360242

HFE3500

IMMUNITY DATA

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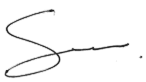
	APPD	CHK	DWG
Sign			
Name	Alex Knill	Nick Heighington	Stuart Nottage
Date	28/10/2025	16/10/2025	25/09/2025

I N D E X

Terminology used

FG	…	Frame GND
L	…	Live Line
N	…	Neutral line
≒	…	Earth
+V	…	+ Output
–V	…	– Output

Test results are reference data based on our standard measurement condition.

1. Summary of Immunity Test Result

MODEL : HFE3500-24/FSD and HFE3500-48/TSD[1]

Item	Standard	Test level	Criteria	Result	Page	Notes & Conditions
Electrostatic Discharge Immunity Test	IEC61000-4-2	2	A	PASS	4	
Radiated Radio-Frequency Electromagnetic Field Immunity Test	IEC61000-4-3	3	A	PASS	5	80 MHz – 1 GHz
		2	A	PASS	5	1 GHz – 6 GHz
Electrical Fast Transient / Burst Immunity Test	IEC61000-4-4	3	B	PASS	6	
Surge Immunity	IEC61000-4-5	3	B	PASS	7	
Conducted Disturbances Induced by Radio-Frequency Field Immunity Test	IEC61000-4-6	3	A	PASS	8	
Power Frequency Magnetic Field Immunity Test	IEC61000-4-8	4	A	PASS	9	
Voltage Dips, Short Interruptions Immunity Test	IEC61000-4-11	70%, 25 cycles	B	PASS	10	
		40%, 10 cycles	B			
		0%, 1 cycle	B			
		0%, 250 cycles	B			
		0%, 0.5 cycles	B			
		80%, 250 cycles	B			

Criteria A

1. The regulation of output voltage must not exceed 5% of initial value during test.
2. The output voltage must be within the regulation of specification after the test.
3. Smoke and fire are not allowed.

Criteria B

1. Must not have temporary function degradation that requires input restart.
2. The output voltage must be within the regulation of specification after test.
3. Smoke and fire are not allowed.

[1] Full HFE3500-24/FSD results given as representative of the range, comprehensive results including HFE3500-48/TSD are given in 360230 - HFE3500 Electromagnetic Compatibility Report.

2. Electrostatic Discharge Immunity Test (IEC61000-4-2)

MODEL: HFE3500-24/FSD

(1) Equipment Used

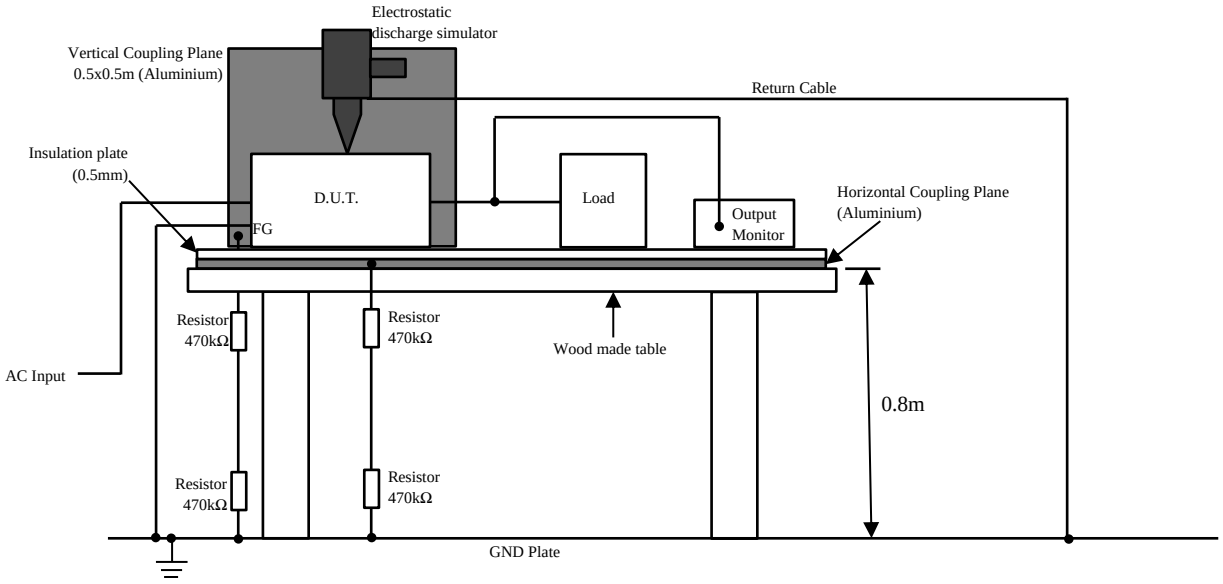
Electro Static Discharge Simulator	:NSG435 (Schaffner)
Discharge Resistance: 330Ω	Capacity: 150pF

(2) Test Conditions

Input Voltage	:230VAC	Output Voltage	:Rated
Output Current	:145A	Polarity	+,–
Number of Tests	:10 times	Discharge Interval	:>1 second
Ambient Temperature	:20°C		

(3) Test Method and Device Test Point

Contact Discharge	:FG, Case, HCP, VCP
Air Discharge	:No test points



(4) Acceptable Conditions

1. Must not have temporary function degradation that requires input restart.
2. The output voltage must be within the regulation of specification after test.
3. Smoke and fire are not allowed.

(5) Test Result

Contact Discharge (kV)	HFE3500-24/FSD	Air Discharge (kV)	HFE3500-24/FSD
2	N/A	2	N/A
4	PASS	4	N/A
6	N/A	8	N/A
8	N/A	15	N/A

3. Radiated Radio-Frequency Electromagnetic Field Immunity Test (IEC61000-4-3)

MODEL: HFE3500-24/TSE

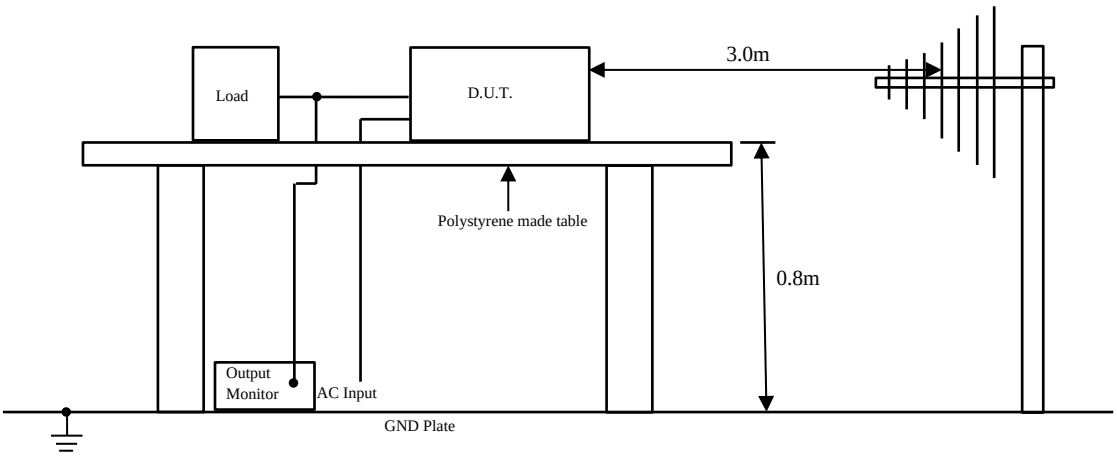
(1) Equipment Used

Signal Generator	:Rohde & Schwarz SMB 100A
Power Amplifier	:Prâna MT200
Power Amplifier	:Prâna SX220-55
Electric Field Sensor	:AR FL7006 Kit
Bilog Antenna	:Schwarzbeck VULP 9118E
Horn Antenna	: TDK RF Solutions HRN-0118

(2) Test Conditions

Input Voltage	:230VAC	Output Voltage	:Rated
Output Current	:100%	Amplitude Modulated	:80% 1kHz
Wave Angle	:Horizontal and Vertical	Ambient Temperature	21°C
Test Angle	:Top/Bottom, Both Sides, Front/Back	Electromagnetic Frequency	:80~1000MHz, 1.0~6.0GHz

(3) Test Method



(4) Acceptable Conditions

1. Must not have temporary function degradation that requires input restart.
2. The output voltage must be within the regulation of specification after test.
3. Smoke and fire are not allowed.

(5) Test Result

Radiation Field Strength (V/m)	Electromagnetic Frequency	HFE3500-24/TSE
10	80~1000 MHz	Criteria A PASS
3	1.0~6.0 GHz	Criteria A PASS
CISPR 35 Table 1, 1.3	1.8~5.0 GHz	Criteria A PASS

4. Electrical Fast Transient/Burst Immunity Test (IEC61000-4-4)

MODEL: HFE3500-24/FSE and HFE3500-48/TSD

(1) Equipment Used

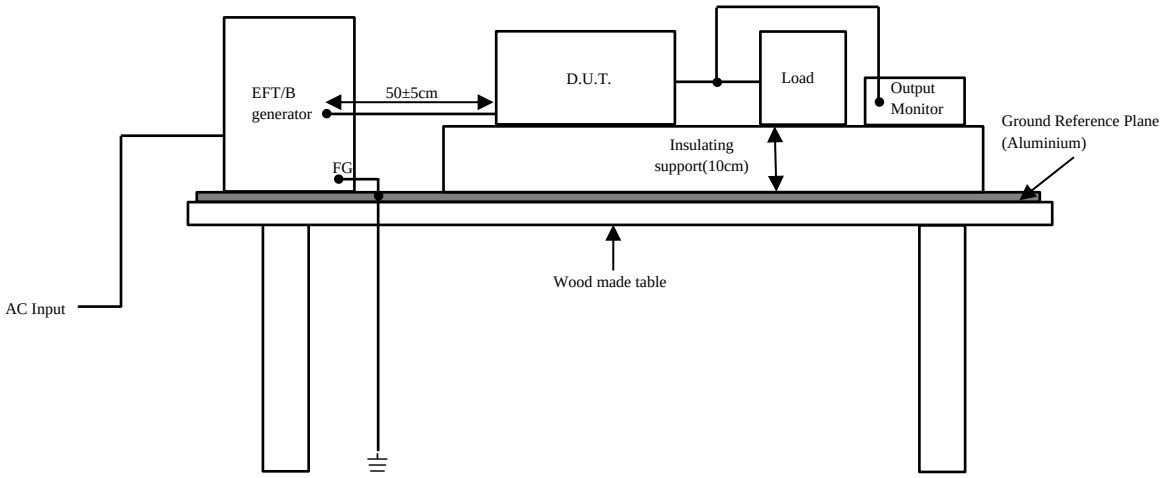
EFT/B Generator	:EMC Partner IMU-MGE
CDN	:EMC Partner CDN2000A-06-32

(2) Test Conditions

Input Voltage	:230VAC	Output Voltage	:Rated
Output Current	:100%	Test Time	:1 minute
Polarity	:+,–	Ambient Temperature	22°C
Number of Tests	:3 times	Pulse Frequency	:5kHz & 100kHz
Burst Time	:15ms, 0.75ms	Number of Pulse	:75
Burst Cycle	:300ms		

(3) Test Method and Device Test Point

Apply to (N,L,FG).



(4) Acceptable Conditions

1. Must not have temporary function degradation that requires input restart.
2. The output voltage must be within the regulation of specification after test.
3. Smoke and fire are not allowed.

(5) Test Result

Test Voltage (kV)	HFE3500-24/FSE	HFE3500-48/TSD
0.5	N/A	N/A
1	N/A	N/A
2	Criteria B PASS	Criteria B PASS
4	N/A	N/A

5. Surge Immunity Test (IEC61000-4-5)

MODEL: HFE3500-24/FSE and HFE3500-48/TSD

(6) Equipment Used

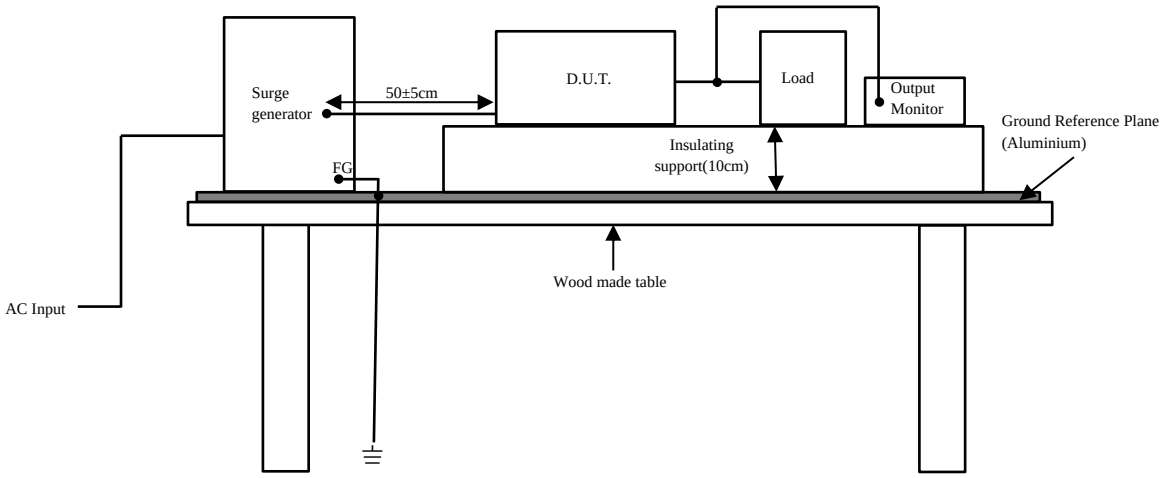
Surge Generator	:EMC Partner IMU-MGE
CDN	:EMC Partner CDN2000A-06-32
Coupling Impedance	:Common – 12Ω, Normal – 2Ω
Coupling Capacitance	:Common – 9μF, Normal – 18μF

(7) Test Conditions

Input Voltage	:240VAC	Output Voltage	:Rated
Output Current	:0, 100%	Number of Tests	:5
Polarity	:+,–	Mode	:Common, Normal
Phase	:0°,90°,180°,270°	Ambient Temp	: 22°C

(8) Test Method and Device Test Point

Apply to Common mode (N-FG, L-FG) and Normal mode (N-L).



(9) Acceptable Conditions

1. Must not have temporary function degradation that requires input restart.
2. The output voltage must be within the regulation of specification after test.
3. Smoke and fire are not allowed.

(10) Test Result

Common			Normal		
Test Voltage (kV)	HFE3500-24/FSE	HFE3500-48/TSD	Test Voltage (kV)	HFE3500-24/FSE	HFE3500-48/TSD
0.5	Criteria A PASS	Criteria A PASS	0.5	Criteria A PASS	Criteria A PASS
1	Criteria A PASS	Criteria A PASS	1	Criteria B PASS	Criteria B PASS
2	Criteria B PASS	Criteria B PASS	2	N/A	N/A
4	N/A	N/A			

6. Conducted Disturbances Induced by Radio-Frequency Field Immunity Test (IEC61000-4-6)

MODEL: HFE3500-24/FSE and HFE3500-48/TSD

Equipment Used

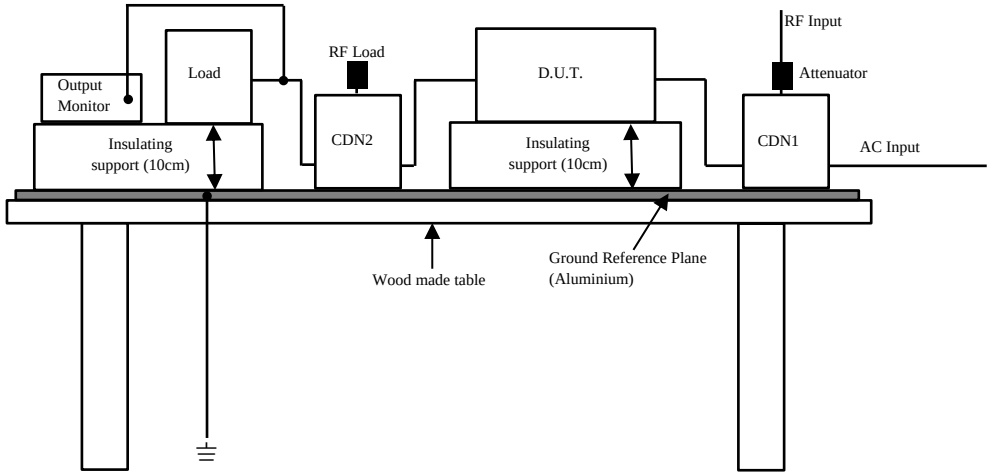
Signal Generator	:Rohde & Schwarz SMB 100A
Power Amplifier	: Prâna N-DP 340
CDN1	:Com-Power CDN M350E
CDN2	:Schwarzbeck CDN M2 32A
Attenuator	:Fairview Microwave SA3N10W-10
Attenuator	:Fairview Microwave SA4N251-06
RF Load	:Fairview Microwave ST3N252

(11) Test Conditions

Input Voltage	:100, 240VAC	Output Voltage	:Rated
Output Current	:0, 100%	Electromagnetic Frequency	:150kHz~80MHz
Ambient Temp	: 20°C	Sweep Condition	:1.0% step up, 2.0 seconds hold

(12) Test Method and Device Test Point

Apply to (N, L, FG) and (+V, –V).



(13) Acceptable Conditions

1. The regulation of output voltage must not exceed 5% of initial value during test.
2. The output voltage must be within the regulation of specification after test.
3. Smoke and fire are not allowed.

(14) Test Result

Voltage Level (V)	HFE3500-24/FSE	HFE3500-48/TSD
1	N/A	N/A
3	N/A	N/A
10	Criteria A PASS	Criteria A PASS

7. Power Frequency Magnetic Field Immunity Test (IEC61000-4-8)

MODEL: HFE3500-24/FSD and HFE3500-48/TSD

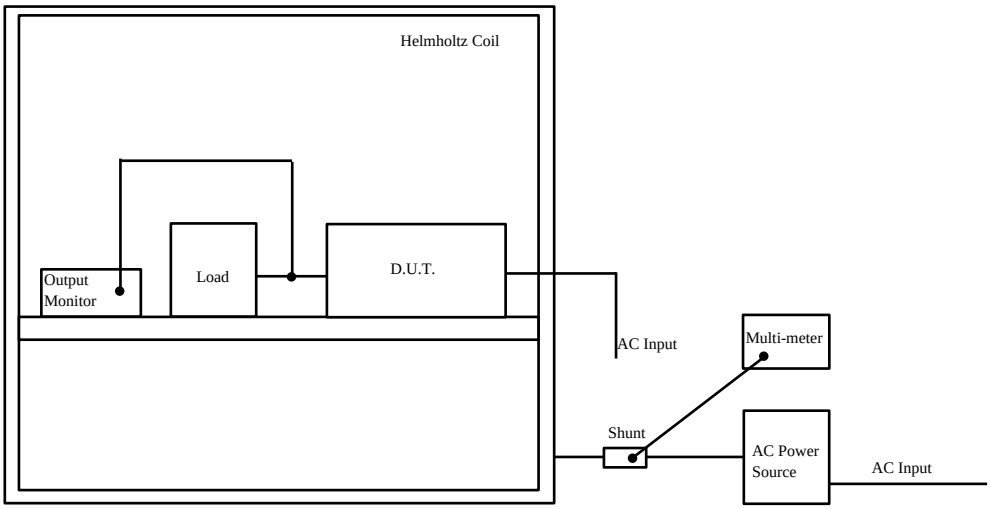
(1) Equipment Used

AC Power Source	:California Instruments 2750L-PT
Helmholtz Coil	:TLU HHC02
Current Shunt	:P74 Calibrated Shunt
Multimeter	:Fluke 287 DMM

(2) Test Conditions

Input Voltage	:240VAC	Output Voltage	:Rated
Output Current	:0, 100%	Magnetic Frequency	:50Hz
Ambient Temp	: 20°C	Direction	:X,Y,Z
Test Time (continuous)	: >30 seconds	Test Time (short duration)	:3 seconds

(3) Test Method and Device Test Point



(4) Acceptable Conditions

1. The regulation of output voltage must not exceed 5% of initial value during test.
2. The output voltage must be within the regulation of specification after test.
3. Smoke and fire are not allowed.

(5) Test Result

Continuous Magnetic Field Strength (A/m)	Short Term Magnetic Field Strength (A/m)	HFE3500-24/FSD	HFE3500-48/TSD
1	-	N/A	N/A
3	-	N/A	N/A
10	-	N/A	N/A
30	300	Criteria A PASS	Criteria A PASS

8. Voltage Dips, Short Interruptions Immunity Test (IEC61000-4-11)

MODEL: HFE3500-24/FSD and HFE3500-48/TSD

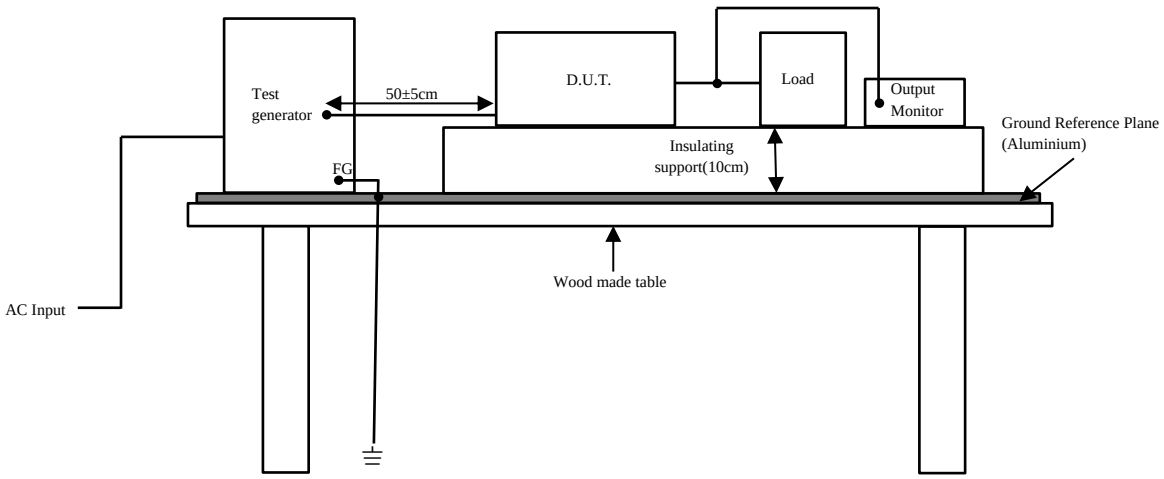
(1) Equipment Used

AC Source	:Chroma AC Source
Loads	:Chroma Load 1200W; Chroma DC Load; Kikusui PLZ1003W; Kikusui PLZ1003W

(2) Test Conditions

Input Voltage	:100, 240VAC	Output Voltage	:Rated
Output Current	:100%	Number of Tests	:3 times
Test Interval	:More than 10 seconds	Mains Frequency	: 50Hz
Ambient Temp	: 20°C	Phase Angle (0% for 0.5 cycle)	:0°,180°

(3) Test Method



(4) Acceptable Conditions

Criteria A

1. The regulation of output voltage must not exceed 5% of initial value during test.
2. The output voltage must be within the regulation of specification after test.
3. Smoke and fire are not allowed.

Criteria B

1. Must not have temporary function degradation that requires input restart.
2. The output voltage must be within the regulation of specification after test.
3. Smoke and fire are not allowed.

(5) Test Result

Test Level	Continue Time	Criteria	HFE3500-24/FSE	HFE3500-48/TSE
70%	25 cycles	B	PASS	PASS
40%	10 cycles	B	PASS	PASS
0%	1 cycle	B	PASS	PASS
0%	250 cycles	B	PASS	PASS
0%	0.5 cycles	B	PASS	PASS
80%	250 cycles	B	PASS	PASS