EVALUATION DATA

MODEL NAME : ECD1000A28

Tested by : Shintaro Oki

Approved by : Tomas Isaksson

Tomas Isaksson

POWERBOX

A Cosel Group Company

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Remark:

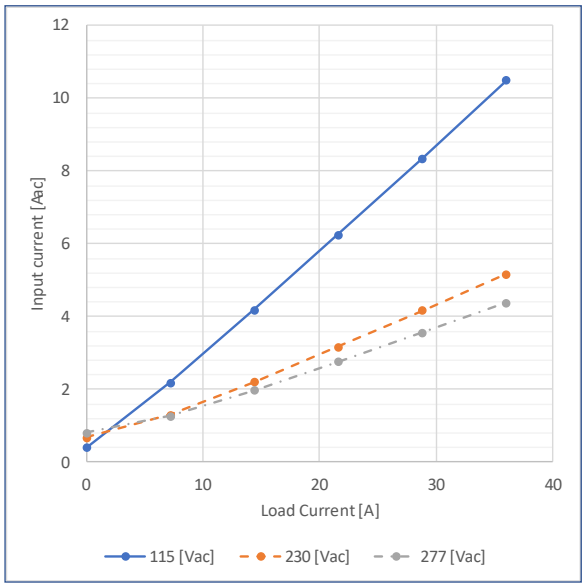
Unless specified the test condition shall be

Input voltage / Frequency:	230 [Vac] / 50 [Hz]
Load current:	36.0 [A]
Baseplate temperature:	25 [°C]

1. Input Current (by Load Current)

Test Circuitry : Figure A

Graph



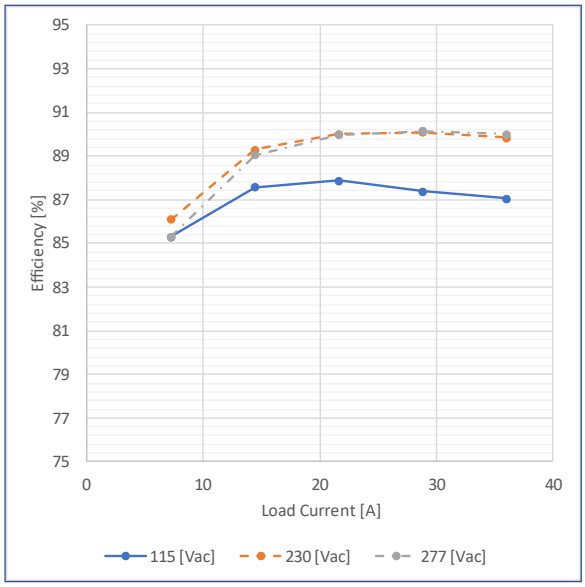
Value

Load Current [A]	Input Current [Aac]		
	Input Voltage		
	115 [Vac]	230 [Vac]	277 [Vac]
0.00	0.394	0.686	0.813
7.20	2.183	1.306	1.265
14.40	4.189	2.207	1.973
21.60	6.245	3.173	2.752
28.80	8.345	4.165	3.562
36.00	10.490	5.173	4.388

2. Efficiency (by Load Current)

Test Circuitry : Figure A

Graph



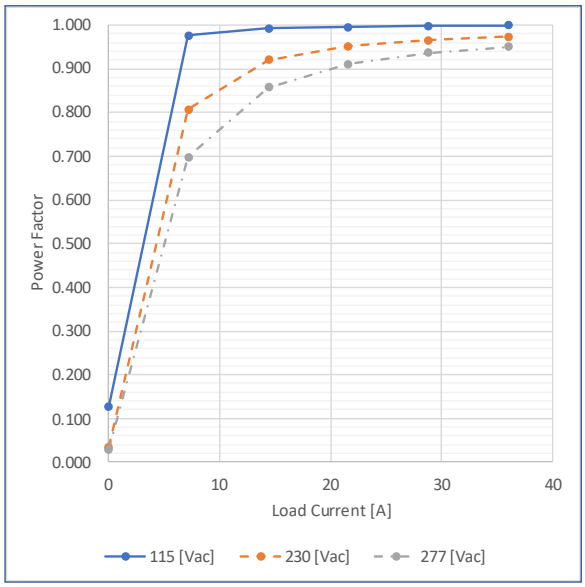
Value

Load Current [A]	Efficiency [%]		
	Input Voltage		
	115 [Vac]	230 [Vac]	277 [Vac]
0.00	-	-	-
7.20	85.315	86.107	85.322
14.40	87.578	89.311	89.047
21.60	87.881	90.002	89.989
28.80	87.385	90.077	90.149
36.00	87.053	89.837	90.017

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	0.128	0.035	0.029
7.20	0.976	0.807	0.698
14.40	0.992	0.920	0.857
21.60	0.996	0.952	0.911
28.80	0.998	0.965	0.936
36.00	0.999	0.973	0.950

4. Leakage Current

Test Circuitry : See table Test Equipment: Simpson 228

Value

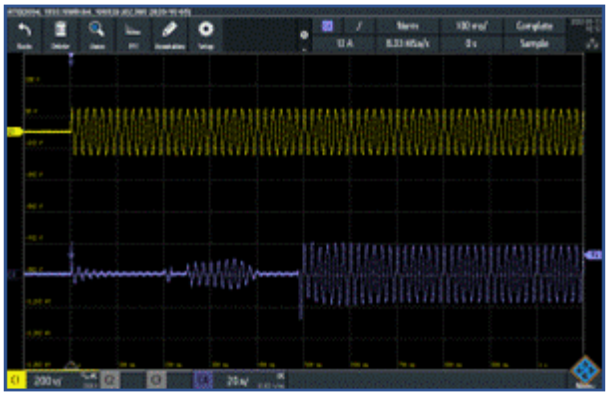
Standard	Testing Circuitry	Measuring Method	Leakage Current [mA] Input Voltage 100 [Vac]	230 [Vac]	277 [Vac]	Note
IEC62368-1	Figure B-1	Both phases	0.25	0.60	0.74	Operation
		One of phases	0.44	1.20	1.45	Stand by
	Figure B-2	Both phases	0.25	0.60	0.74	Operation
		One of phases	0.44	1.20	1.45	Stand by

5. Inrush Current

Test Circuitry : Figure A

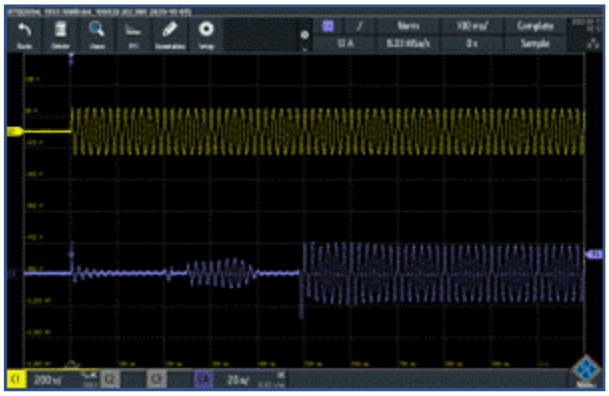
C1: Input Voltage (200V/div)
C4: Input Current (20A/div)

Waveform



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

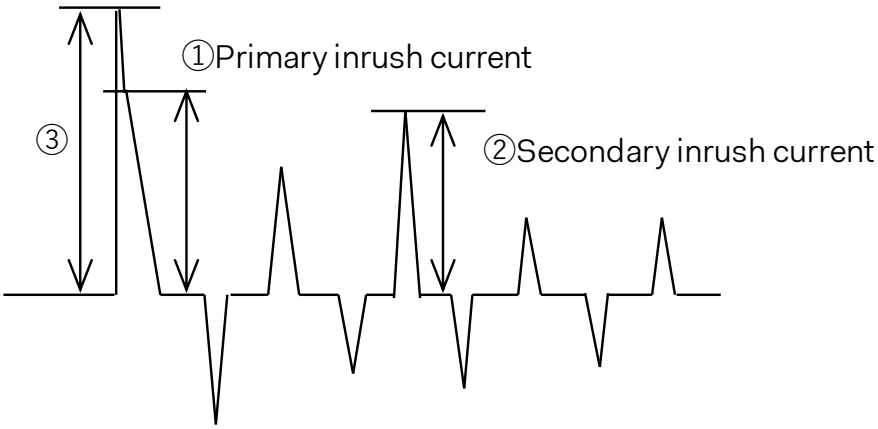
① Primary Inrush Current : 12.5 [A]
② Secondary Inrush Current : 28.3 [A]



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

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

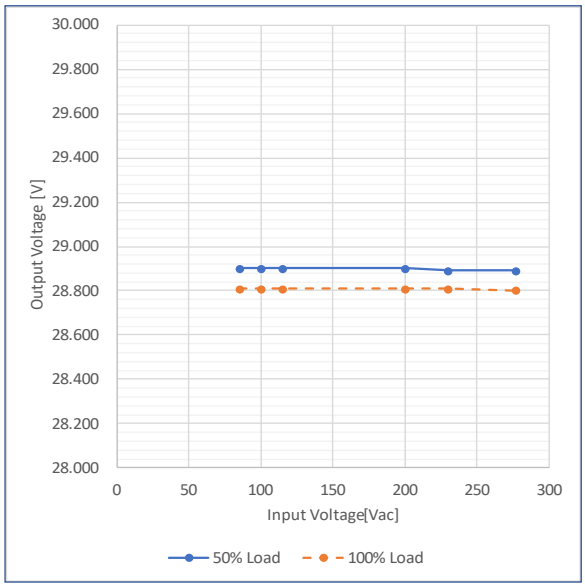
Remark:
A surge current flown into Line-to-Line capacitor (③) would be excluded as primary inrush current (①).



6. Line Regulation

Test Circuitry : Figure A Change input voltage from 85 to 277 [Vac]

Graph



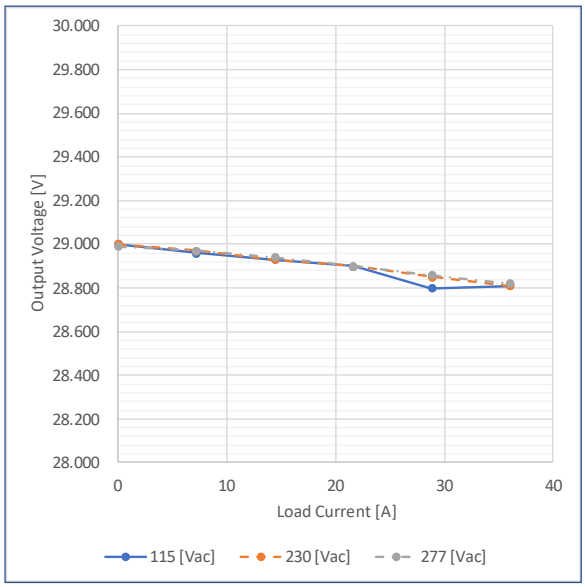
Value

Input Voltage [Vac]	Output Voltage [V] Load Factor	
	50% Load	100% Load
85.00	28.900	28.810
100.00	28.900	28.810
115.00	28.900	28.810
200.00	28.900	28.810
230.00	28.890	28.810
277.00	28.890	28.800

7. Load Regulation

Test Circuitry : Figure A Change Load Current from 0 to 36.0 [A]

Graph



Value

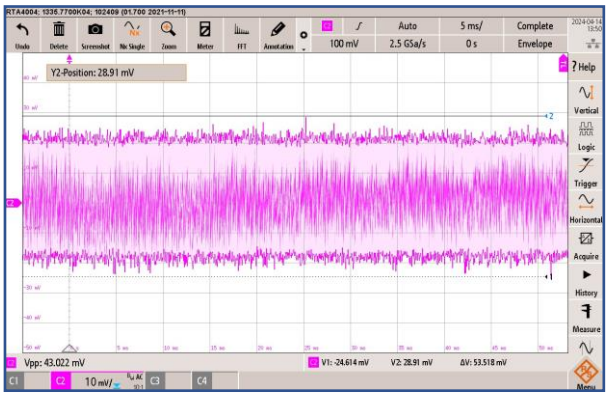
Load Current [A]	Output Voltage [V] Input Voltage		
	115 [Vac]	230 [Vac]	277 [Vac]
0.00	29.000	29.000	28.990
7.20	28.960	28.970	28.970
14.40	28.930	28.930	28.940
21.60	28.900	28.900	28.900
28.80	28.800	28.850	28.860
36.00	28.810	28.810	28.820

8. Ripple Noise

Test Circuitry : Figure C

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

Waveform



(5ms/div)

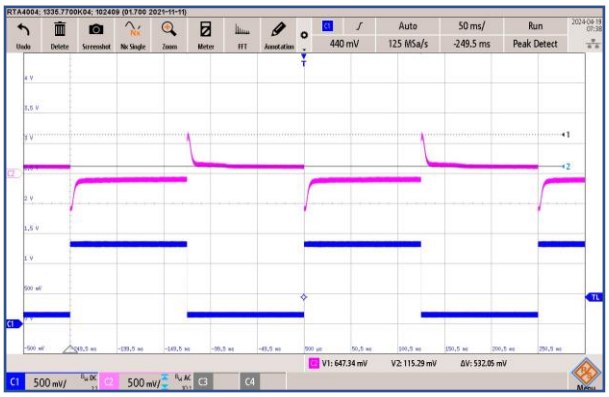
9. Dynamic Load Response

Test Circuitry : Figure A
Load Current 3.5 [A]<-> 32 [A]

C2: Output voltage (500mV/div)
C1: Output current (11.85A/div)

Waveform

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

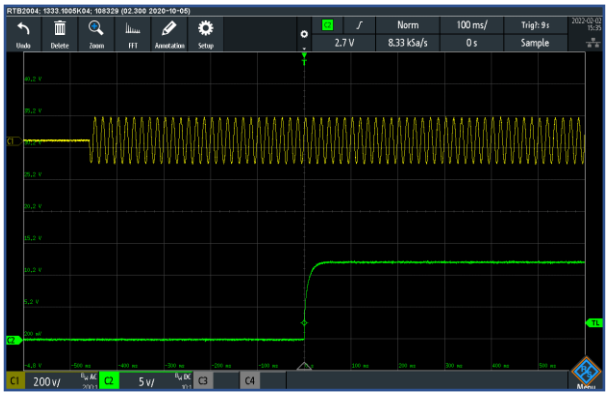


10. Rise Time Characteristics by AC ON

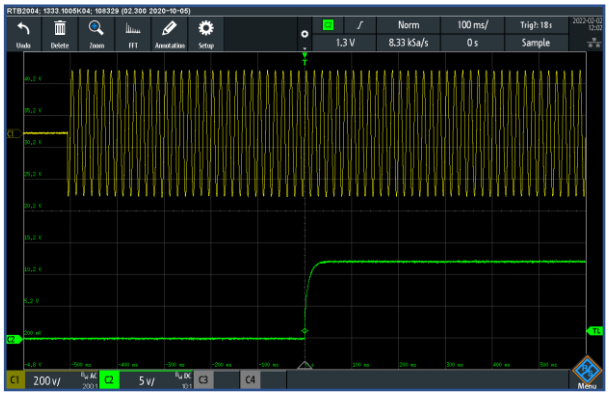
Test Circuitry : Figure A

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

Waveform



Input Voltage 100 [Vac]
Load Current 36.0 [A]
(100ms/div)



Input Voltage 277 [Vac]
Load Current 36.0 [A]
(100ms/div)

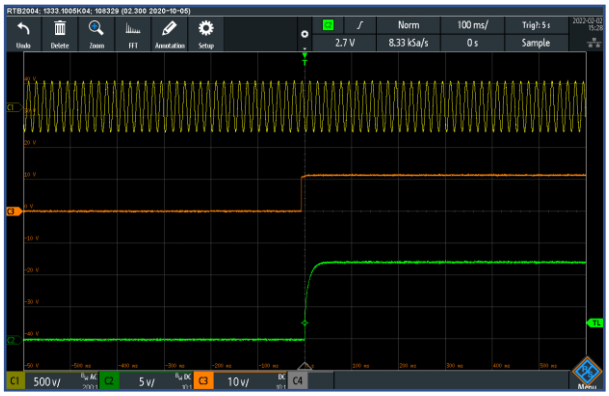
11. Rise Time Characteristics with RC Signal

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 36.0 [A]
(100ms/div)



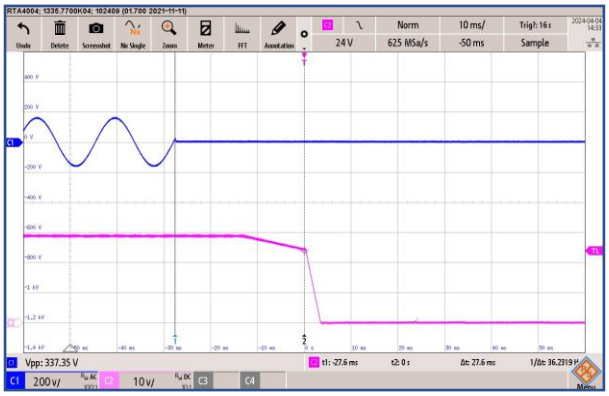
Input Voltage 277 [Vac]
Load Current 36.0 [A]
(100ms/div)

12. Fall Time / Hold-up Time

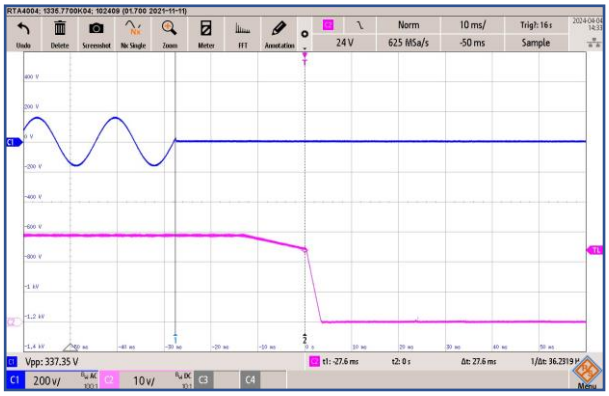
Test Circuitry : Figure A

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

Waveform

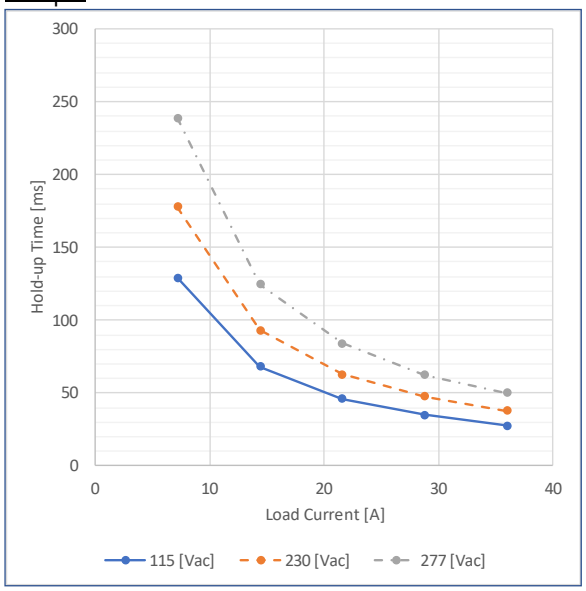


Input Voltage 115 [Vac]
Load Current 36.0 [A]
(10ms/div)



Input Voltage 277 [Vac]
Load Current 36.0 [A]
(10ms/div)

Graph



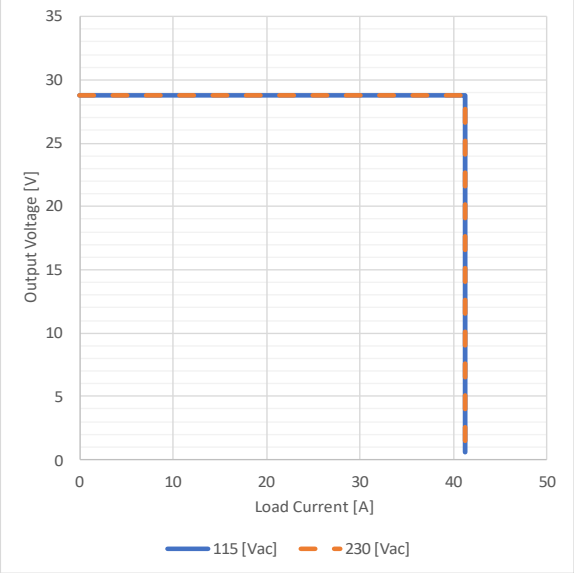
Value

Load Current [A]	Hold-up Time [ms] Input Voltage 115 [Vac]	230 [Vac]	277 [Vac]
0.00	-	-	-
7.20	129.0	178.0	239.0
14.40	68.0	93.0	124.5
21.60	46.2	62.6	84.2
28.80	35.0	47.8	62.4
36.00	27.6	37.9	50.2

13. Over Current Protection

Test Circuitry : Figure A

Graph



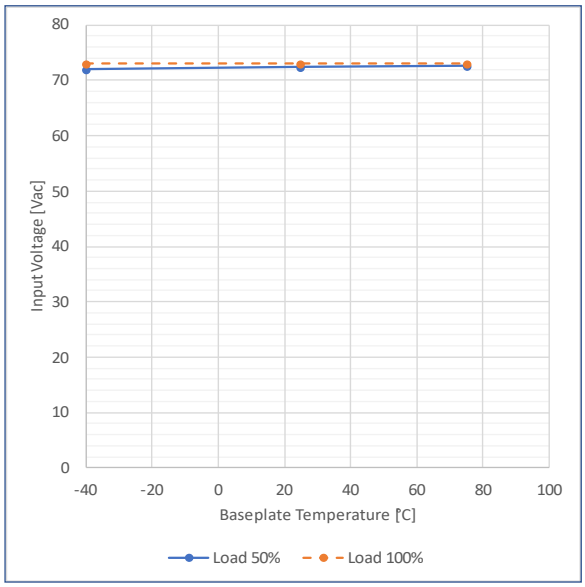
Value

Output Voltage [V]	Load Current [A]	
	Input Voltage	
	115 [Vac]	230 [Vac]
28.00	41.200	41.200
23.33	41.200	41.200
18.67	41.200	41.200
14.00	41.300	41.300
9.33	41.200	41.200
4.67	41.200	41.200

14. Minimum Input Voltage for Regulated Output Voltage

Test Circuitry : Figure A

Graph



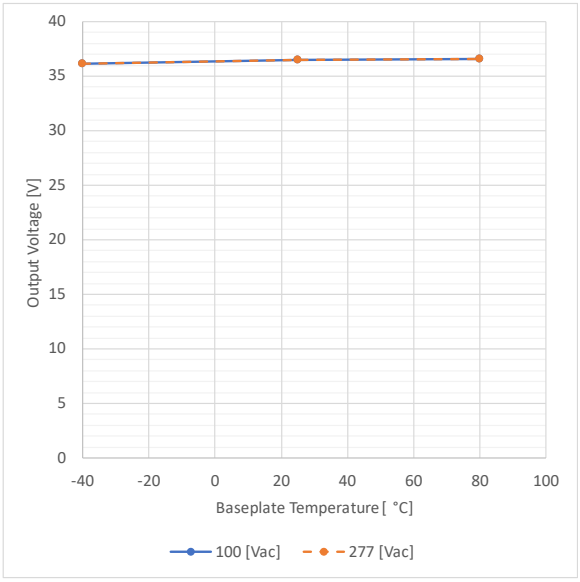
Value

Baseplate Temperature [°C]	Input Voltage [Vac]	
	Load Current	
	Load 50%	Load 100%
-40	72.0	73.0
25	72.4	73.0
75	72.6	73.0

15. Over Voltage Protection

Test Circuitry : Figure A

Graph



Value

Baseplate Temperature [°C]	Output Voltage [V]	
	Input Voltage	
	100 [Vac]	277 [Vac]
-40	36.160	36.160
25	36.450	36.460
80	36.570	36.570

16. Conducted Emission

Input Voltage : 115Vac / 230Vac 50Hz Load : 100 %

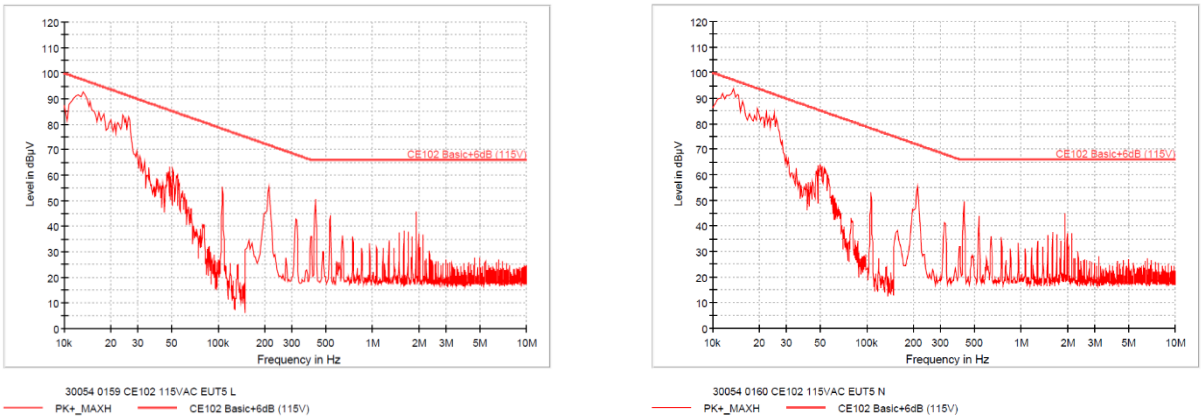


Fig. 16.1 MIL-STD-461F CE102 Result, ECD1000A28, 115V, Line and Neutral

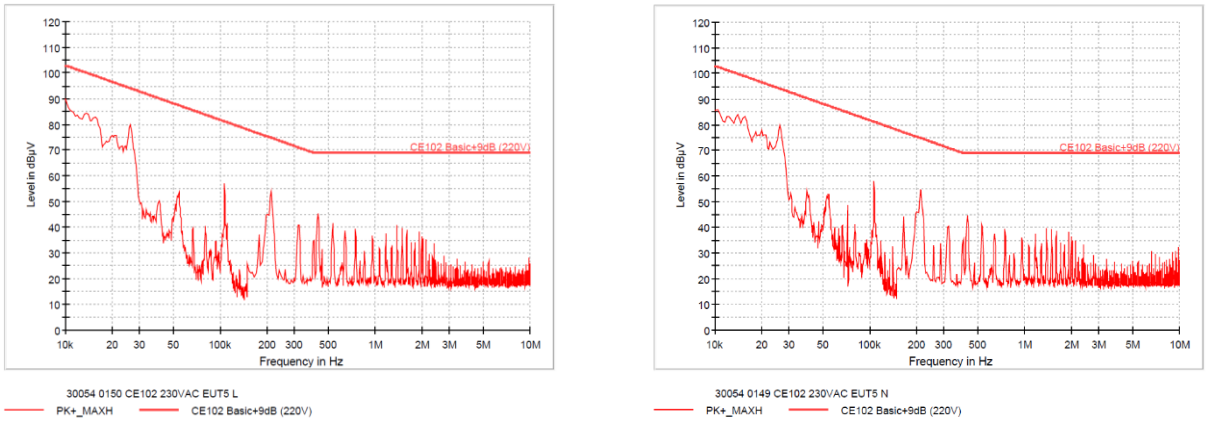
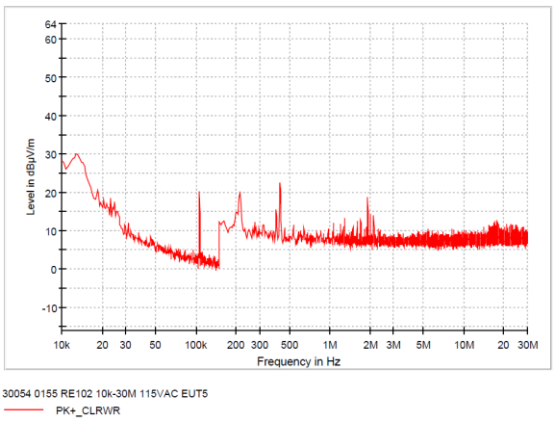


Fig. 16.2 MIL-STD-461F CE102 Result, ECD1000A28, 230V, Line and Neutral

17. Radiated Emission

Input Voltage : 115Vac / 230Vac 50Hz Load : 100 %



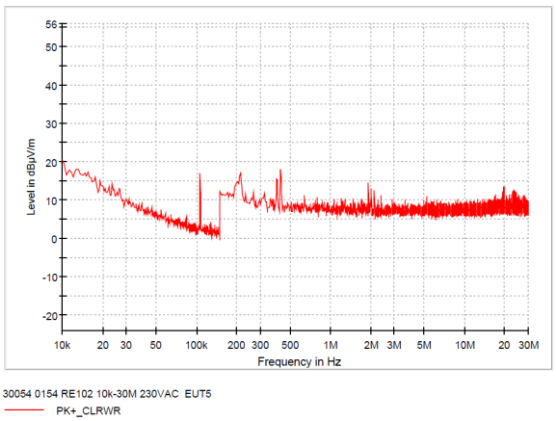
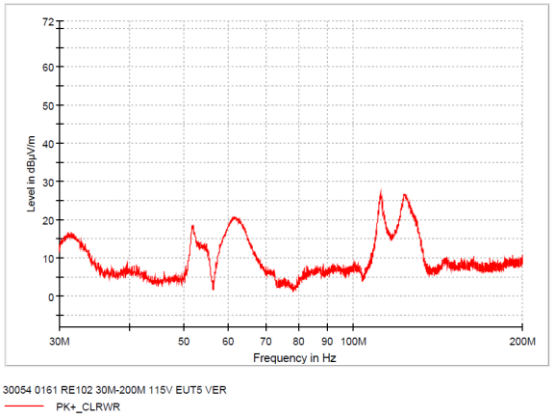


Fig. 17.1 MIL-STD-461F RE102 10kHz to 30MHz Result, ECD1000A28, 115V and 230V



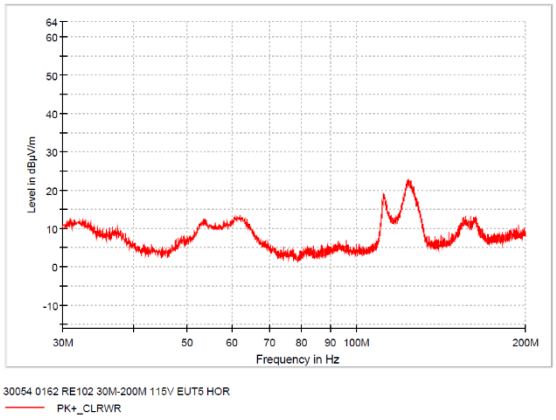
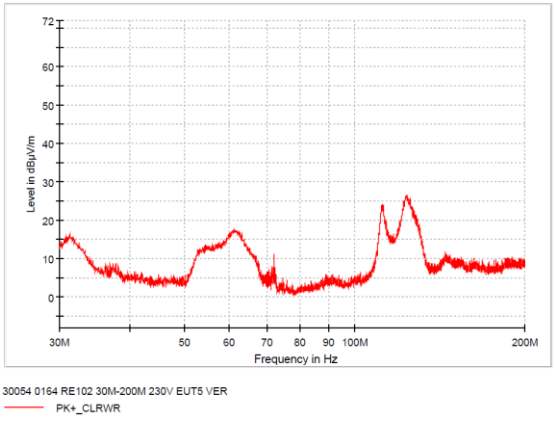


Fig. 17.2 MIL-STD-461F RE102 30MHz to 200MHz Result, ECD1000A28, 115V, Vertical and Horizontal



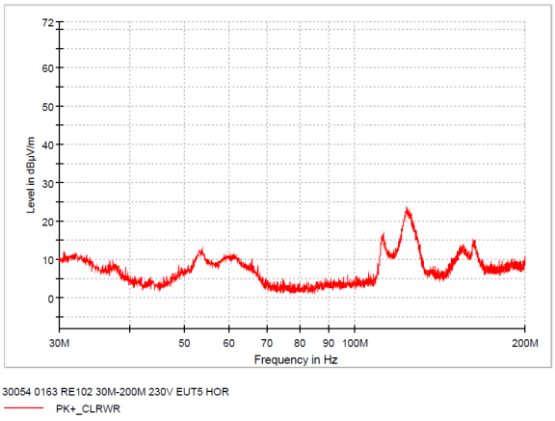


Fig. 17.3 MIL-STD-461F RE102 30MHz to 200MHz Result, ECD1000A28, 230V, Vertical and Horizontal

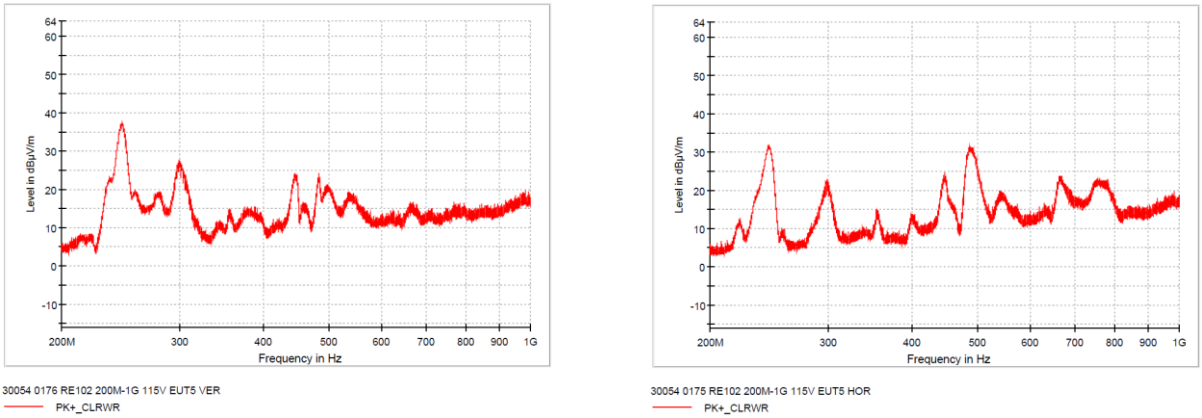


Fig. 17.4 MIL-STD-461F RE102 200MHz to 1GHz Result, ECD1000A28, 115V, Vertical and Horizontal

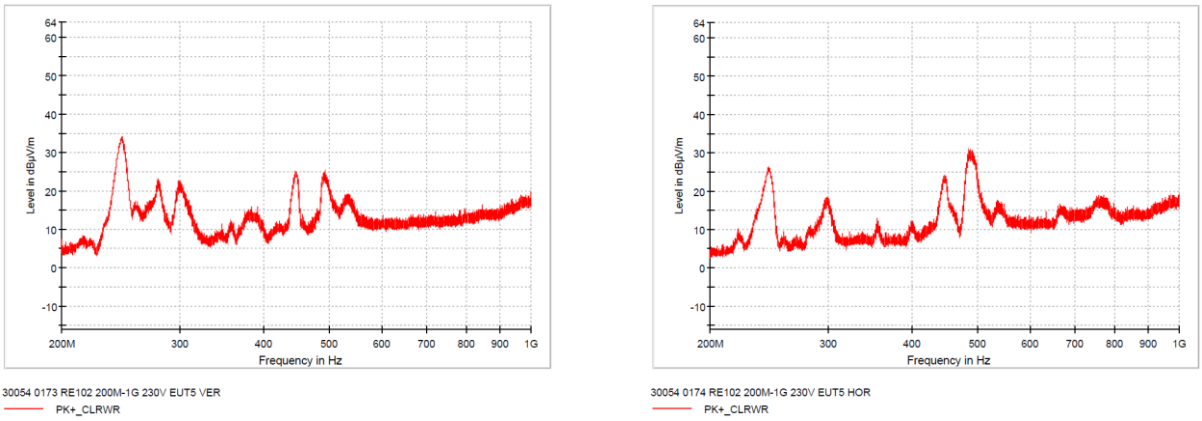


Fig. 17.5 MIL-STD-461F RE102 200MHz to 1GHz Result, ECD1000A28, 230V, Vertical and Horizontal

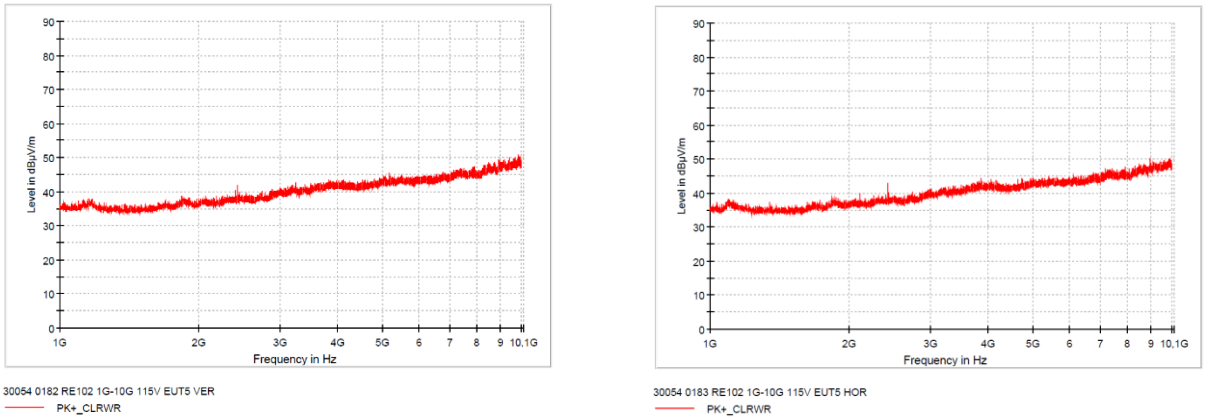


Fig. 17.6 MIL-STD-461F RE102 1GHz to 10GHz Result, ECD1000A28, 115V, Vertical and Horizontal

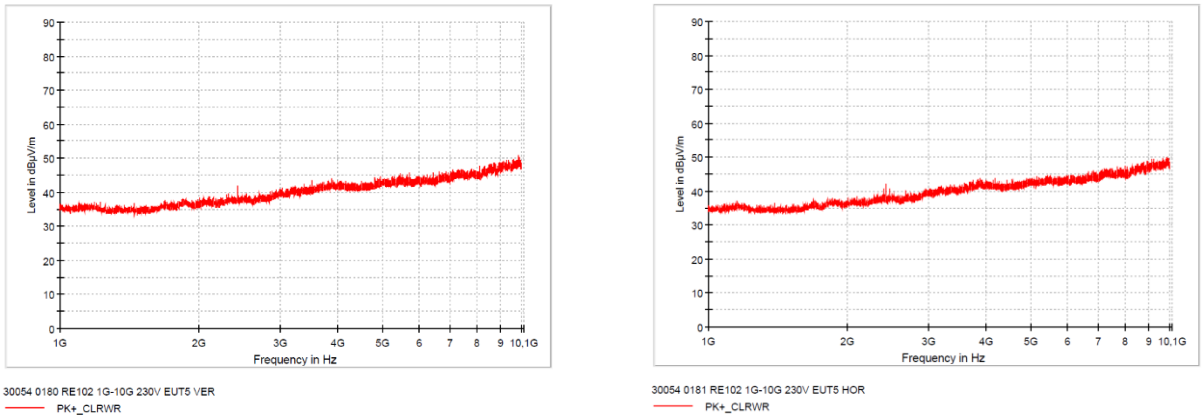


Fig. 17.7 MIL-STD-461F RE102 1GHz to 10GHz Result, ECD1000A28, 230V, Vertical and Horizontal

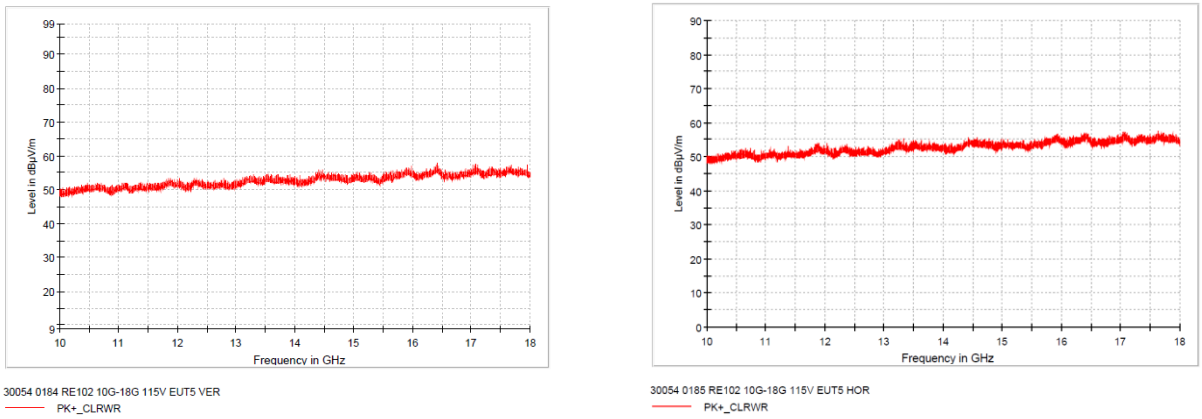


Fig. 17.8 MIL-STD-461F RE102 10GHz to 18GHz Result, ECD1000A28, 115V, Vertical and Horizontal

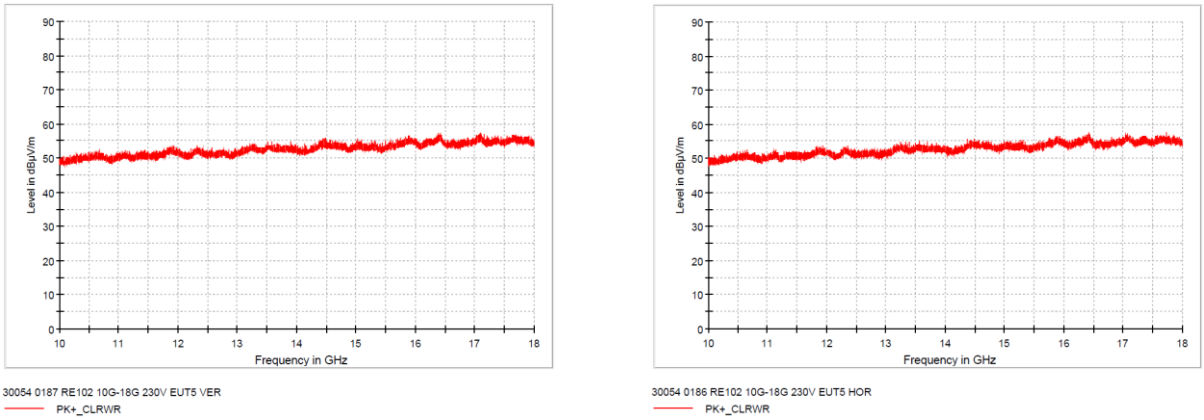


Fig. 17.9 MIL-STD-461F RE102 10GHz to 18GHz Result, ECD1000A28, 230V, Vertical and Horizontal

Fig. 17.10 MIL-STD-461F CE102 and RE102test set-up

18. Figure of Test Circuitry

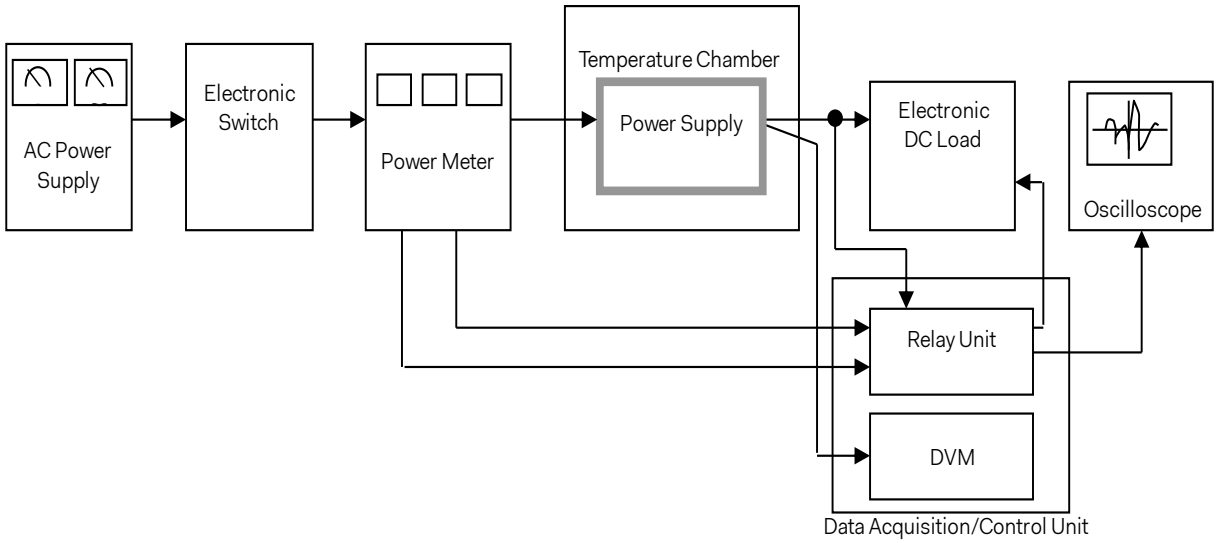


Figure A Test circuity for general performance measurement

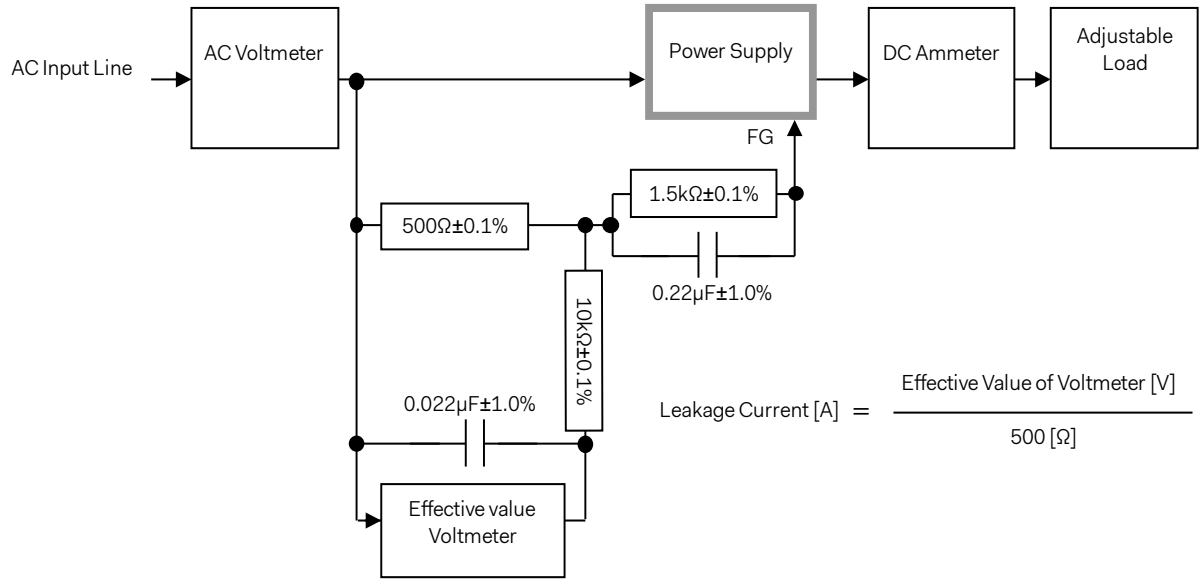


Figure B-1 Leakage current measurement (IEC62368-1, refer to IEC60990 Fig.4)

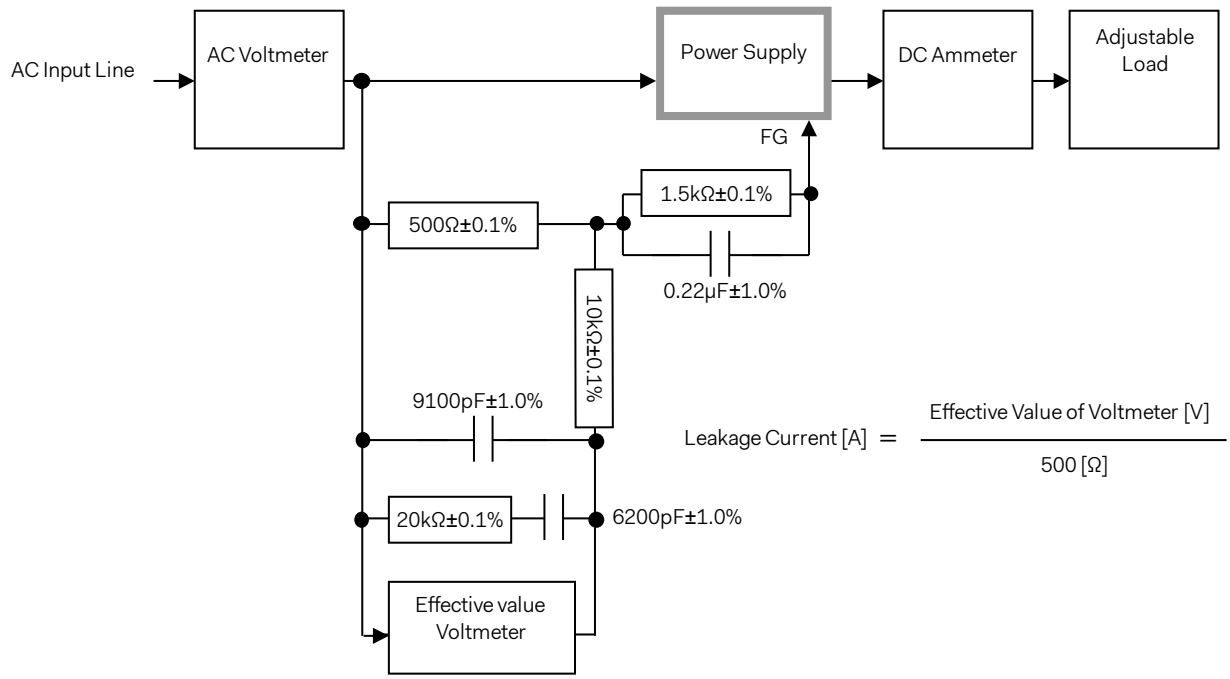


Figure B-2 Leakage current measurement (IEC62368-1, refer to IEC60990 Fig.5)

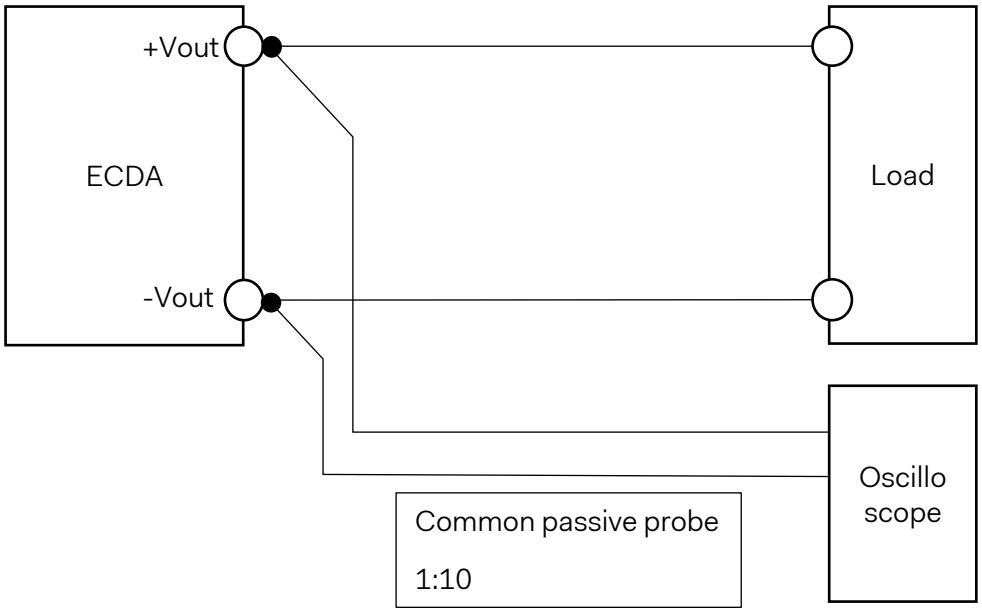


Figure C Ripple voltage measurement

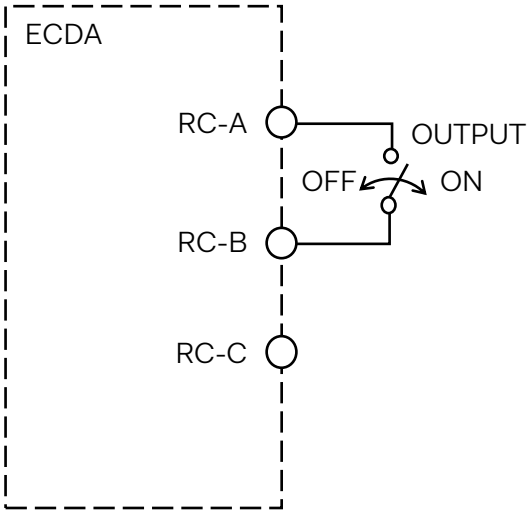


Figure D Turn on by RC measurement