

# EVALUATION DATA

MODEL NAME : ECD500A12

Tested by : *Shintaro Oki*  
Shintaro Oki

Approved by : *Tomas Isaksson*  
Tomas Isaksson

P R

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POWERBOX  
A Cosel Group Company

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Remark:

Unless specified the test condition shall be

Input voltage / Frequency: 230 [Vac] / 50 [Hz]

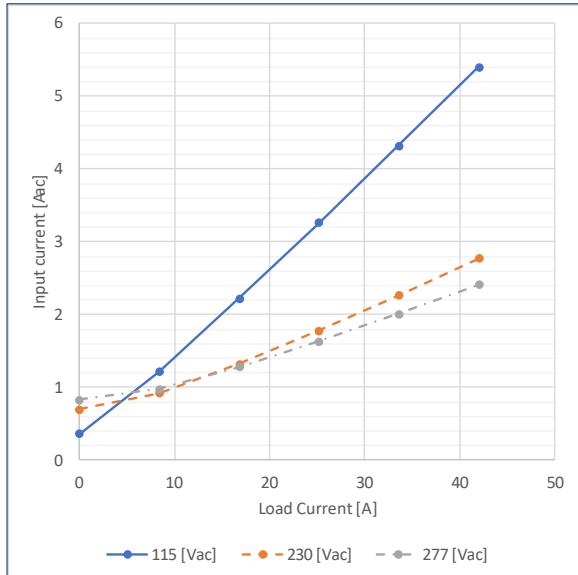
Load current: 42.0 [A]

Baseplate temperature: 25 [°C]

1. Input Current (by Load Current)

Test Circuitry : Figure A

Graph



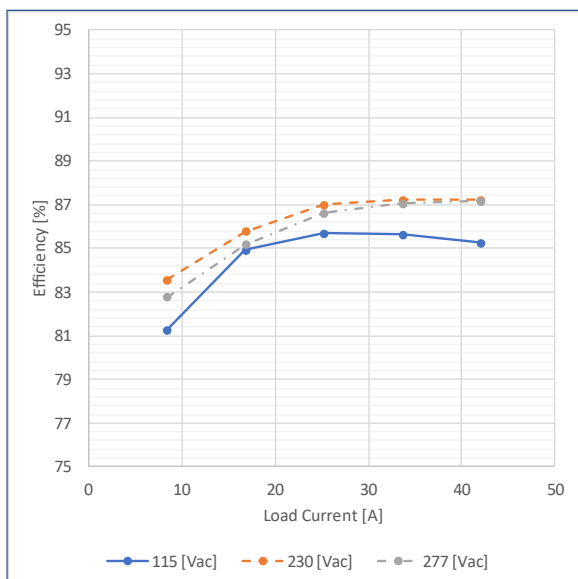
Value

Load Current [A]	Input Current [Aac]		
	Input Voltage		
	115 [Vac]	230 [Vac]	277 [Vac]
0.00	0.362	0.698	0.828
8.40	1.212	0.921	0.982
16.80	2.222	1.325	1.282
25.20	3.263	1.782	1.631
33.60	4.323	2.268	2.015
42.00	5.400	2.772	2.416

2. Efficiency (by Load Current)

Test Circuitry : Figure A

Graph



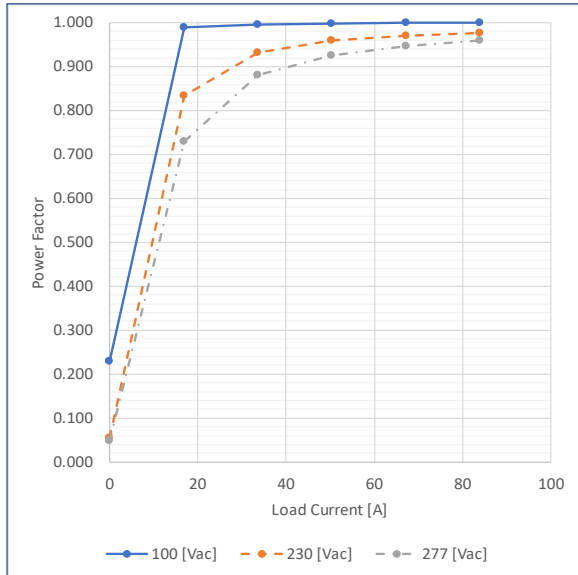
Value

Load Current [A]	Efficiency [%]		
	Input Voltage		
	115 [Vac]	230 [Vac]	277 [Vac]
0.00	-	-	-
8.40	81.270	83.571	82.763
16.80	84.929	85.772	85.176
25.20	85.697	86.996	86.617
33.60	85.641	87.233	87.058
42.00	85.259	87.231	87.161

3. Power Factor (by Load Current)

Test Circuitry : Figure A

Graph



Value

Load Current [A]	Power Factor		
	Input Voltage		
	115 [Vac]	230 [Vac]	277 [Vac]
0.00	0.129	0.034	0.029
8.40	0.937	0.599	0.471
16.80	0.977	0.809	0.699
25.20	0.987	0.887	0.808
33.60	0.992	0.924	0.865
42.00	0.995	0.943	0.898

4. Leakage Current

Test Circuitry : See table

Test Equipment: Simpson 228

Value

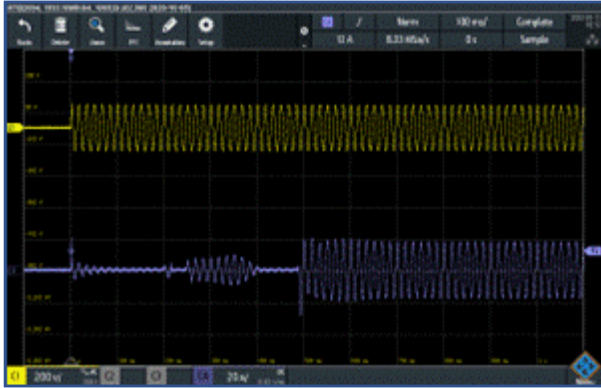
Standard	Testing Circuitry	Measuring Method	Leakage Current [mA]			Note
			Input Voltage			
			100 [Vac]	230 [Vac]	277 [Vac]	
IEC62368-1	Figure B-1	Both phases	0.25	0.60	0.74	Operation
		One of phases	0.44	1.20	1.45	Stand by
	Figure B-2	Both phases	0.25	0.60	0.74	Operation
		One of phases	0.44	1.20	1.45	Stand by

5. Inrush Current

Test Circuitry : Figure A

— C1: Input Voltage (200V/div)  
— C4: Input Current (20A/div)

Waveform



Input Voltage : 100 [Vac]  
(100ms/div)

- ① Primary Inrush Current : 12.5 [A]
- ② Secondary Inrush Current : 28.3 [A]

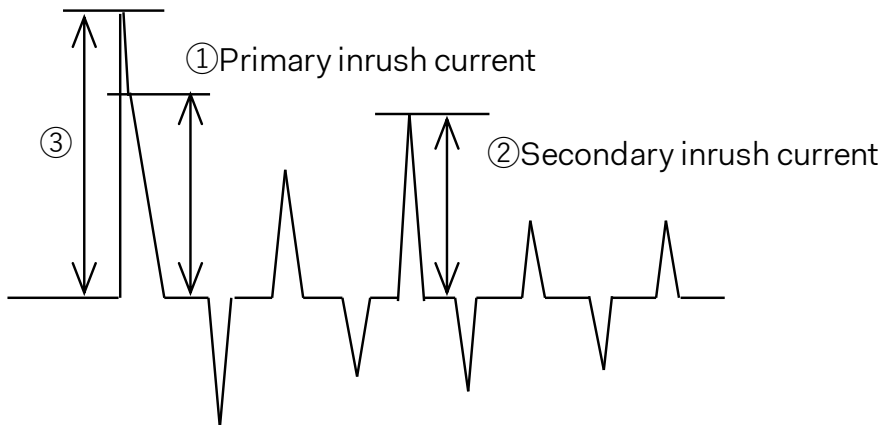


Input Voltage : 277 [Vac]  
(100ms/div)

- ① Primary Inrush Current : 37.1 [A]
- ② Secondary Inrush Current : 14.0 [A]

Remark:

A surge current flown into Line-to-Line capacitor (③) would be excluded as primary inrush current (①).

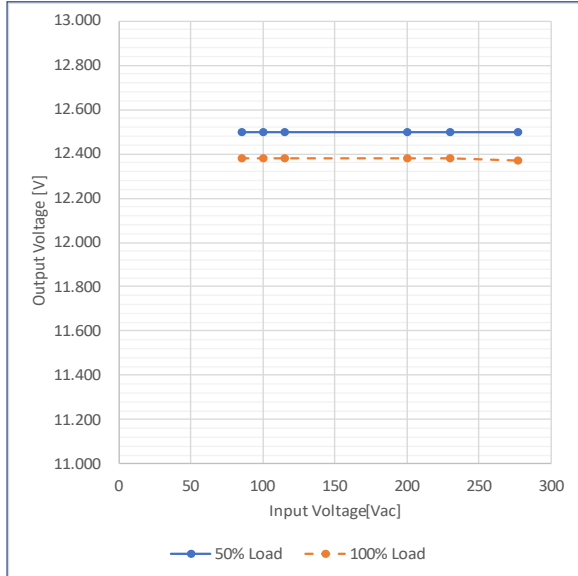


### 6. Line Regulation

Test Circuitry : Figure A

Change input voltage from 85 to 277 [Vac]

#### Graph



#### Value

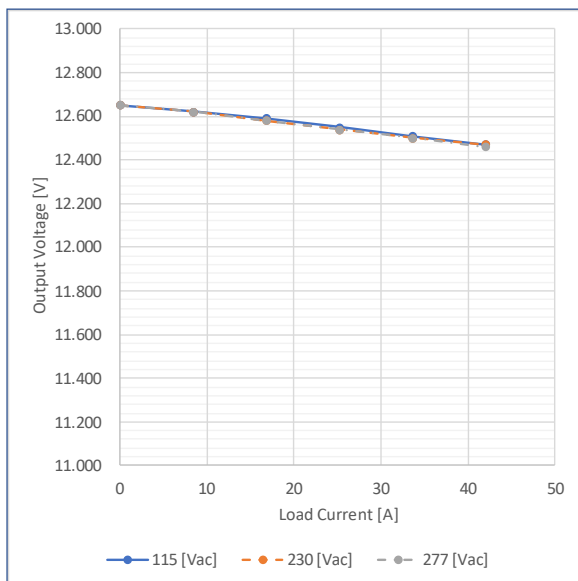
Input Voltage [Vac]	Output Voltage [V]	
	Load Factor	
	50% Load	100% Load
85.00	12.550	12.470
100.00	12.550	12.470
115.00	12.550	12.460
200.00	12.550	12.460
230.00	12.550	12.460
277.00	12.550	12.460

### 7. Load Regulation

Test Circuitry : Figure A

Change Load Current from 0 to 42.0 [A]

#### Graph



#### Value

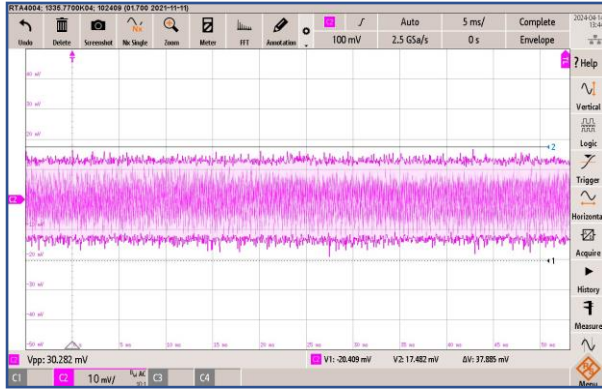
Load Current [A]	Output Voltage [V]		
	Input Voltage		
	115 [Vac]	230 [Vac]	277 [Vac]
0.00	12.650	12.650	12.650
8.40	12.620	12.620	12.620
16.80	12.590	12.580	12.580
25.20	12.550	12.540	12.540
33.60	12.510	12.500	12.500
42.00	12.470	12.470	12.460

8. Ripple Noise

Test Circuitry : Figure C

— C2: Output voltage (10mV/div)  
 BW: 20MHz

Waveform



(5ms/div)

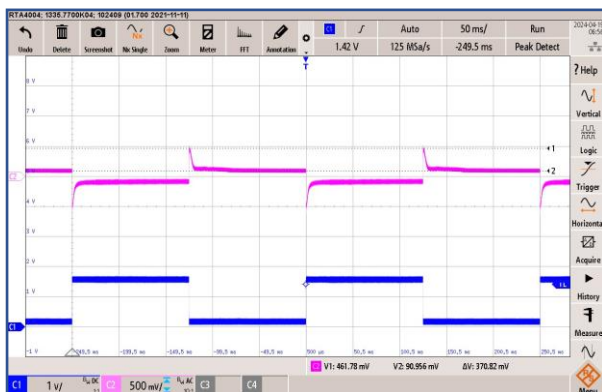
9. Dynamic Load Response

Test Circuitry : Figure A  
 Load Current 4 [A] <-> 37.5 [A]

— C2: Output voltage (500mV/div)  
 — C4: Output current (23.4A/div)

Waveform

Load changes from 10% to 90% of rated current.

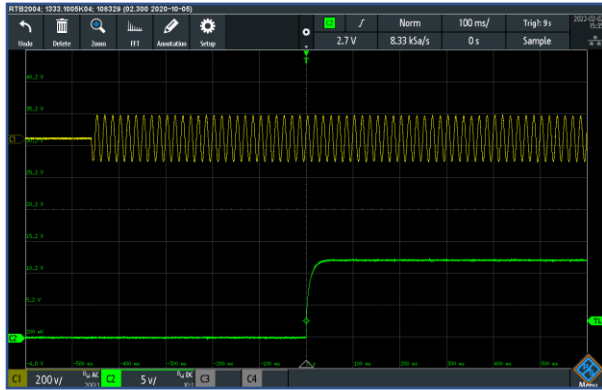


10. Rise Time Characteristics by AC ON

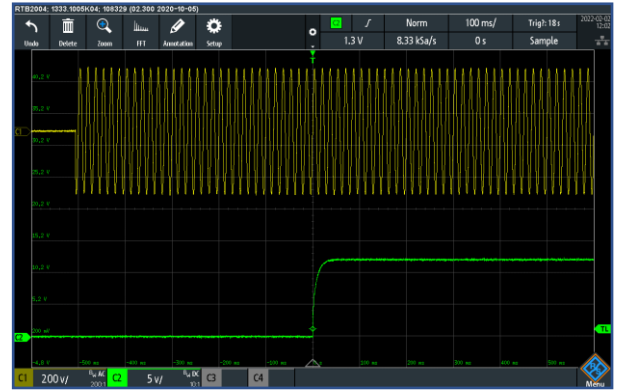
Test Circuitry : Figure A

— C1: Input voltage (200V/div)  
— C2: Output voltage (5V/div)

Waveform



Input Voltage 100 [Vac]  
Load Current 42.0 [A]  
(100ms/div)



Input Voltage 277 [Vac]  
Load Current 42.0 [A]  
(100ms/div)

11. Rise Time Characteristics with RC Signal

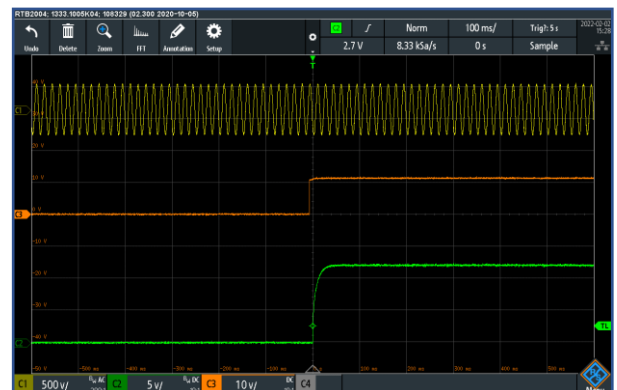
Test Circuitry : Figure D

— C1: Input voltage (500V/div)  
— C2: Output voltage (5V/div)  
— C3: RC signal (10V/div)

Waveform



Input Voltage 100 [Vac]  
Load Current 42.0 [A]  
(100ms/div)



Input Voltage 277 [Vac]  
Load Current 42.0 [A]  
(100ms/div)

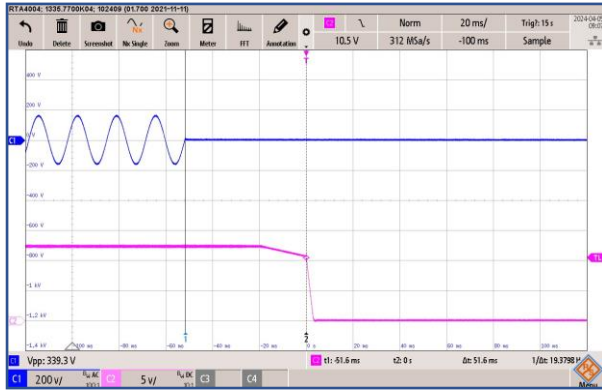


12. Fall Time / Hold-up Time

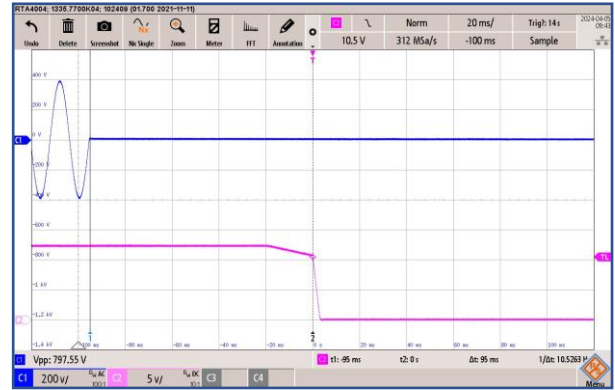
Test Circuitry : Figure A

— C1: Input voltage (200V/div)  
 — C2: Output voltage (5V/div)

Waveform

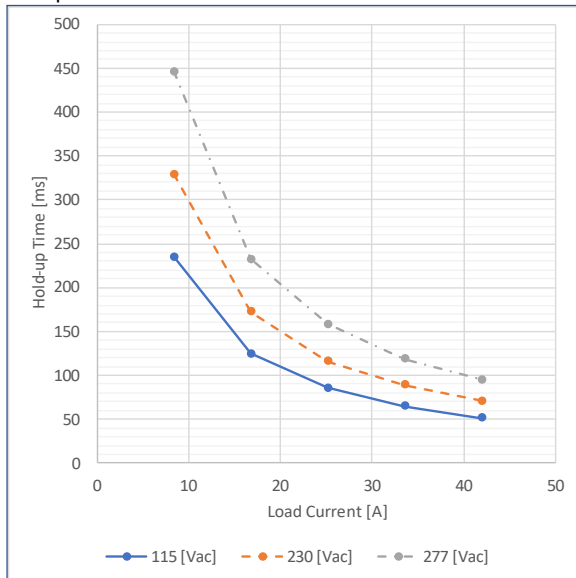


Input Voltage 115 [Vac]  
 Load Current 42.0 [A]  
 (10ms/div)



Input Voltage 277 [Vac]  
 Load Current 42.0 [A]  
 (10ms/div)

Graph



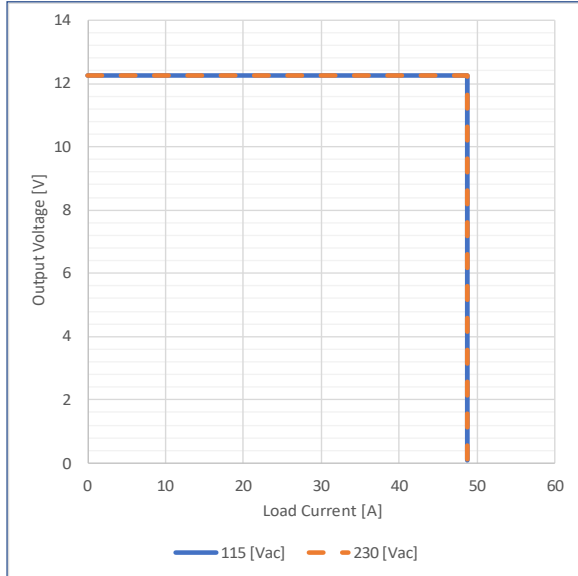
Value

Load Current [A]	Hold-up Time [ms]		
	Input Voltage		
	115 [Vac]	230 [Vac]	277 [Vac]
0.00	-	-	-
8.40	235.0	329.0	446.0
16.80	124.5	172.5	232.5
25.20	85.4	116.0	158.0
33.60	64.4	88.8	118.5
42.00	51.6	70.6	95.0

13. Over Current Protection

Test Circuitry : Figure A

Graph



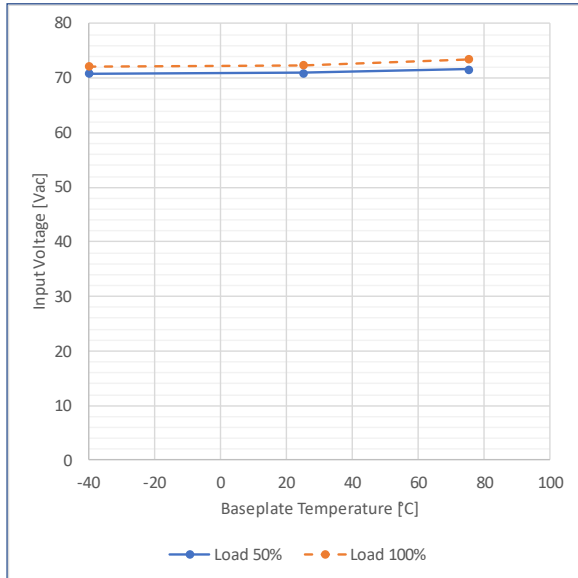
Value

Output Voltage [V]	Load Current [A]	
	Input Voltage	
	115 [Vac]	230 [Vac]
12.00	48.680	48.690
10.00	48.700	48.720
8.00	48.720	48.760
6.00	48.730	48.730
4.00	48.680	48.670
2.00	48.670	48.670
0.00		

14. Minimum Input Voltage for Regulated Output Voltage

Test Circuitry : Figure A

Graph



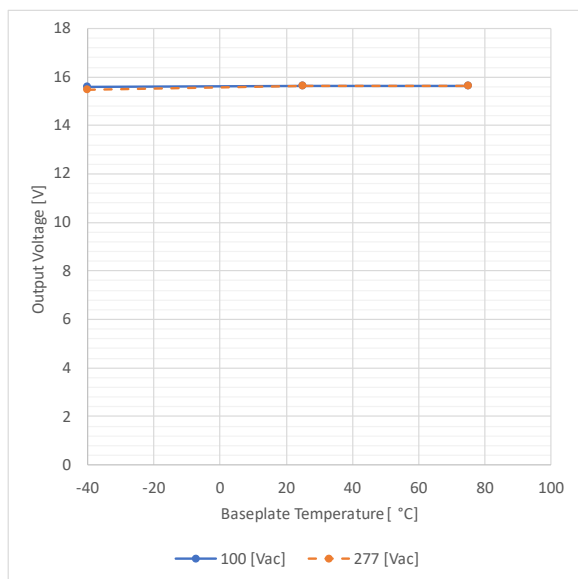
Value

Baseplate Temperature [°C]	Input Voltage [Vac]	
	Load Current	
	Load 50%	Load 100%
-40	70.9	72.2
25	71.0	72.4
75	71.6	73.5

15. Over Voltage Protection

Test Circuitry : Figure A

Graph



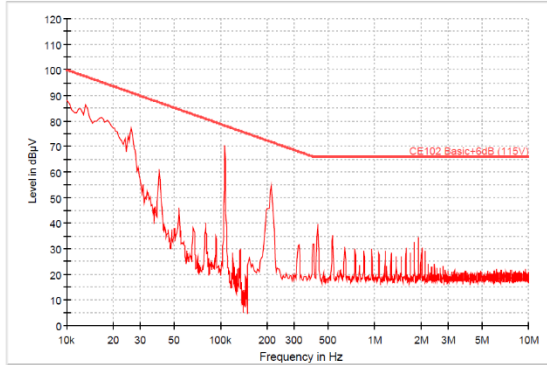
Value

Baseplate Temperature [°C]	Output Voltage [V]	
	Input Voltage	
	100 [Vac]	277 [Vac]
-40	15.580	15.460
25	15.640	15.640
75	15.640	15.640

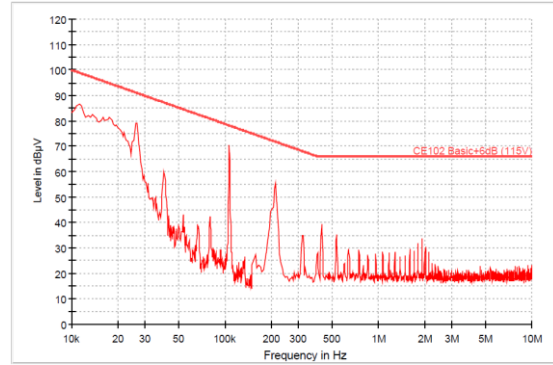
16. Conducted Emission

Input Voltage : 115Vac / 230Vac 50Hz

Load : 100 %

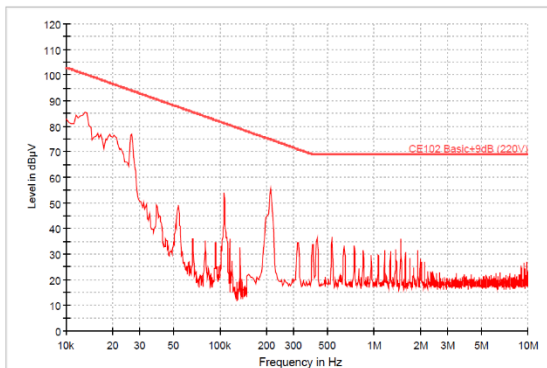


30054 0157 CE102 115VAC EUT6 L  
PK+\_MAXH CE102 Basic+6dB (115V)

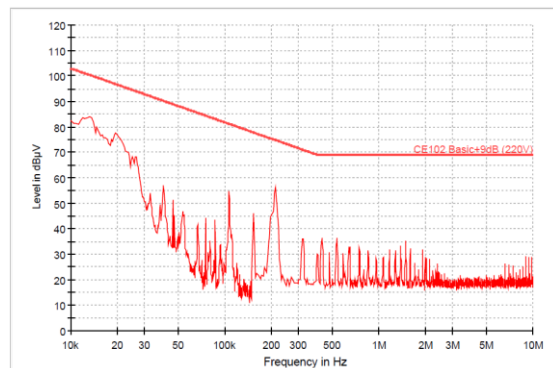


30054 0157 CE102 115VAC EUT6 N  
PK+\_MAXH CE102 Basic+6dB (115V)

Fig. 16.1 MIL-STD-461F CE102 Result, ECD500A12, 115V, Line and Neutral



30054 0151 CE102 230VAC EUT6 L  
PK+\_MAXH CE102 Basic+9dB (220V)



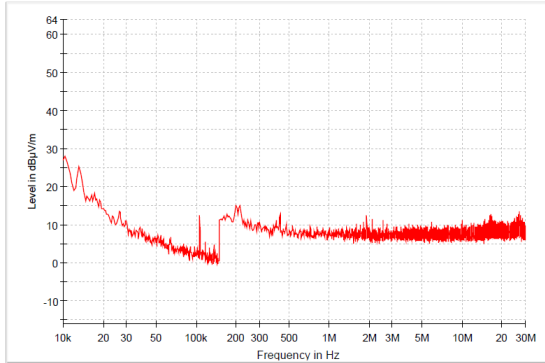
30054 0152 CE102 230VAC EUT6 N  
PK+\_MAXH CE102 Basic+9dB (220V)

Fig. 16.2 MIL-STD-461F CE102 Result, ECD500A12, 230V, Line and Neutral

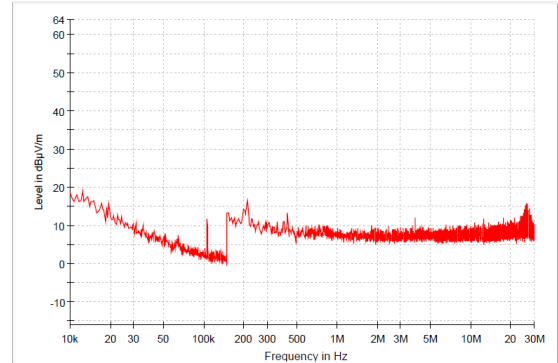
17. Radiated Emission

Input Voltage : 115Vac / 230Vac 50Hz

Load : 100 %

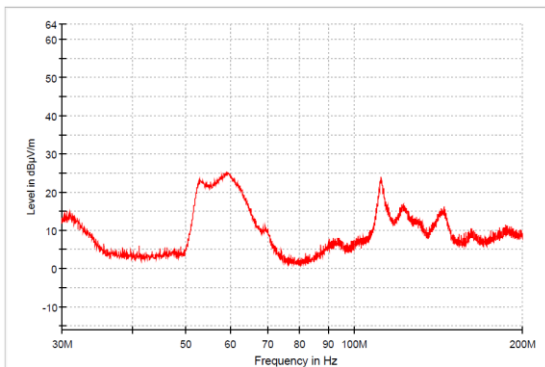


30054 0156 RE102 10k-30M 115VAC EUT6  
PK+\_CLRWR

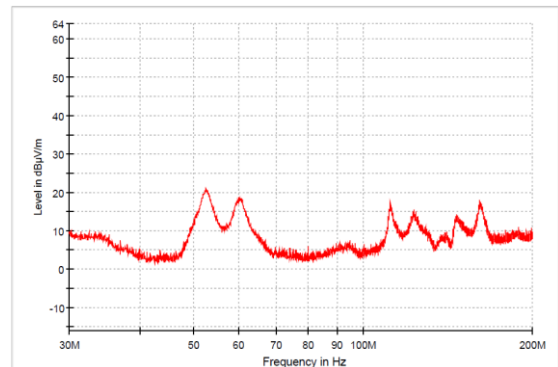


30054 0153 RE102 10k-30M 230VAC EUT6  
PK+\_CLRWR

Fig. 17.1 MIL-STD-461F RE102 10kHz to 30MHz Result, ECD500A12, 115V and 230V

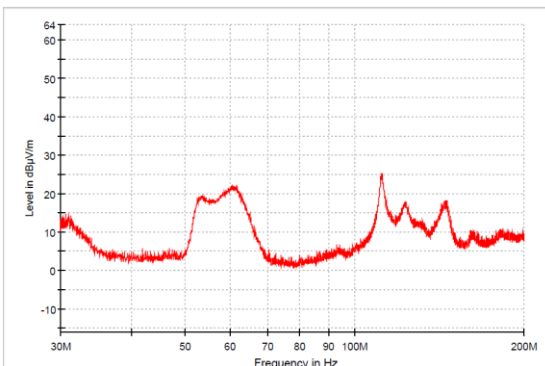


30054 0168 RE102 30M-200M 115V EUT6 VERT  
PK+\_CLRWR

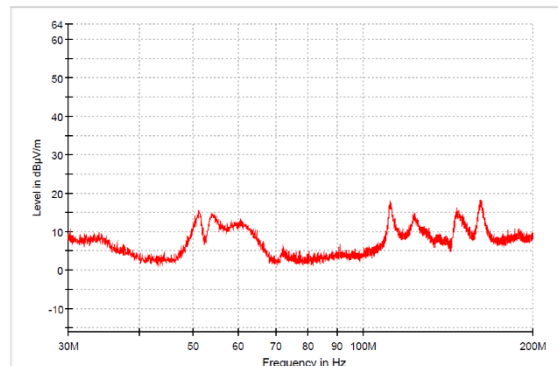


30054 0167 RE102 30M-200M 115V EUT6 HOR  
PK+\_CLRWR

Fig. 17.2 MIL-STD-461F RE102 30MHz to 200MHz Result, ECD500A12, 115V, Vertical and Horizontal

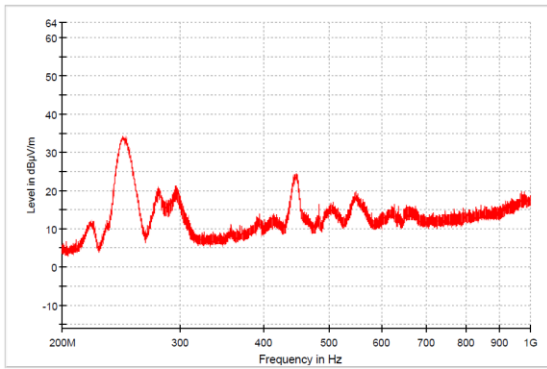


30054 0165 RE102 30M-200M 230V EUT6 VERT  
PK+\_CLRWR

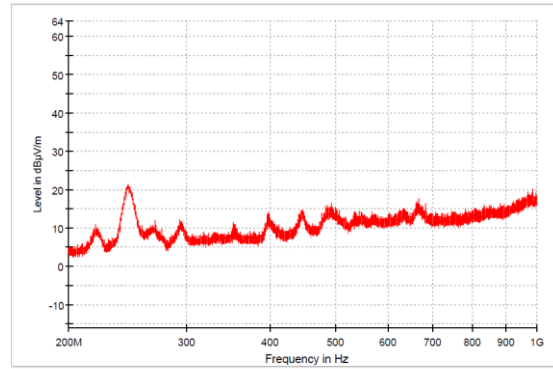


30054 0166 RE102 30M-200M 230V EUT6 HOR  
PK+\_CLRWR

Fig. 17.3 MIL-STD-461F RE102 30MHz to 200MHz Result, ECD500A12, 230V, Vertical and Horizontal

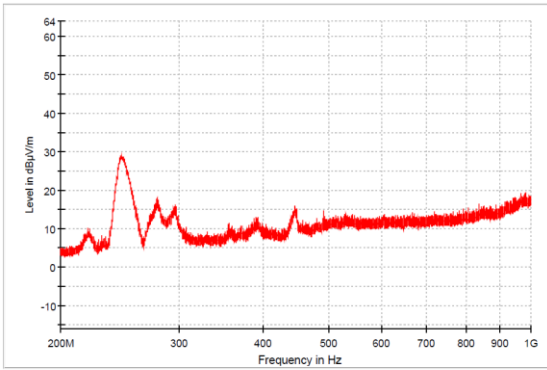


30054 0169 RE102 200M-1G 115V EUT6 VER  
 PK+\_CLRWR

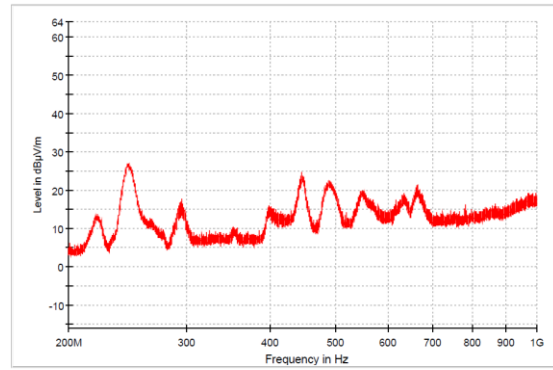


30054 0171 RE102 200M-1G 230V EUT6 HOR  
 PK+\_CLRWR

Fig. 17.4 MIL-STD-461F RE102 200MHz to 1GHz Result, ECD500A12, 115V, Vertical and Horizontal

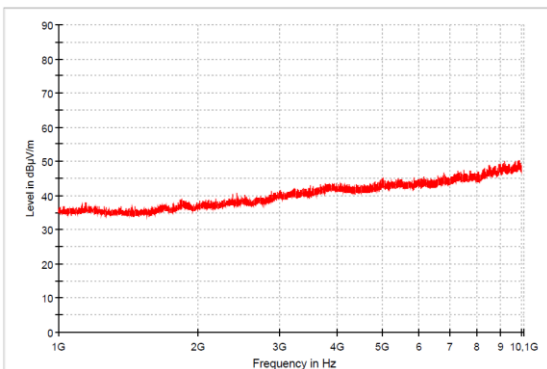


30054 0172 RE102 200M-1G 230V EUT6 VER  
 PK+\_CLRWR

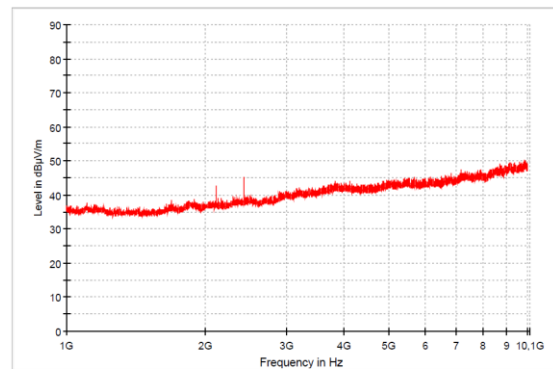


30054 0170 RE102 200M-1G 115V EUT6 HOR  
 PK+\_CLRWR

Fig. 17.5 MIL-STD-461F RE102 200MHz to 1GHz Result, ECD500A12, 230V, Vertical and Horizontal

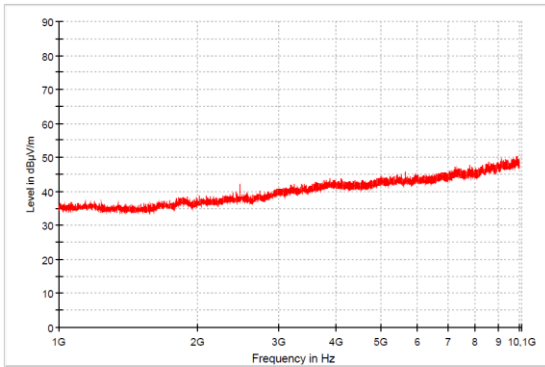


30054 0192 RE102 1G-10G 115V EUT6 VER  
 PK+\_CLRWR

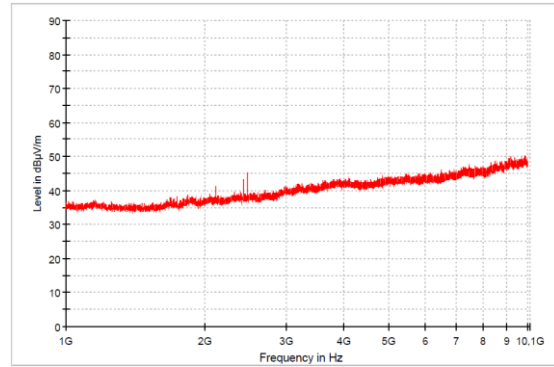


30054 0193 RE102 1G-10G 115V EUT6 HOR  
 PK+\_CLRWR

Fig. 17.6 MIL-STD-461F RE102 1GHz to 10GHz Result, ECD500A12, 115V, Vertical and Horizontal

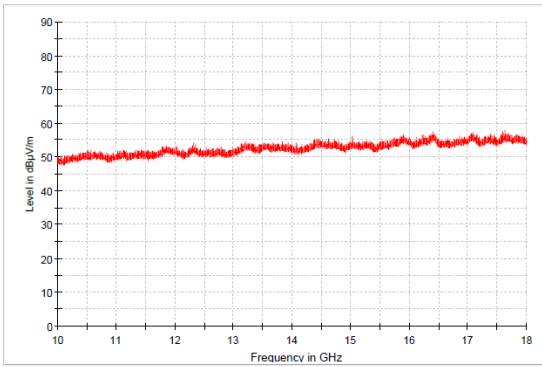


30054 0195 RE102 1G-10G 230V EUT6 VER  
PK+\_CLRWR

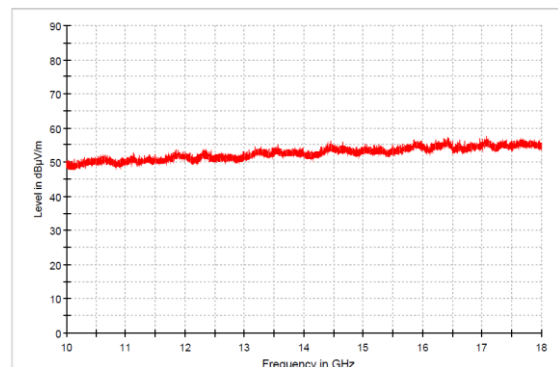


30054 0194 RE102 1G-10G 230V EUT6 HOR  
PK+\_CLRWR

Fig. 17.7 MIL-STD-461F RE102 1GHz to 10GHz Result, ECD500A12, 230V, Vertical and Horizontal

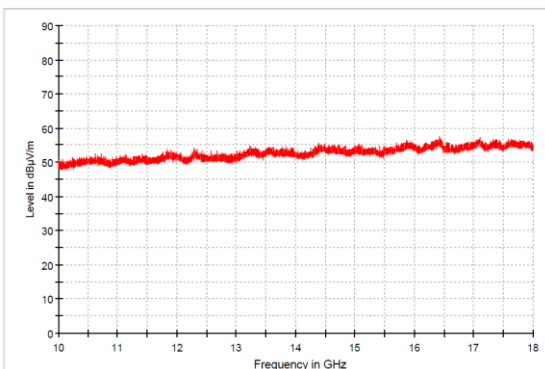


30054 0191 RE102 10G-18G 115V EUT6 VER  
PK+\_CLRWR

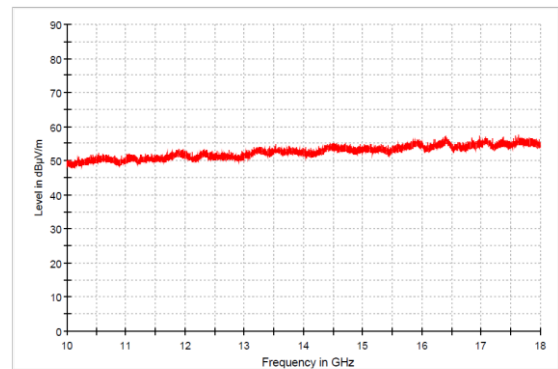


30054 0190 RE102 10G-18G 115V EUT6 HOR  
PK+\_CLRWR

Fig. 17.8 MIL-STD-461F RE102 10GHz to 18GHz Result, ECD500A12, 115V, Vertical and Horizontal



30054 0188 RE102 10G-18G 230V EUT6 VER  
PK+\_CLRWR



30054 0189 RE102 10G-18G 230V EUT6 HOR  
PK+\_CLRWR

Fig. 17.9 MIL-STD-461F RE102 10GHz to 18GHz Result, ECD500A12, 230V, Vertical and Horizontal



Fig. 17.10 MIL-STD-461F CE102 and RE102 test set-up



18. Figure of Test Circuitry

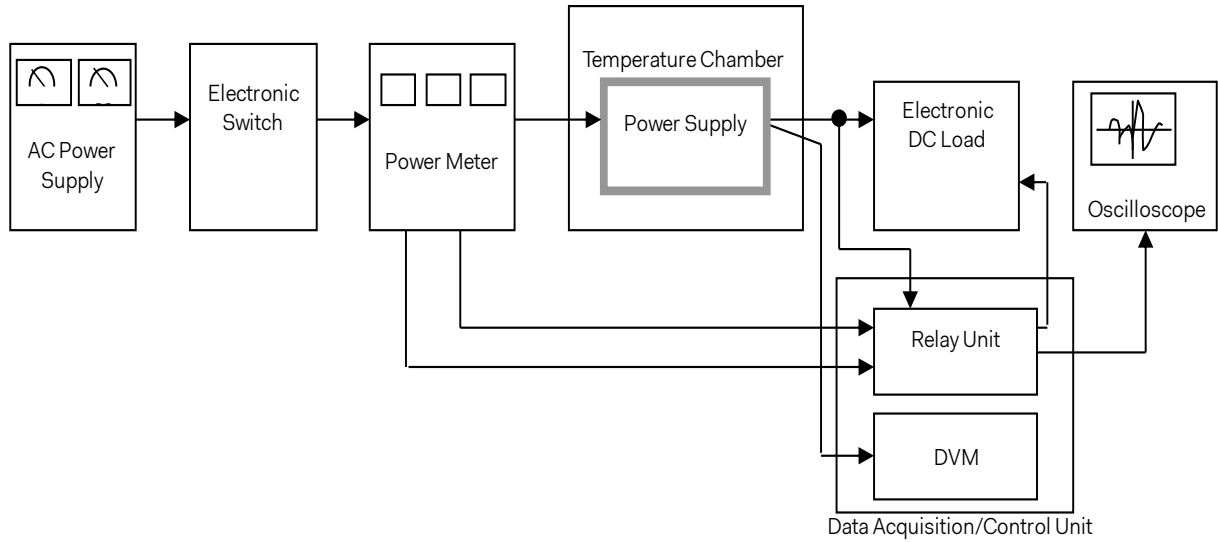


Figure A Test circuitry for general performance measurement

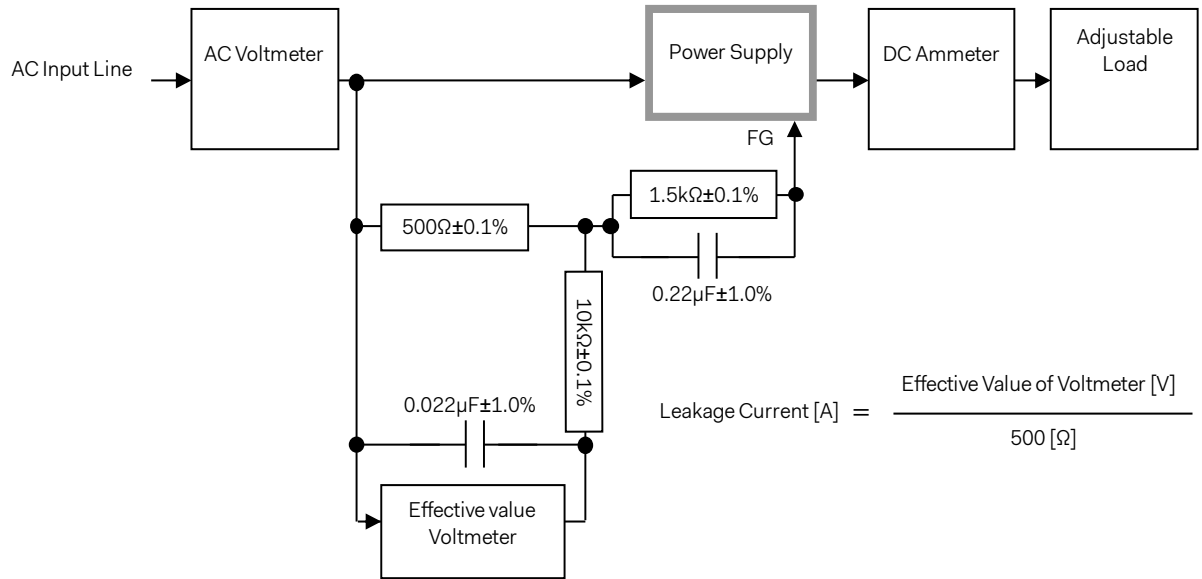


Figure B-1 Leakage current measurement (IEC62368-1, refer to IEC60990 Fig.4)

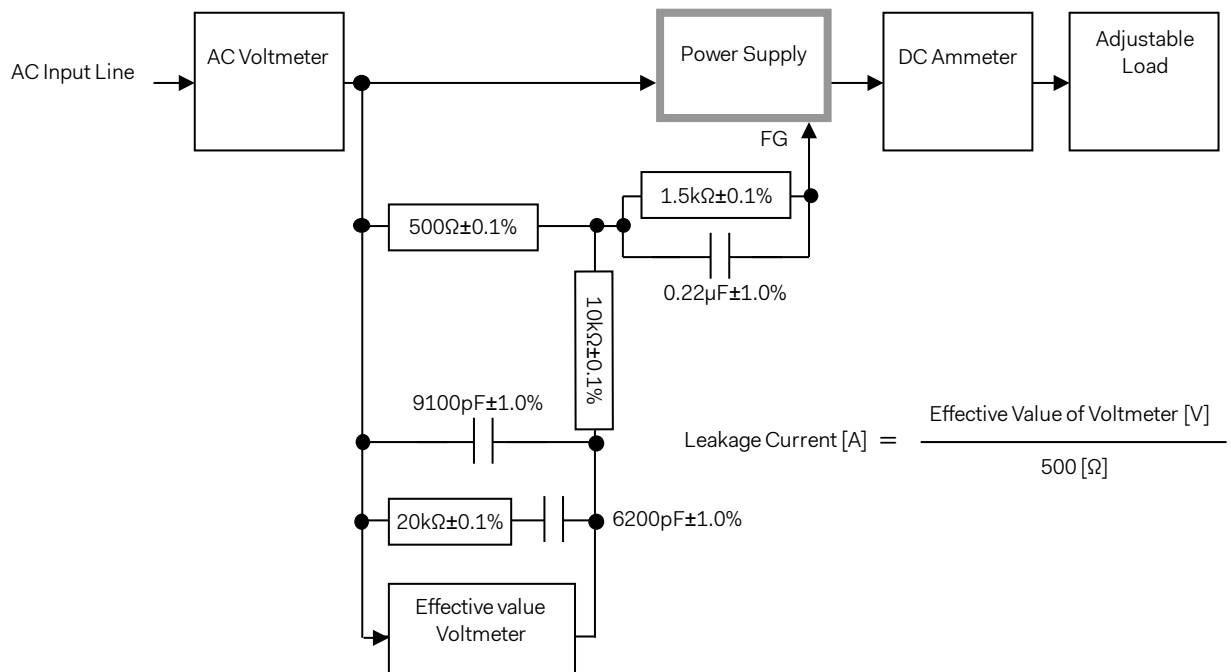


Figure B-2 Leakage current measurement (IEC62368-1, refer to IEC60990 Fig.5)

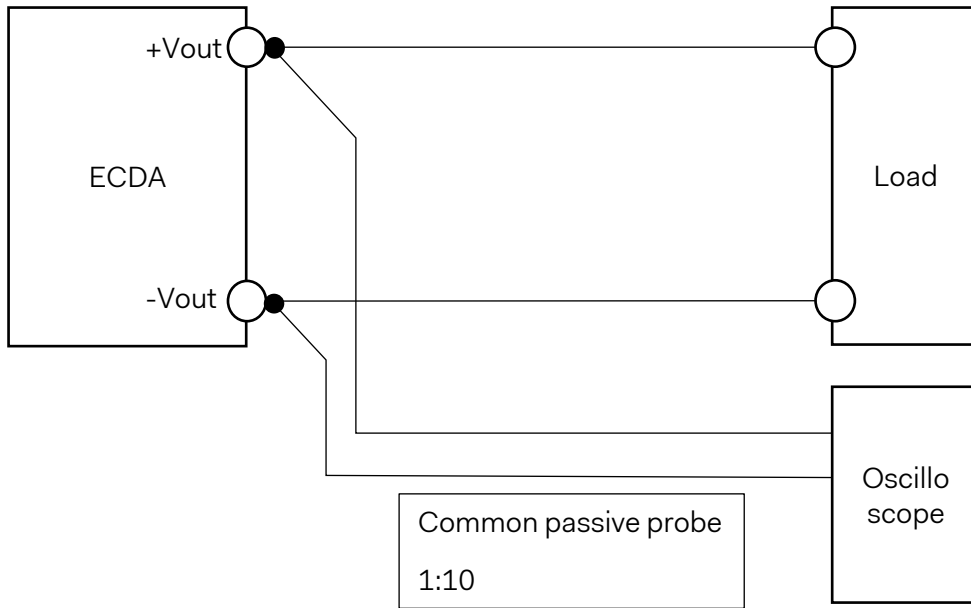


Figure C Ripple voltage measurement

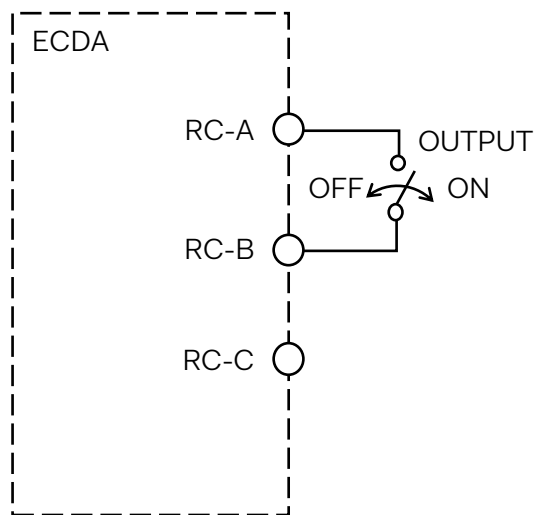


Figure D Turn on by RC measurement