	$15 \leq n \leq 39$	$3.85/n$	$0.15 \times 15/n$
Even harmonics				
2	1.08			
4	0.43			
6	0.30			
$8 \leq n \leq 40$	$0.23 \times 8/n$			

- Notes: 1. Class A and Class D are classified according to section 5 of EN 61000-3-2.
2. According to section 7 of EN 61000-3-2, the above limits for all equipment except for lighting equipment having an active input power > 75 W and no limits apply for equipment with an active input power up to and including 75 W.

Classification of equipment

Class A	Class B	Class C	Class D
Balanced three-phase equipment; Household appliances excluding equipment as Class D; Tools excluding portable tools; Dimmers for incandescent lamps; Audio equipment; Equipment not specified in one of the three other classes.	Portable tools; Arc welding equipment which is not professional equipment.	Lighting equipment.	Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors; Television receivers; Refrigerators and freezers having one or more variable-speed drives to control compressor motor(s).

5.4 Voltage Fluctuations and Flicker Measurement

Test Item	Limit	Note
P_{st}	1.0	P_{st} means short-term flicker indicator.
P_{lt}	0.65	P_{lt} means long-term flicker indicator.
T_{dt} (ms)	500	T_{dt} means maximum time that $d(t)$ exceeds 3.3 %.
d_c (%)	3.3%	d_c means relative steady-state voltage change
d_{max} (%)		d_{max} means maximum relative voltage change. Control Method of Equipment (see below)
	4%	■ - without additional conditions
	6%	☐ - switched manually, or - switched automatically more frequently than twice per day, and also has either a delayed restart (the delay not less than a few tens of seconds), or manual restart, after a power supply interruption
	7%	☐ - attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or switched on automatically, or - is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

5.5 General immunity requirements

Port	Basic Standard	Test item	Test specification	Performance criteria
Power input (AC)	IEC 61000-4-4	Fast Transients, Common Mode (EFT)	±1 kV 5/50 ns (Tr/Th) 5 kHz, repetition frequency	B
	IEC 61000-4-5	Surge	Line to line: ±1 kV, 1.2/50 µs Line to earth: ±2 kV, 1.2/50 µs	B
	IEC 61000-4-6	Radio Frequency, Common Mode (CS)	0.15-10 MHz, 3V, 80% AM (1kHz), 10-30 MHz, 3V-1V, 80% AM (1kHz), 30-80 MHz, 1V, 80% AM (1kHz),	A
	IEC 61000-4-11	Voltage dips and interruptions (DIP)	Voltage Dips: < 5 % residual voltage, 0.5 cycle 70% residual voltage, 25 cycles (at 50Hz) Voltage Interruption: < 5 % residual voltage, 250 cycles (at 50 Hz)	B C C
DC power/ Wired network and Signal/ Control port	IEC 61000-4-4	Fast Transients, Common Mode (EFT)	±0.5 kV 5/50 ns (Tr/Th) 100 kHz, repetition frequency for xDSL port 5 kHz, repetition frequency for other port	B
	IEC 61000-4-5	Surge	Wired network ports (directly connected to outdoor cables): Symmetrically operated: 10/700µs w/o primary protectors: ±1.0kV, or with primary protectors fitted: ±1.0kV and ±4.0kV, Coaxial or shielded operated: 1.2/50µs shield to ground: ±0.5 kV,	C B B
			DC power ports (directly connected to outdoor cables): 1.2/50 µs each individual line to earth, or shield to ground: ±0.5 kV,	
		Radio Frequency, Common Mode (CS)	0.15-10 MHz, 3V, 80% AM (1kHz), 10-30 MHz, 3V-1V, 80% AM (1kHz), 30-80 MHz, 1V, 80% AM (1kHz),	A
	IEC 61000-4-6	Broadband impulse noise disturbances (Applicable only to xDSL ports.)	Repetitive : Impulse frequency profile : 0.15 – 0.5 MHz, 107 dBuV ; 0.5 – 10 MHz, 107 – 36 dBuV ; 10 – 30 MHz, 36 – 30 dBuV Burst duration : 0.70 ms Burst period :10 ms(for 50 Hz) At least 2 minutes for each port under test.	A
			Isolated : Impulse frequency profile : 0.15 –30 MHz, 110 dBuV Burst duration : 0.24 ms, 10 ms and 300 ms Isolated impulses : 5 times Interval : at least 60 seconds	B

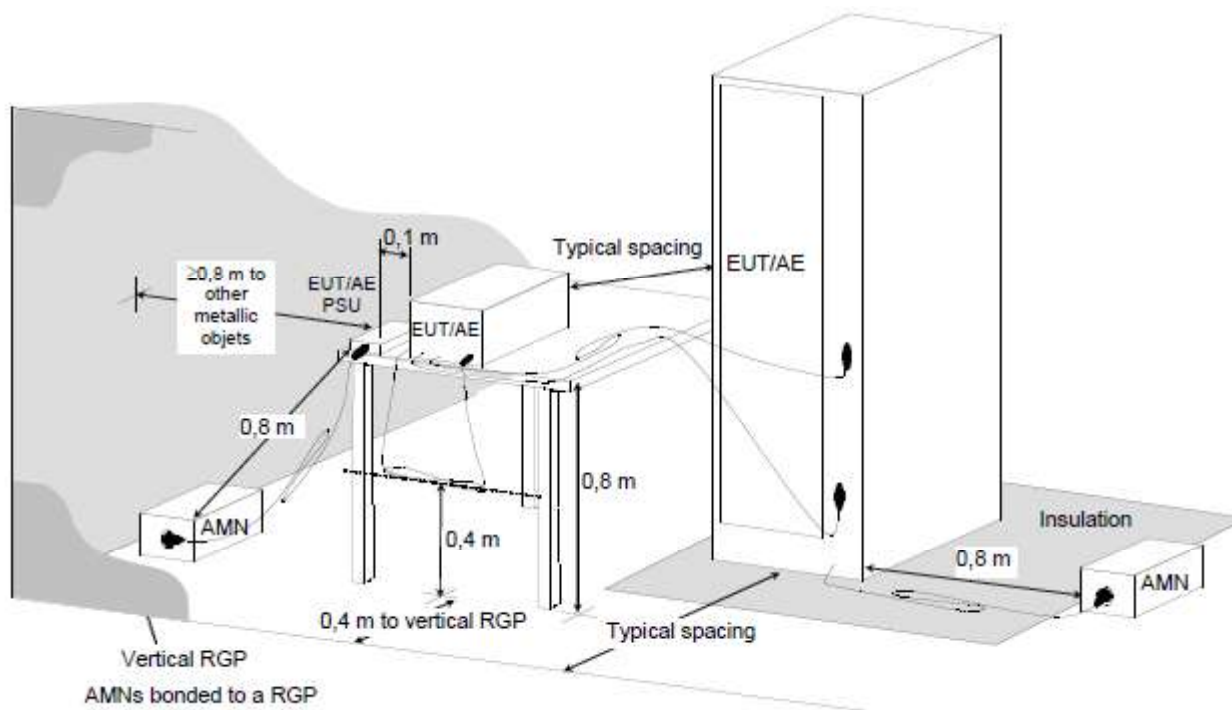
Port	Basic Standard	Test item	Test specification	Performance criteria
Enclosure	IEC 61000-4-2	Electrostatic Discharge (ESD)	±4 kV (contact) ±8 kV (Air)	B
	IEC 61000-4-3	Radio Frequency Electromagnetic Field (RS)	Swept Frequency Test: 80 to 1000(MHz), 3 V/m, 80 % AM (1 kHz) Spot Frequency Test: 1800, 2600, 3500, 5000 MHz (±1 %), 3V/m, 80% AM (1kHz)	A
	IEC 61000-4-8	Power Frequency Magnetic Field (PFMF)	1A/m, 50Hz	A

6 Test Arrangements

6.1 Conducted Emissions from Power Ports

- a. The EUT is placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN), or an Artificial Network (AN) as specified in CISPR 25 if used in a vehicle. Other support units are connected to the power mains through another LISN and/or AN. They provide coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

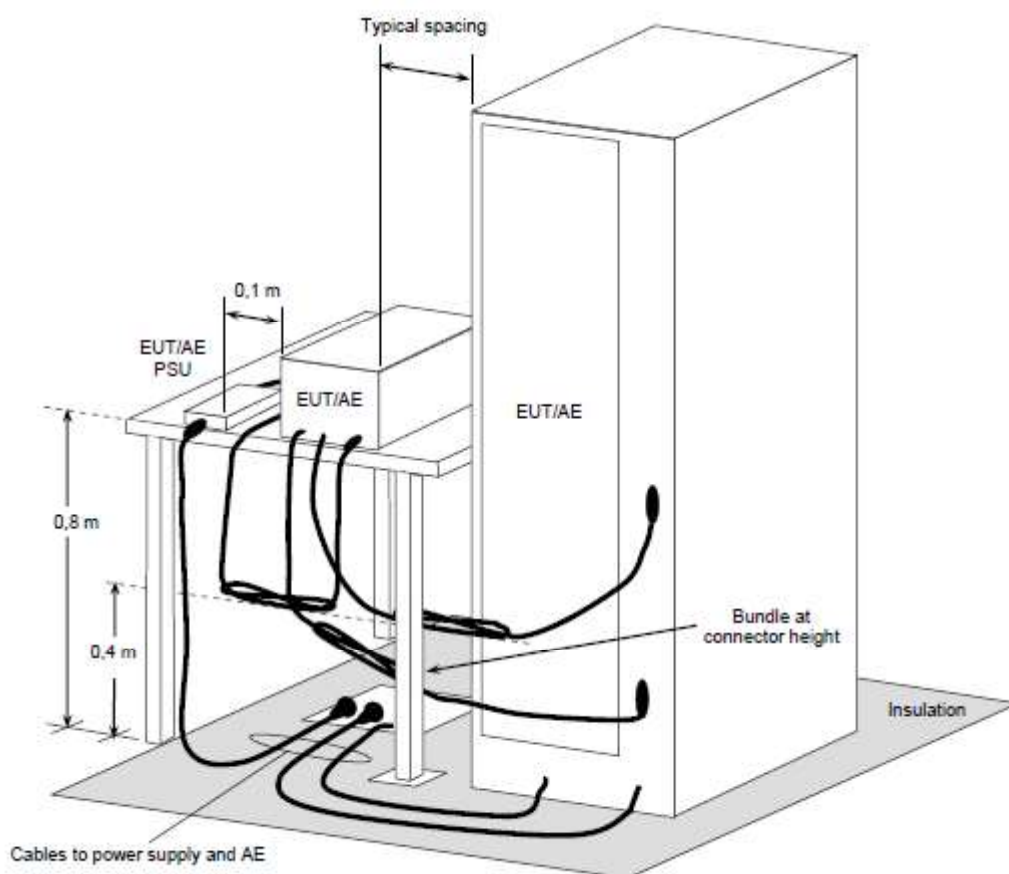


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

6.2 Radiated Emissions up to 1 GHz

- For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the floor standing EUT shall be insulated (by insulation of maximum thickness of 150 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- The EUT is set 10 meters away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1 m to 4 m and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system is set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

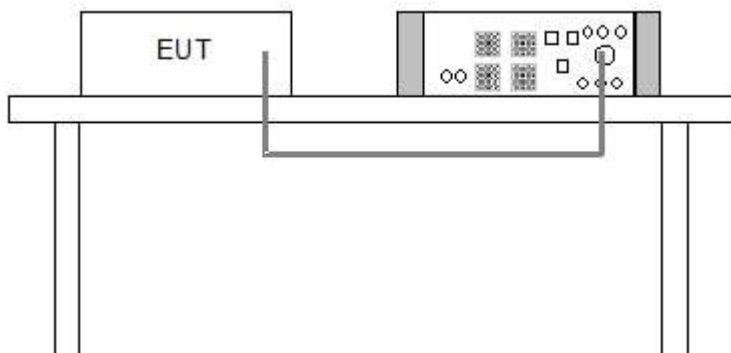
Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

6.3 Harmonic Current Measurement

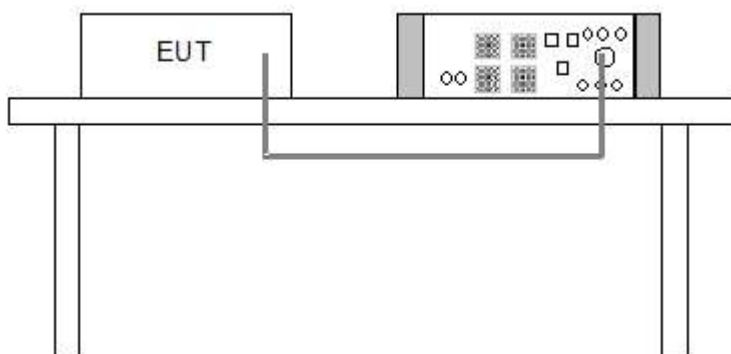
- The harmonic current limits apply to line currents and not to currents in the neutral conductor. Nevertheless, for single-phase equipment, it is permissible to measure the currents in the neutral conductor instead of the currents in the line.
- The EUT is tested as presented by, and in accordance with information provided by, the manufacturer. Preliminary operation of motor drives by the manufacturer may be needed before the tests are undertaken to ensure that results correspond with normal use.
- In all configurations, the use of additional load shall not cause the total output power available to be exceeded.
- The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

6.4 Voltage Fluctuations and Flicker Measurement

- Controls or automatic programs of the EUT shall be set to produce the most unfavourable sequence of voltage changes, using only those combinations of controls and programmes which are mentioned by the manufacturer in the instruction manual, or are otherwise likely to be used.
- Preliminary operation of motor drives may be needed before the tests to ensure that results corresponding to those of normal use are obtained.
- During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.



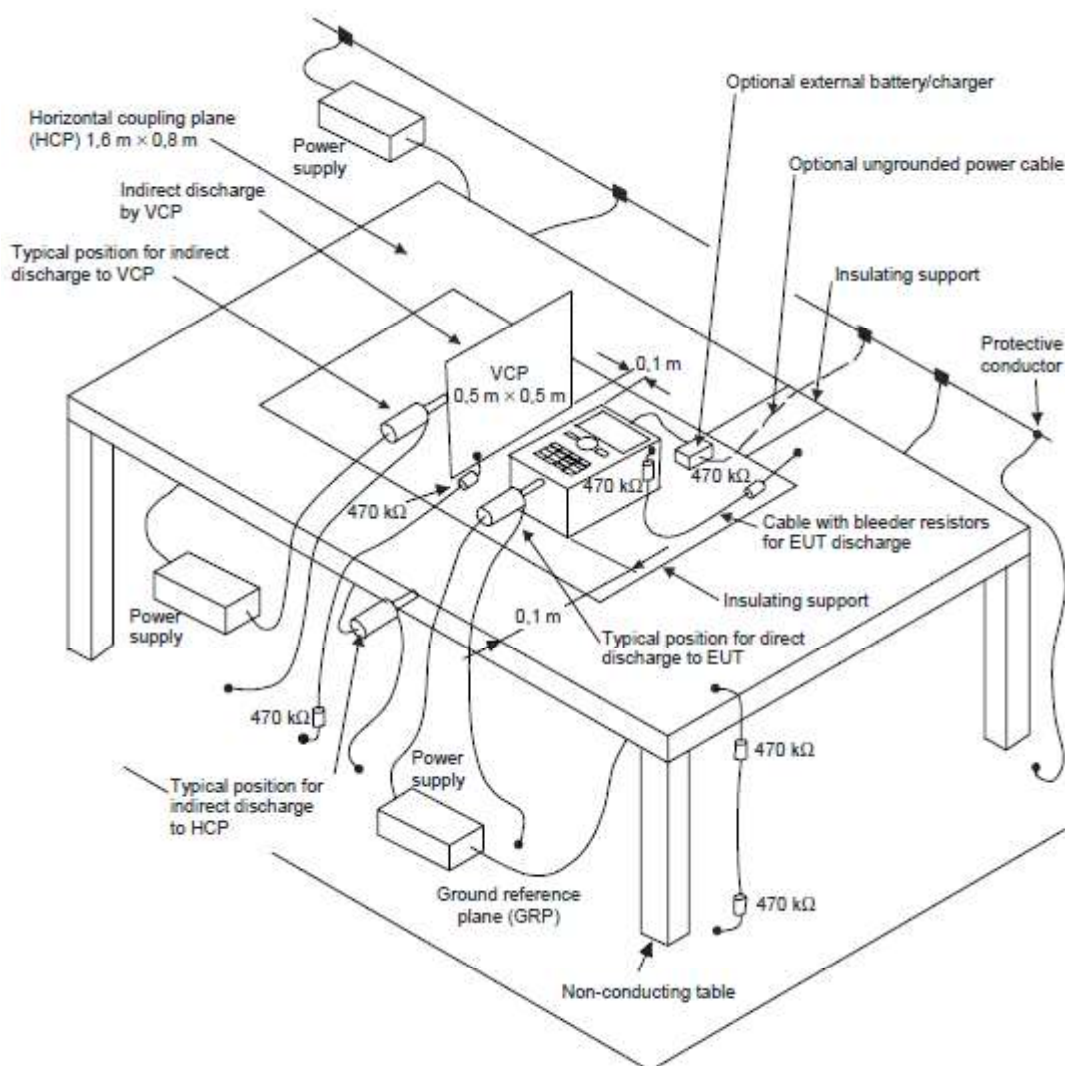
For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

6.5 Electrostatic Discharges (ESD)

Discharge Impedance:	330 ohm / 150 pF
Number of Discharge:	Air – Direct: 10 discharges per location (each polarity) Contact – Direct & Indirect: 10 discharges per location (each polarity)
Discharge Period:	1-second minimum

The basic test procedure was in accordance with EN/IEC 61000-4-2:

- Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- The time interval between two successive single discharges was at least 1 second.
- The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- At least ten single discharges (in the most sensitive polarity) were applied to the **Horizontal Coupling Plane** at points on each side of the EUT. The ESD generator was positioned at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP**.
- At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN/IEC 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

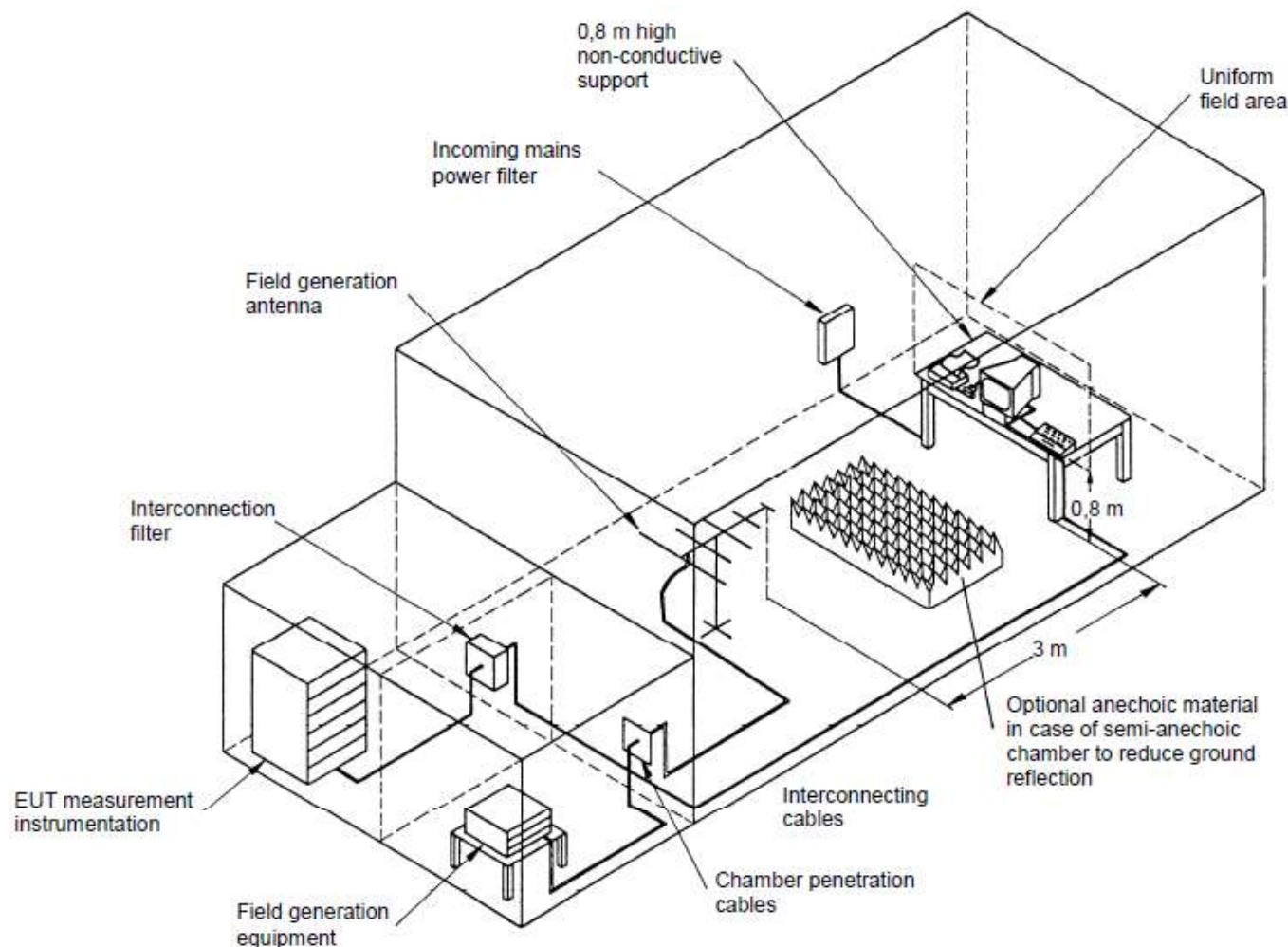
The equipment under test was installed in a representative system as described in section 7 of IEC 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 m.

6.6 Radio Frequency Electromagnetic Field (RS)

Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time:	3 seconds

The test procedure was in accordance with EN/IEC 61000-4-3.

- The testing was performed in a modified semi-anechoic chamber.
- The frequency range shall be swept, with the signal 80% amplitude modulated with a 1kHz sine wave.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN/IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

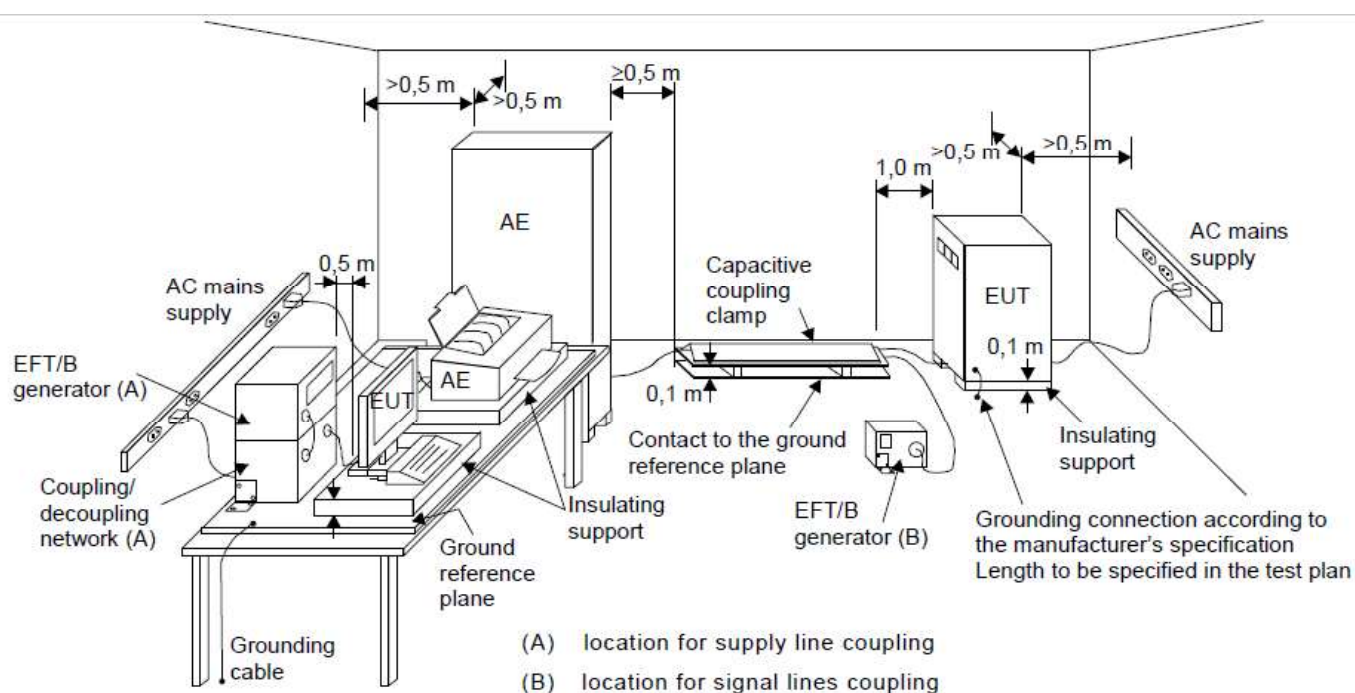
FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN/IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

6.7 Fast Transients Common Mode (EFT)

Impulse Repetition Frequency:	xDSL telecommunication port: 100kHz others: 5kHz
Impulse Wave Shape:	5/50 ns
Burst Duration:	0.75 ms for 100kHz Repetition Frequency 15 ms for 5kHz Repetition Frequency
Burst Period:	300 ms
Test Duration:	1 min.

- Both positive and negative polarity discharges were applied.
- The distance between any coupling devices and the EUT should be 0.5 m for table-top equipment testing, and 1.0 m for floor standing equipment.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with EN/IEC 61000-4-4, 5/50 ns.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

6.8 Surges

Wave-Shape:	Wired network ports (direct to outdoor cables): Symmetrically operated: 10/700 μ s Open Circuit Voltage 5/320 μ s Short Circuit Current Non-symmetrically operated: 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current Shielded cables (direct to outdoor cables): 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current Wired network ports (indoor cables, longer than 30m): 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current Input DC power port (direct to outdoor cables): 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current Input AC power port: 1.2/50 μ s Open Circuit Voltage 8/20 μ s Short Circuit Current
Pulse Repetition Rate:	20 sec.
Number of Tests:	5 positive and 5 negative at selected points

a. EUT Power ports:

The surge shall be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling network shall not exceed 2 meters in length.

For double-insulated products without PE or external earth connections, the test shall be done in a similar way as for grounded products but without adding any additional external grounded connections. If there are no other possible connections to earth, line-to-ground tests may be omitted.

b. Wired network ports

● Unshielded unsymmetrical interconnection lines:

The coupling / decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling network shall not exceed 2 meters in length.

No line-to-ground surges are applied for double-insulated products (i.e. products without any dedicated earth terminal).

● Unshielded symmetrical interconnection lines:

For symmetrical interconnection lines and high-speed interconnection lines, the CDN shall be selected to match the number of lines/pairs existing the cable. If coupling arrestors are use, test levels below the ignition point of the coupling arrestor cannot be specified.

The interconnection line between the EUT and the coupling/decoupling networks shall not exceed 2 meters in length.

In order to avoid the coupling and decoupling capacitors having a filtering effect on the data transfer, a balanced high frequency design associating the coupling capacitors with coupling chokes is required. Where normal functioning of high speed communications lines cannot be achieved because of the impact of the CDN on the EUT, product committees should specify appropriate operation or that no surge immunity test is required.

● Shielded lines:

The EUT is isolated from ground and the surge is applied to its metallic enclosure; the termination (or auxiliary equipment) at the port(s) under test is grounded. This test applies to equipment with one or more shielded cables.

The length of the cable between the port(s) under test and the device attached to the other end of the cable (AE in Figure 12) shall be:

- 20 m (preferred length) or,
- the shortest length over 10 m, where the manufacturer provides pre-assembled cables used in actual installations.

No test shall be required for cables which according to the manufacturer's specification are ≤ 10 m.

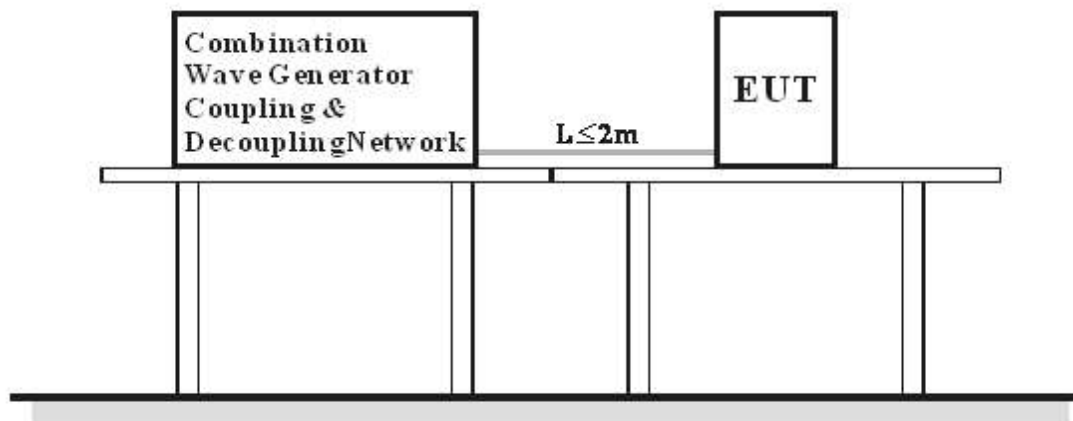
Rules for application of the surge to shielded lines:

- a) Shields grounded at both ends:
 – the test shall be carried out.

The test level is applied on shields with a $2\ \Omega$ generator source impedance and with the $18\ \mu\text{F}$ capacitor.

- b) Shields grounded at one end:
 – the test shall be carried out according to unshielded unsymmetrical interconnection lines or unshielded symmetrical interconnection lines because the shield does not provide any protection against surges induced by magnetic fields.

For EUTs which do not have metallic enclosures, the surge is applied directly to the shielded cable at the EUT side.

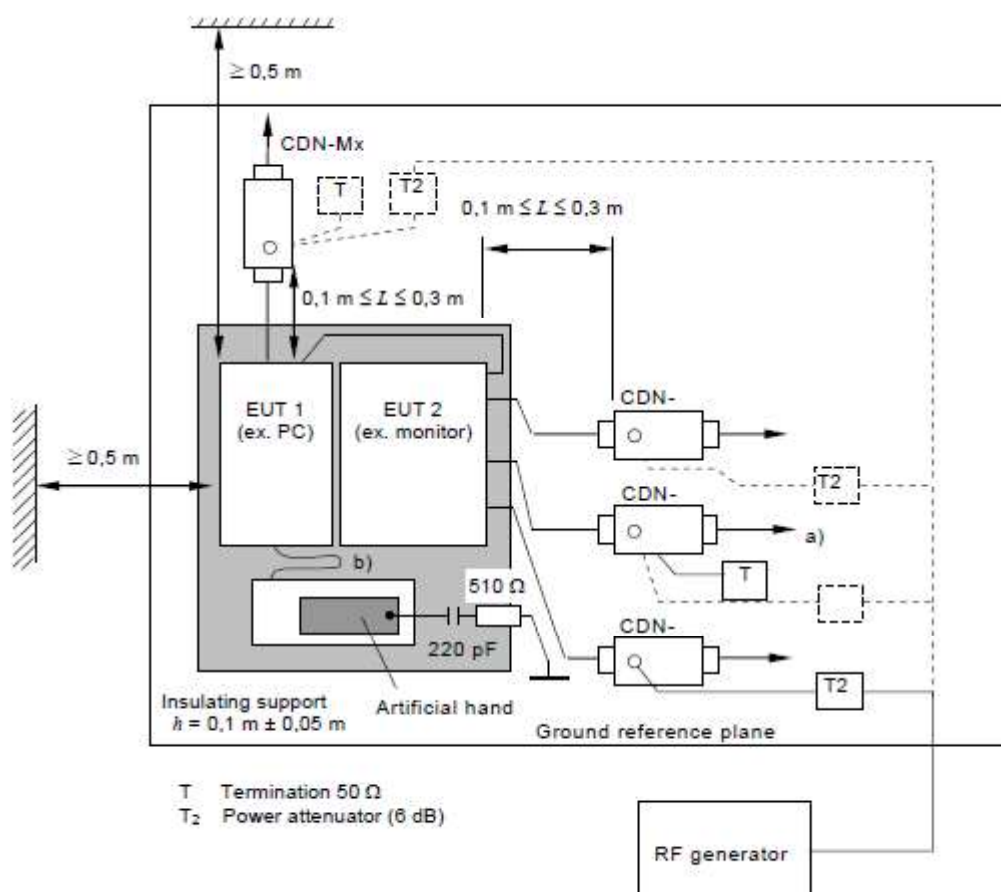


For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

6.9 Radio Frequency Common Mode (CS)

Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of preceding frequency value
Dwell Time	3 seconds

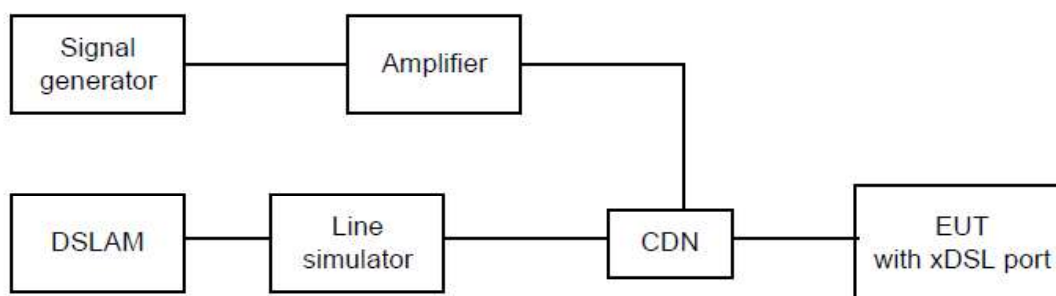
- The EUT shall be tested within its intended operating and climatic conditions.
- An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.
- One of the CDNs not used for injection was terminated with 50 ohm, providing only one return path. All other CDNs were coupled as decoupling networks.
- The frequency range shall be swept, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value.
- Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.



Note: 1. The EUT clearance from any metallic obstacles shall be at least 0,5 m.
2. Interconnecting cables (≤ 1 m) belonging to the EUT shall remain on the insulating support.
For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

Broadband impulse noise disturbances, Repetitive and Isolated (Applicable only to xDSL ports.)

- The EUT shall be tested within its intended operating and climatic conditions.
- An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.
- One of the CDNs not used for injection was terminated with 50 ohm, providing only one return path. All other CDNs were coupled as decoupling networks.
- For the repetitive impulse test the disturbance shall be applied for a period of at least 2 minutes for each port under test.
- For the isolated impulse test a minimum of 5 isolated impulses shall be applied with an interval of at least 60 seconds between successive impulses.
- Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.



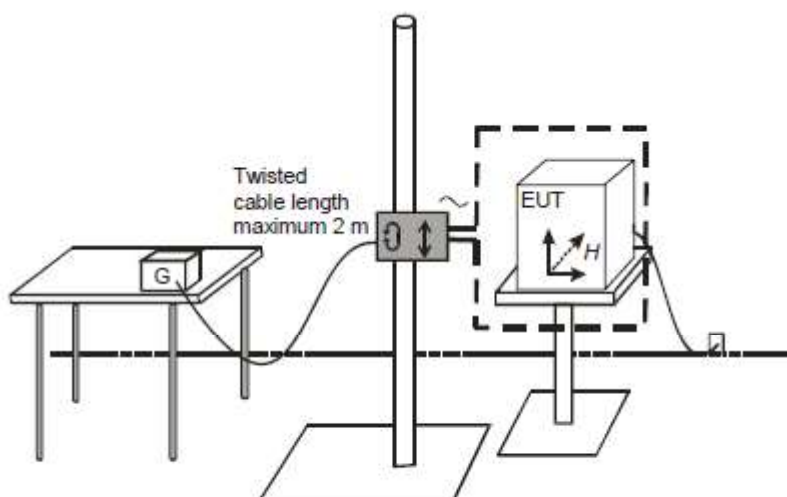
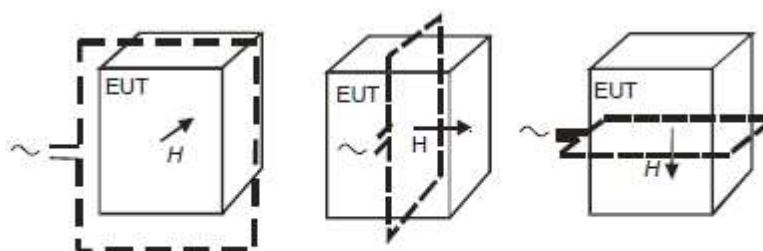
Example schematic of the broadband impulsive conducted disturbances test setup

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

6.10 Power Frequency Magnetic Field (PFMF)

Observation Time:	1 minute
Inductance Coil:	Rectangular coil, 1 m x 1 m (L x W) or 2.6 m x 1 m (L x W)

- The equipment is configured and connected to satisfy its functional requirements.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

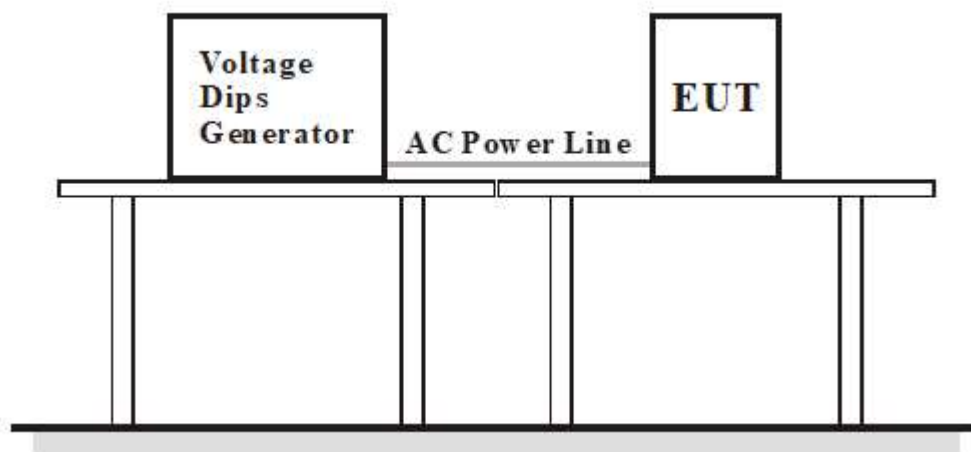


For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

6.11 Voltage Dips and Interruptions (DIP)

Interval between Event:	10 seconds
Sync Angle (degrees):	0° / 180°
Test Cycle:	3 times

- The test shall be performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer. If no cable length is specified, it shall be the shortest possible length suitable to the application of the EUT.
- The EUT shall be tested for each selected combination of test levels and duration with a sequence of 3 dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at 0 voltage crossover point of the voltage waveform.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7 Test Results of Test Item

7.1 Conducted Emissions from Power Ports

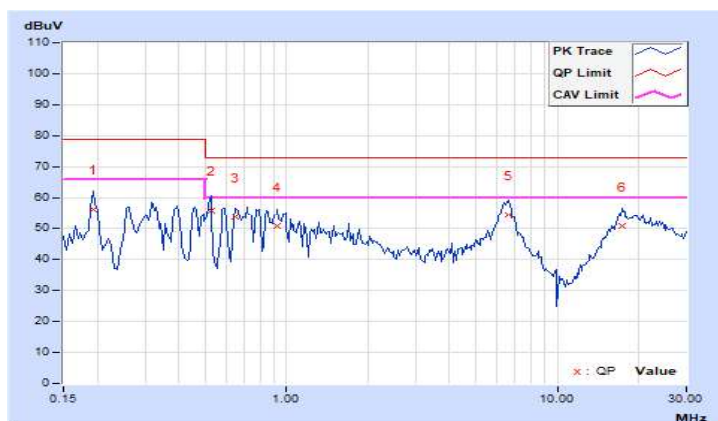
Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110 Vac, 60 Hz	Environmental Conditions	23°C, 77% RH
Tested by	Desmond Chen		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19297	10.05	46.40	39.63	56.45	49.68	79.00	66.00	-22.55	-16.32
2	0.52500	10.07	45.68	37.66	55.75	47.73	73.00	60.00	-17.25	-12.27
3	0.65000	10.07	43.77	36.13	53.84	46.20	73.00	60.00	-19.16	-13.80
4	0.92734	10.07	40.80	30.87	50.87	40.94	73.00	60.00	-22.13	-19.06
5	6.58594	10.26	44.01	35.57	54.27	45.83	73.00	60.00	-18.73	-14.17
6	17.26563	10.53	40.22	33.15	50.75	43.68	73.00	60.00	-22.25	-16.32

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

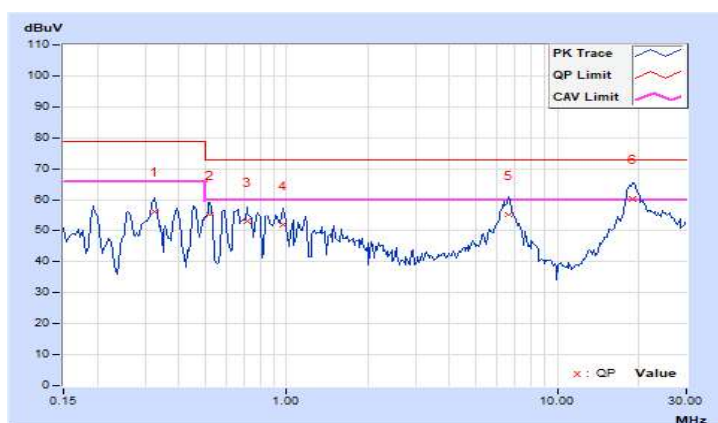


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	110 Vac, 60 Hz	Environmental Conditions	23°C, 77% RH
Tested by	Desmond Chen		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.32578	10.07	46.20	41.66	56.27	51.73	79.00	66.00	-22.73	-14.27
2	0.52109	10.08	44.96	37.23	55.04	47.31	73.00	60.00	-17.96	-12.69
3	0.71250	10.07	42.76	34.54	52.83	44.61	73.00	60.00	-20.17	-15.39
4	0.97031	10.07	41.62	31.50	51.69	41.57	73.00	60.00	-21.31	-18.43
5	6.58984	10.26	44.95	36.55	55.21	46.81	73.00	60.00	-17.79	-13.19
6	19.07813	10.57	49.94	42.27	60.51	52.84	73.00	60.00	-12.49	-7.16

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



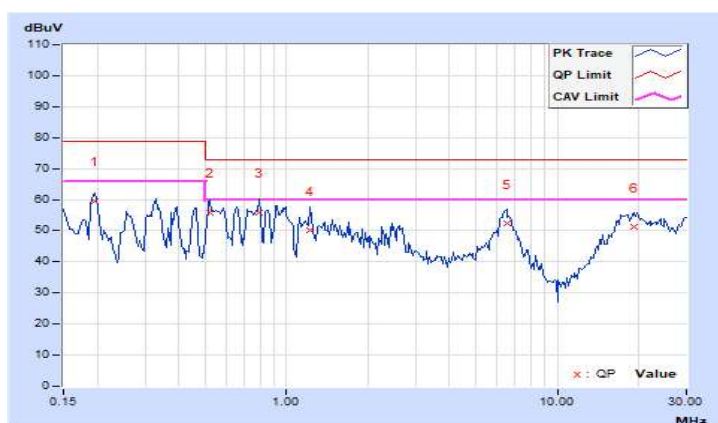
Mode B

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	23°C, 77% RH
Tested by	Desmond Chen		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19687	10.05	49.63	42.59	59.68	52.64	79.00	66.00	-19.32	-13.36
2	0.52109	10.07	45.68	38.55	55.75	48.62	73.00	60.00	-17.25	-11.38
3	0.79063	10.07	45.69	36.61	55.76	46.68	73.00	60.00	-17.24	-13.32
4	1.22656	10.08	39.75	30.24	49.83	40.32	73.00	60.00	-23.17	-19.68
5	6.53516	10.26	41.83	33.20	52.09	43.46	73.00	60.00	-20.91	-16.54
6	19.31250	10.59	40.45	32.42	51.04	43.01	73.00	60.00	-21.96	-16.99

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

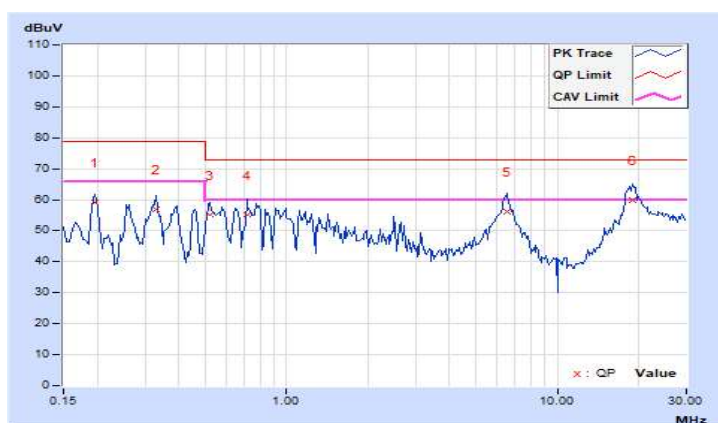


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	230 Vac, 50 Hz	Environmental Conditions	23°C, 77% RH
Tested by	Desmond Chen		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19687	10.06	49.23	45.68	59.29	55.74	79.00	66.00	-19.71	-10.26
2	0.32969	10.07	47.10	40.23	57.17	50.30	79.00	66.00	-21.83	-15.70
3	0.52109	10.08	45.20	38.33	55.28	48.41	73.00	60.00	-17.72	-11.59
4	0.71250	10.07	45.25	36.96	55.32	47.03	73.00	60.00	-17.68	-12.97
5	6.51172	10.26	46.07	36.99	56.33	47.25	73.00	60.00	-16.67	-12.75
6	18.96094	10.57	49.37	41.64	59.94	52.21	73.00	60.00	-13.06	-7.79

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



7.2 Radiated Emissions up to 1 GHz

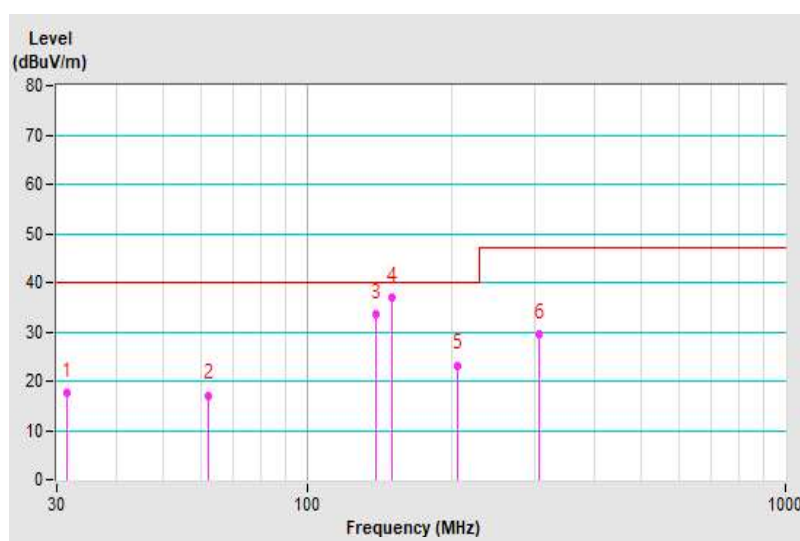
Mode A

Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	110 Vac, 60 Hz	Environmental Conditions	23°C, 61% RH
Tested By	Bob Lin		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	31.60	17.47 QP	40.00	-22.53	2.64 H	74	36.51	-19.04
2	62.06	16.88 QP	40.00	-23.12	3.21 H	141	35.04	-18.16
3	139.57	33.46 QP	40.00	-6.54	2.06 H	122	50.14	-16.68
4	150.92	36.80 QP	40.00	-3.20	3.58 H	122	53.01	-16.21
5	206.55	23.04 QP	40.00	-16.96	3.77 H	351	42.33	-19.29
6	304.91	29.36 QP	47.00	-17.64	3.10 H	131	44.46	-15.10

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

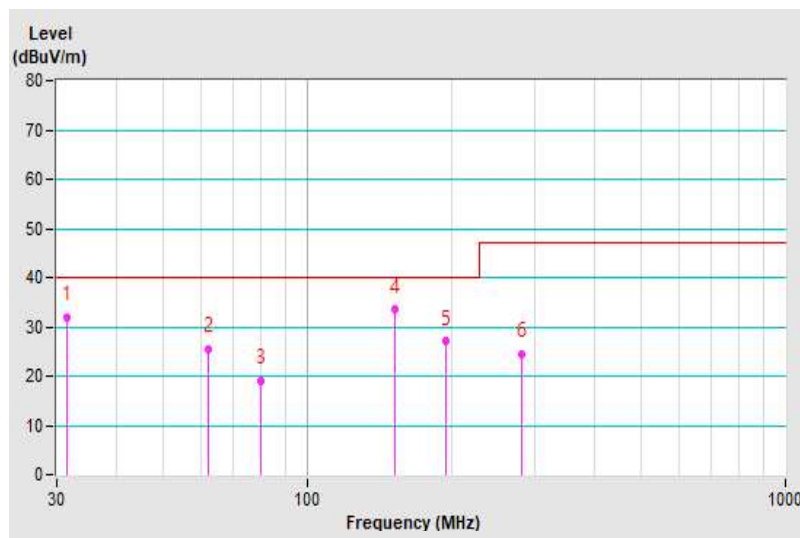


Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	110 Vac, 60 Hz	Environmental Conditions	23°C, 61% RH
Tested By	Bob Lin		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	31.50	31.84 QP	40.00	-8.16	1.34 V	272	51.06	-19.22
2	62.16	25.38 QP	40.00	-14.62	2.51 V	152	43.79	-18.41
3	80.25	18.98 QP	40.00	-21.02	1.37 V	8	41.06	-22.08
4	152.86	33.43 QP	40.00	-6.57	1.40 V	292	49.71	-16.28
5	195.15	26.97 QP	40.00	-13.03	1.65 V	312	46.51	-19.54
6	281.19	24.43 QP	47.00	-22.57	1.00 V	353	40.49	-16.06

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



7.3 Harmonic Current Measurement

Mode A

Test Duration	5 min	Fundamental Voltage / Ampere	230.37 Vrms / 9.312 Arms
Power Consumption	2128.7 W	Power Frequency	49.99 Hz
Power Factor	0.998	Environmental Conditions	24°C, 69% RH
Tested By	Bernie Lu		

Harm#	Harms (avg) (A)	100% Limit (A)	Harms (max) (A)	150% Limit (A)
1	9.257	-	14.421	-
2	0.050	1.080	0.059	1.620
3	0.058	2.300	0.061	3.450
4	0.017	0.430	0.019	0.645
5	0.032	1.140	0.034	1.710
6	0.017	0.300	0.019	0.450
7	0.028	0.770	0.030	1.155
8	0.013	0.230	0.015	0.345
9	0.027	0.400	0.029	0.600
10	0.014	0.184	0.016	0.276
11	0.021	0.330	0.023	0.495
12	0.014	0.153	0.015	0.230
13	0.022	0.210	0.023	0.315
14	0.014	0.131	0.016	0.197
15	0.029	0.150	0.032	0.225
16	0.014	0.115	0.016	0.173
17	0.039	0.132	0.041	0.198
18	0.014	0.102	0.016	0.153
19	0.046	0.118	0.048	0.178
20	0.014	0.092	0.016	0.138
21	0.050	0.107	0.053	0.161
22	0.014	0.084	0.017	0.125
23	0.052	0.098	0.054	0.147
24	0.015	0.077	0.017	0.115
25	0.053	0.090	0.056	0.135
26	0.016	0.071	0.018	0.107
27	0.054	0.083	0.057	0.125
28	0.016	0.066	0.018	0.099
29	0.052	0.078	0.054	0.116
30	0.016	0.061	0.018	0.092
31	0.049	0.073	0.051	0.109
32	0.016	0.058	0.018	0.086
33	0.044	0.068	0.047	0.102
34	0.016	0.054	0.018	0.081
35	0.038	0.064	0.041	0.096
36	0.016	0.051	0.018	0.077
37	0.034	0.061	0.036	0.091
38	0.016	0.048	0.018	0.073
39	0.030	0.058	0.032	0.087
40	0.012	0.046	0.014	0.069

Note: Dynamic limits were applied for this test. The highest harmonics values in the above table may not occur at the same window as the maximum harmonics/limit ratio.

7.4 Voltage Fluctuations and Flicker Measurement

Mode A

Observation (Tp)	10 min		
Input Power	230 Vac, 50 Hz	Environmental Conditions	24°C, 69% RH
Tested By	Bernie Lu		

Test Parameter	Measurement Value	Limit	Remarks
P_{st}	0.399	1.00	Pass
P_{lt}	0.174	0.65	Pass
T_{max} (ms)	0.000	500	Pass
d_{max} (%)	0.000	4.00	Pass
d_c (%)	0.000	3.30	Pass

Notes:

1. P_{st} means short-term flicker indicator.
2. P_{lt} means long-term flicker indicator.
3. T_{max} means accumulated time value of $d(t)$ with a deviation exceeding 3.3 %.
4. d_{max} means maximum relative voltage change.
5. d_c means maximum relative steady-state voltage change.

7.5 Electrostatic Discharges (ESD)

Mode A

For EN 55035

Input Power	AC 230V / 50Hz	Environmental conditions	25 °C, 46 % RH 1005 mbar
Tested by	Bernie Lu		

Test Results of Direct Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Contact Discharge	Air Discharge	Performance Criteria
2, 4	+/-	1, 2	Note	---	A
2, 4, 8	+/-	3, 4	---	Note	A

Description of test points of direct application: Please refer to following page for representative mark only.

Test Results of Indirect Application					
Discharge Level (kV)	Polarity (+/-)	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criteria
2, 4	+/-	Four Side	Note	Note	A

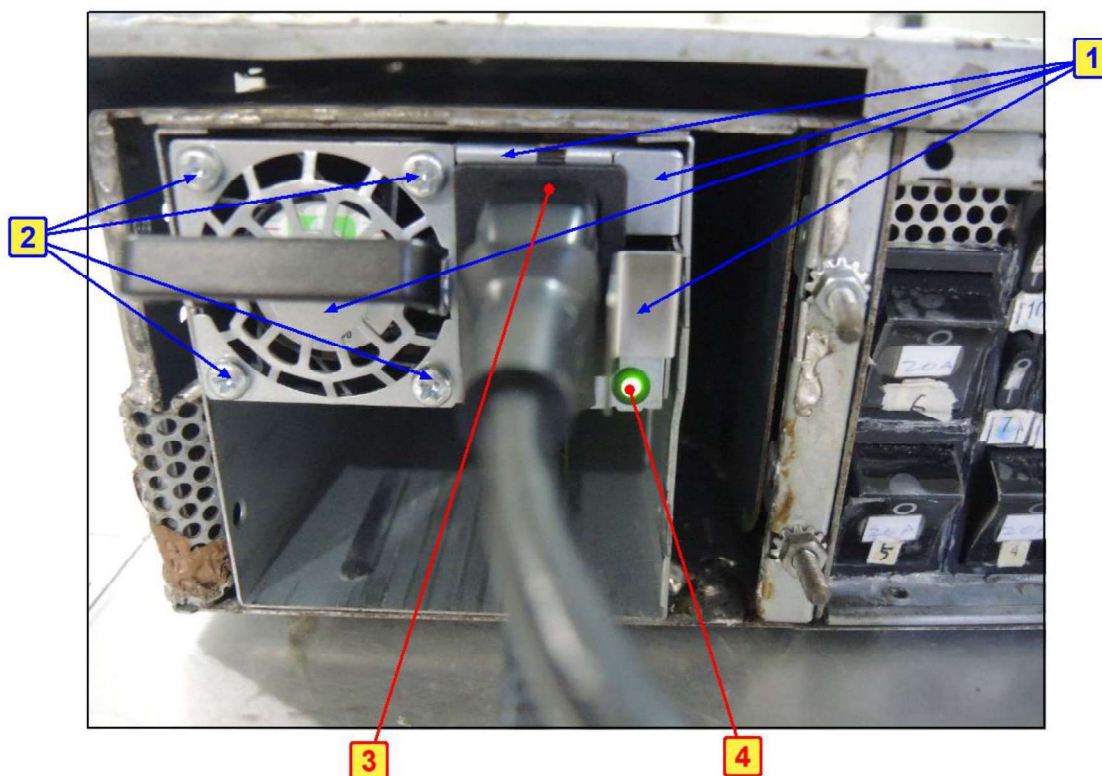
Description of test points of indirect application:

1. Front side
2. Rear side
3. Right side
4. Left side

Please refer to the attached page for description of test points.

Note: The EUT is operated normal during the test.

Description of test point



7.6 Radio Frequency Electromagnetic Field (RS)

Mode A

For EN 55035

Input Power	AC 230V / 50Hz	Environmental conditions	25 °C, 65 % RH 1003 mbar
Tested by	Xun Lee		

Frequency (MHz)	Polarity	Azimuth(°)	Applied Field Strength		Observation	Performance Criteria
			(V/m)	Modulation		
80-1000	V&H	0, 90, 180, 270	3	80% AM (1kHz)	Note	A
1800, 2600, 3500, 5000	V&H	0, 90, 180, 270	3	80% AM (1kHz)	Note	A

Note: The EUT is operated normal during the test.

7.7 Fast Transients Common Mode (EFT)

Mode A

For EN 55035

Input Power	AC 230V / 50Hz	Environmental conditions	24 °C, 74 % RH 1008 mbar
Tested by	Joey Liu		

Input AC power port				
Voltage (kV)	Test Point	Polarity (+/-)	Observation	Performance Criteria
1	L	+/-	Note	A
1	N	+/-	Note	A
1	PE	+/-	Note	A
1	L-N-PE	+/-	Note	A

Note: The EUT is operated normal during the test.

7.8 Surges

Mode A

For EN 55035

Input Power	AC 230V / 50Hz	Environmental conditions	24 °C, 69 % RH 1005 mbar
Tested by	Bernie Lu		

Input AC power port					
Voltage (kV)	Test Point	Azimuth(°)	Polarity (+/-)	Observation	Performance Criteria
0.5, 1	L-N	90, 270	+/-	Note	A
0.5, 1, 2	L-PE	90, 270	+/-	Note	A
0.5, 1, 2	N-PE	90, 270	+/-	Note	A

Note: The EUT is operated normal during the test.

7.9 Radio Frequency Common Mode (CS)

Mode A

For EN 55035

Input Power	AC 230V / 50Hz	Environmental conditions	25 °C, 68 % RH 1003 mbar
Tested by	Xun Lee		

Input AC power port							
Frequency (MHz)	Level (V rms)	Modulation	Tested Line	Injection Method	Return Path	Observation	Performance Criteria
0.15-10	3	80% AM (1kHz)	AC	CDN-M3	---	Note	A
10-30	3-1	80% AM (1kHz)	AC	CDN-M3	---	Note	A
30-80	1	80% AM (1kHz)	AC	CDN-M3	---	Note	A

Note: The EUT is operated normal during the test.

7.10 Power Frequency Magnetic Field (PFMF)

Mode A

For EN 55035

Input Power	AC 230V / 50Hz	Environmental conditions	24 °C, 69 % RH 1005 mbar
Tested by	Bernie Lu		

Application	Frequency (Hz)	Field Strength (A/m)	Observation	Performance Criteria
X - Axis	50	1	Note	A
Y - Axis	50	1	Note	A
Z - Axis	50	1	Note	A

Note: The EUT is operated normal during the test.

7.11 Voltage Dips and Interruptions (DIP)

Mode A

For EN 55035

Input Power	AC 230V / 50Hz	Environmental conditions	24 °C, 69 % RH 1005 mbar
Tested by	Bernie Lu		

Input Power for testing: <u>230Vac, 50 Hz</u> (Nominal input Voltage)					
Voltage Residual (%)	Duration (cycle)	Interval (sec)	Times	Observation	Performance Criteria
< 5	0.5	10	3	Note 1	A
70	25	10	3	Note 2	B
< 5	250	10	3	Note 2	B

Input Power for testing: <u>127Vac, 50 Hz</u> (Nominal input Voltage)					
Voltage Residual (%)	Duration (cycle)	Interval (sec)	Times	Observation	Performance Criteria
< 5	0.5	10	3	Note 1	A
70	25	10	3	Note 2	B
< 5	250	10	3	Note 2	B

Input Power for testing: <u>100Vac, 50 Hz</u> (Minimum rated input voltage)					
Voltage Residual (%)	Duration (cycle)	Interval (sec)	Times	Observation	Performance Criteria
< 5	0.5	10	3	Note 1	A
70	25	10	3	Note 2	B
< 5	250	10	3	Note 2	B

Notes:

1. The EUT is operated normal during the test.
2. The EUT shutdown during the test, but self-recover after the test.

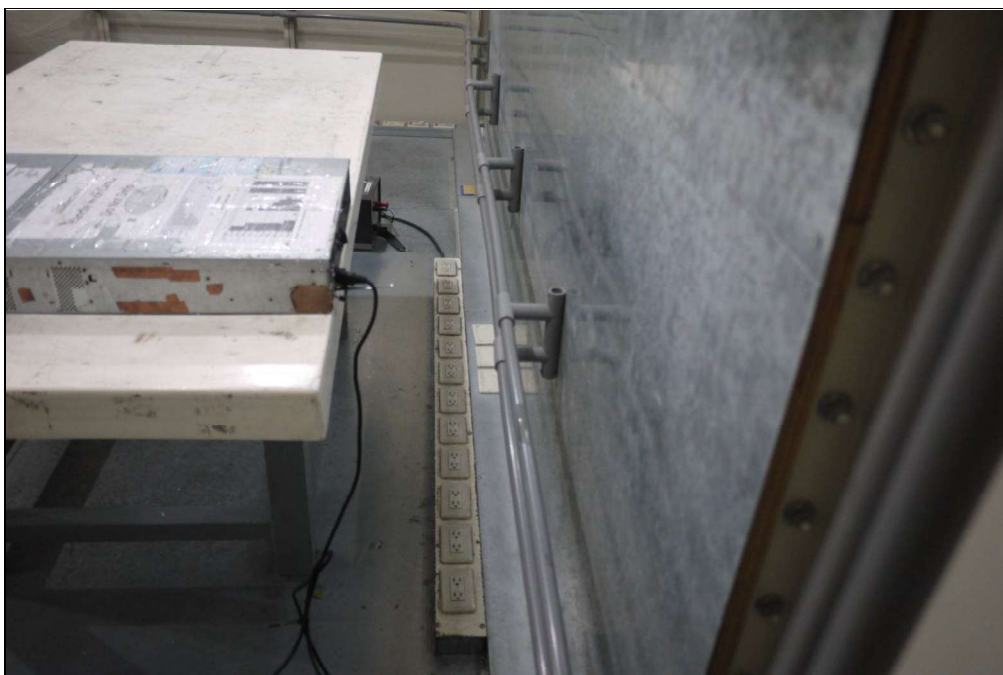
8 Pictures of Test Arrangements

8.1 Conducted Emissions from Power Ports

Mode A

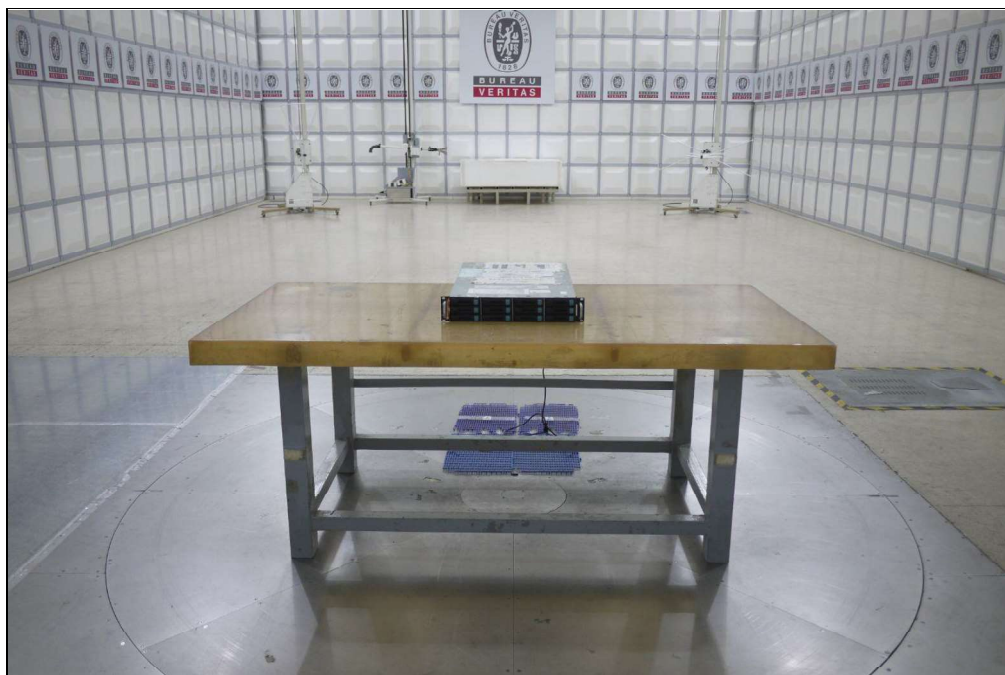


Mode B



8.2 Radiated Emissions up to 1 GHz

Mode A



8.3 Harmonic Current Measurement

Mode A



8.4 Voltage Fluctuations and Flicker Measurement

Mode A



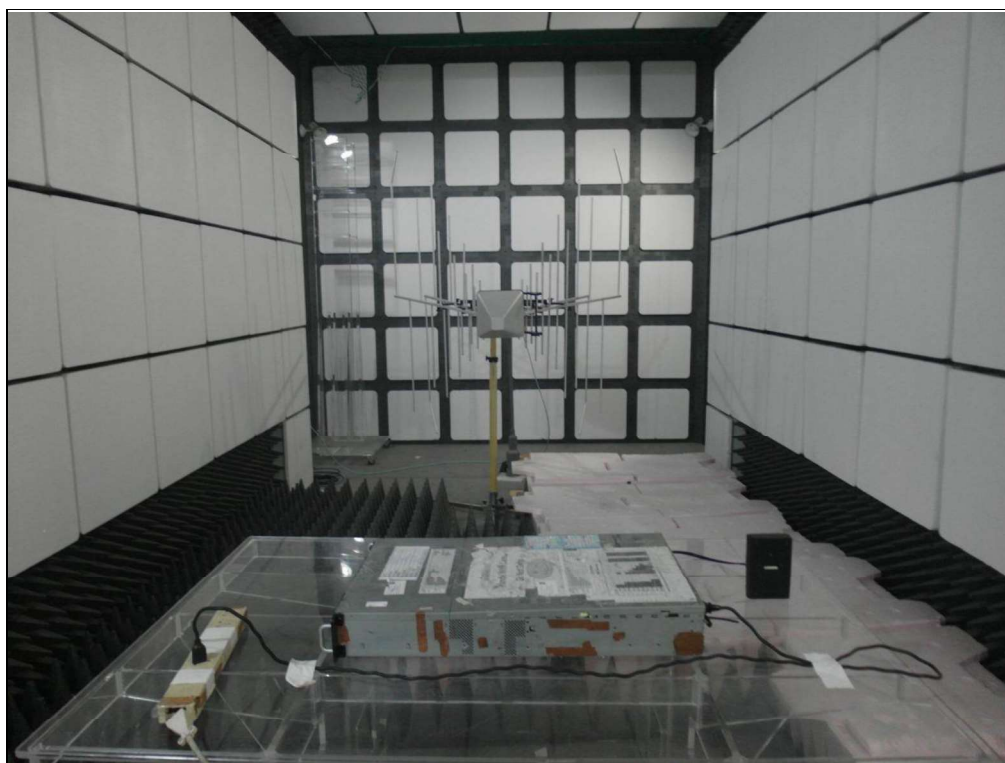
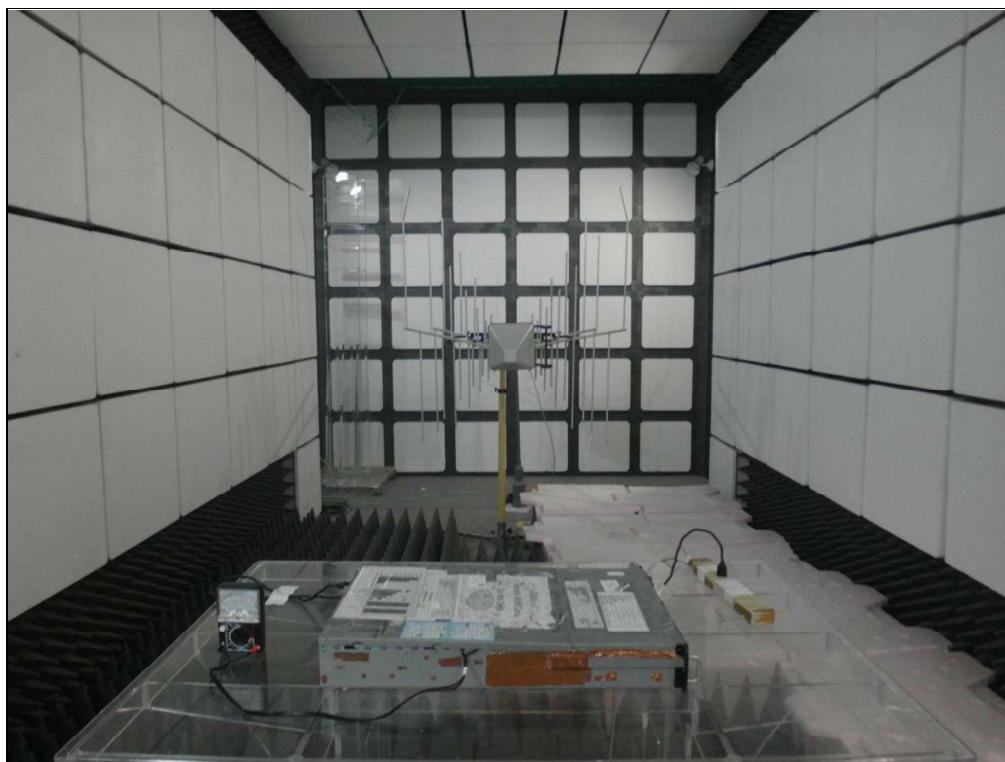
8.5 Electrostatic Discharges (ESD)

Mode A



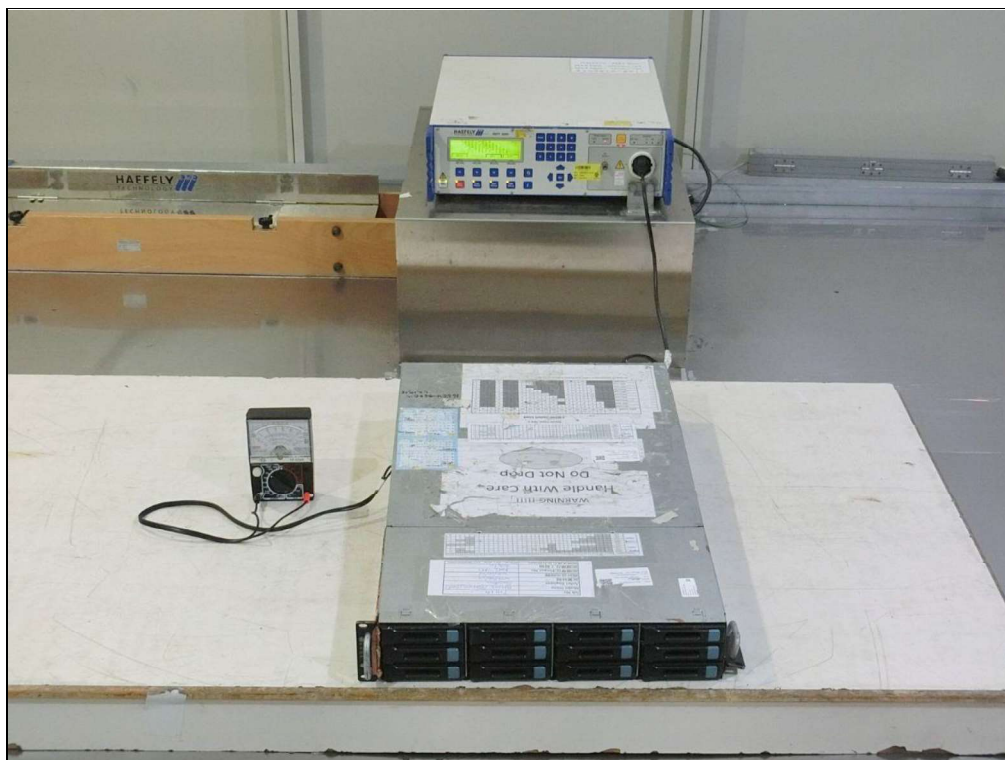
8.6 Radio Frequency Electromagnetic Field (RS)

Mode A



8.7 Fast Transients Common Mode (EFT)

Mode A



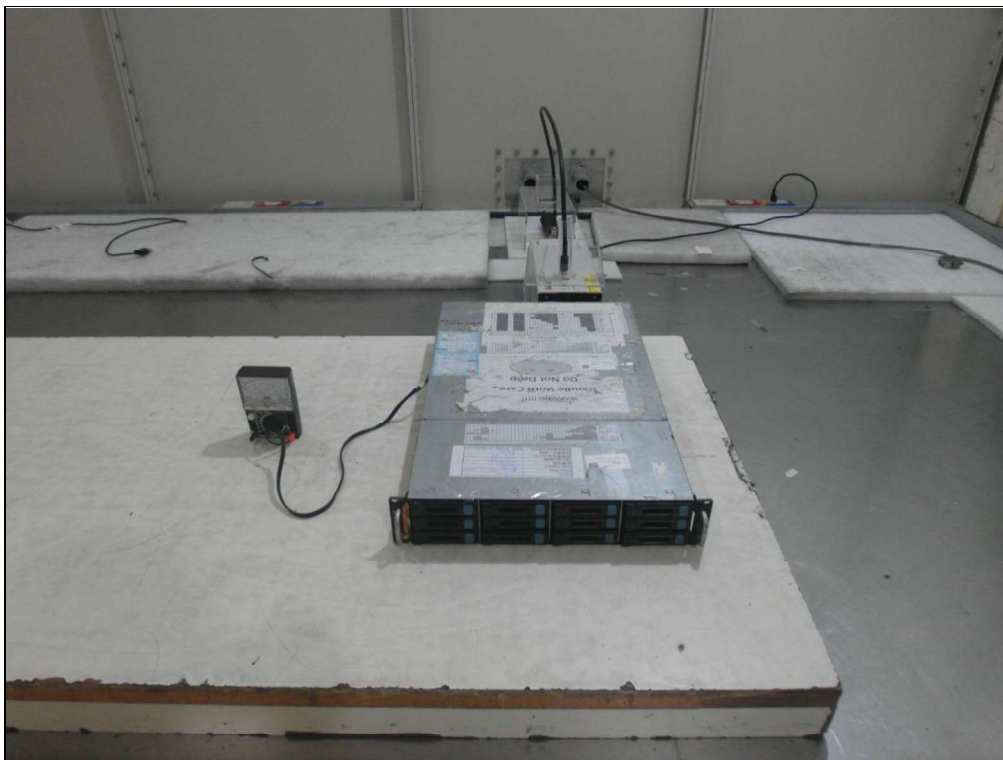
8.8 Surges

Mode A



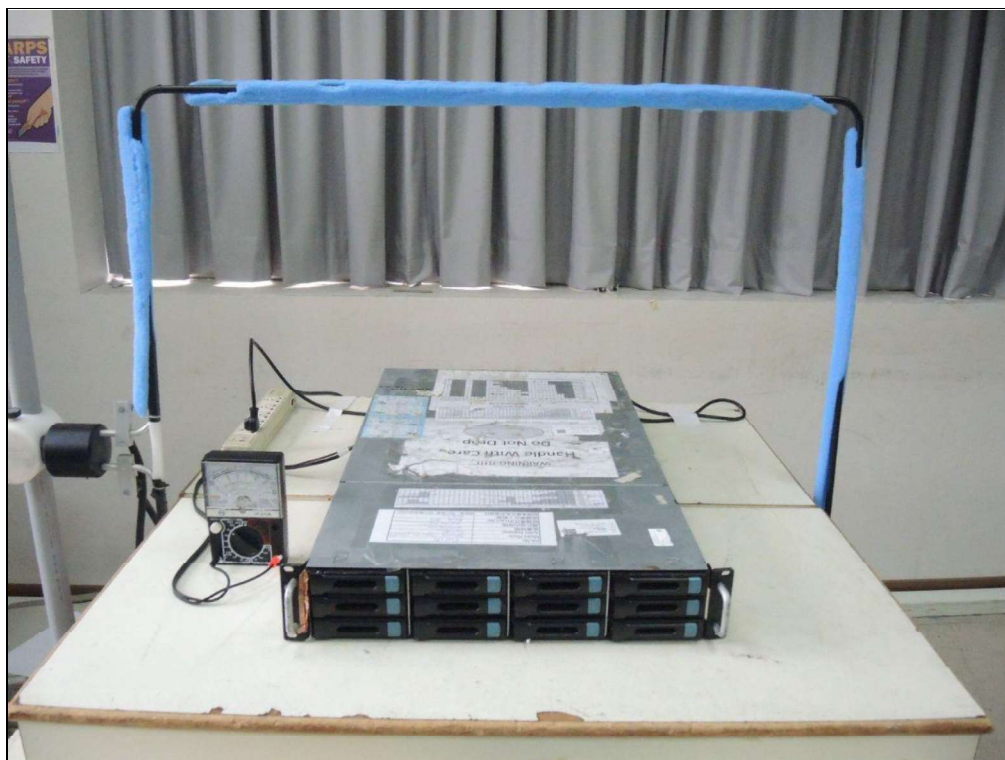
8.9 Radio Frequency Common Mode (CS)

Mode A



8.10 Power Frequency Magnetic Field (PFMF)

Mode A



8.11 Voltage Dips and Interruptions (DIP)

Mode A



9 Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: <http://ee.bureauveritas.com.tw>

The address and road map of all our labs can be found in our web site also.

--- END ---

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: ICES-003:2020 Issue 7, Class A

ICES-Gen:2018 Issue 1 +A1:2021

ANSI C63.4-2014 amended as per ANSI C63.4a-2017

Report No.: CIBEDU-WTW-P22060391

Model No.: FSM005, FSM010

Series Model: R1CA2202E, R1CA2162D

Received Date: 2022/6/13

Test Date: 2022/6/13 ~ 2022/6/15

Issued Date: 2022/7/7

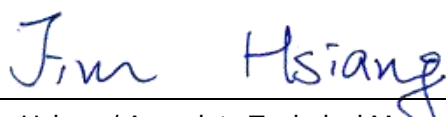
Applicant: AcBel Polytech Inc.

Address: No.159, Sec. 3, Danjin Rd., Danshui Dist., New Taipei City 251, Taiwan (R.O.C.)

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Approved by:  , **Date:** 2022/7/7
Jim Hsiang / Associate Technical Manager

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Prepared by : Ivy Lin / Specialist



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Release Control Record

Issue No.	Description	Date Issued
CIBEDU-WTW-P22060391	ORIGINAL RELEASE.	2022/7/7

1 Certificate

Product: Switching Power Supply

Brand: AcBel

Test Model: FSM005, FSM010

Series Model: R1CA2202E, R1CA2162D

Sample Status: Engineering sample

Applicant: AcBel Polytech Inc.

Test Date: 2022/6/13 ~ 2022/6/15

Standard: ICES-003:2020 Issue 7, Class A
ICES-Gen:2018 Issue 1 +A1:2021
ANSI C63.4-2014 amended as per ANSI C63.4a-2017

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

2 Summary of Test Results

The test items that the EUT need to perform in accordance with its interfaces, evaluated functions, are as follows:

Standard	Test Item	Result	Remark
ICES-003	Conducted Emissions from Power Ports	Pass	Minimum passing Class A margin is -2.11 dB at 14.84766 MHz
ICES-003	Radiated Emissions up to 1 GHz	Pass	Minimum passing Class A margin is -2.33 dB at 31.75 MHz

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Specification	Expanded Uncertainty (k=2) (±)	Maximum allowable uncertainty (±)
Conducted Emissions from Power Ports	9 kHz ~ 30 MHz	2.94 dB	3.4 dB (U_{CISPR})
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	3m: 5.66 dB 10m: 4.32 dB	6.3 dB (U_{CISPR})

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	Switching Power Supply
Brand	AcBel
Test Model	FSM005, FSM010
Series Model	R1CA2202E, R1CA2162D
Model Difference	Refer to note as below
Sample Status	Engineering sample
Operating Software	N/A
Power Supply Rating	Refer to note as below
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

The EUT is a Switching Power Supply (AC/DC 3-pin) and it has several models, which are identical to each other except for the following:

Model	Rating	Transformer PCB5
FSM005, R1CA2202E	Input: 100-127V~, 50/60Hz,12A 200-240V~, 50/60Hz,10A OR 240Vdc, 10A Output: FOR 200-240V~: +12.2V/164A & +12Vsb/3A Max. OUTPUT POWER:2000W For 220-240V~ OR 240Vdc: +12.2V/164A Max. & +12Vsb/ 3.0A Max Maximum Output Power=2000W For 208-219V~: +12.2V/155A Max. & +12Vsb/3.0A Max. Maximum Output Power=1900W For 200-207V~: +12.2V/148A Max. & +12Vsb/3.0A Max. Maximum Output Power=1800W For 100-127V~: +12.2V/82A Max. & +12Vsb/3.0A Max. Maximum Output Power=1000W	R90000-9161I
FSM010, R1CA2162D	Input: 100-127V~, 50/60Hz,12A 200-240V~, 50/60Hz,10A OR 240Vdc, 10A Output: For 200-240V~ and 240Vdc: +12.2V/132A Max. & +12Vsb/3.0A Max. Maximum Output Power=1600W For 100-127V~: +12.2V/82A Max. & +12Vsb/3.0A Max. Maximum Output Power=1000W	R90000-9151I

During the test, **Model: FSM005, FSM010** were selected as the representative models for the test.

3.2 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 50-80kHz, provided by AcBel Polytech Inc., for detailed internal source, please refer to the manufacturer's specifications.

3.3 Features of EUT

The tests reported herein were performed according to the method specified by AcBel Polytech Inc., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

Please refer to appendix of the report if the applicant has provided additional descriptions of the EUT.

3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT has been pre-tested under following test modes.

Test Condition	
Mode	Conducted Emissions from Power Ports
1	EUT_FSM005 with full load + Input Power(240 Vdc)
2	EUT_FSM010 with full load + Input Power(240 Vdc)
3	EUT_FSM005 with full load + Input Power(120 Vac, 60 Hz)
4	EUT_FSM005 with full load + Input Power(240 Vac, 60 Hz)
Note: The worst case is that mode 4 is shown in bold.	
Mode	Radiated Emissions up to 1 GHz
1	EUT_FSM005 with full load + Input Power(240 Vdc)
2	EUT_FSM005 with full load + Input Power(120 Vac, 60 Hz)
3	EUT_FSM010 with full load + Input Power(240 Vdc)
4	EUT_FSM010 with full load + Input Power(120 Vac, 60 Hz)
Note:	
a. The worst case is that mode 3 is shown in bold.	
b. There are DC 240 V and AC 120V/60Hz to be pre-tested then DC 240 V has the highest emission value.	

Test mode is presented in the report as below.

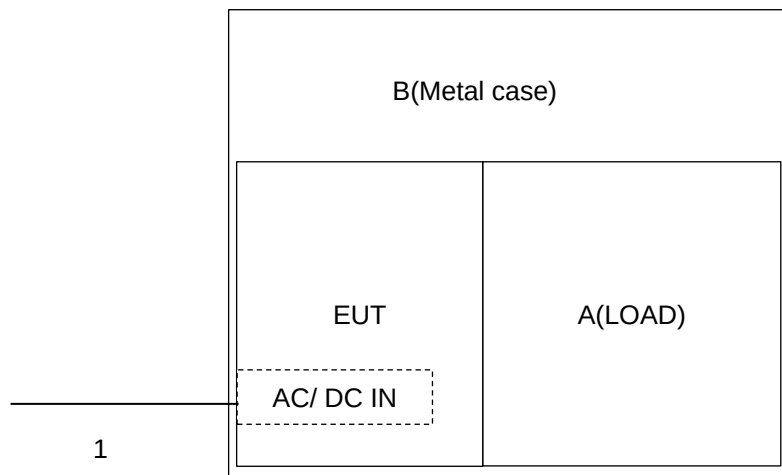
Test Condition	
Mode	Conducted Emissions from Power Ports
A	EUT_FSM005 with full load + Input Power(240 Vac, 60 Hz)
Mode	Radiated Emissions up to 1 GHz
A	EUT_FSM010 with full load + Input Power(240 Vdc)

3.5 Test Program Used and Operation Descriptions

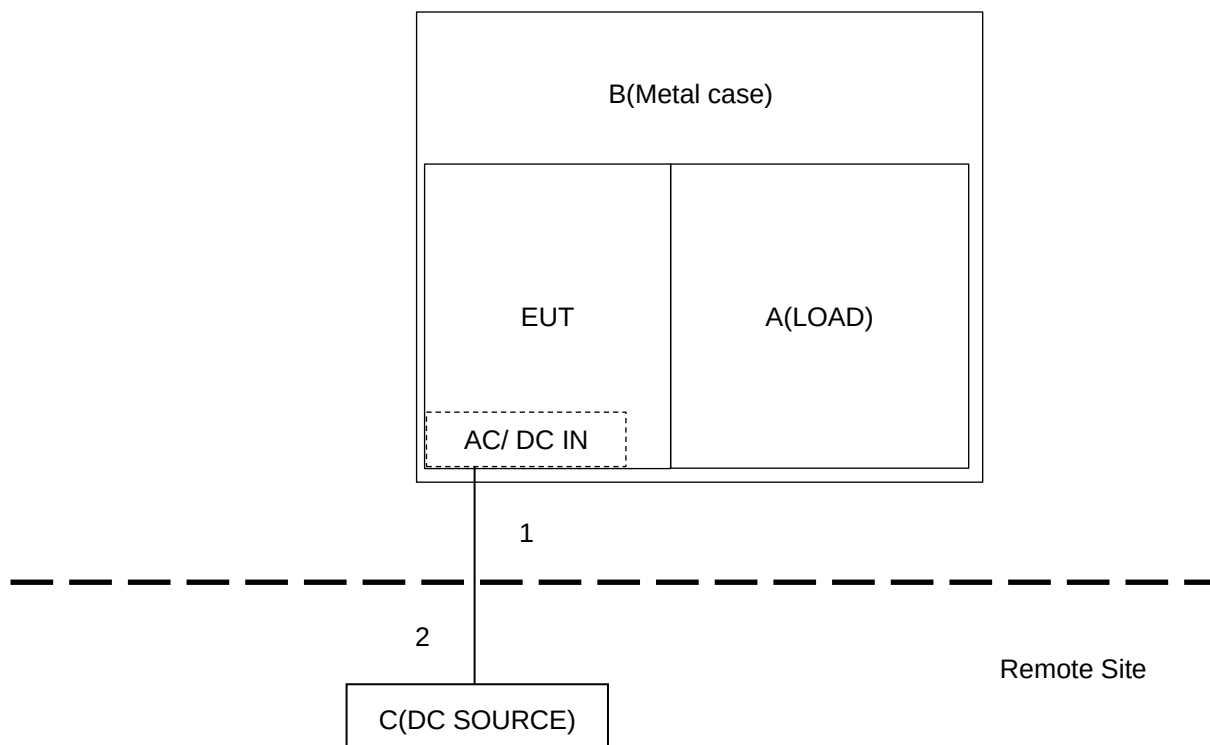
Connected a resistor load with EUT and installed both of them into a metal case and then set the EUT under full resistor load for the test.

3.6 Connection Diagram of EUT and Peripheral Devices

AC Mode



DC Mode



3.7 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	LOAD	N/A	N/A	N/A	N/A	Supplied by applicant
B	METAL CASE	N/A	N/A	N/A	N/A	Supplied by applicant
C	Power supply_DC	CHROMA	62150H-600S	62150EC00479	N/A	Provided by Lab

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	AC / DC power cable	1	1.8	No	0	Provided by Lab
2	DC power cable	1	10	No	0	Provided by Lab

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 Conducted Emissions from Power Ports

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Attenuator STI	STI02-2200-10	NO.1	2021/9/15	2022/9/14
DC LISN Schwarzbeck	NNLK 8121	8121-808	2022/4/29	2023/4/28
DC LISN R&S	ESH3-Z6	844950/018	2021/7/25	2022/7/24
		100219	2021/7/25	2022/7/24
Isolation Transformer Erika Fiedler	D-65396	017	2021/9/9	2022/9/8
LISN R&S	ENV216	101197	2021/6/23	2022/6/22
LISN Schwarzbeck	NNLK8129	8129229	2022/6/8	2023/6/7
	NNLK 8121	8121-731	2022/5/26	2023/5/25
LISN R&S	ENV216	101196	2022/5/24	2023/5/23
RF Coaxial Cable Commate	5D-FB	Cable-CO10-01	2022/2/9	2023/2/8
Software BVADT	Cond_V7.3.7.4	N/A	N/A	N/A
Test Receiver R&S	ESR3	102414	2021/12/20	2022/12/19
TEST RECEIVER ROHDE & SCHWARZ	ESCS 30	100288	2022/1/4	2023/1/3

Notes:

1. The test was performed in Linkou Conduction 10.
2. Tested Date: 2022/6/15

4.2 Radiated Emissions up to 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Coupling/Dcoupling Network Schwarzbeck	CDNE-M2	00097	2022/6/1	2023/5/31
	CDNE-M3	00091	2022/6/1	2023/5/31
Pre_Amplifier EMCI	EMC9135	980327	2022/2/17	2023/2/16
Pre_Amplifier Sonoma	310N	352922	2022/2/16	2023/2/15
RF Coaxial Cable JYBAO	LMR-600	Cable-CH8-01	2021/9/24	2022/9/23
		Cable-CH8-02	2021/9/24	2022/9/23
RF Coaxial Cable Pacific	8D-FB	Cable-CH8-03	2021/9/24	2022/9/23
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Test Receiver R&S	ESR3	102413	2022/2/11	2023/2/10
		102414	2021/12/20	2022/12/19
Tower Max Full.	MF7802	MF780208105	N/A	N/A
TRILOG Broad Band Antenna Schwarzbeck	VULB 9168	9168-316	2021/10/19	2022/10/18
		9168-317	2021/10/19	2022/10/18
Turn Table & Tower Max Full.	MF7802	MF7802121	N/A	N/A

Notes:

1. The test was performed in Linkou 10M Chamber (Chamber 8) , The test site validated date: 2021/8/28 (NSA)
2. Tested Date: 2022/6/13

5 Limits of Test Items

5.1 Conducted Emissions from Power Ports

Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Notes: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

5.2 Radiated Emissions up to 1 GHz

Frequency range (MHz)	Class A (3 m) Quasi-peak dBμV/m	Class A (10 m) Quasi-peak dBμV/m	Class B (3 m) Quasi-peak dBμV/m	Class B (10 m) Quasi-peak dBμV/m
30-88	50.0	40.0	40.0	30.0
88-216	54.0	43.5	43.5	33.1
216-230	56.9	46.4	46.0	35.6
230-960	57.0	47.0	47.0	37.0
960-1000	60.0	49.5	54.0	43.5

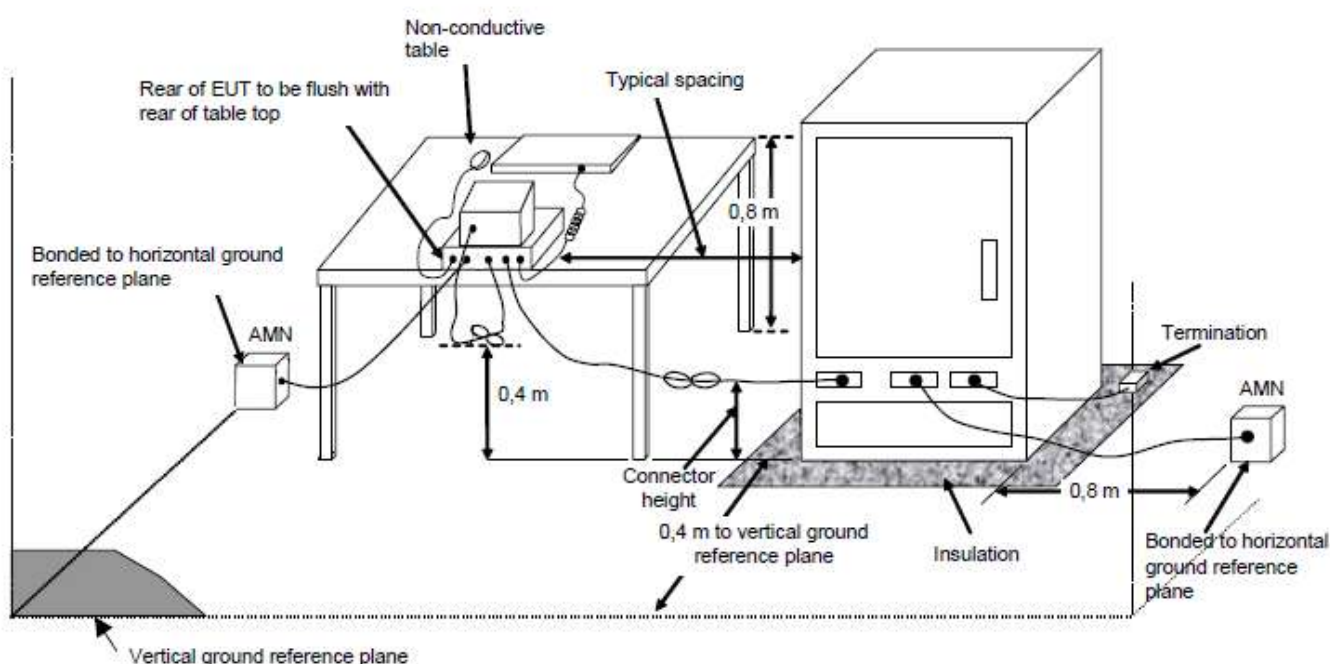
Notes: 1. The lower limit shall apply at the transition frequencies.

6 Test Arrangements

6.1 Conducted Emissions from Power Ports

- For the table-top EUT is placed on a 0.8 meter insulation table; for the floor standing EUT shall be insulated (by insulation of 12 mm) from the horizontal reference ground plane. The EUT is placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units are connected to the power mains through another LISN. They provide coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

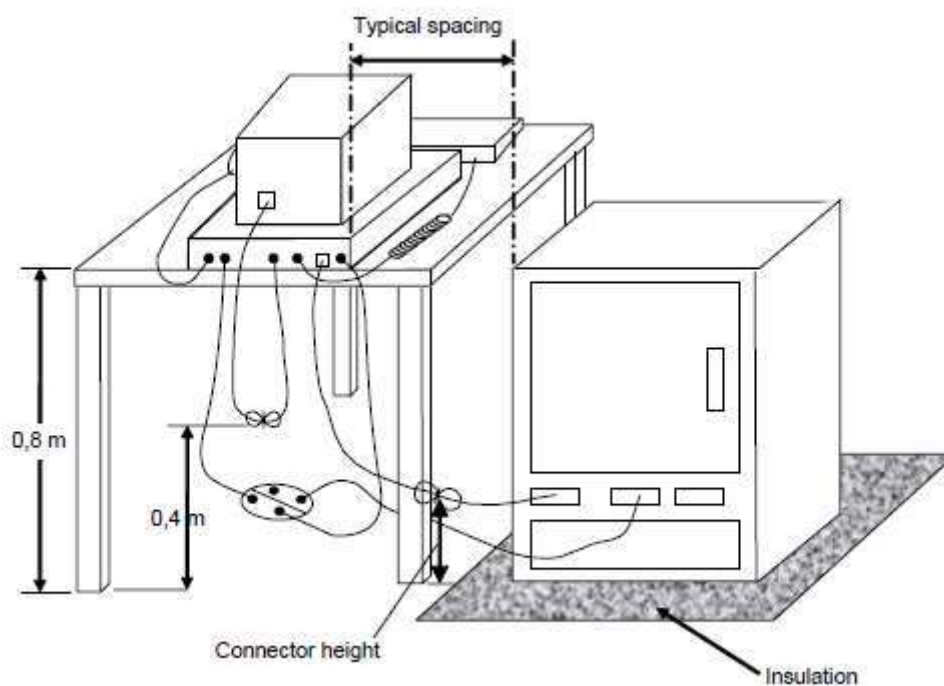


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

6.2 Radiated Emissions up to 1 GHz

- For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the floor standing EUT shall be insulated (by insulation of 12 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- The EUT was set 10 METERS FOR 30 MHZ TO 1 GHZ away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

7 Test Results of Test Item

7.1 Conducted Emissions from Power Ports

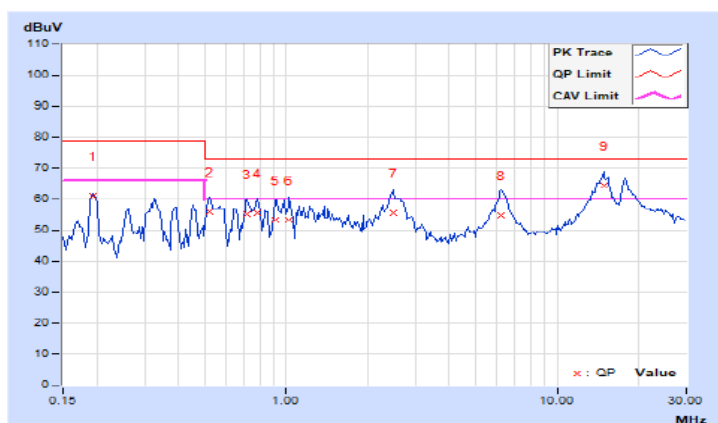
Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	240 Vac, 60 Hz	Environmental Conditions	21°C, 72% RH
Tested by	Hermes Lin		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19297	10.06	51.13	50.89	61.19	60.95	79.00	66.00	-17.81	-5.05
2	0.52109	10.06	45.75	38.71	55.81	48.77	73.00	60.00	-17.19	-11.23
3	0.72031	10.07	45.01	36.65	55.08	46.72	73.00	60.00	-17.92	-13.28
4	0.77891	10.07	45.48	36.59	55.55	46.66	73.00	60.00	-17.45	-13.34
5	0.90781	10.08	43.40	35.27	53.48	45.35	73.00	60.00	-19.52	-14.65
6	1.02734	10.08	43.25	33.41	53.33	43.49	73.00	60.00	-19.67	-16.51
7	2.50000	10.15	45.42	32.17	55.57	42.32	73.00	60.00	-17.43	-17.68
8	6.22656	10.25	44.61	35.84	54.86	46.09	73.00	60.00	-18.14	-13.91
9	14.84766	10.41	54.14	47.48	64.55	57.89	73.00	60.00	-8.45	-2.11

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

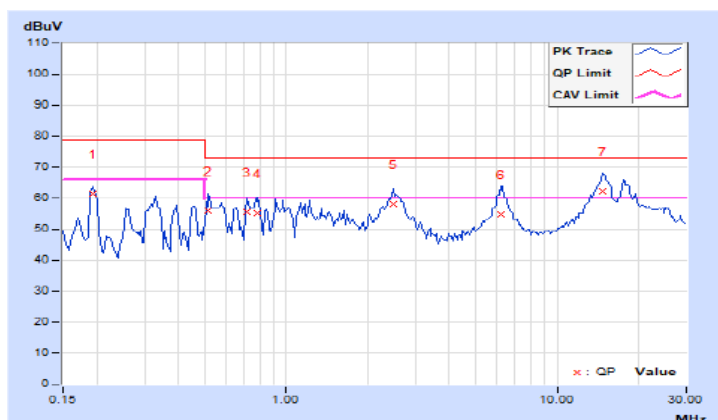


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	240 Vac, 60 Hz	Environmental Conditions	21°C, 72% RH
Tested by	Hermes Lin		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19297	10.07	51.49	45.91	61.56	55.98	79.00	66.00	-17.44	-10.02
2	0.51328	10.07	46.02	37.58	56.09	47.65	73.00	60.00	-16.91	-12.35
3	0.71250	10.08	45.32	38.03	55.40	48.11	73.00	60.00	-17.60	-11.89
4	0.78672	10.08	45.26	36.59	55.34	46.67	73.00	60.00	-17.66	-13.33
5	2.48828	10.16	47.90	33.16	58.06	43.32	73.00	60.00	-14.94	-16.68
6	6.18750	10.26	44.73	36.35	54.99	46.61	73.00	60.00	-18.01	-13.39
7	14.71094	10.42	51.83	44.82	62.25	55.24	73.00	60.00	-10.75	-4.76

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



7.2 Radiated Emissions up to 1 GHz

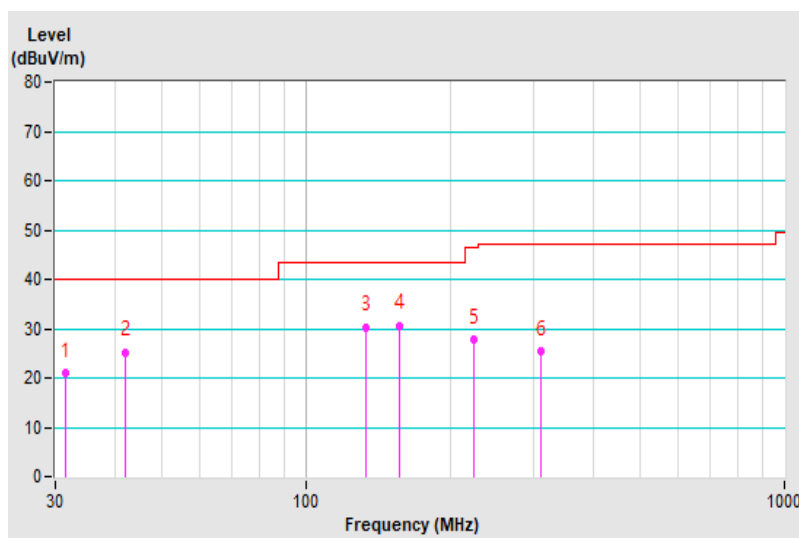
Mode A

Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	240 Vdc	Environmental Conditions	25°C, 66% RH
Tested By	Wesley Lin		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	31.41	20.88 QP	40.00	-19.12	3.14 H	144	39.89	-19.01
2	42.08	25.05 QP	40.00	-14.95	3.38 H	349	42.68	-17.63
3	133.26	30.34 QP	43.50	-13.16	4.00 H	91	48.46	-18.12
4	156.49	30.50 QP	43.50	-13.00	3.01 H	7	47.20	-16.70
5	224.25	27.69 QP	46.40	-18.71	3.71 H	351	47.21	-19.52
6	310.44	25.28 QP	47.00	-21.72	4.00 H	38	40.78	-15.50

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

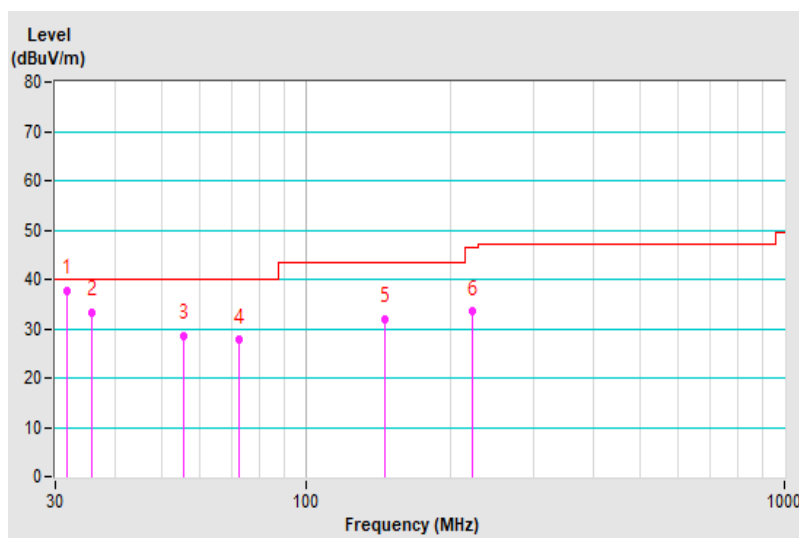


Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	240 Vdc	Environmental Conditions	25°C, 66% RH
Tested By	Wesley Lin		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	31.75	37.67 QP	40.00	-2.33	1.82 V	149	52.36	-14.69
2	35.82	33.27 QP	40.00	-6.73	1.00 V	330	47.92	-14.65
3	55.56	28.42 QP	40.00	-11.58	1.03 V	81	41.43	-13.01
4	72.68	27.68 QP	40.00	-12.32	2.28 V	350	43.59	-15.91
5	146.79	31.84 QP	43.50	-11.66	1.11 V	68	44.58	-12.74
6	222.51	33.40 QP	46.40	-13.00	1.00 V	194	49.22	-15.82

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



8 Pictures of Test Arrangements

8.1 Conducted Emissions from Power Ports

Mode A



8.2 Radiated Emissions up to 1 GHz

Mode A



9 Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Email: service.adt@bureauveritas.com

Web Site: <http://ee.bureauveritas.com.tw>

The address and road map of all our labs can be found in our web site also.

--- END ---

TEST REPORT

CERTIFICATE OF CONFORMITY

Standard: 47 CFR FCC Part 15, Subpart B, Class A
ANSI C63.4:2014

Report No.: FDBEDU-WTW-P22060391A R1

Product: Switching Power Supply

Brand: AcBel

Model No.: FSM043, FSM044

Series Model: FSM005, R1CA2202E, FSM010, R1CA2162D, R1CA2162E, R1CA2202H

Received Date: 2022/11/15

Test Date: 2023/2/9 ~ 2023/2/15

Issued Date: 2023/3/10

Applicant: AcBel Polytech Inc.

Address: No.159, Sec. 3, Danjin Rd., Tamsui Dist., New Taipei City 251, Taiwan (R.O.C.)

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

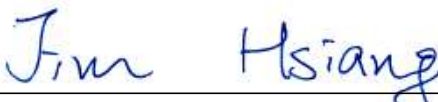
Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

FCC Registration /

Designation Number: 418586 / TW1078

Approved by:


Jim Hsiang / Associate Technical Manager

, Date:

2023/3/10

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Prepared by : Ivy Lin / Specialist



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Release Control Record

Issue No.	Description	Date Issued
FDBEDU-WTW-P22060391A	Original release.	2023/1/10
FDBEDU-WTW-P22060391A R1	Update test data of Conducted Emissions from Power Ports and Radiated Emissions up to 1 GHz.	2023/3/10

1 Certificate

Product: Switching Power Supply

Brand: AcBel

Test Model: FSM043, FSM044

Series Model: FSM005, R1CA2202E, FSM010, R1CA2162D, R1CA2162E, R1CA2202H

Sample Status: Engineering sample

Applicant: AcBel Polytech Inc.

Test Date: 2023/2/9 ~ 2023/2/15

Standard: 47 CFR FCC Part 15, Subpart B, Class A
ANSI C63.4:2014

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

2 Summary of Test Results

The test items that the EUT need to perform in accordance with its interfaces, evaluated functions, are as follows:

Standard / Clause	Test Item	Result	Remark
FCC Part 15.107	Conducted Emissions from Power Ports	Pass	Minimum passing Class A margin is -14.04 dB at 0.52291 MHz
FCC Part 15.109	Radiated Emissions up to 1 GHz	Pass	Minimum passing Class A margin is -7.75 dB at 69.77 MHz

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Specification	Expanded Uncertainty (k=2) (±)	Maximum allowable uncertainty (±)
Conducted Emissions from Power Ports	9 kHz ~ 30 MHz	3.00 dB	3.4 dB (U_{CISPR})
Radiated Emissions up to 1 GHz	30 MHz ~ 1 GHz	3m: 5.44 dB 10m: 4.02 dB	6.3 dB (U_{CISPR})

The other instruments specified are routine verified to remain within the calibrated levels, no measurement uncertainty is required to be calculated.

2.2 Supplementary Information

There is not any deviation from the test standards for the test method, and no modifications required for compliance.

3 General Information

3.1 Description of EUT

Product	Switching Power Supply
Brand	AcBel
Test Model	FSM043, FSM044
Series Model	FSM005, R1CA2202E, FSM010, R1CA2162D, R1CA2162E, R1CA2202H
Model Difference	Refer to note as below
Sample Status	Engineering sample
Operating Software	N/A
Power Supply Rating	Refer to note as below
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

- This report is issued as a supplementary report to BV CPS report no.: FDBEDU-WTW-P22060391. The differences compared with the original report are listed as below. Therefore, the EUT is re-tested in this report.
 - ♦ Add new PCB_type B (collocate Inlet (on board) and Inlet (with wired))
 - ♦ Add new models for air blow backward
- The EUT is a Switching Power Supply (AC/DC 3-pin) and it has several models, which are identical to each other except for the following: (Additional model as shaded area)

3. Model	Rating	Transformer PCB5
FSM005, R1CA2202E	Input: 100-127V~, 50/60Hz, 12A 200-240V~, 50/60Hz, 10A OR 240Vdc, 10A Output: FOR 200-240V~: +12.2V/164A & +12Vsb/3A Max. OUTPUT POWER:2000W For 220-240V~ OR 240Vdc: +12.2V/164A Max. & +12Vsb/ 3.0A Max Maximum Output Power=2000W For 208-219V~: +12.2V/155A Max. & +12Vsb/3.0A Max. Maximum Output Power=1900W For 200-207V~: +12.2V/148A Max. & +12Vsb/3.0A Max. Maximum Output Power=1800W For 100-127V~: +12.2V/82A Max. & +12Vsb/3.0A Max. Maximum Output Power=1000W	R90000-9161I
FSM010, R1CA2162D	Input: 100-127V~, 50/60Hz, 12A 200-240V~, 50/60Hz, 10A OR 240Vdc, 10A Output: For 200-240V~ and 240Vdc: +12.2V/132A Max. & +12Vsb/3.0A Max. Maximum Output Power=1600W For 100-127V~: +12.2V/82A Max. & +12Vsb/3.0A Max. Maximum Output Power=1000W	R90000-9151I

Model	Rating	Transformer PCB5
FSM043, R1CA2162E	Input: 100-127V~, 50/60Hz, 12A 200-240V~, 50/60Hz, 10A OR 240Vdc, 10A Output: For 200-240V~ and 240Vdc: +12.2V/132A Max. & +12Vsb/3.0A Max. Maximum Output Power=1600W For 100-127V~: +12.2V/82A Max. & +12Vsb/3.0A Max. Maximum Output Power=1000W	R90000-9151I
FSM044, R1CA2202H	Input: 100-127V~, 50/60Hz, 12A 200-240V~, 50/60Hz, 10A OR 240Vdc, 10A Output: FOR 200-240V~: +12.2V/164A & +12Vsb/3A Max. OUTPUT POWER:2000W For 220-240V~ OR 240Vdc: +12.2V/164A Max. & +12Vsb/ 3.0A Max Maximum Output Power=2000W For 208-219V~: +12.2V/155A Max. & +12Vsb/3.0A Max. Maximum Output Power=1900W For 200-207V~: +12.2V/148A Max. & +12Vsb/3.0A Max. Maximum Output Power=1800W For 100-127V~: +12.2V/82A Max. & +12Vsb/3.0A Max. Maximum Output Power=1000W	R90000-9161I

During the test, **Model: FSM043, FSM044** were selected as the representative models for the test.

3.2 Primary Clock Frequencies of Internal Source

The highest frequency generated or used within the EUT or on which the EUT operates or tunes is 50-80kHz, provided by AcBel Polytech Inc., for detailed internal source, please refer to the manufacturer's specifications.

3.3 Features of EUT

The tests reported herein were performed according to the method specified by AcBel Polytech Inc., for detailed feature description, please refer to the manufacturer's specifications or user's manual.

Please refer to appendix of the report if the applicant has provided additional descriptions of the EUT.

3.4 Operating Modes of EUT and Determination of Worst Case Operating Mode

The EUT has been pre-tested under following test modes.

Test Condition	
Mode	Conducted Emissions from Power Ports
1	EUT_FSM044 with full load + Input Power(240 Vdc)
2	EUT_FSM043 with full load + Input Power(240 Vdc)
3	EUT_FSM044 with full load + Input Power(120 Vac, 60 Hz)
4	EUT_FSM044 with full load + Input Power(240 Vac, 60 Hz)
Note: The worst case is that mode 3 is shown in bold.	
Mode	Radiated Emissions up to 1 GHz
1	EUT_FSM044 with full load + Input Power(240 Vdc)
2	EUT_FSM043 with full load + Input Power(240 Vdc)
3	EUT_FSM044 with full load + Input Power(120 Vac, 60 Hz)
Note: The worst case is that mode 3 is shown in bold.	

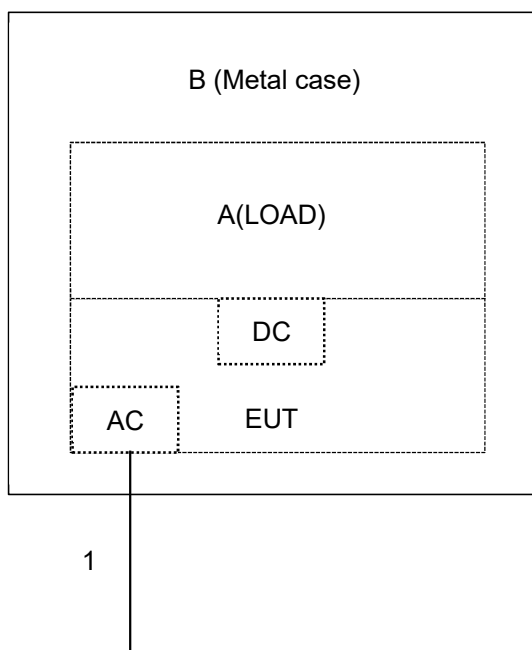
Test mode is presented in the report as below.

Test Condition	
Mode	Conducted Emissions from Power Ports
A	EUT_FSM044 with full load + Input Power(120 Vac, 60 Hz)
Mode	Radiated Emissions up to 1 GHz
A	EUT_FSM044 with full load + Input Power(120 Vac, 60 Hz)

3.5 Test Program Used and Operation Descriptions

Connected a resistor load with EUT and installed load and EUT into a metal case and then set the EUT under full resistor load.

3.6 Connection Diagram of EUT and Peripheral Devices



3.7 Configuration of Peripheral Devices and Cable Connections

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A	LOAD	N/A	N/A	N/A	N/A	Supplied by applicant
B	METAL CASE	N/A	N/A	N/A	N/A	Supplied by applicant

ID	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	AC/DC power(3pin) cable	1	1.8	No	0	Provided by Lab

4 Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

4.1 Conducted Emissions from Power Ports

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Test Receiver R&S	ESR3	102413	2023/2/7	2024/2/6
LISN R&S	ENV216	101197	2022/7/5	2023/7/4
LISN R&S	ENV216	101195	2022/8/1	2023/7/31
LISN Schwarzbeck	NNLK8129	8129229	2022/6/8	2023/6/7
DC LISN Schwarzbeck	NNLK 8121	8121-808	2022/4/29	2023/4/28
LISN Schwarzbeck	NNLK 8121	8121-731	2022/5/26	2023/5/25
LISN Schwarzbeck	NNLK 8121	8121-00759	2022/8/18	2023/8/17
LISN R&S	ENV216	101196	2022/5/24	2023/5/23
LISN EMCO	3825/2	9504-2359	2022/8/2	2023/8/1
DC LISN R&S	ESH3-Z6	844950/018	2022/8/2	2023/8/1
LISN EMCO	3825/2	9204-1964	2022/6/17	2023/6/16
DC LISN R&S	ESH3-Z6	100219	2022/8/2	2023/8/1
Coupling/Dcoupling Network Schwarzbeck	CDNE-M2	00097	2022/6/1	2023/5/31
Coupling/Dcoupling Network Schwarzbeck	CDNE-M3	00091	2022/6/1	2023/5/31
Coupling/Dcoupling Network TESEQ	CDN A201A	44601	2022/12/14	2023/12/13
RF Coaxial Cable Commate	5D-FB	Cable-CO3-01	2022/9/14	2023/9/13
Attenuator STI	STI02-2200-10	NO.3	2022/10/21	2023/10/20
High Voltage Probe Schwarzbeck	TK9420	00982	2022/12/14	2023/12/13
50 ohm terminal LYNICS	0900510	E1-011286	2022/9/19	2023/9/18
50 ohm terminal LYNICS	0900510	E1-011285	2022/9/19	2023/9/18
50 Ohms Terminator LYNICS	0900510	E1-01-299	2023/1/05	2024/1/04
Isolation Transformer Erika Fiedler	D-65396	017	2022/9/8	2023/9/7
Software BVADT	Cond_V7.3.7.4	NA	NA	NA

Notes:

1. The test was performed in Linkou Conduction 3.
2. The VCCI Site Registration No. C-10274.
3. Tested Date: 2023/2/9

4.2 Radiated Emissions up to 1 GHz

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
Bi-log Broadband Antenna Schwarzbeck	VULB9168	9168-1213	2022/10/20	2023/10/19
		9168-1214	2022/10/20	2023/10/19
Coupling/Dcoupling Network Schwarzbeck	CDNE-M2	00097	2022/6/1	2023/5/31
	CDNE-M3	00091	2022/6/1	2023/5/31
Pre_Amplifier EMCI	EMC9135	980326	2022/2/17	2023/2/16
		980327	2022/2/17	2023/2/16
RF Coaxial Cable JYEBAO	LMR-600	Cable-CH8-01	2022/9/23	2023/9/22
		Cable-CH8-02	2022/9/23	2023/9/22
RF Coaxial Cable Pacific	8D-FB	Cable-CH8-03	2022/9/23	2023/9/22
Software BVADT	Radiated_V8.7.08	N/A	N/A	N/A
Test Receiver R&S	ESR3	102983	2022/5/30	2023/5/29
		102984	2022/6/10	2023/6/9
Tower Max Full.	MF7802	MF780208105	N/A	N/A
Turn Table & Tower Max Full.	MF7802	MF7802121	N/A	N/A

Notes:

1. The test was performed in Linkou 10M Chamber (Chamber 8). The test site validated date: 2022/8/27 (NSA).
2. The VCCI Site Registration No. R-12946.
3. Tested Date: 2023/2/15

5 Limits of Test Items

5.1 Conducted Emissions from Power Ports

Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

Notes: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases linearly with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

5.2 Radiated Emissions up to 1 GHz

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 10 meters (dBµV/m)				
Frequencies (MHz)	FCC 15B, Class A	FCC 15B, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	39.1	29.5	40	30
88-216	43.5	33.1		
216-230	46.4	35.6		
230-960				
960-1000	49.5	43.5	47	37

Radiated Emissions Limits at 3 meters (dBμV/m)				
Frequencies (MHz)	FCC 15B, Class A	FCC 15B, Class B	CISPR 22, Class A	CISPR 22, Class B
30-88	49.5	40.0	50.5	40.5
88-216	54.0	43.5		
216-230	56.9	46.0		
230-960			57.5	47.5
960-1000	60.0	54.0		

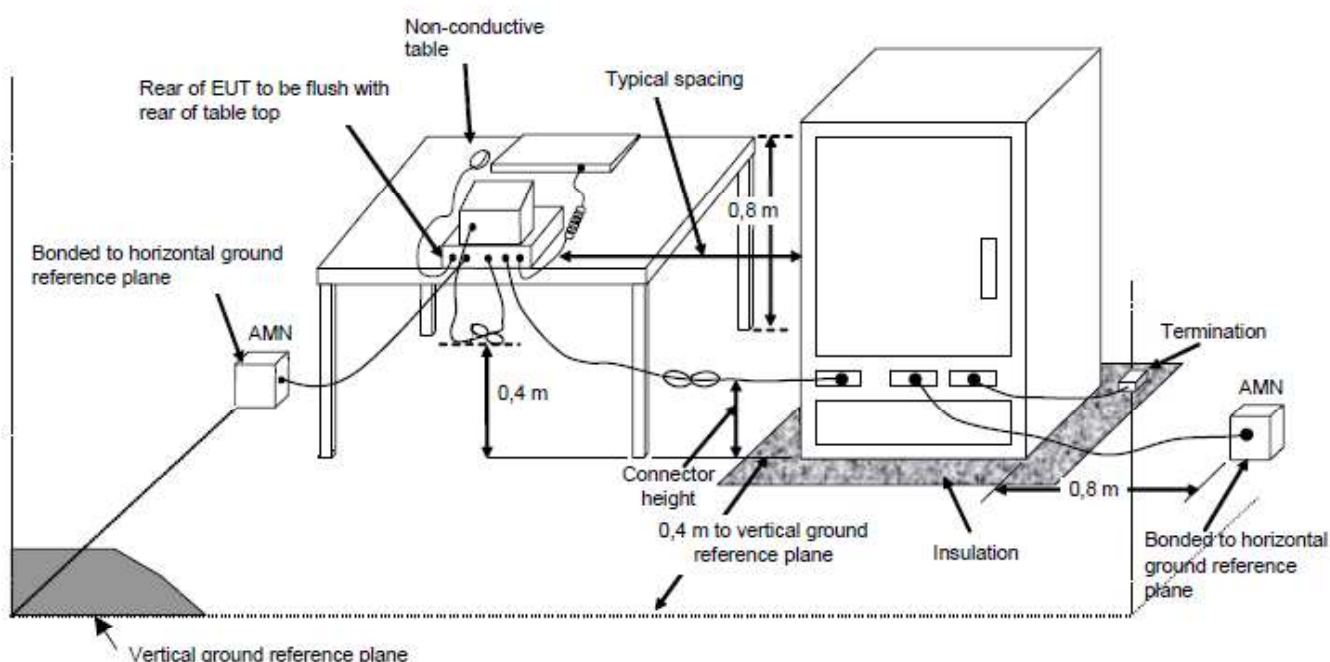
Notes: 1. The lower limit shall apply at the transition frequencies.

6 Test Arrangements

6.1 Conducted Emissions from Power Ports

- a. For the table-top EUT is placed on a 0.8 meter insulation table; for the floor standing EUT shall be insulated (by insulation of 12 mm) from the horizontal reference ground plane. The EUT is placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units are connected to the power mains through another LISN. They provide coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The test results of conducted emissions at mains ports are recorded of six worst margins for quasi-peak (mandatory) [and average (if necessary)] values against the limits at frequencies of interest unless the margin is 20 dB or greater.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

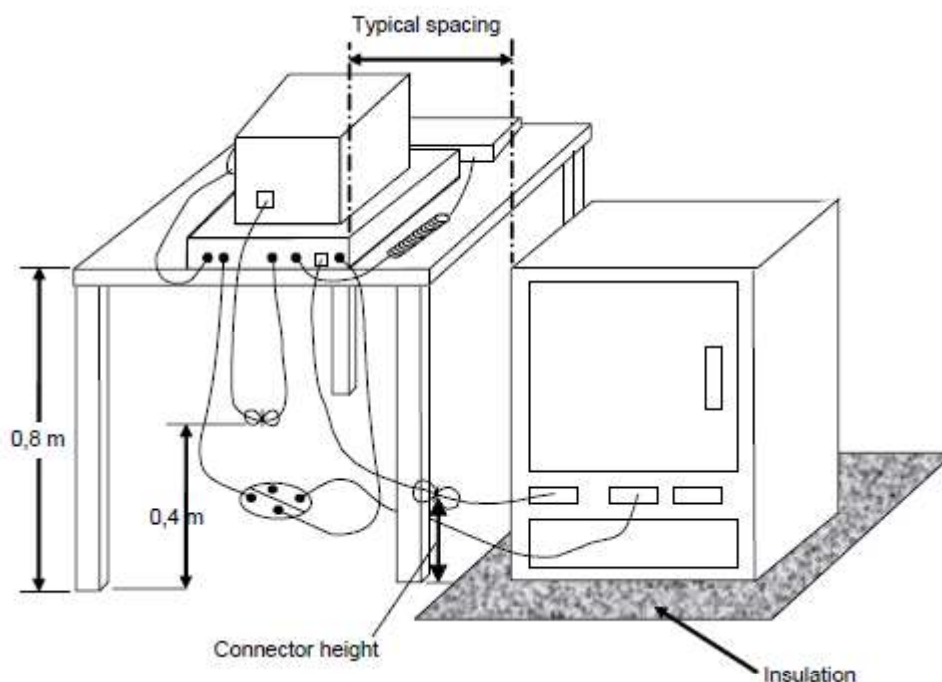


For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

6.2 Radiated Emissions up to 1 GHz

- For the table-top EUT is placed on a 0.8 meter to the top of rotating table; for the floor standing EUT shall be insulated (by insulation of 12 mm) from the horizontal reference ground plane. The rotating table is rotated 360 degrees to determine the position of the highest radiation. If the equipment requires a dedicated ground connection, this shall be provided and bonded to the RGP.
- The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is up to 1 GHz.

Note: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for quasi-peak detection (QP) at frequency up to 1GHz.



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

7 Test Results of Test Item

7.1 Conducted Emissions from Power Ports

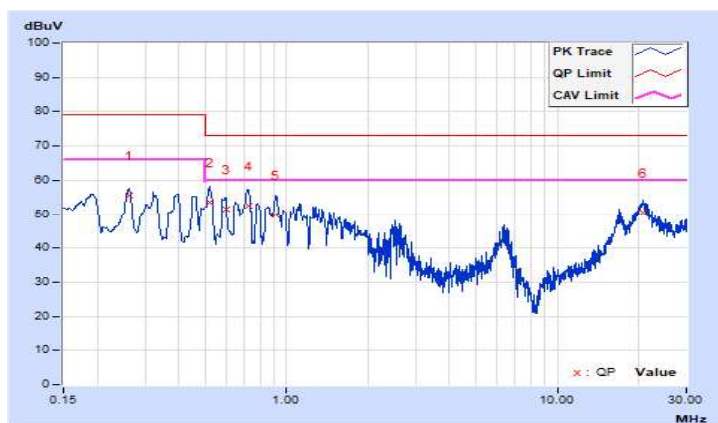
Mode A

Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	21°C, 75% RH
Tested by	Perry Yang		

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.26200	10.06	45.60	40.67	55.66	50.73	79.00	66.00	-23.34	-15.27
2	0.52291	10.07	43.48	35.89	53.55	45.96	73.00	60.00	-19.45	-14.04
3	0.59600	10.07	41.59	31.29	51.66	41.36	73.00	60.00	-21.34	-18.64
4	0.72687	10.06	42.62	33.66	52.68	43.72	73.00	60.00	-20.32	-16.28
5	0.91200	10.06	39.64	30.33	49.70	40.39	73.00	60.00	-23.30	-19.61
6	20.77200	10.63	39.72	32.22	50.35	42.85	73.00	60.00	-22.65	-17.15

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

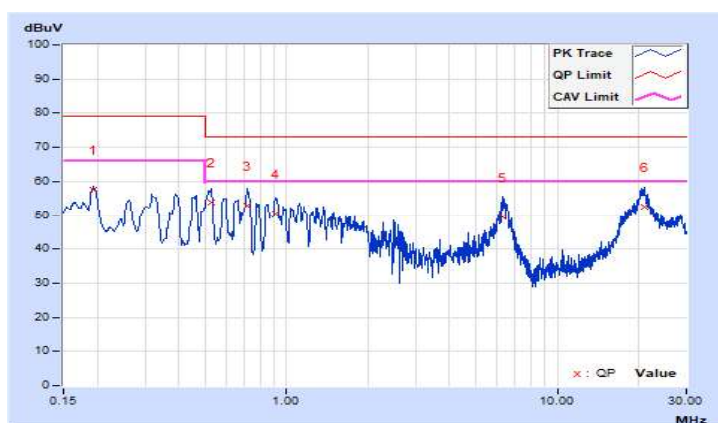


Frequency Range	150 kHz ~ 30 MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	21°C, 75% RH
Tested by	Perry Yang		

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.19367	10.05	47.62	41.00	57.67	51.05	79.00	66.00	-21.33	-14.95
2	0.52706	10.07	43.79	35.50	53.86	45.57	73.00	60.00	-19.14	-14.43
3	0.72000	10.06	42.69	34.05	52.75	44.11	73.00	60.00	-20.25	-15.89
4	0.90800	10.06	40.36	30.97	50.42	41.03	73.00	60.00	-22.58	-18.97
5	6.27200	10.24	39.20	30.19	49.44	40.43	73.00	60.00	-23.56	-19.57
6	20.96607	10.70	41.98	34.44	52.68	45.14	73.00	60.00	-20.32	-14.86

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



7.2 Radiated Emissions up to 1 GHz

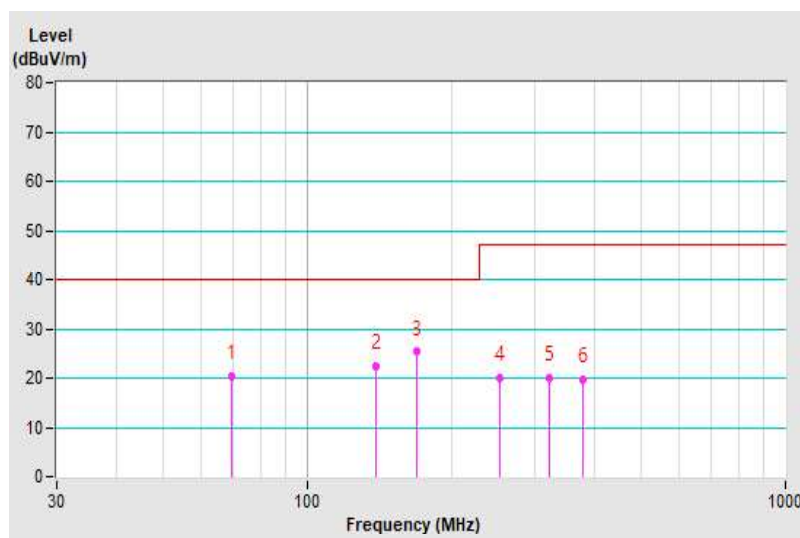
Mode A

Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	19°C, 63% RH
Tested By	Bob Lin		

Antenna Polarity & Test Distance : Horizontal at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	69.63	20.46 QP	40.00	-19.54	3.13 H	302	39.79	-19.33
2	138.94	22.37 QP	40.00	-17.63	1.79 H	134	39.43	-17.06
3	169.54	25.27 QP	40.00	-14.73	3.96 H	339	42.00	-16.73
4	253.35	20.06 QP	47.00	-26.94	1.67 H	74	37.05	-16.99
5	320.92	20.08 QP	47.00	-26.92	3.82 H	310	34.80	-14.72
6	376.70	19.78 QP	47.00	-27.22	3.40 H	188	33.19	-13.41

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

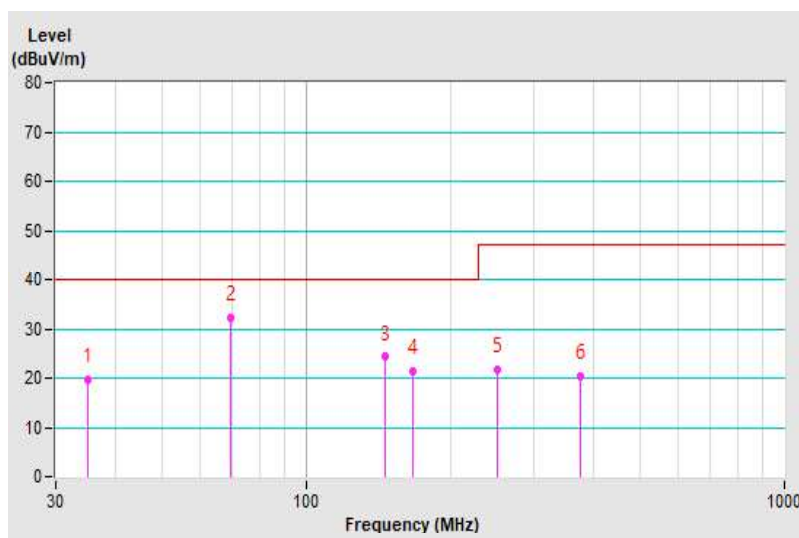


Frequency Range	30 MHz ~ 1 GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120 kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	19°C, 63% RH
Tested By	Bob Lin		

Antenna Polarity & Test Distance : Vertical at 10 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	34.95	19.74 QP	40.00	-20.26	1.73 V	210	38.34	-18.60
2	69.77	32.25 QP	40.00	-7.75	2.46 V	322	51.73	-19.48
3	146.11	24.26 QP	40.00	-15.74	1.19 V	318	40.84	-16.58
4	167.60	21.48 QP	40.00	-18.52	2.30 V	283	37.93	-16.45
5	251.32	21.66 QP	47.00	-25.34	1.11 V	78	39.05	-17.39
6	375.58	20.48 QP	47.00	-26.52	2.07 V	134	34.33	-13.85

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
– Pre-Amplifier Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value



8 Pictures of Test Arrangements

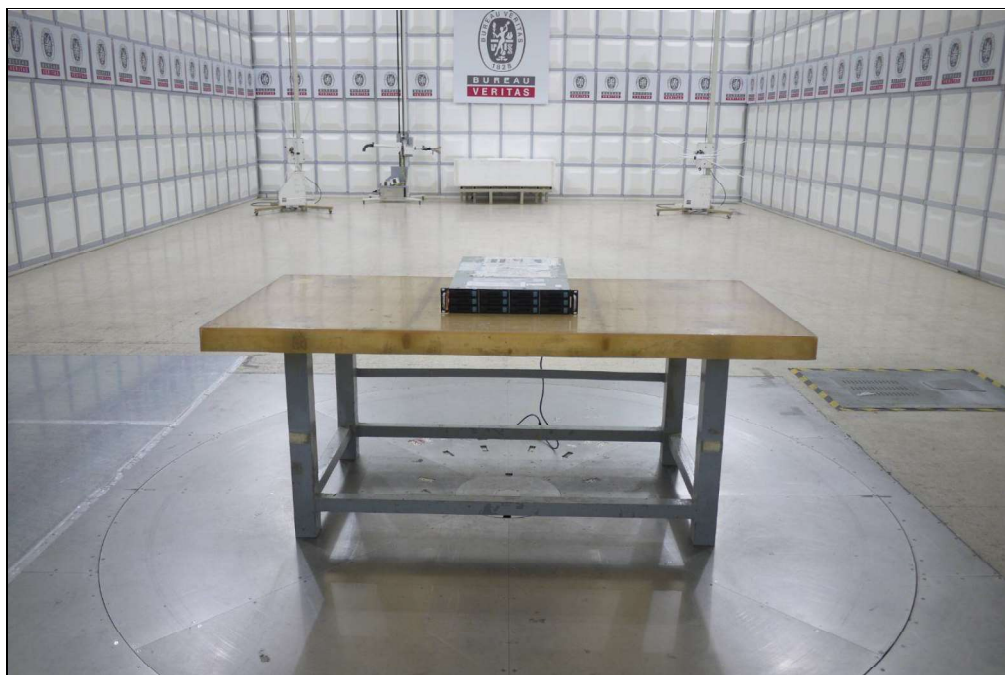
8.1 Conducted Emissions from Power Ports

Mode A



8.2 Radiated Emissions up to 1 GHz

Mode A



9 Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: <http://ee.bureauveritas.com.tw>

The address and road map of all our labs can be found in our web site also.

--- END ---