

DRB240-24-1

EVALUATION DATA

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Terminology used

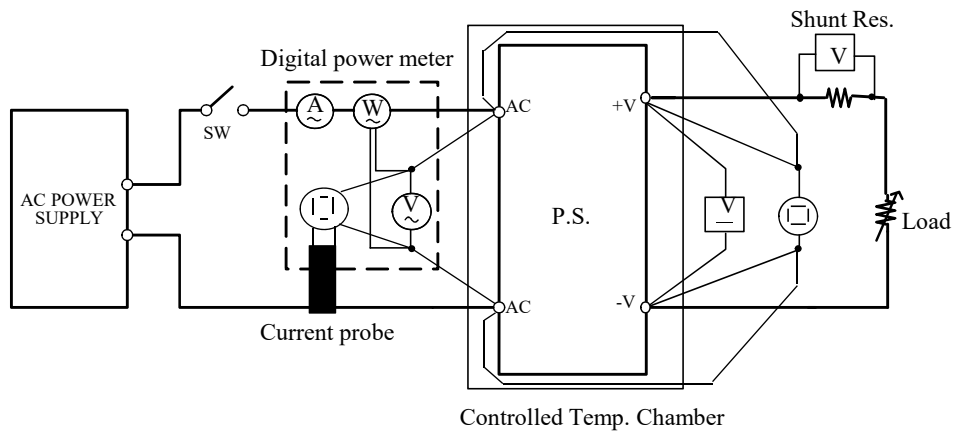
	Definition
V_{in} Input voltage
V_{out} Output voltage
I_{in} Input current
I_{out} Output current
T_a Ambient temperature
f Frequency

1. Evaluation Method

1.1 Circuit used for determination

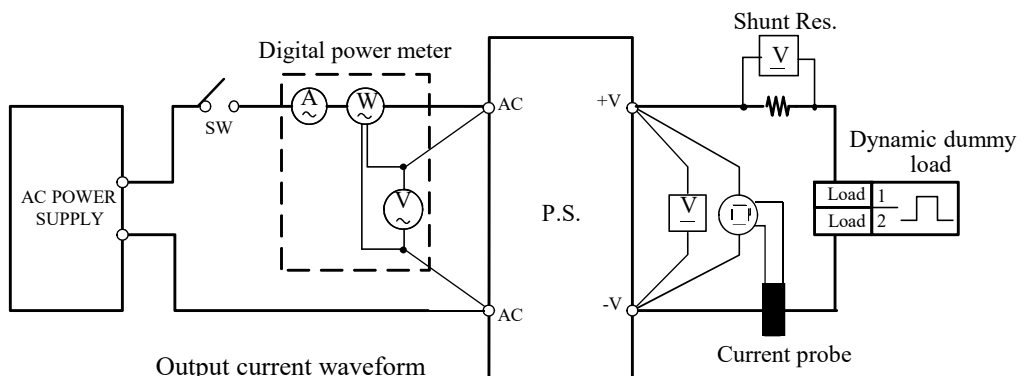
Circuit 1 used for determination

- Steady state data
- Over current protection (OCP) characteristics
- Over voltage protection (OVP) characteristics
- Output rise characteristics
- Output fall characteristics
- Hold up time characteristics
- Response to brown out characteristics
- Input Current Harmonics
- Input current

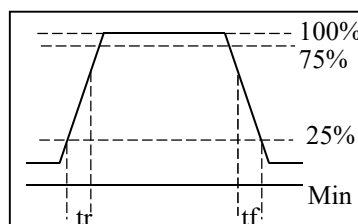


Circuit 2 used for determination

- Dynamic load response characteristics

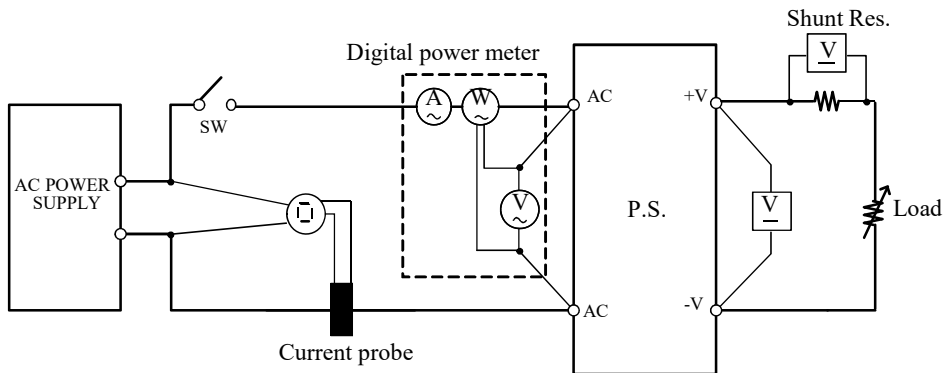


Output current waveform
I_{out} 25% <=> 75%



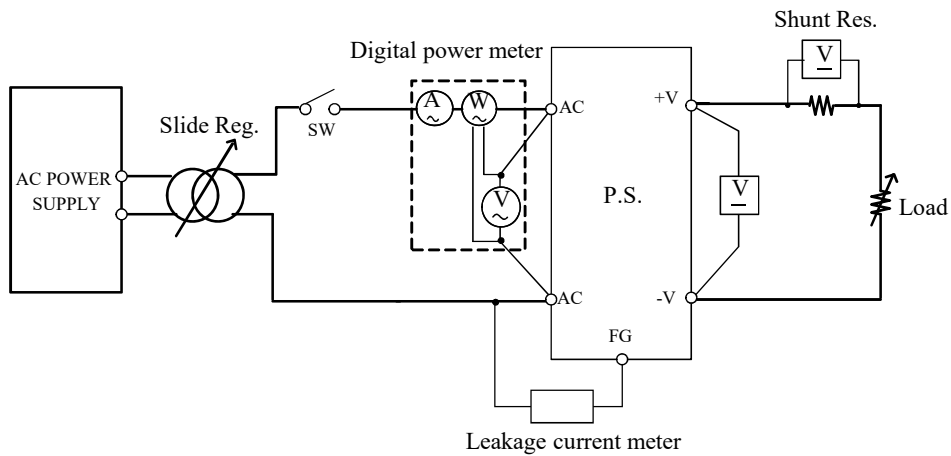
Circuit 3 used for determination

• Inrush current waveform



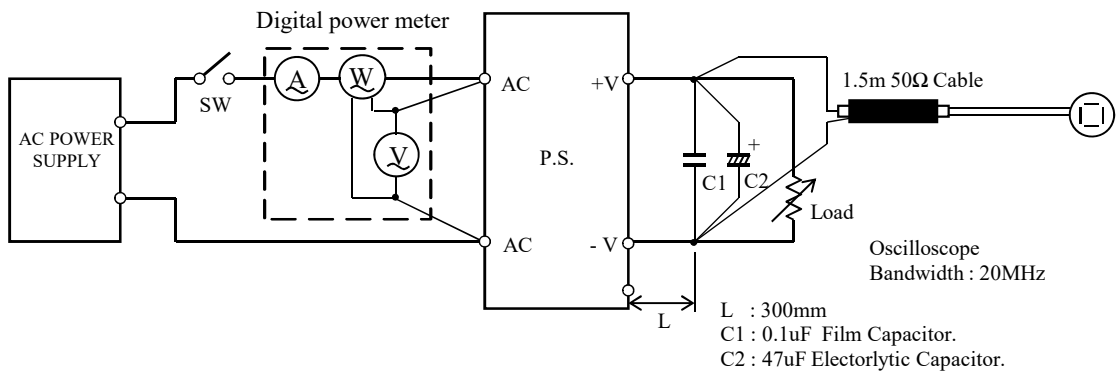
Circuit 4 used for determination

• Leakage current characteristics



Circuit 5 used for determination

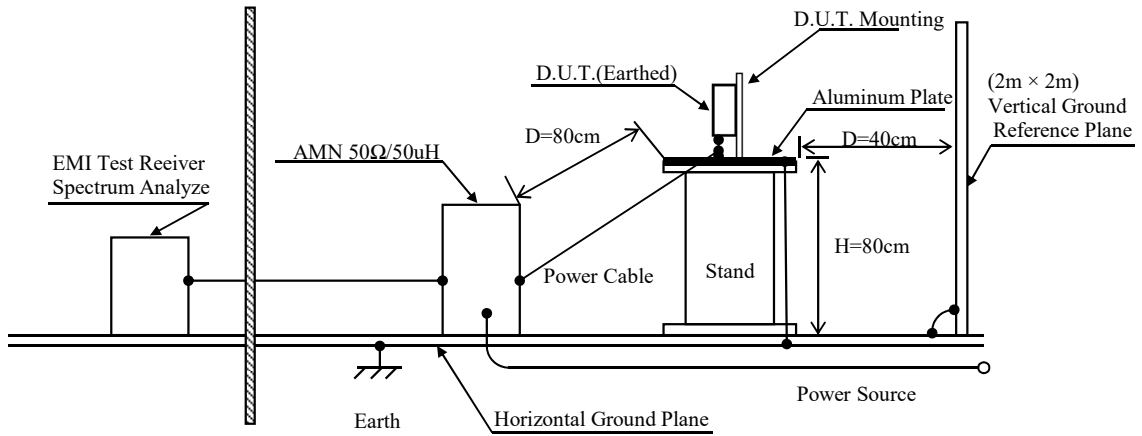
• Output ripple and noise waveform



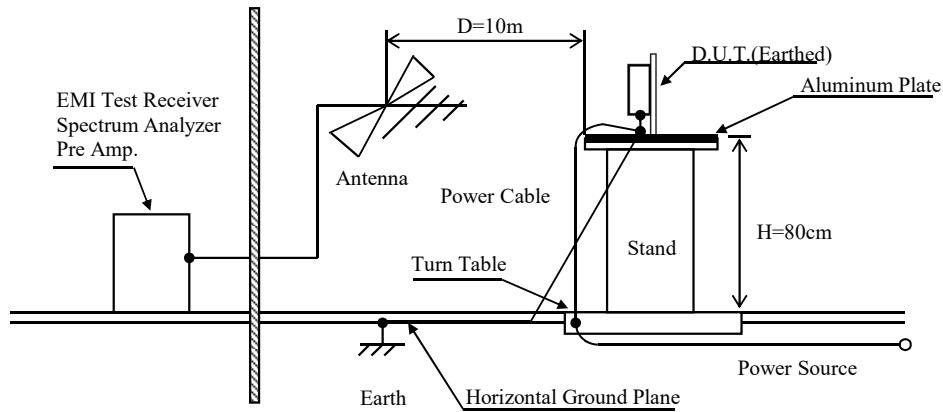
Configuration used for determination

- Electro-Magnetic Interference characteristics

(a) Conducted Emission



(b) Radiated Emission



1.2 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA	DL1740/DL1740E
2	DIGITAL MULTIMETER	AGILENT	34970A
3	DIGITAL POWER METER	HIOKI	3333
4	CURRENT PROBE/AMPLIFIER	YOKOGAWA	701931
5	DATA ACQUISITION UNIT	AGILENT	34970A
6	ELECTRONIC LOAD	CHROMA	63112A
7	CONTROLLED TEMP. CHAMBER	ESPEC	SH-641
8	LEAKAGE CURRENT METER	SIMPSON	228
9	AC SOURCE	CHROMA	61505
10	AC SOURCE (CE-UL Lab)	KEYSIGHT TECHNOLOGIES	6813B
11	EMI TEST RECEIVER (CE-UL Lab)	ROHDE & SCHWARZ	ES17
12	LISN (CE-UL Lab)	SCHAFFNER LISN	NNB 41
13	LISN (CE-UL Lab)	EMCO LISN (AE)	3825/2
14	EMI TEST RECEIVER (RE-UL Lab)	ROHDE & SCHWARZ 100Hz-26.5Ghz	ESU26
15	ANTENNA (BILOG) (RE-UL Lab)	TESEQ	CBL6112B
16	ANTENNA (HORN) (RE-UL Lab)	EMCO	3115
17	PRE AMP (RE-UL Lab)	HP	8447D
18	PRE AMP (RE-UL Lab)	TOYO	TPA0108-40

2 Characteristics

2.1 Steady state data

(1) Regulation - line and load, Temperature drift / Start up voltage and Drop out voltage

24V

1. Regulation - line and load

Condition Ta : 25°C

Iout \ Vin	85VAC	115VAC	230VAC	264VAC	line regulation	
0%	24.101	24.101	24.101	24.101	0mV	0.000%
50%	24.065	24.065	24.065	24.064	1mV	0.004%
100%	24.032	24.032	24.031	24.031	1mV	0.004%
load regulation	69mV	69mV	70mV	70mV		
	0.287%	0.287%	0.292%	0.292%		

2. Temperature drift

Condition Vin : 115VAC
Iout : 100%

Ta	-25°C	25°C	55°C	temperature stability	
Vout	23.951V	24.032V	24.042V	91mV	0.379%

3. Start up voltage and Drop out voltage

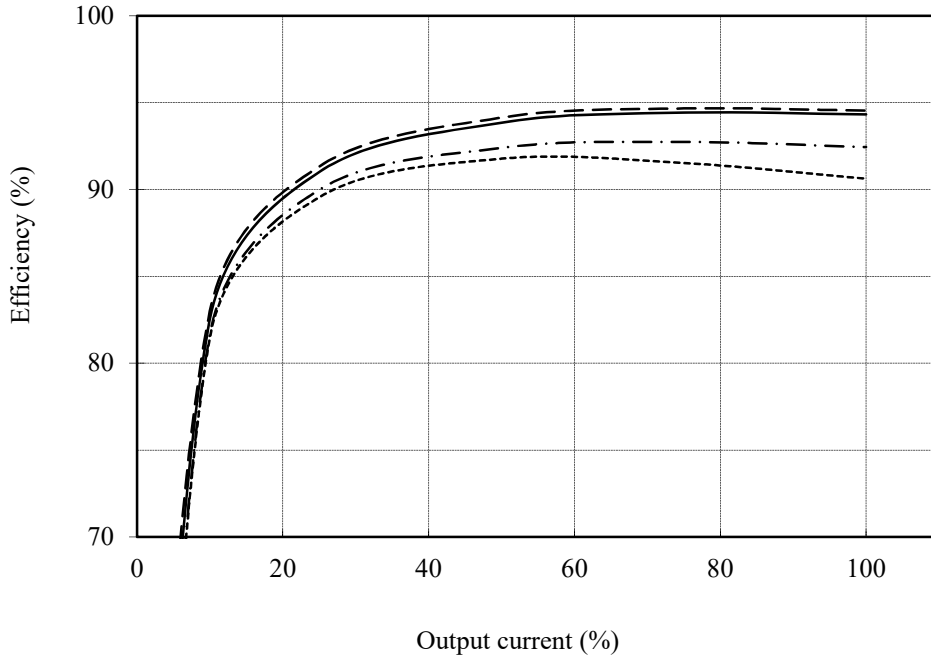
Condition Ta : 25°C
Iout : 100%

Start up voltage (Vin)	80VAC
Drop out voltage (Vin)	61VAC

(2) Efficiency vs. Output current

Conditions Vin : 85VAC -----
: 115VAC -.-.-.-
: 230VAC ————
: 264VAC - - - -
Ta : 25°C

24V

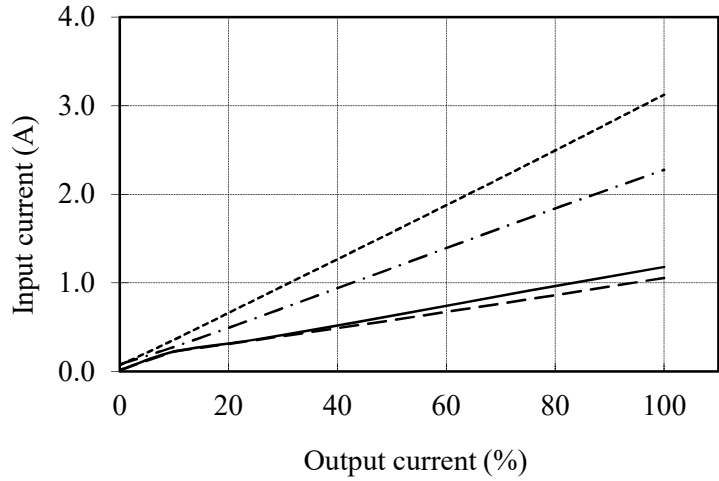


(3) Input current vs. Output current

Conditions Vin : 85VAC -----
 : 115VAC -.-.-.-
 : 230VAC ————
 : 264VAC - - - -
 Ta : 25°C

24V

Vin	Input current
	Iout : 0%
85VAC	0.071A
115VAC	0.081A
230VAC	0.014A
264VAC	0.016A



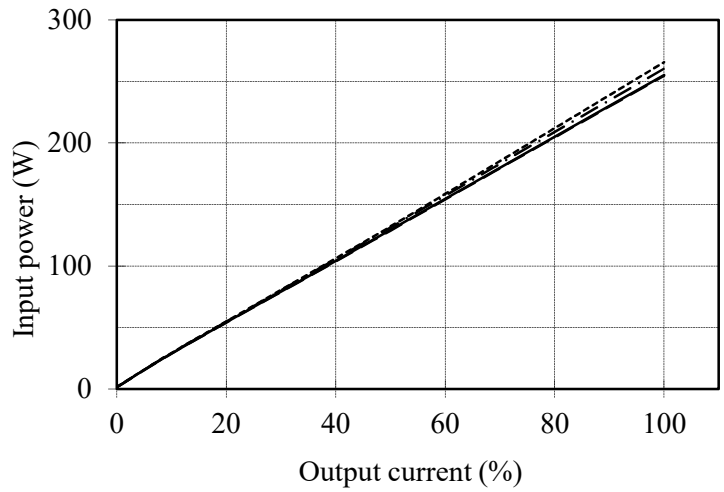
DRB240-24-1

(4) Input power vs. Output current

Conditions Vin: 85VAC -----
: 115VAC -.-.-.-
: 230VAC ————
: 264VAC - - - -
Ta: 25°C

24V

Vin	Input power
	Iout : 0%
85VAC	1.68W
115VAC	1.64W
230VAC	1.60W
264VAC	1.58W

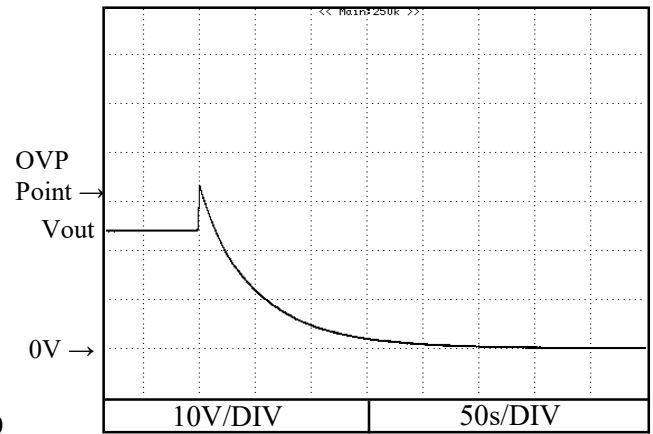
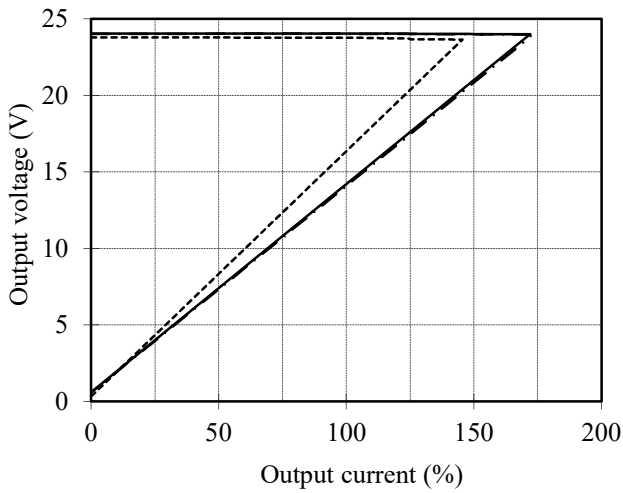


2.2 Over current protection (OCP) characteristics 2.3 Over voltage protection (OVP) characteristics

Conditions Vin : 115VAC
 Ta : -25°C -----
 25°C -.-.-.-
 55°C _____

Conditions Vin : 115VAC
 Iout : 0%
 Ta : 25°C

24V



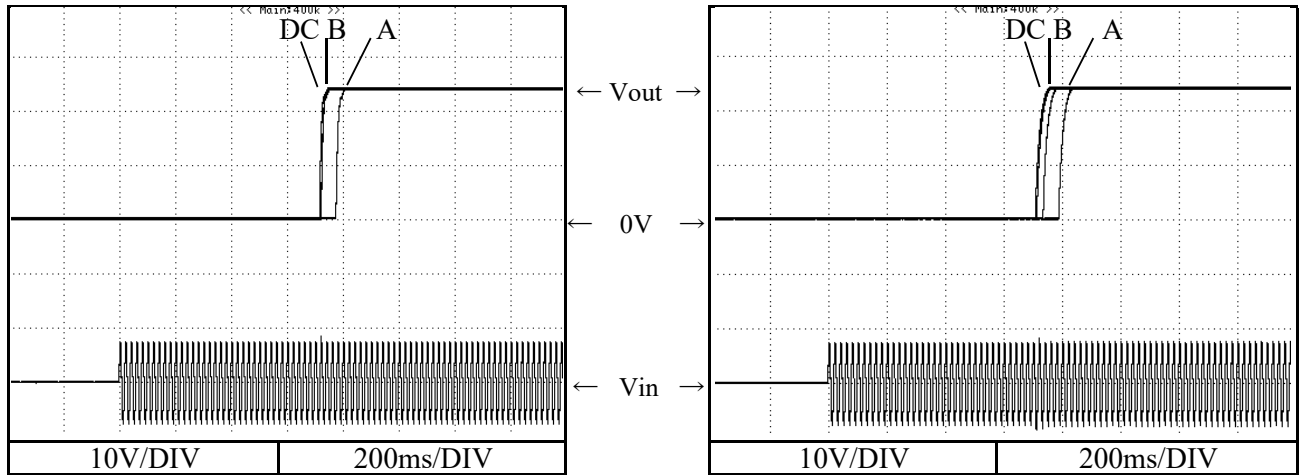
2.4 Output rise characteristics

Conditions Vin: 85VAC (A)
: 115VAC (B)
: 230VAC (C)
: 264VAC (D)
Ta: 25°C

24V

Iout : 0%

Iout : 100%



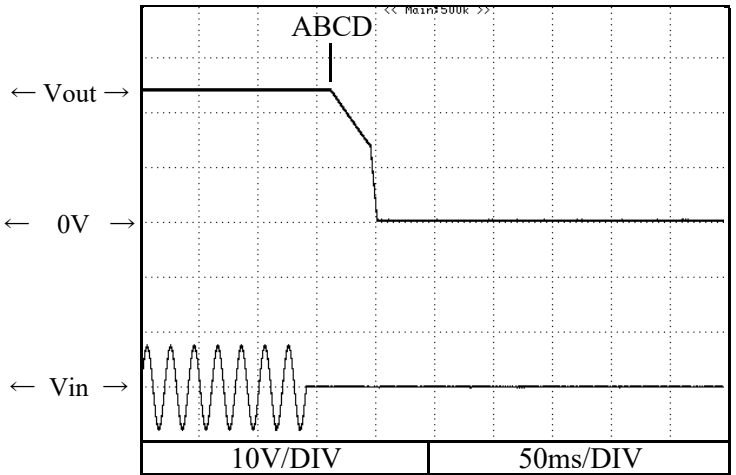
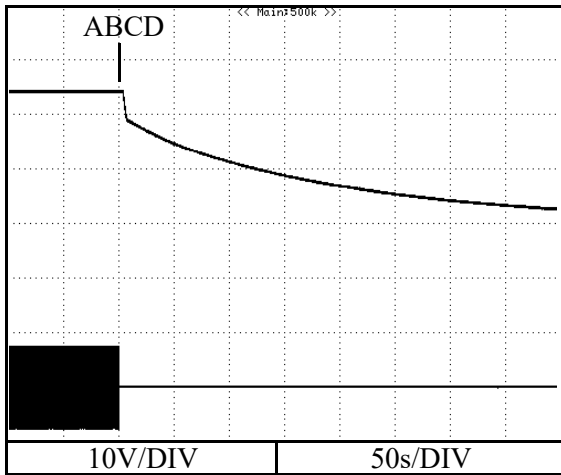
2.5 Output fall characteristics

Conditions Vin: 85VAC (A)
 : 115VAC (B)
 : 230VAC (C)
 : 264VAC (D)
 Ta: 25°C

24V

Iout : 0%

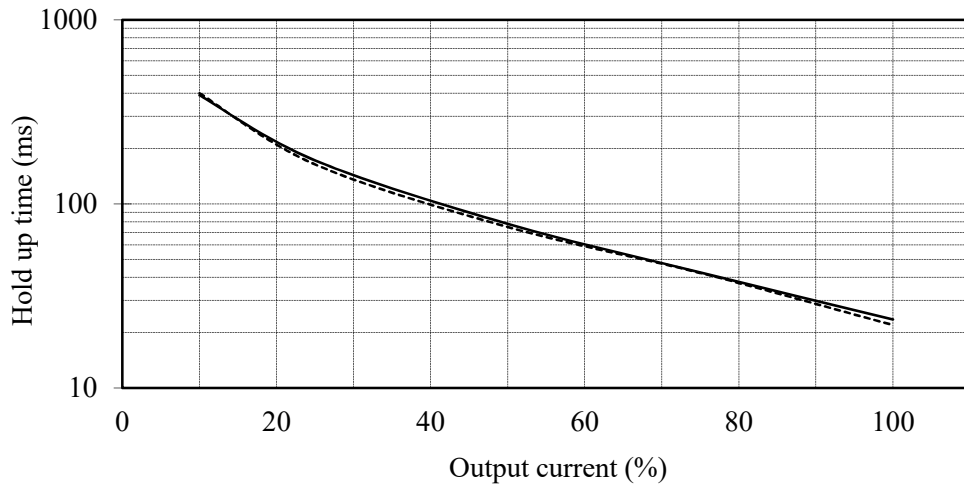
Iout : 100%



2.6 Hold up time characteristics

Conditions Vin : 115VAC -----
 230VAC —
 Ta : 25°C

24V



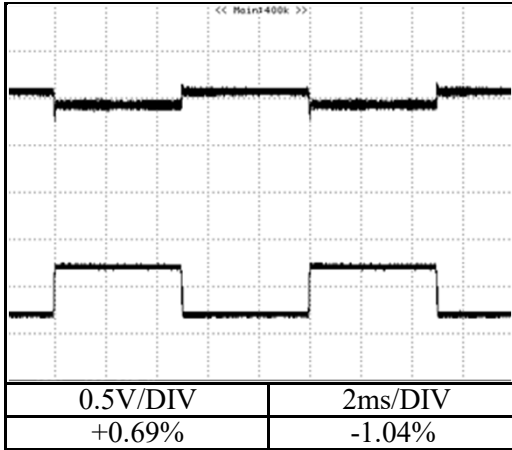
2.7 Dynamic load response characteristics

Conditions Vin : 115VAC
 Iout : 25% ↔ 75%
 (tr = tf = 50us)
 Ta : 25°C

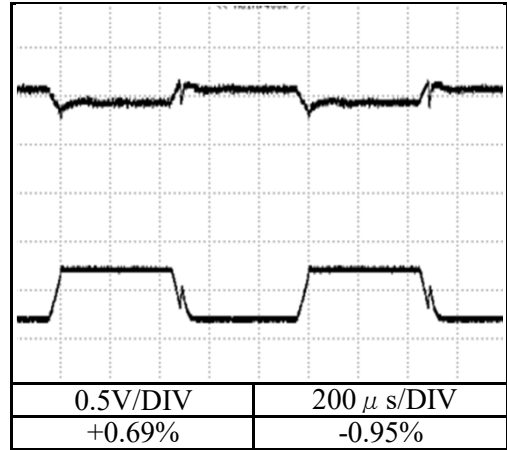
24V

f = 100Hz

f = 1kHz



← Vout →
 ← Iout →
 ← Iout:0% →

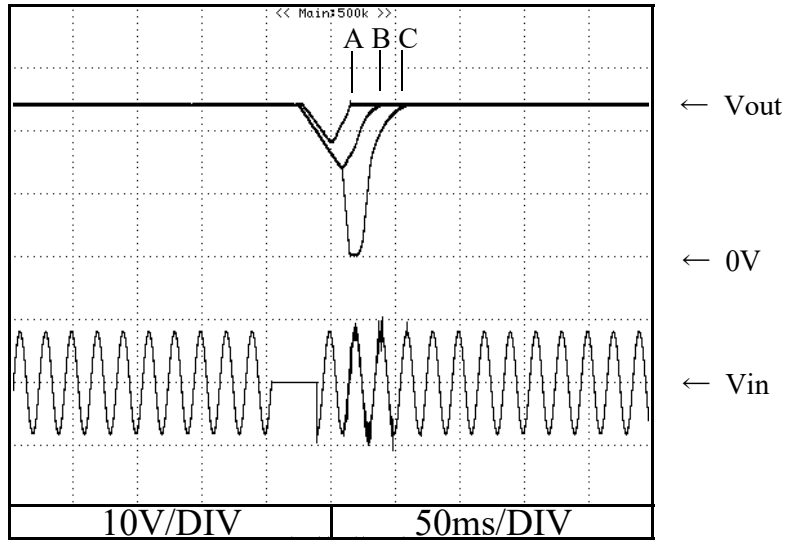


2.8 Response to brown out characteristics

Conditions Vin : 115VAC
Iout : 100%
Ta : 25°C

24V

A = 23ms
B = 34ms
C = 35ms

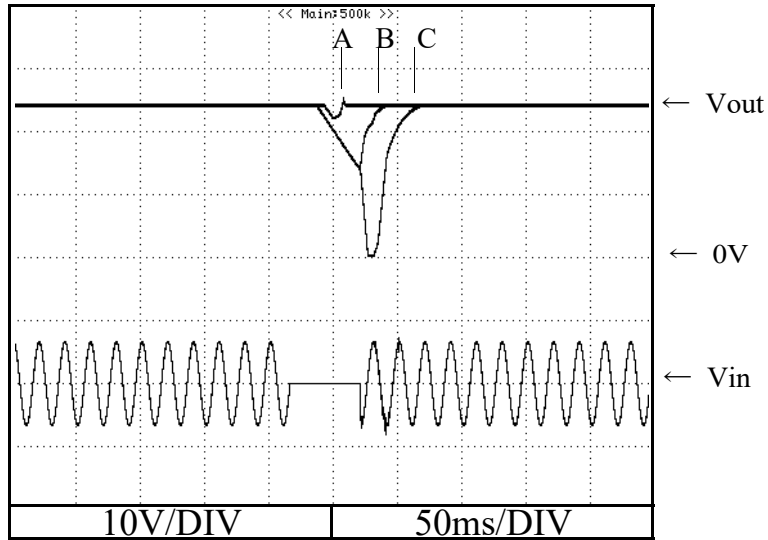


2.8 Response to brown out characteristics

Conditions Vin : 230VAC
Iout : 100%
Ta : 25°C

24V

A = 27ms
B = 54ms
C = 55ms

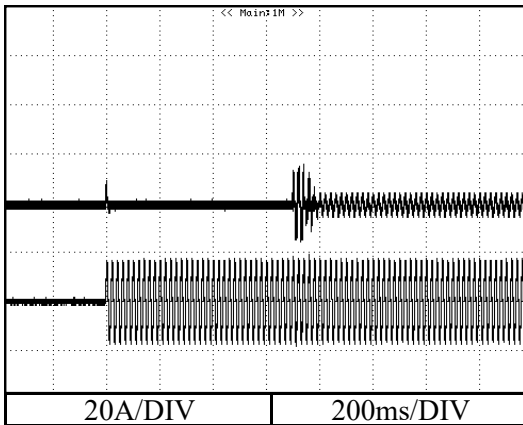


2.9 Inrush current waveform

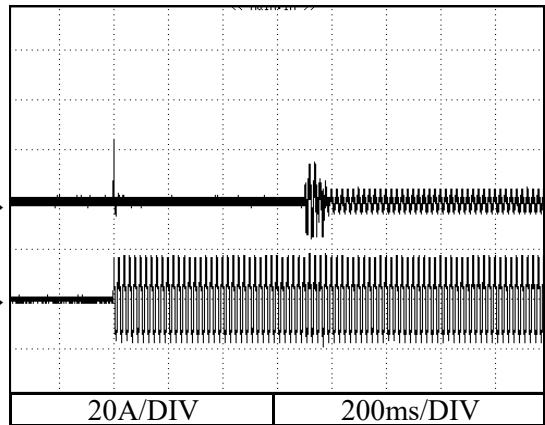
24V

Conditions V_{in} : 115VAC
 I_{out} : 100%
 T_a : 25°C

Switch on phase angle of input AC voltage
 $\phi = 0^\circ$

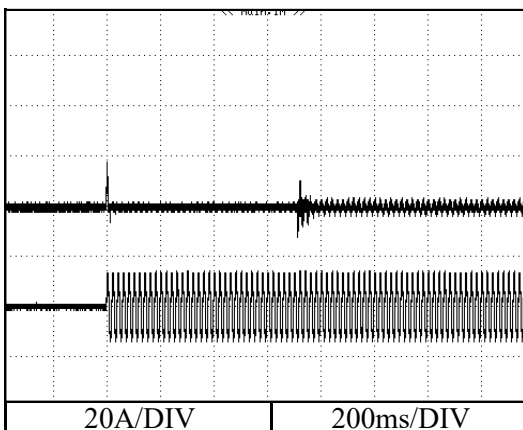


Switch on phase angle of input AC voltage
 $\phi = 90^\circ$

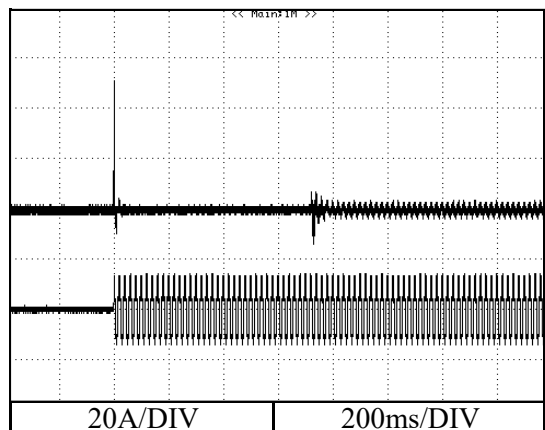


Conditions V_{in} : 230VAC
 I_{out} : 100%
 T_a : 25°C

Switch on phase angle of input AC voltage
 $\phi = 0^\circ$



Switch on phase angle of input AC voltage
 $\phi = 90^\circ$

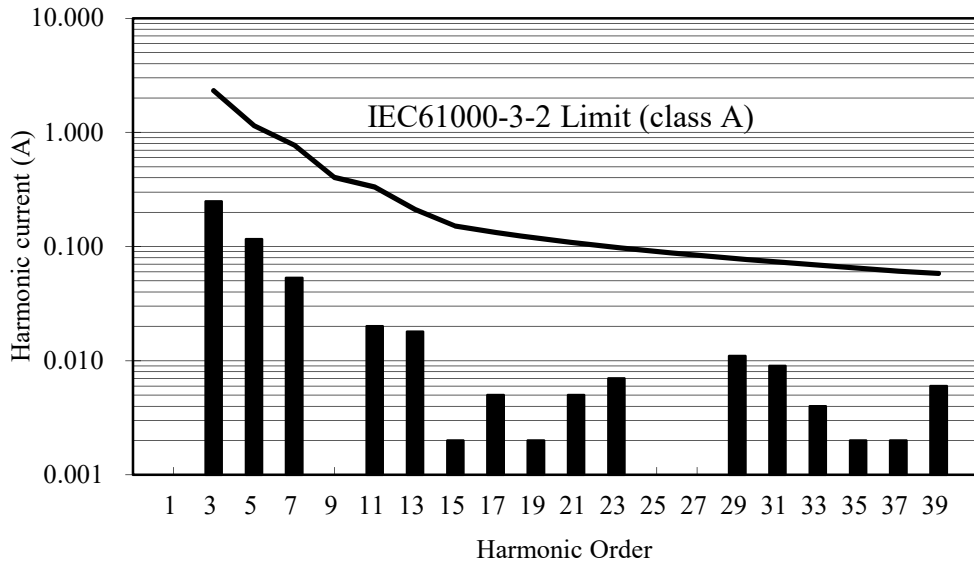


2.10 Input current harmonics

Conditions Iout : 100%
Ta : 25°C

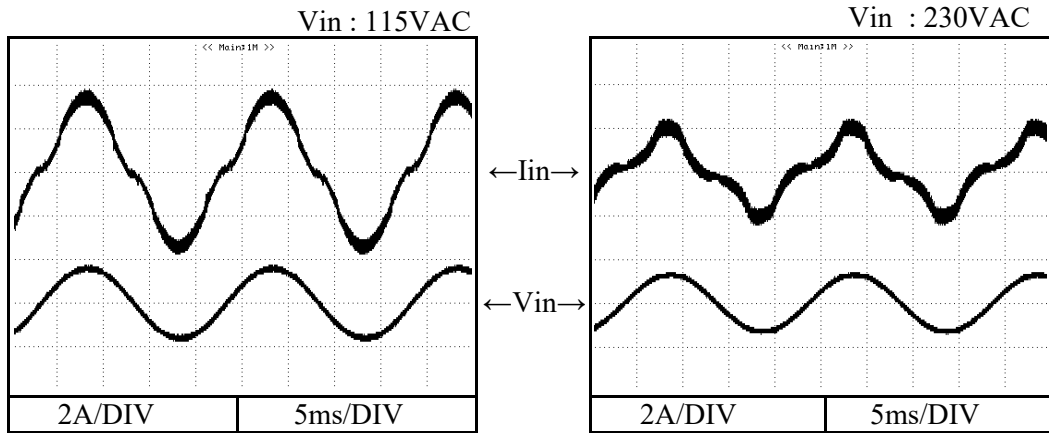
24V

Vin : 115VAC



2.11 Input current waveform

Conditions Iout : 100%
Ta : 25°C

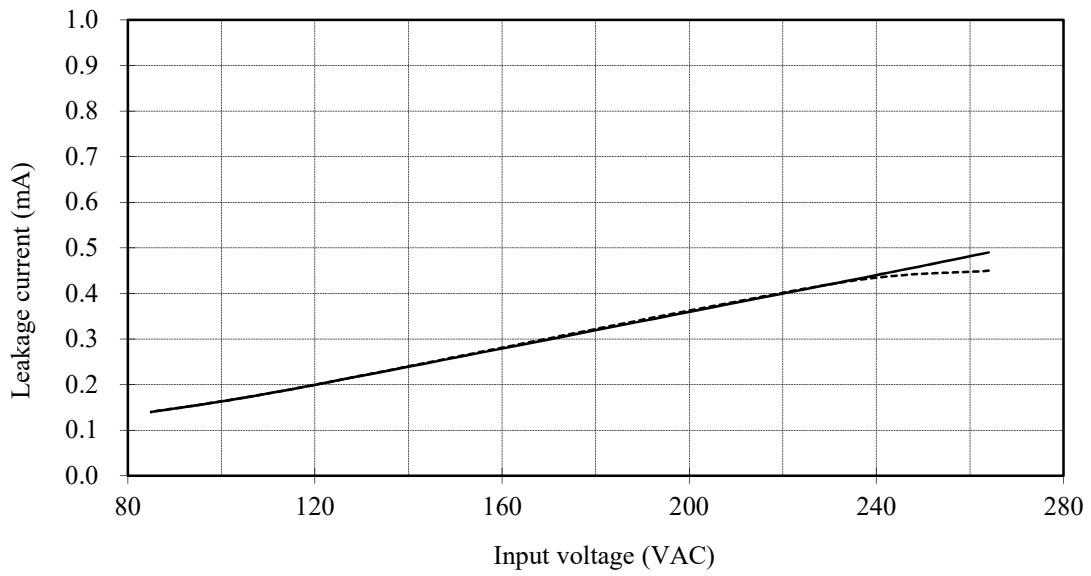


2.12 Leakage current characteristics

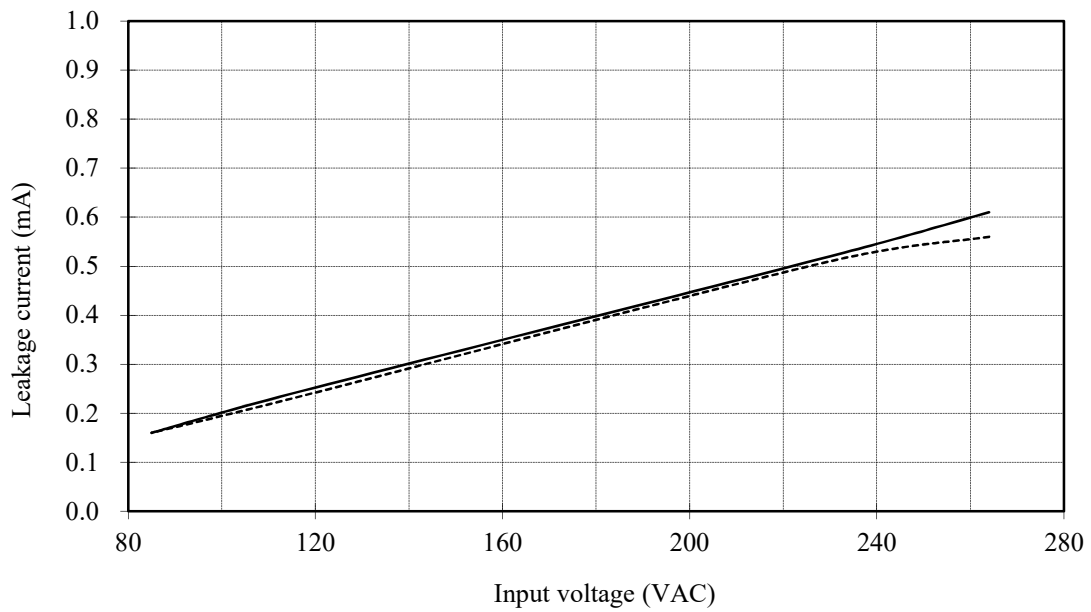
Conditions Iout : 0% -----
100% ———
Ta : 25°C

24V

f : 50Hz



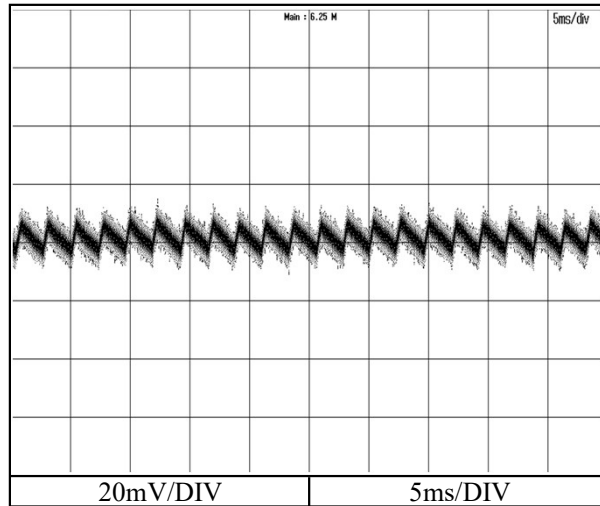
f : 60Hz



2.13 Output ripple and noise waveform

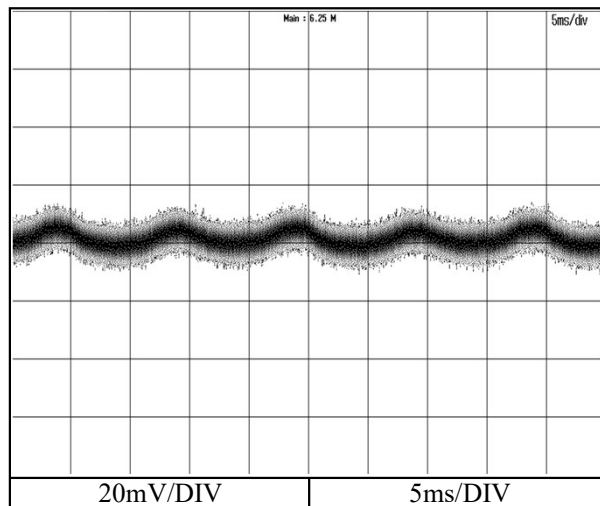
Conditions Vin : 115VAC
Iout : 0%
Ta : 25°C

24V



Conditions Vin : 115VAC
Iout : 100%
Ta : 25°C

24V



2.14 Electro-Magnetic Interference characteristics

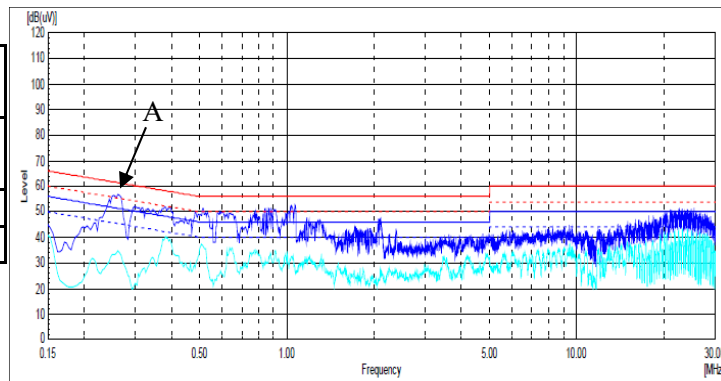
Conditions Vin : 230VAC
 Iout : 100%
 Ta : 25°C
 QP Limit : — (red line)
 AVE Limit : — (blue line)

Conducted Emission

24V

LIVE

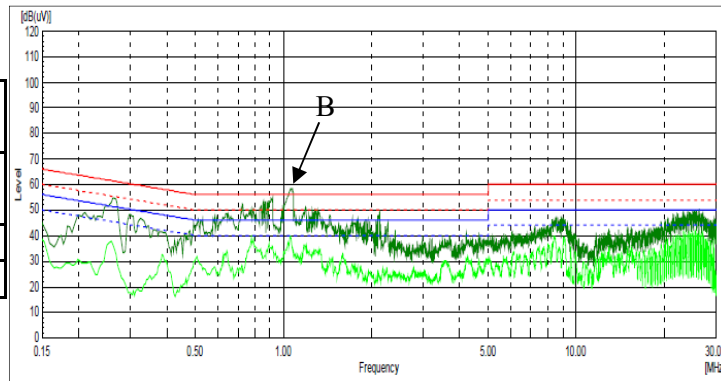
Point A (0.258MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	61.5	54.8
AV	51.5	41.5



EN55032-B
QP Limit
 EN55032-B
AV Limit

NEUTRAL

Point B (1.168MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	56	49.2
AV	46	32.6



EN55032-B
QP Limit
 EN55032-B
AV Limit

2.15 Electro-Magnetic Interference characteristics

Conditions V_{in} : 230VAC
 I_{out} : 100%
 T_a : 25°C
 Horizontal : — (orange)
 Vertical : — (blue)

Radiated Emission

24V

Point A (274.78MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	37.0	27.0

