HWS15A

EVALUATION DATA

型式データ

INDEX

2. 特性データ　Characteristics

使用記号　Terminology used

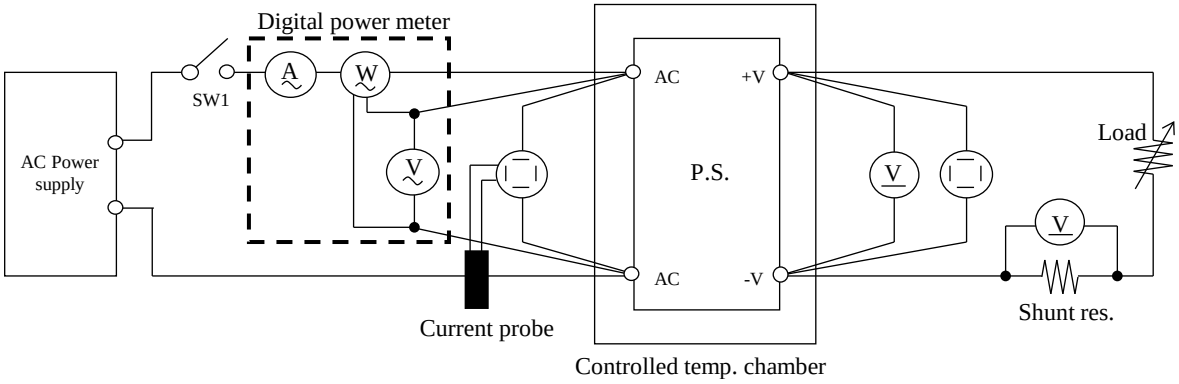
	定義 Definition		
Vin	.....	入力電圧	Input voltage
Vout	.....	出力電圧	Output voltage
Iin	.....	入力電流	Input current
Iout	.....	出力電流	Output current
Ta	.....	周囲温度	Ambient temperature
f	.....	周波数	Frequency

1. 測定方法 Evaluation Method

1.1 測定回路 Circuit used for determination

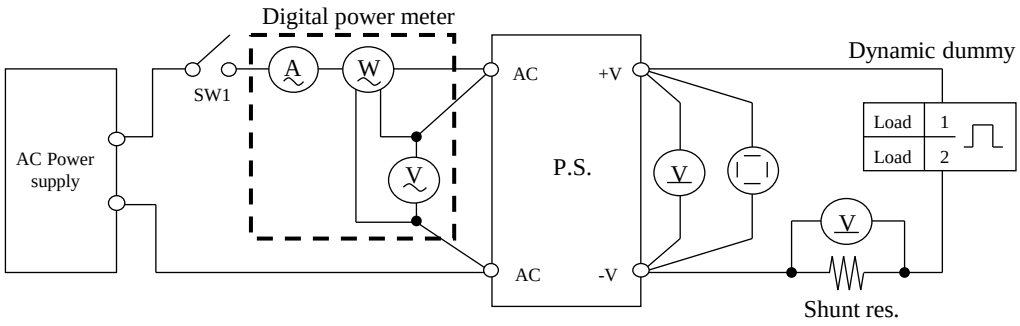
測定回路1 Circuit 1 used for determination

- ・静特性 Steady state data
- ・通電ドリフト特性 Warm up voltage drift characteristics
- ・出力保持時間特性 Hold up time characteristics
- ・出力立ち上がり特性 Output rise characteristics
- ・出力立ち下がり特性 Output fall characteristics
- ・過電流保護特性 Over current protection (OCP) characteristics
- ・過電圧保護特性 Over voltage protection (OVP) characteristics
- ・過渡応答(入力急変)特性 Dynamic line response characteristics
- ・入力電圧瞬停特性 Response to brown out characteristics
- ・入力電流波形 Input current waveform

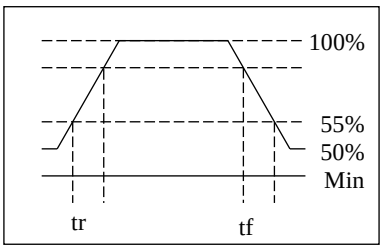


測定回路2 Circuit 2 used for determination

- ・過渡応答(負荷急変)特性 Dynamic load response characteristics

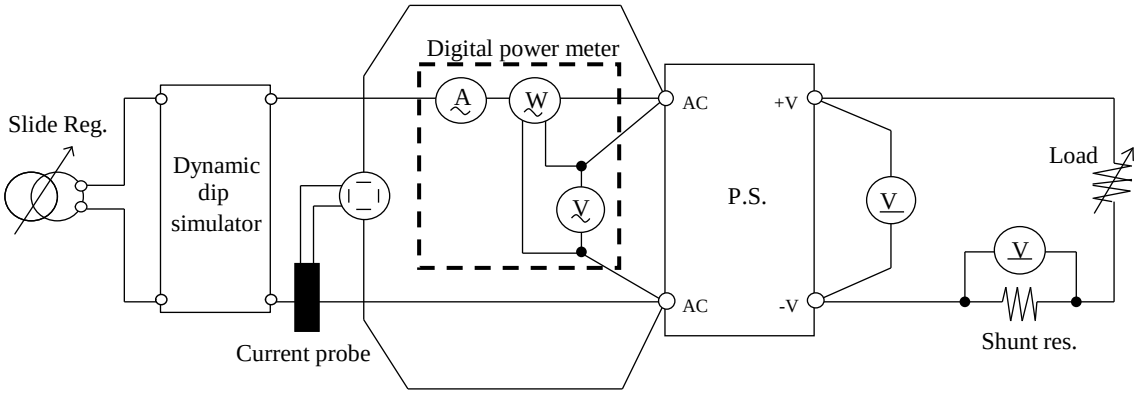


Output current waveform



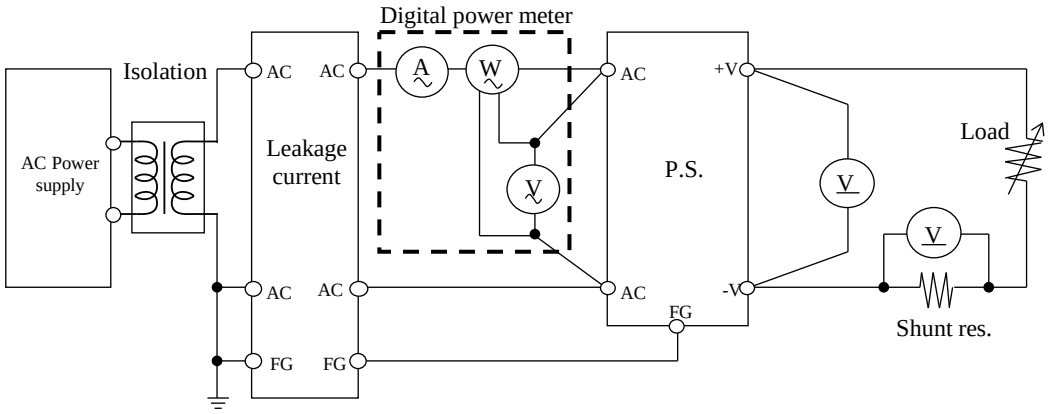
測定回路3 Circuit 3 used for determination

・入力サージ電流（突入電流）波形　Inrush current waveform



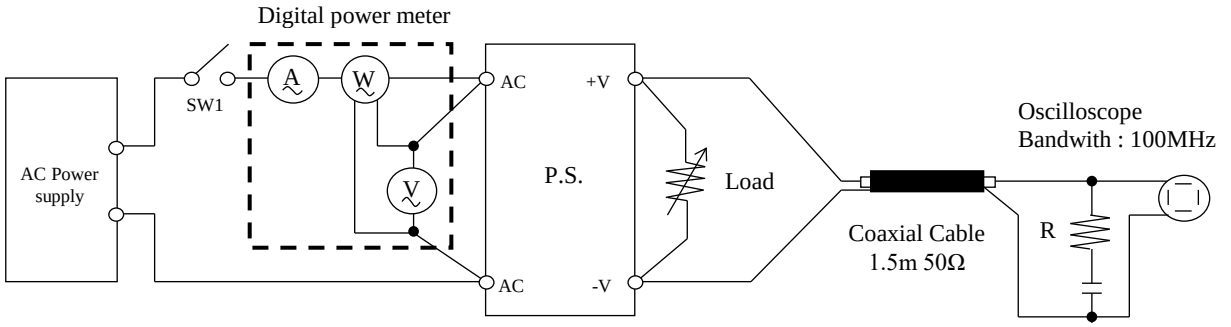
測定回路4 Circuit 4 used for determination

・リーク電流特性　Leakage current characteristics



測定回路5 Circuit 5 used for determination

・出力リップル、ノイズ波形　　Output ripple and noise waveform

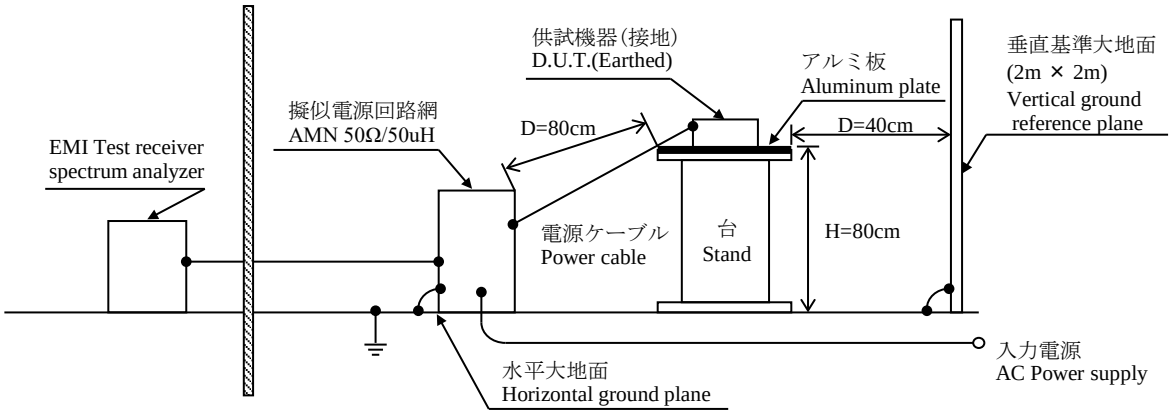


R ：50Ω
C1 : 4700pF Ceramic cap.

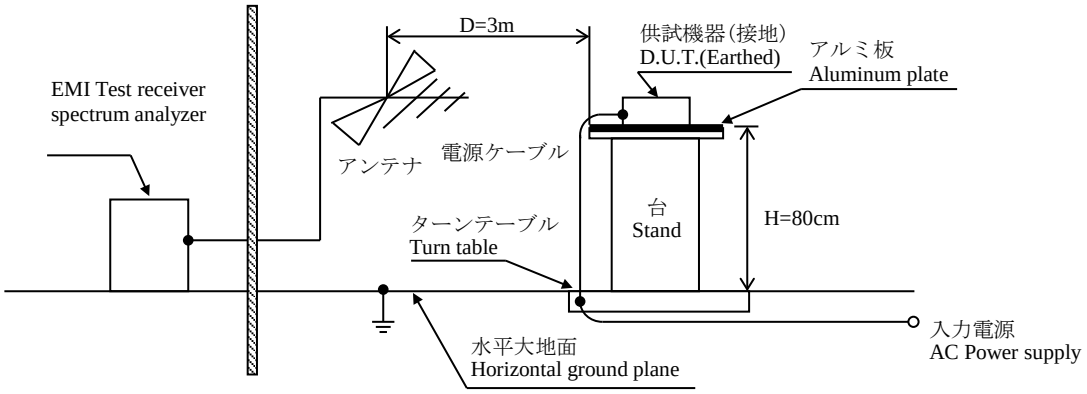
測定構成 Configuration used for determination

・EMI特性　Electro-Magnetic Interference characteristics

(a) 雑音端子電圧（帰還ノイズ）
Conducted Emission



(b) 雑音電界強度（放射ノイズ）
Radiated Emission



1.2 使用測定機器　　List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DL9040L / DLM2054
2	DIGITAL MULTIMETER	AGILENT	34970A
3	DIGITAL POWER METER	HIOKI	3334
4	DIGITAL POWER METER	YOKOGAWA ELECT.	WT110 / WT210
5	CURRENT PROBE	YOKOGAWA ELECT.	701928 / 701930
6	DYNAMIC DUMMY LOAD	TAKASAGO	FK-400L / FK-600L
7	DYNAMIC DUMMY LOAD	KIKUSUI	PLZ1004W / PLZ150U
8	DUMMY LOAD	PCN	PHF250 SERIES
9	ISOLATION TRANS	MATSUNAGA	3WTC-50K
10	CVCF	TAKASAGO	AA2000XG
11	CVCF	KIKUSUI	PCR4000L
12	CVCF	NF	ES10000S
13	LEAKAGE CURRENT METER	HIOKI	3156
14	DYNAMIC DIP SIMULATOR	TAKAMISAWA	PSA-210
15	CONTROLLED TEMP. CHAMBER	ESPEC	SU-261 / SH-240
16	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESCI
17	PRE AMP.	SONOMA	310N
18	AMN	SCHWARZBECK	NNLK8121
19	ANTENNA	SCHWARZBECK	CBL6111D
20	HARMONIC / FLICKER ANALYZER	KIKUSUI	KHA1000
21	SINGLE-PHASE MASTER	NF	4420
22	REFERENCE IMPEDANCE NETWORK 20A	NF	4150
23	MULTI OUTLET UNIT	KIKUSUI	OT01-KHA

2.1 静特性　　Steady state data

(1) 入力・負荷・温度変動／出力起動・遮断電圧

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

5V

1. Regulation - line and load　　Condition　Ta：　25 ℃

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	5.010V	5.010V	5.010V	5.010V	0mV	0.000%
50%	5.008V	5.008V	5.008V	5.008V	0mV	0.000%
100%	5.006V	5.006V	5.006V	5.006V	0mV	0.000%
load regulation	4mV	4mV	4mV	4mV		
	0.080%	0.080%	0.080%	0.080%		

2. Temperature drift　　Conditions　Vin：100 VAC
Iout：100 %

Ta	-10℃	+25℃	+50℃	temperature stability	
Vout	5.006V	5.006V	5.002V	4mV	0.080%

3. Start up voltage and Drop out voltage　　Conditions　Ta：　25 ℃
Iout：100 %

Start up voltage (Vin)	76VAC
Drop out voltage (Vin)	51VAC

12V

1. Regulation - line and load　　Condition　Ta：　25 ℃

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	12.006V	12.006V	12.006V	12.006V	0mV	0.000%
50%	12.004V	12.004V	12.004V	12.004V	0mV	0.000%
100%	12.003V	12.003V	12.003V	12.003V	0mV	0.000%
load regulation	3mV	3mV	3mV	3mV		
	0.025%	0.025%	0.025%	0.025%		

2. Temperature drift　　Conditions　Vin：100 VAC
Iout：100 %

Ta	-10℃	+25℃	+50℃	temperature stability	
Vout	12.004V	12.003V	12.000V	4mV	0.033%

3. Start up voltage and Drop out voltage　　Conditions　Ta：　25 ℃
Iout：100 %

Start up voltage (Vin)	76VAC
Drop out voltage (Vin)	53VAC

24V

1. Regulation - line and load　　Condition　Ta：　25 ℃

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	24.007V	24.007V	24.007V	24.007V	0mV	0.000%
50%	24.004V	24.004V	24.004V	24.004V	0mV	0.000%
100%	24.003V	24.003V	24.002V	24.003V	1mV	0.004%
load regulation	4mV	4mV	5mV	4mV		
	0.017%	0.017%	0.021%	0.017%		

2. Temperature drift　　Conditions　Vin：100 VAC
Iout：100 %

Ta	-10℃	+25℃	+50℃	temperature stability	
Vout	24.054V	24.003V	23.977V	77mV	0.321%

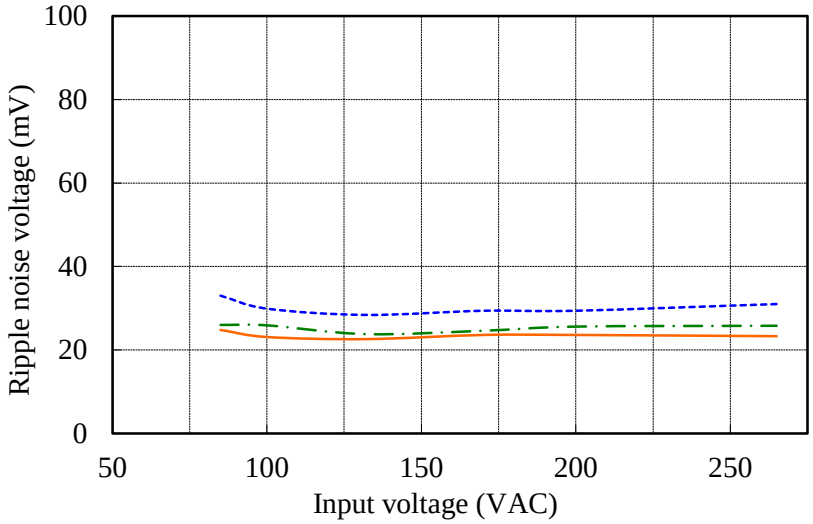
3. Start up voltage and Drop out voltage　　Conditions　Ta：　25 ℃
Iout：100 %

Start up voltage (Vin)	76VAC
Drop out voltage (Vin)	49VAC

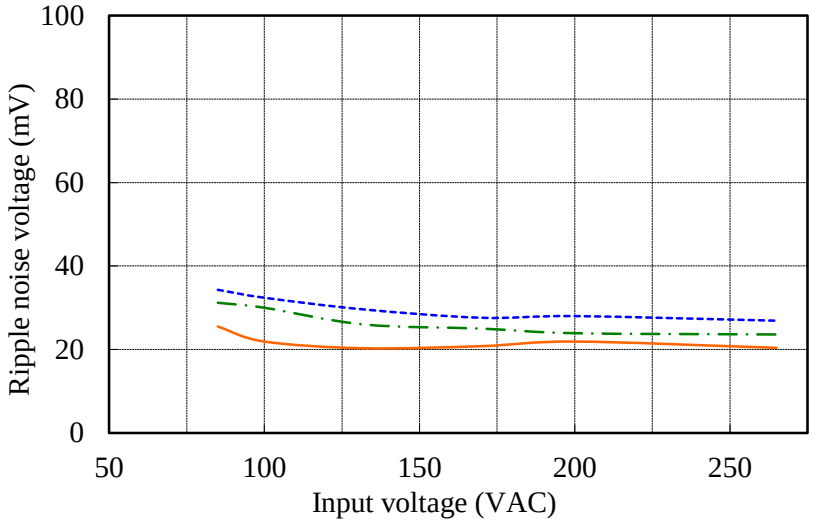
(2) リップルノイズ電圧対入力電圧
Ripple noise voltage vs. Input voltage

Conditions Iout: 100 %
Ta : -10 ℃
25 ℃
50 ℃

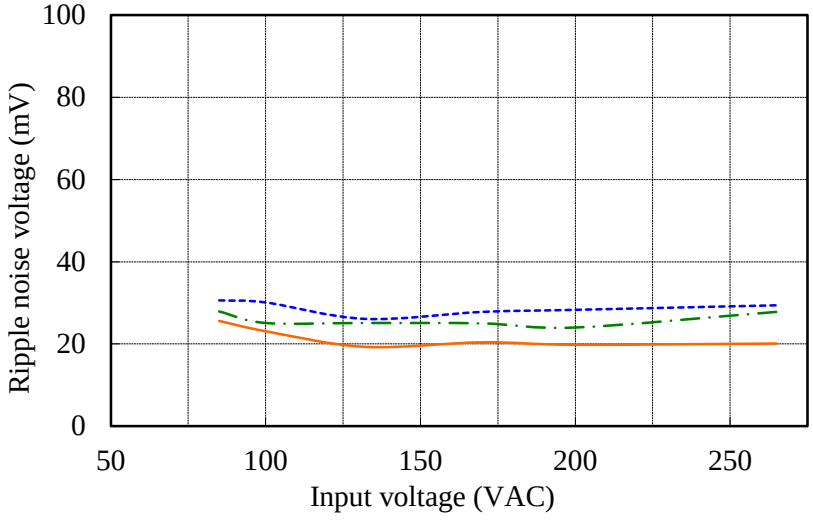
5V



12V



24V

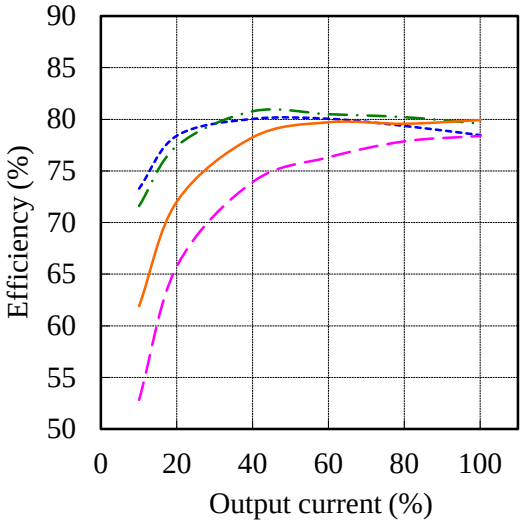


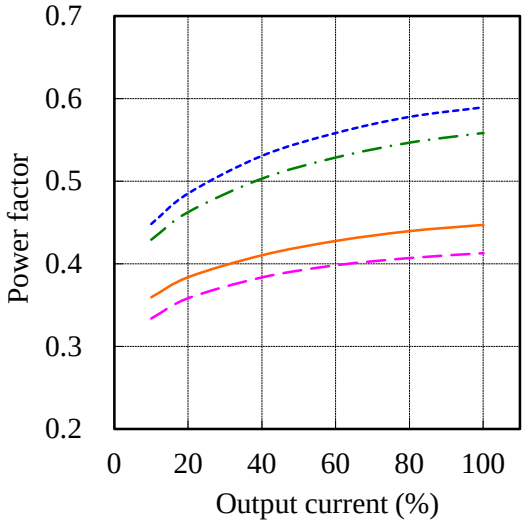
(3) 効率・力率対出力電流

Efficiency and Power factor vs. Output current

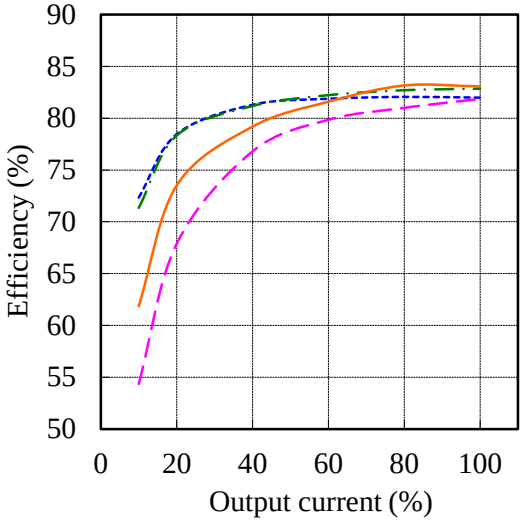
Conditions Vin : 85 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

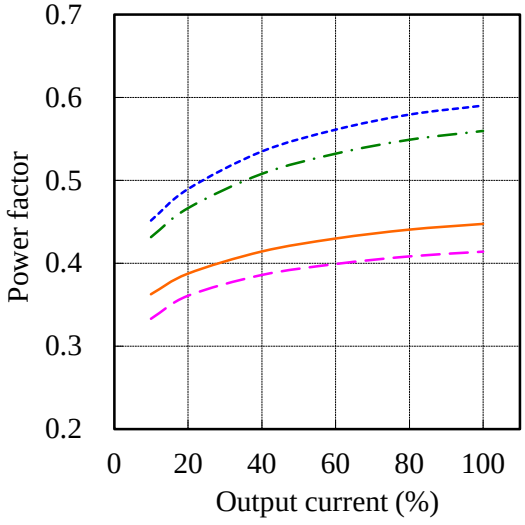
5V



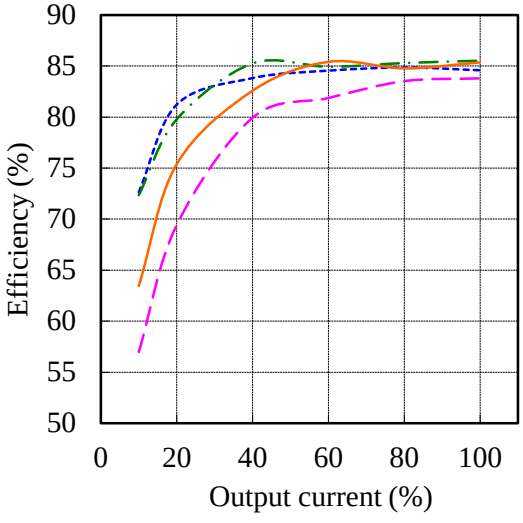


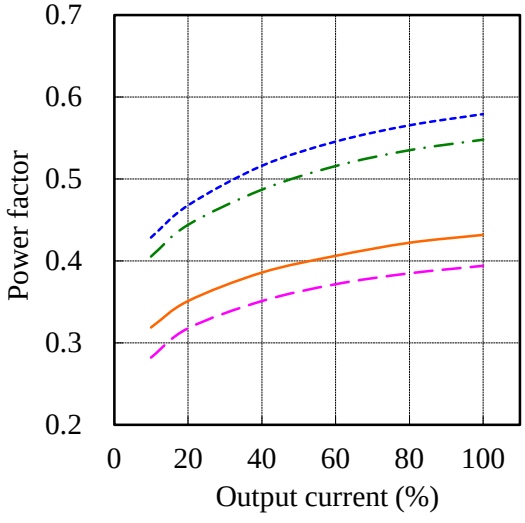
12V





24V



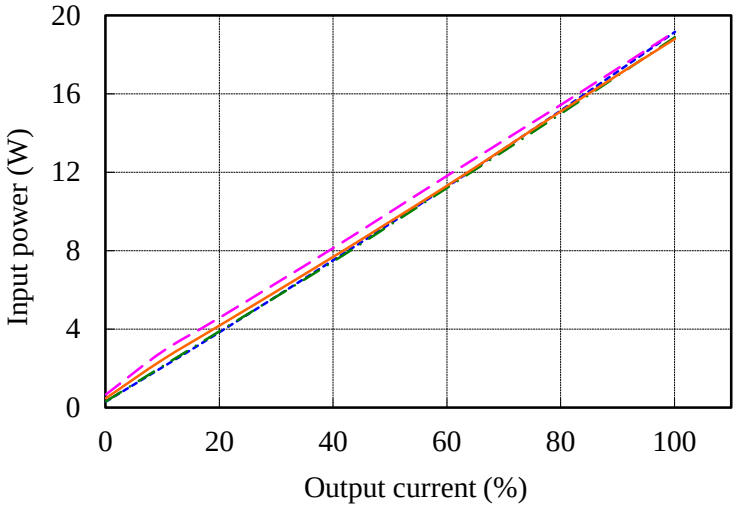


(4) 入力電力対出力電流
Input power vs. Output current

Conditions Vin : 85 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

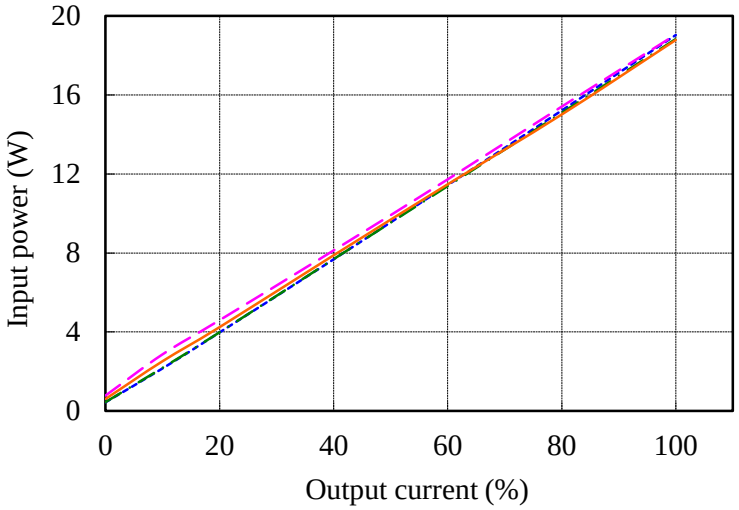
5V

Vin	Input power
	Iout : 0%
85VAC	0.3W
100VAC	0.3W
200VAC	0.5W
265VAC	0.7W



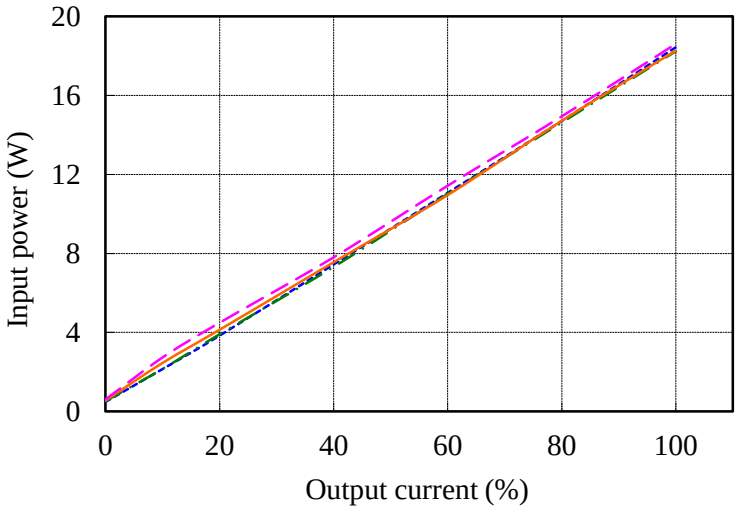
12V

Vin	Input power
	Iout : 0%
85VAC	0.4W
100VAC	0.5W
200VAC	0.6W
265VAC	0.8W



24V

Vin	Input power
	Iout : 0%
85VAC	0.5W
100VAC	0.5W
200VAC	0.6W
265VAC	0.6W

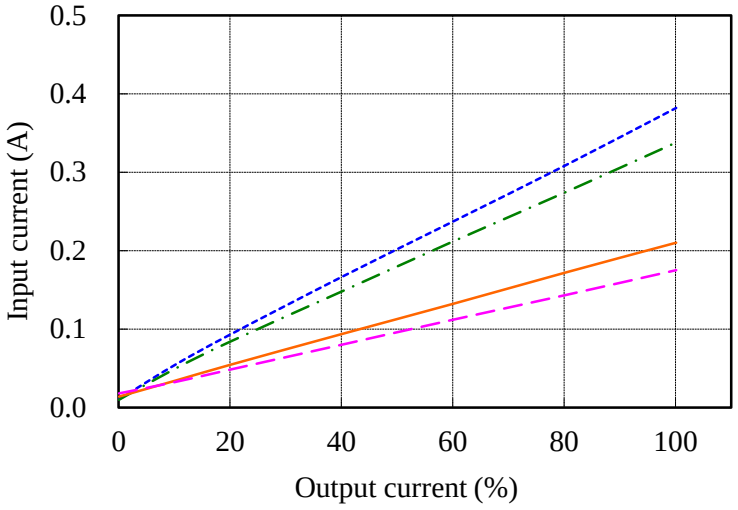


(5) 入力電流対出力電流
Input current vs. Output current

Conditions Vin : 85 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

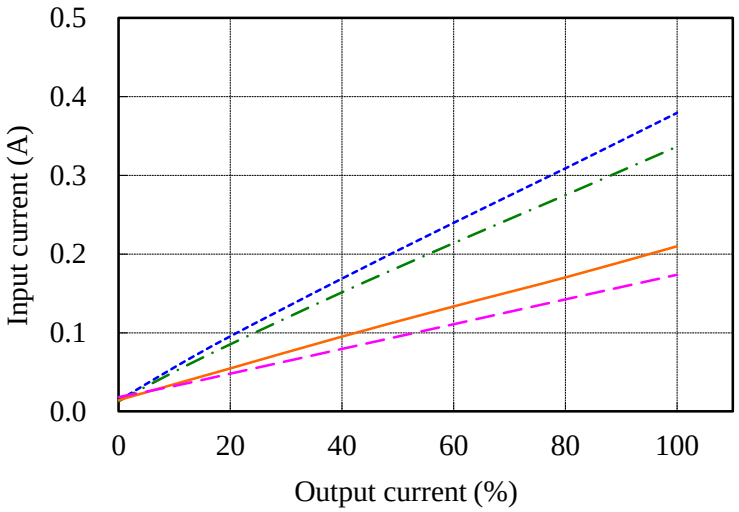
5V

Vin	Input current
	Iout : 0%
85VAC	0.01A
100VAC	0.01A
200VAC	0.01A
265VAC	0.02A



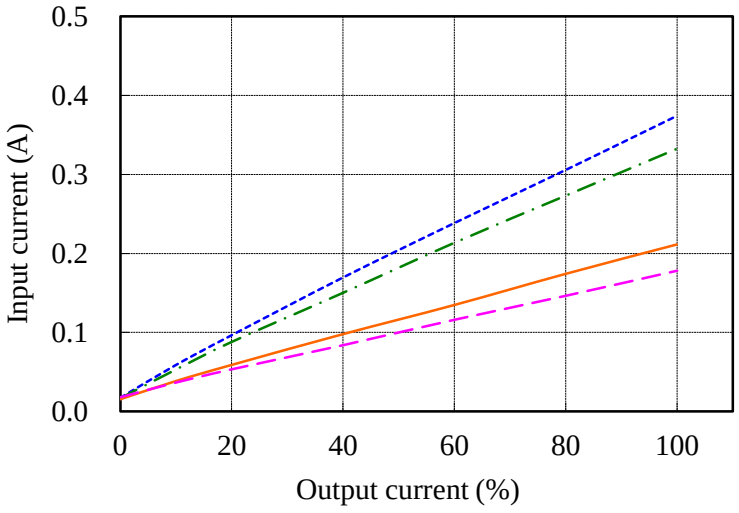
12V

Vin	Input current
	Iout : 0%
85VAC	0.01A
100VAC	0.01A
200VAC	0.01A
265VAC	0.02A



24V

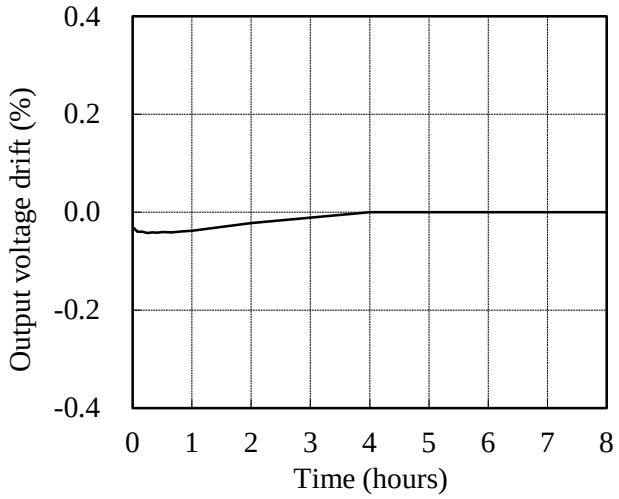
Vin	Input current
	Iout : 0%
85VAC	0.02A
100VAC	0.02A
200VAC	0.02A
265VAC	0.02A



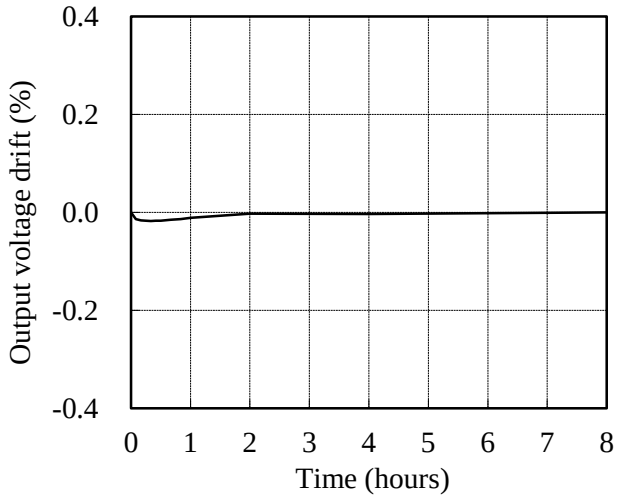
2.2 通電ドリフト特性
Warm up voltage drift characteristics

Conditions Vin : 100 VAC
Iout : 100 %
Ta : 25 ℃

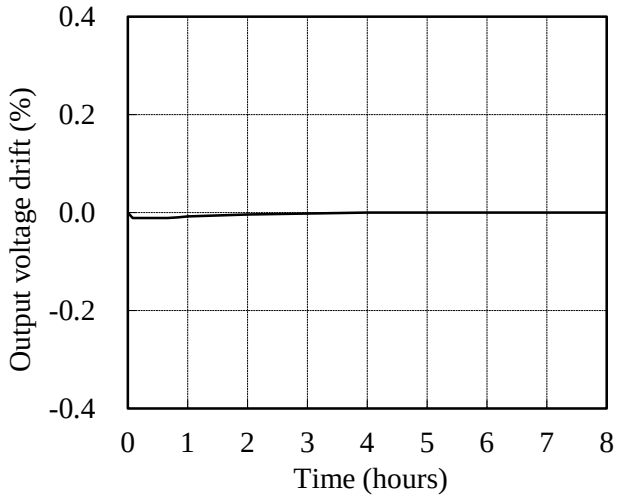
5V



12V

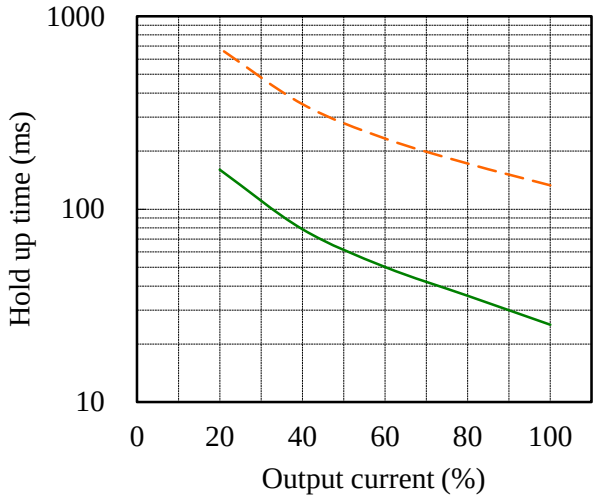


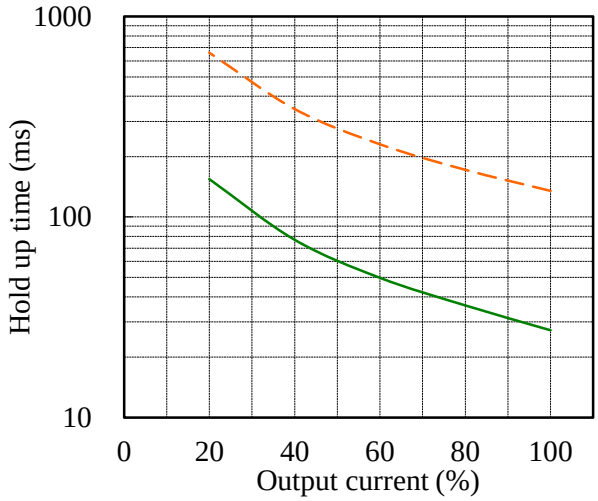
24V

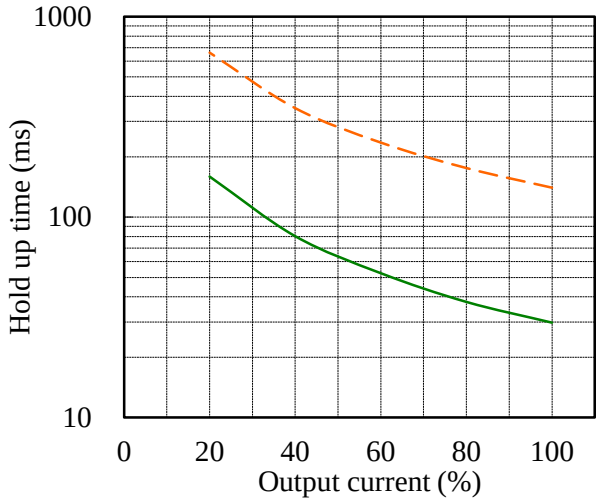


2.3 出力保持時間特性
Hold up time characteristics

Conditions Vin : 100 VAC
200 VAC
Ta : 25 ℃





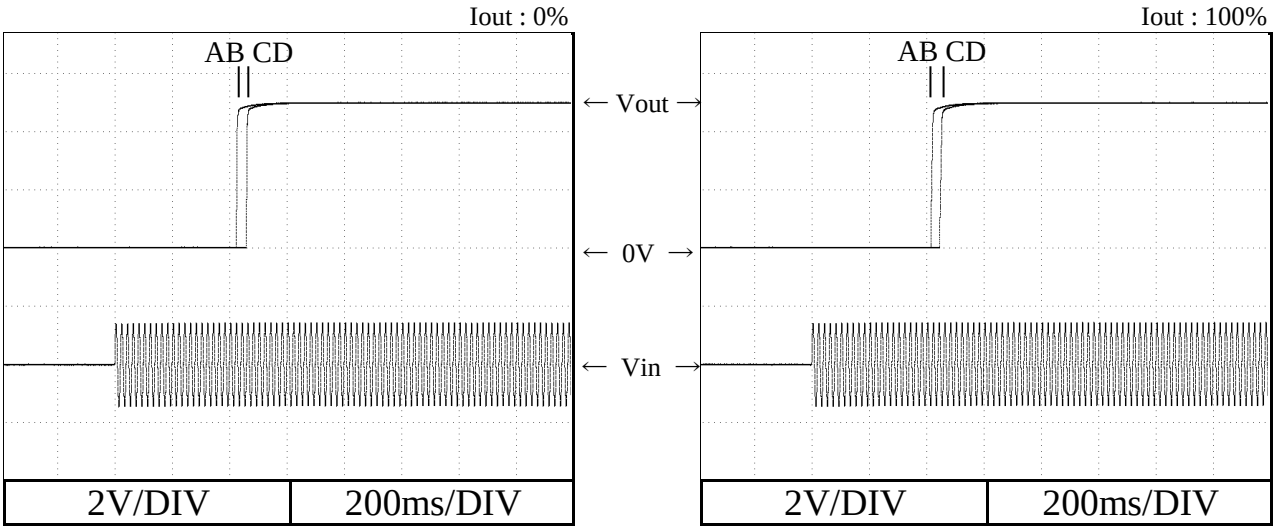


2.4 出力立ち上がり特性

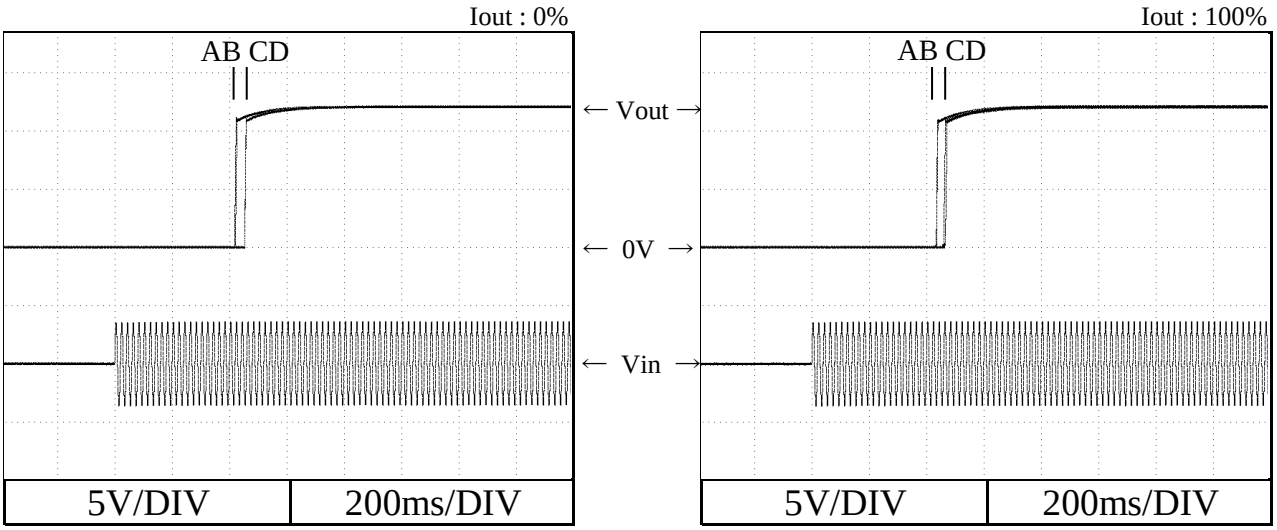
Output rise characteristics

Conditions Vin : 85 VAC (A)
100 VAC (B)
200 VAC (C)
265 VAC (D)
Ta : 25 ℃

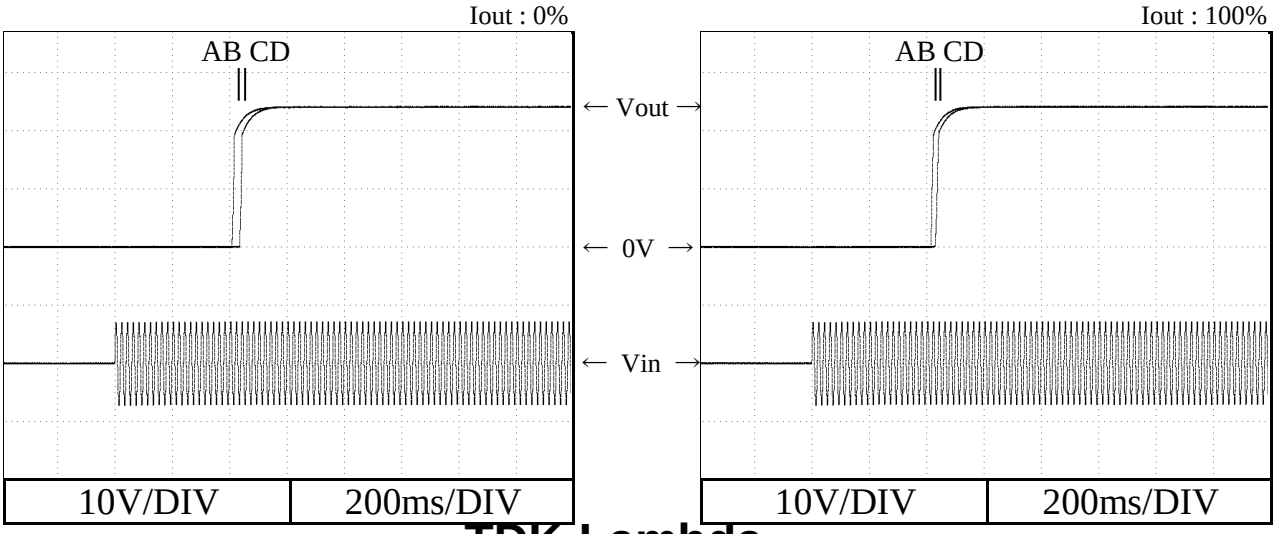
5V



12V



24V

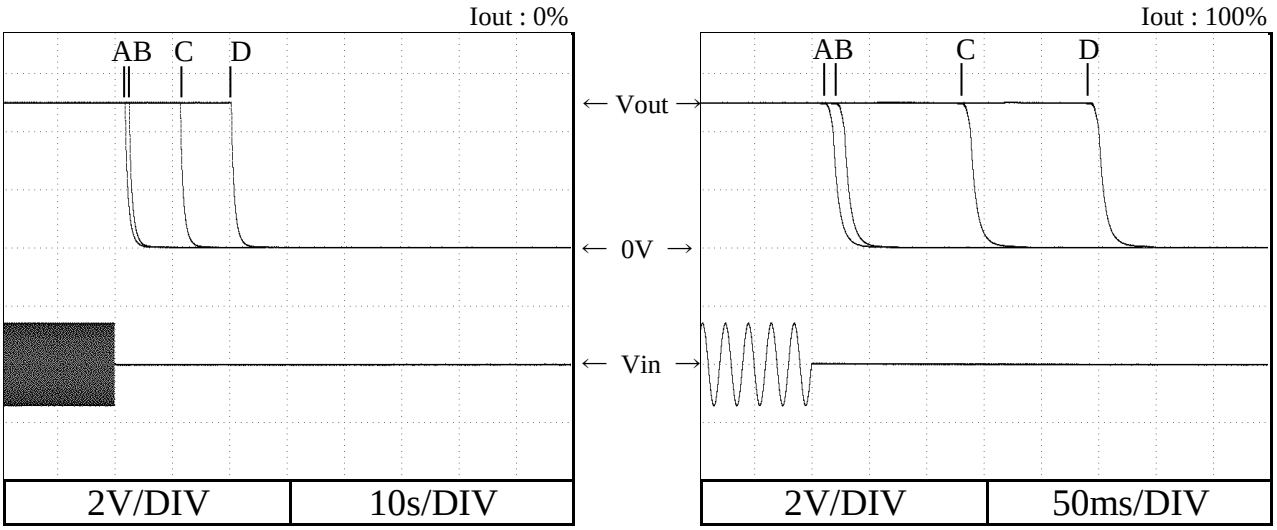


2.5 出力立ち下がり特性

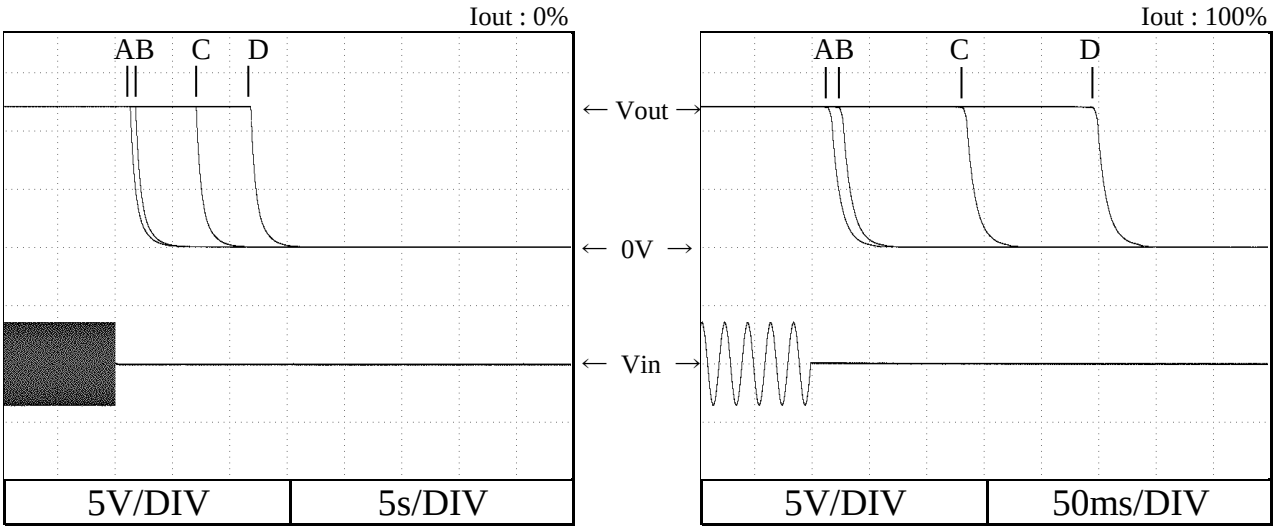
Output fall characteristics

Conditions Vin : 85 VAC (A)
100 VAC (B)
200 VAC (C)
265 VAC (D)
Ta : 25 ℃

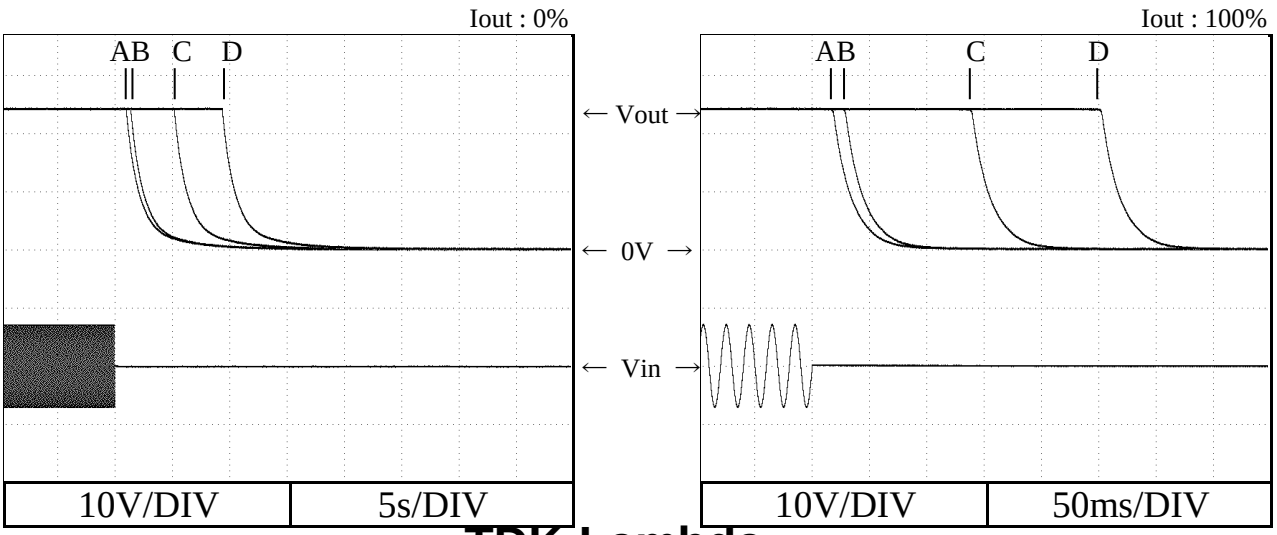
5V



12V



24V



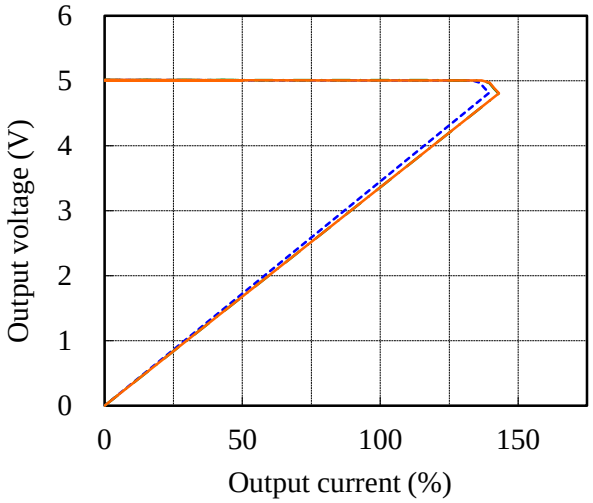
2.6 過電流保護特性

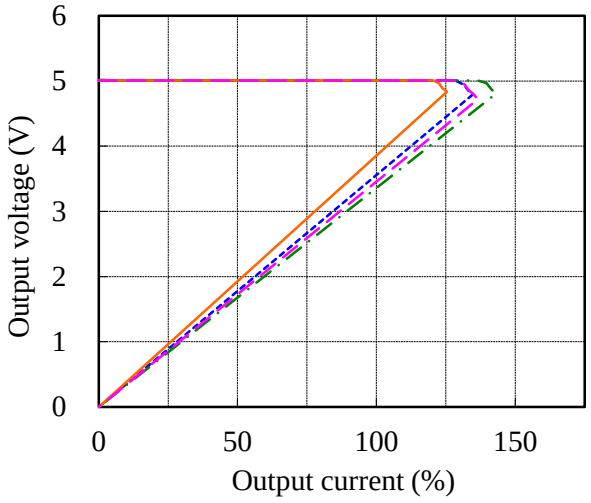
Over current protection (OCP) characteristics

Conditions Vin : 100 VAC
Ta : -10 ℃
25 ℃
50 ℃

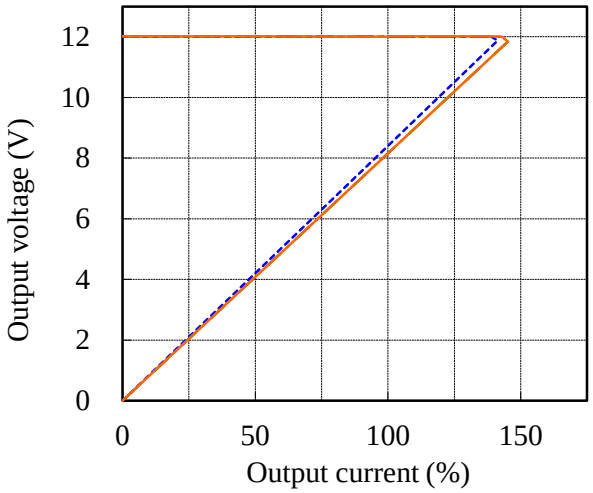
Conditions Vin : 85 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

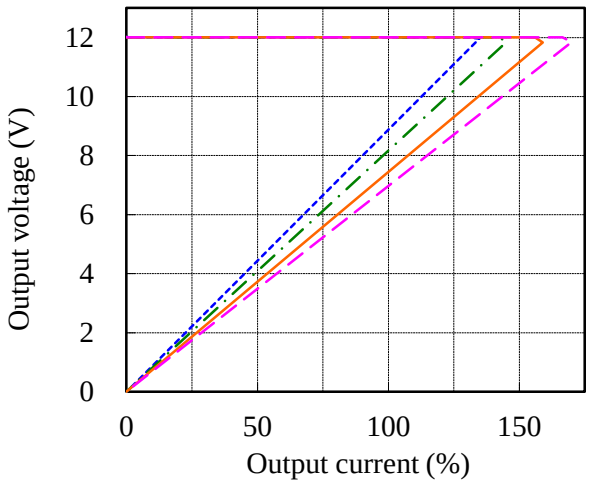
5V



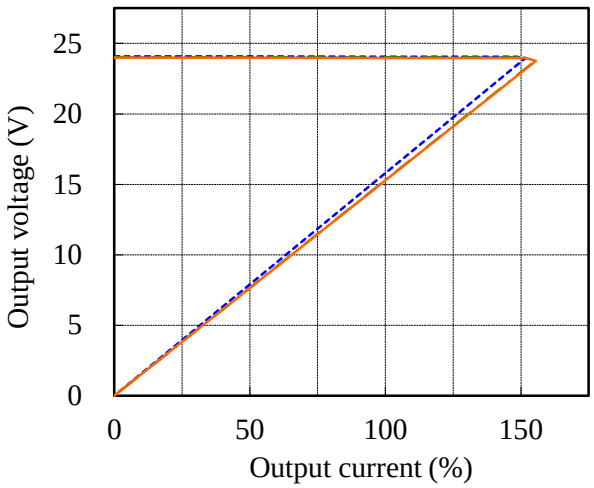


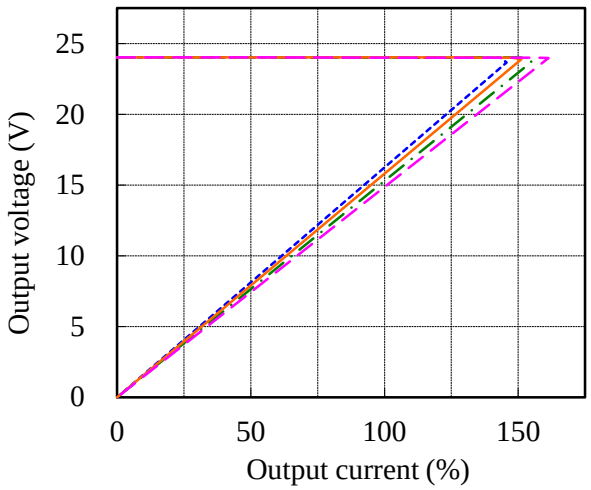
12V





24V



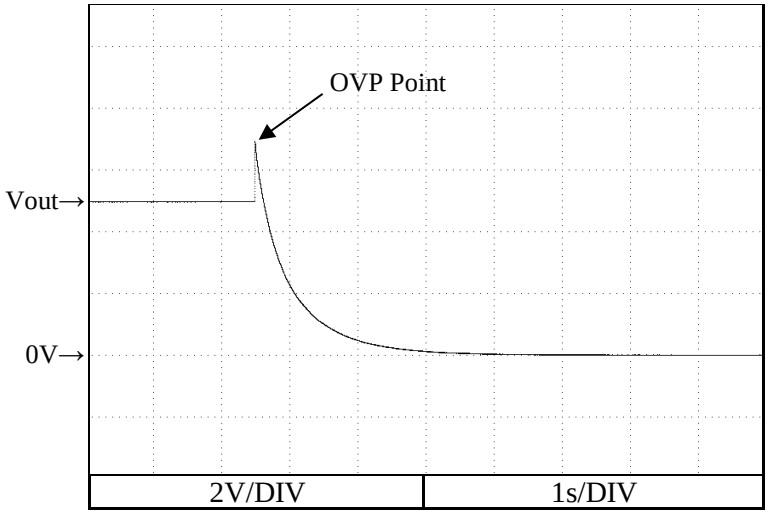


2.7 過電圧保護特性

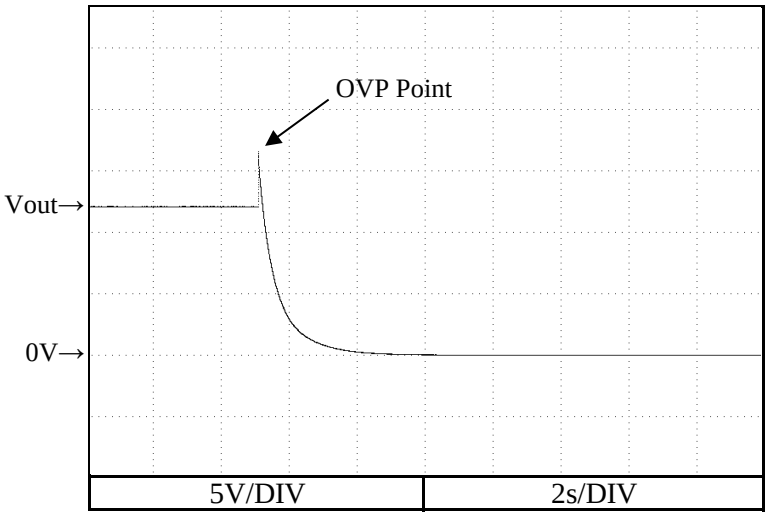
Over voltage protection (OVP) characteristics

Conditions Vin : 100 VAC
Iout : 0 %
Ta : 25 ℃

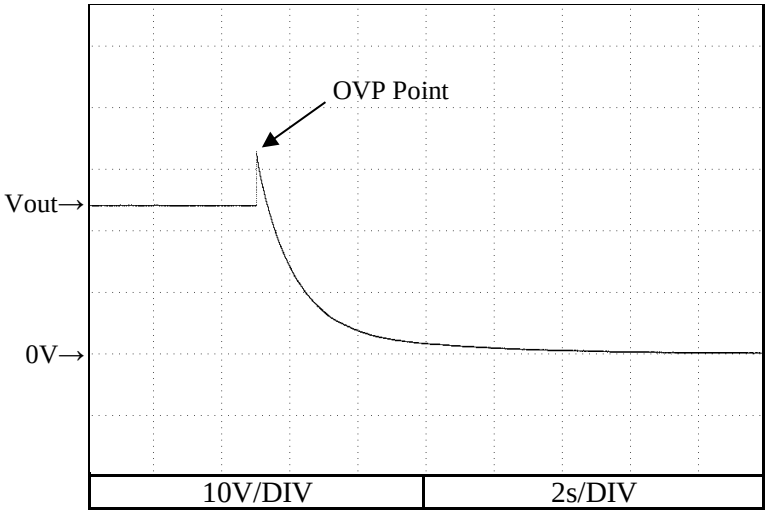
5V



12V



24V

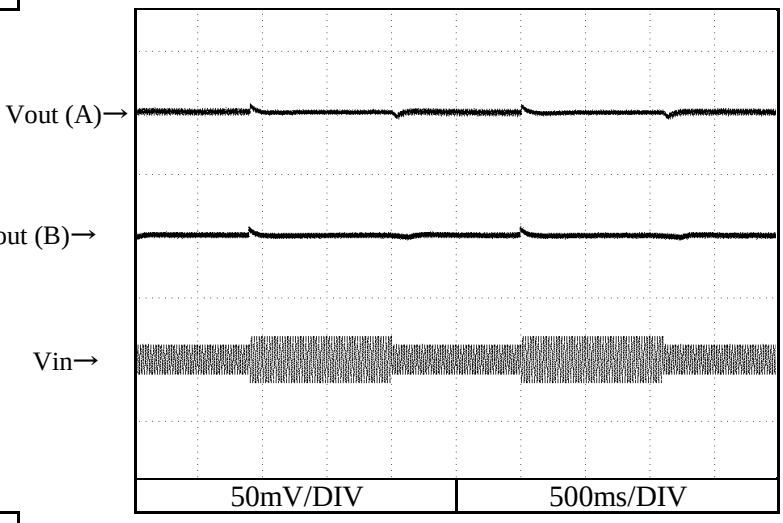


2.8 過渡応答（入力急変）特性

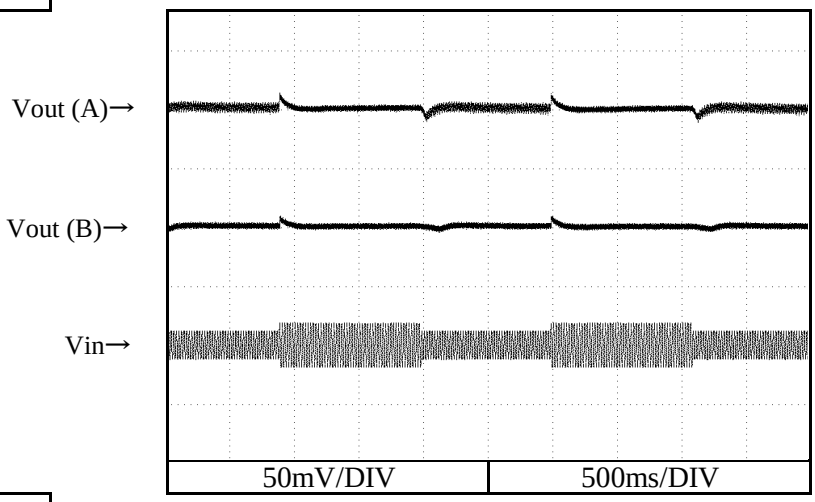
Dynamic line response characteristics

Conditions Vin : 85 VAC←→132VAC (A)
170 VAC←→265VAC (B)
Iout : 100 %
Ta : 25 ℃

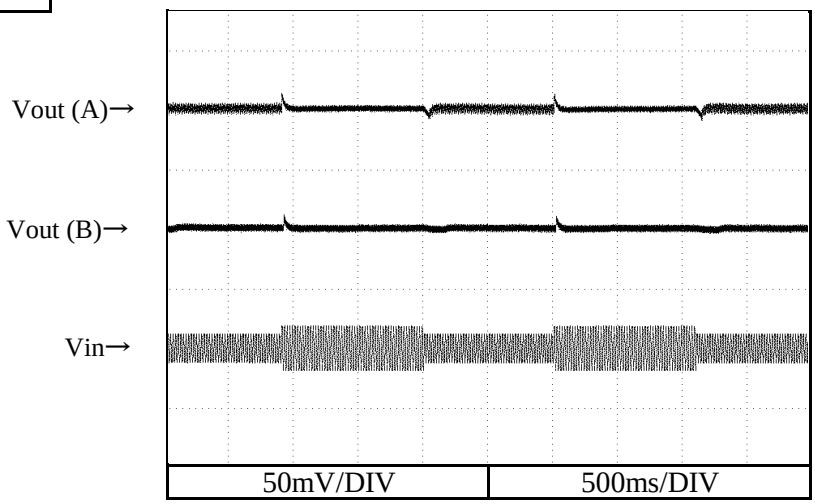
5V



12V



24V

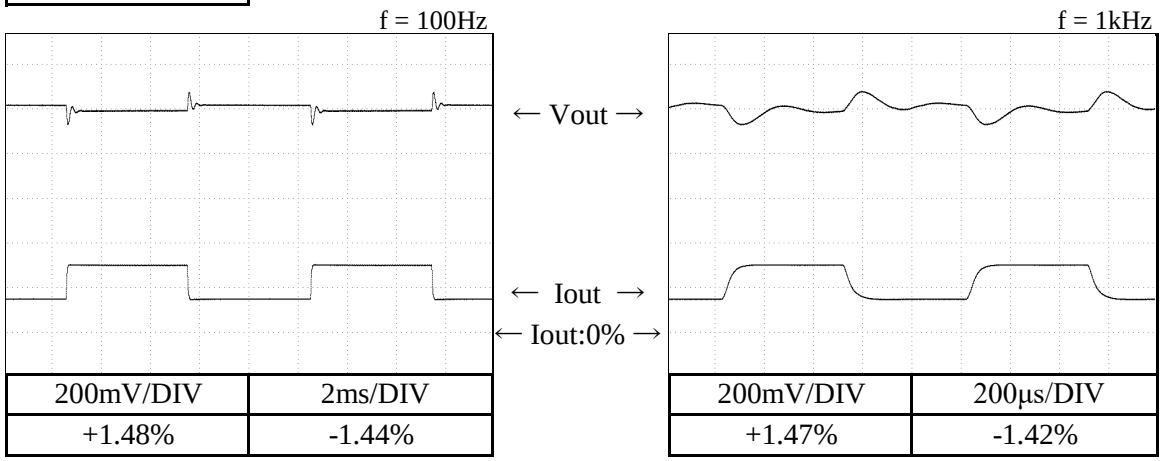


2.9 過渡応答（負荷急変）特性

Dynamic load response characteristics

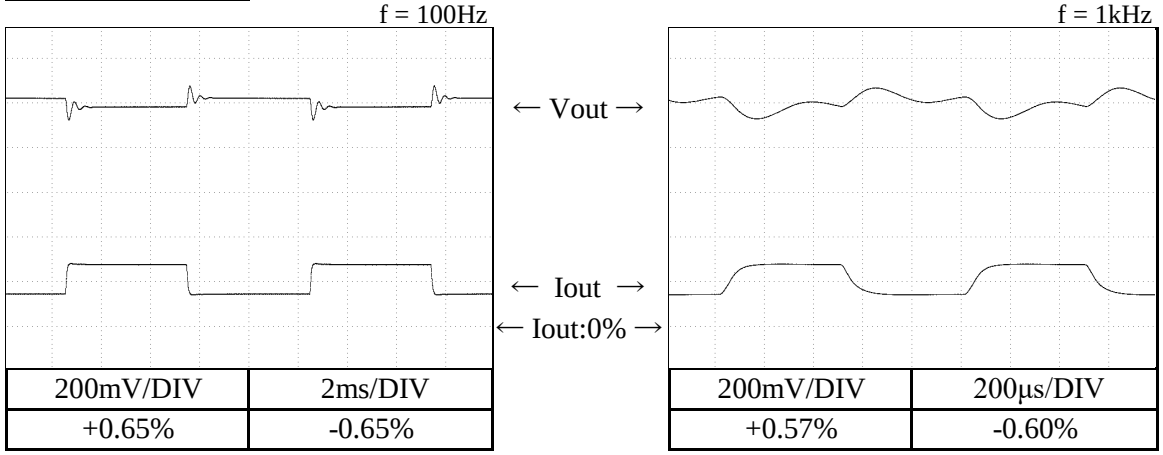
Conditions Vin : 100 VAC
Iout : 50 % ⟷ 100 %
(tr = tf = 50us)
Ta : 25 ℃

5V



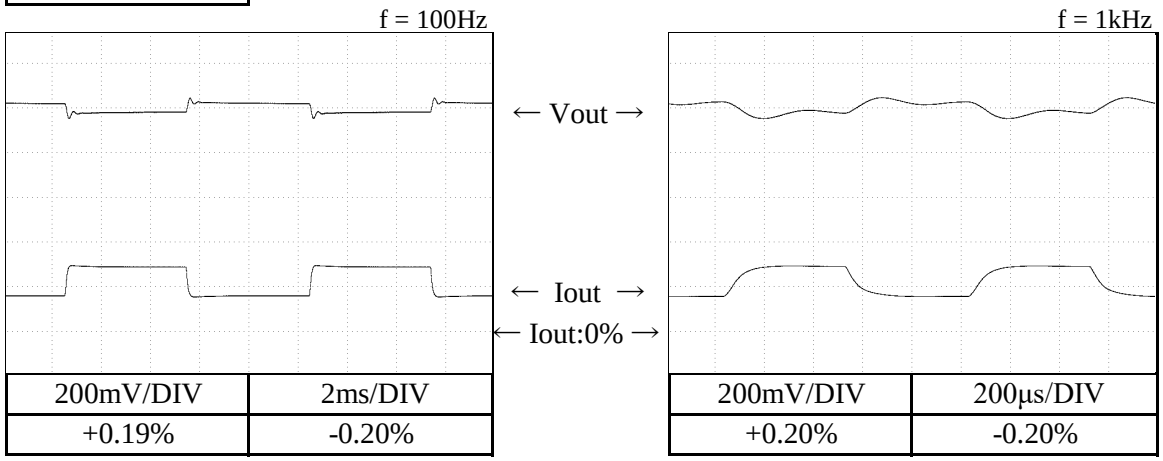
200mV/DIV	2ms/DIV	200mV/DIV	200μs/DIV
+1.48%	-1.44%	+1.47%	-1.42%

12V



200mV/DIV	2ms/DIV	200mV/DIV	200μs/DIV
+0.65%	-0.65%	+0.57%	-0.60%

24V



200mV/DIV	2ms/DIV	200mV/DIV	200μs/DIV
+0.19%	-0.20%	+0.20%	-0.20%

2.10 入力電圧瞬停特性

Response to brown out characteristics

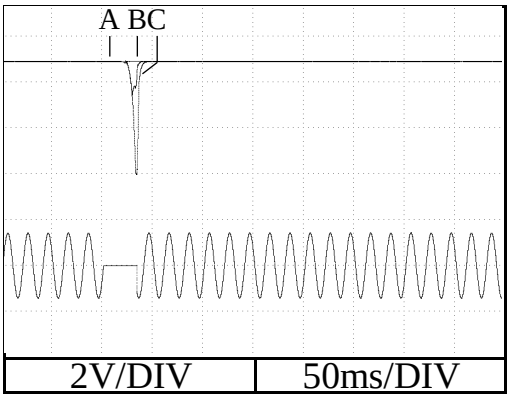
Conditions Iout : 100 %
Ta : 25 ℃

瞬停時間 Interruption time

A : 出力電圧が低下なし Output voltage does not drop.
B : 出力電圧の低下が0Vまでいかない Output voltage drop down not reaching 0V.
C : 出力電圧が0Vまで低下 Output voltage drops until 0V.

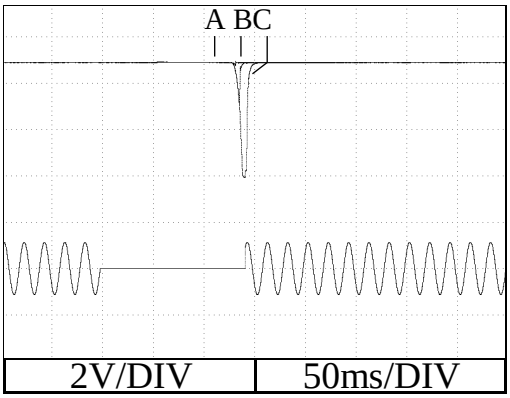
5V

Vin : 100VAC
A = 23ms、B = 28ms、C = 33ms



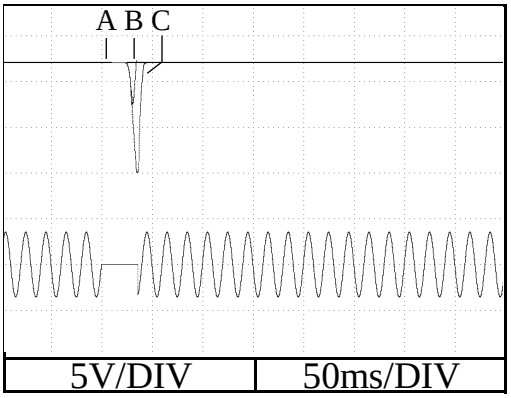
← Vout →
← 0V →
← Vin →

Vin : 200VAC
A = 132ms、B = 137ms、C = 143ms



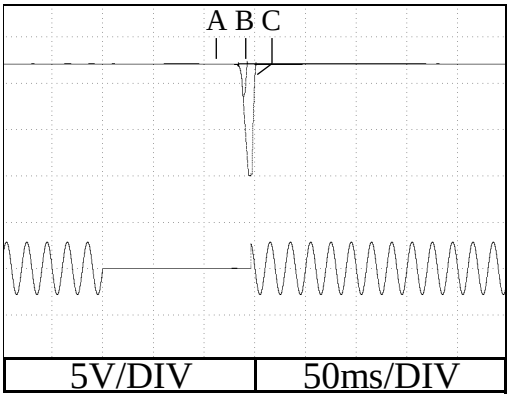
12V

Vin : 100VAC
A = 25ms、B = 29ms、C = 36ms



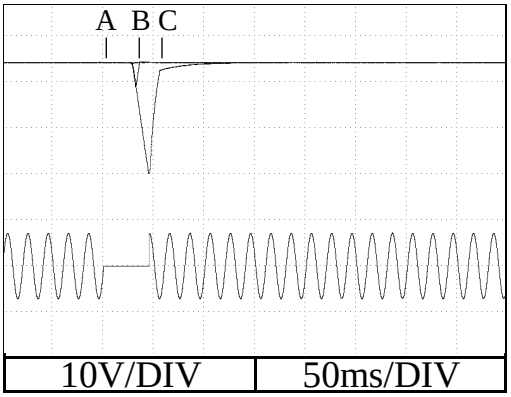
← Vout →
← 0V →
← Vin →

Vin : 200VAC
A = 135ms、B = 139ms、C = 146ms



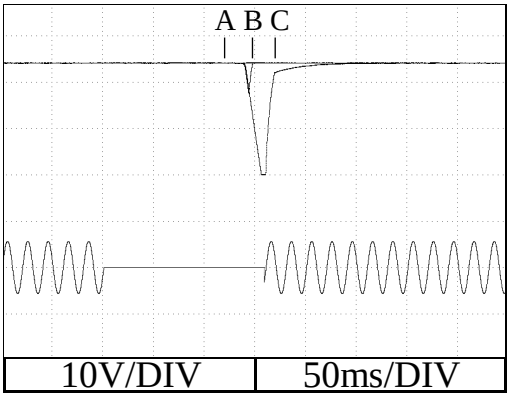
24V

Vin : 100VAC
A = 28ms、B = 32ms、C = 45ms



← Vout →
← 0V →
← Vin →

Vin : 200VAC
A = 138ms、B = 143ms、C = 158ms

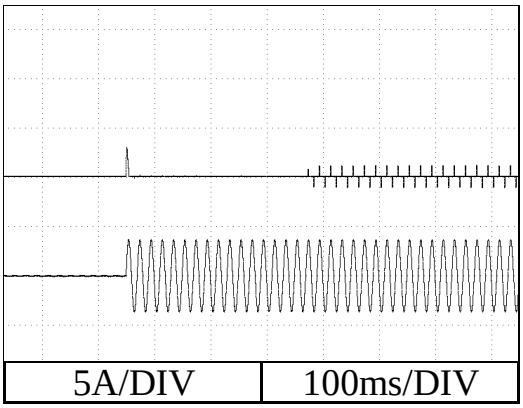


2.11 入力サージ電流（突入電流）波形
Inrush current waveform

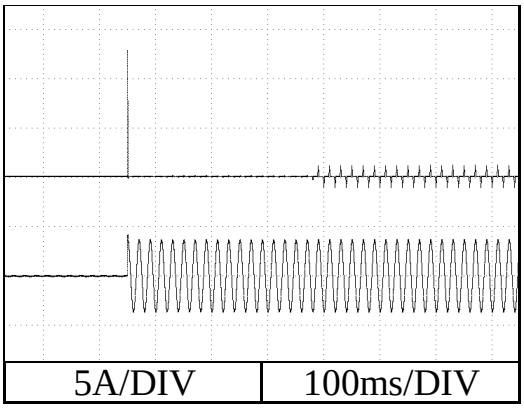
5V

Conditions Vin : 100 VAC
Iout : 100 %
Ta : 25 ℃

Switch on phase angle of input AC voltage
ϕ = 0°

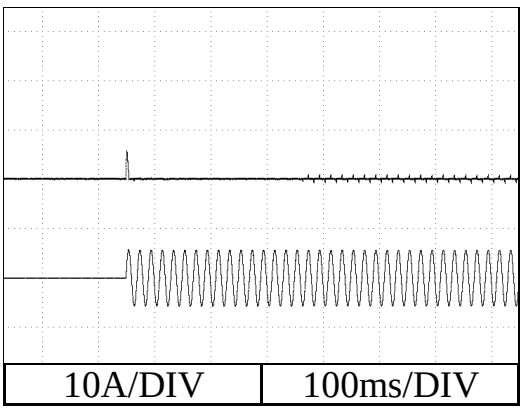


Switch on phase angle of input AC voltage
ϕ = 90°

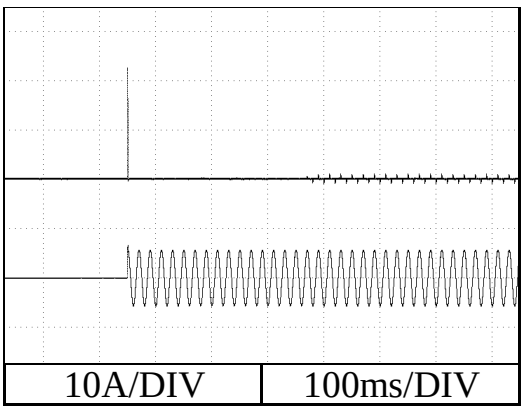


Conditions Vin : 200 VAC
Iout : 100 %
Ta : 25 ℃

Switch on phase angle of input AC voltage
ϕ = 0°



Switch on phase angle of input AC voltage
ϕ = 90°



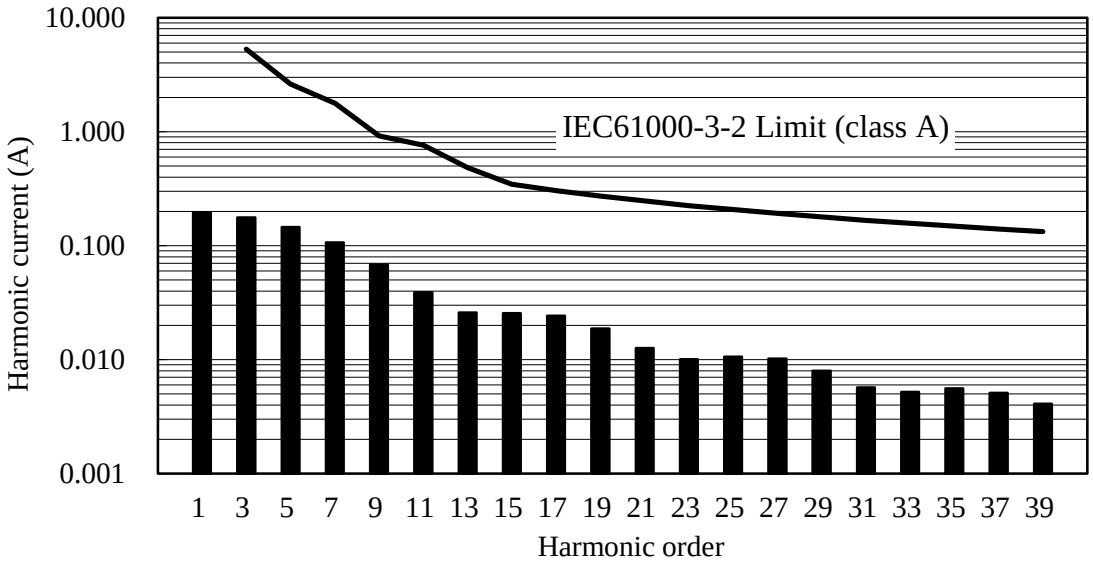
2.12 高調波成分

Input current harmonics

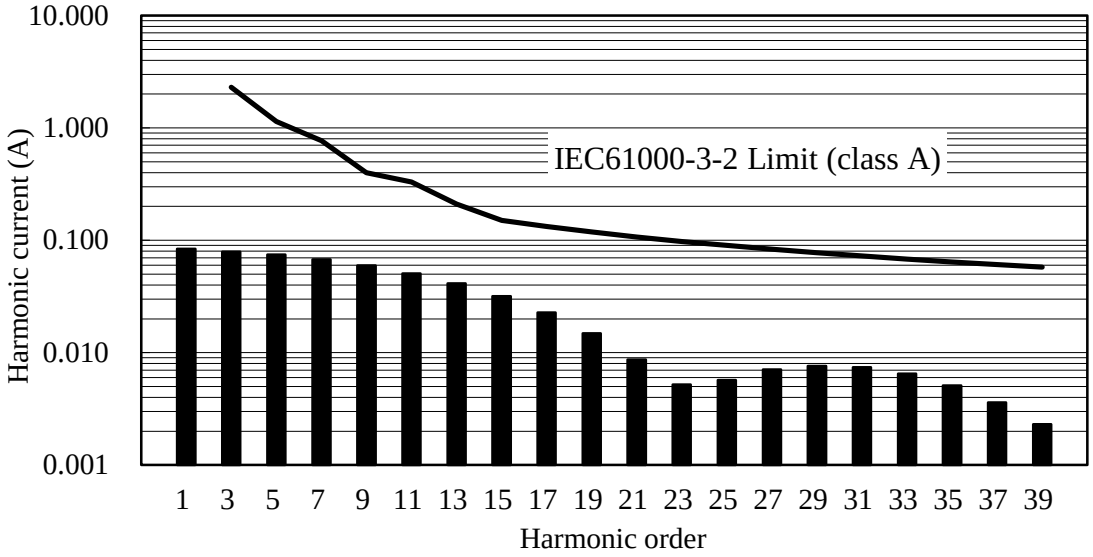
Conditions Iout : 100 %
Ta : 25 ℃

5V

Vin : 100 VAC



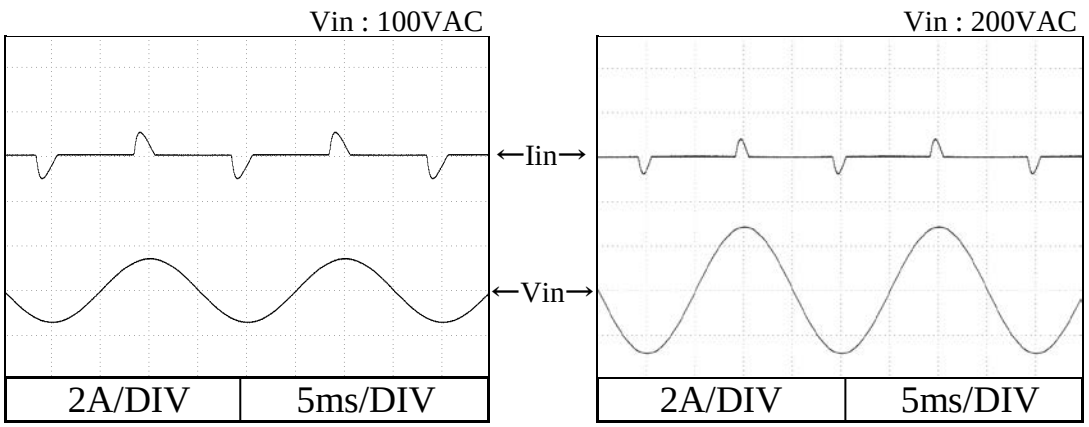
Vin : 230 VAC



2.13 入力電流波形

Input current waveform

Conditions Iout : 100 %
Ta : 25 ℃



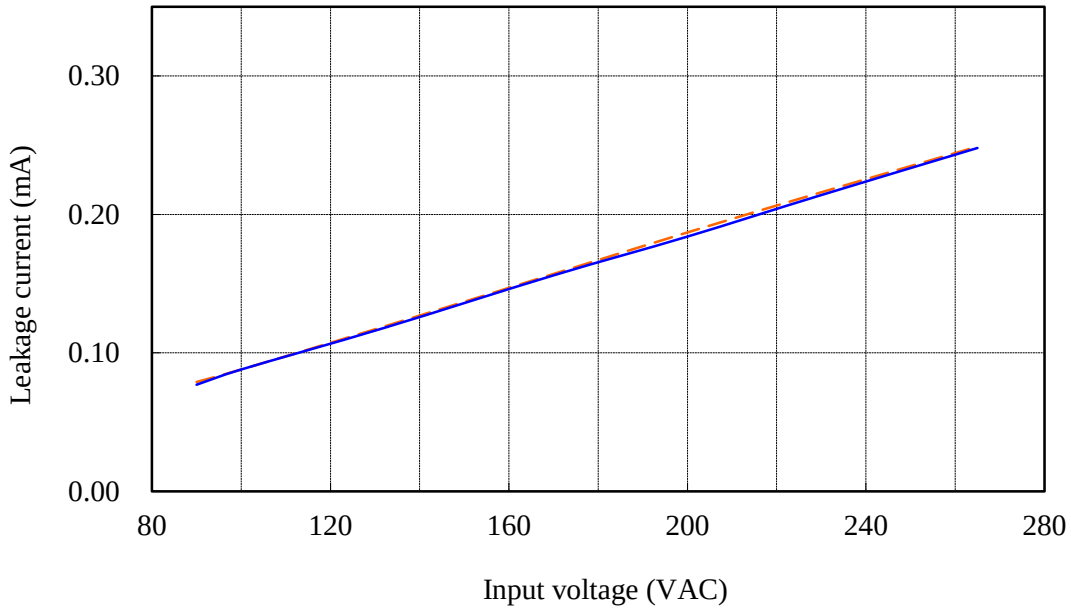
2.14 リーク電流特性

Leakage current characteristics

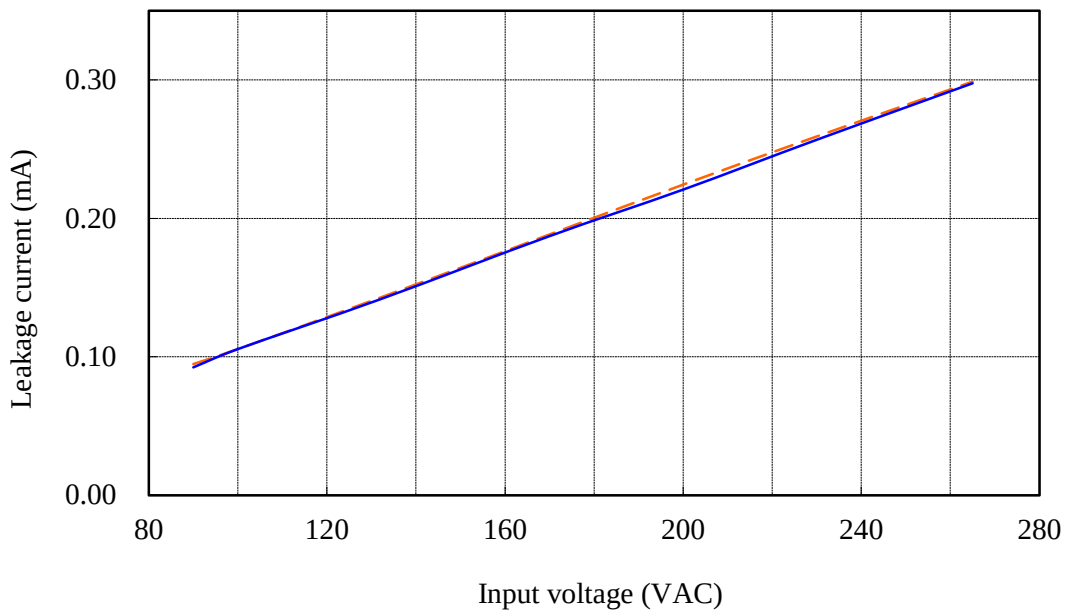
Conditions Iout : 0 % ——
100 % - - - - -
Ta : 25 ℃
Equipment used : 3156 (HIOKI)

5V

f : 50 Hz



f : 60 Hz

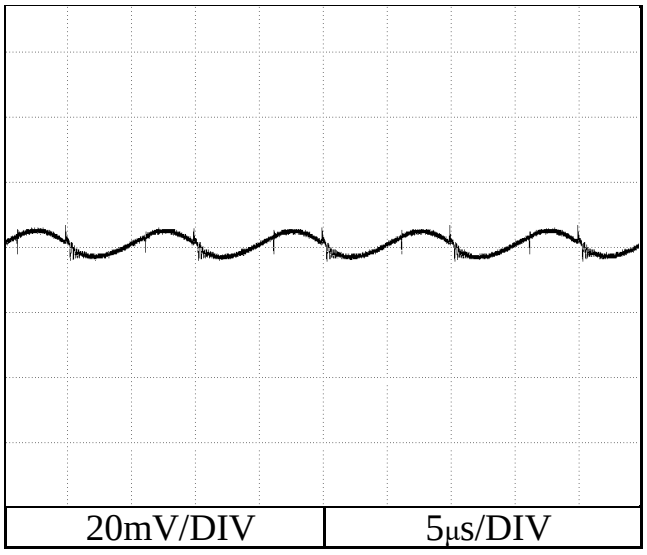


2.15 出力リップル、ノイズ波形

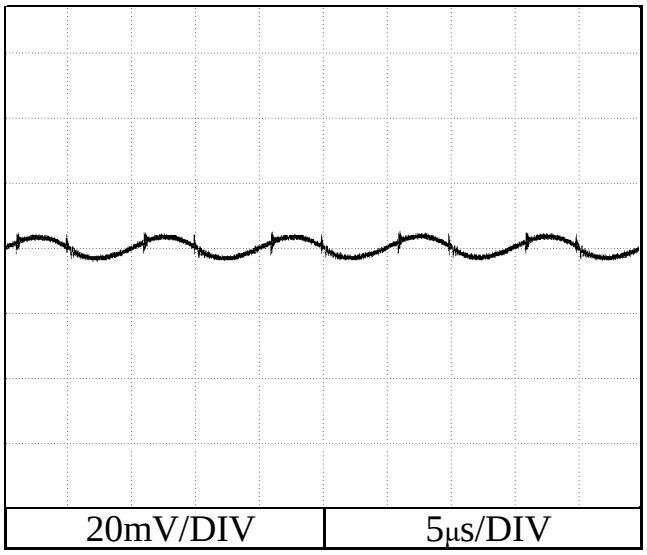
Output ripple and noise waveform

Conditions Vin : 100 VAC
Iout : 100 %
Ta : 25 ℃

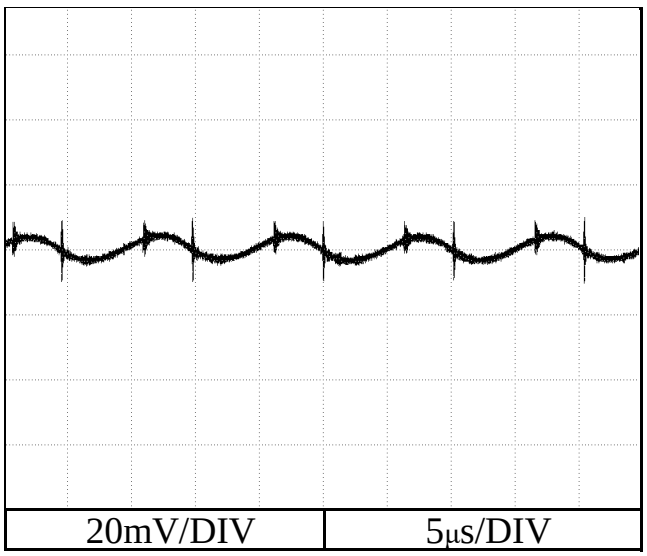
5V



12V



24V



2.16 ＥＭＩ特性

Electro-Magnetic Interference characteristics

Conditions Vin : 230 VAC
Iout : 100 %
Ta : 25 ℃

雑音端子電圧

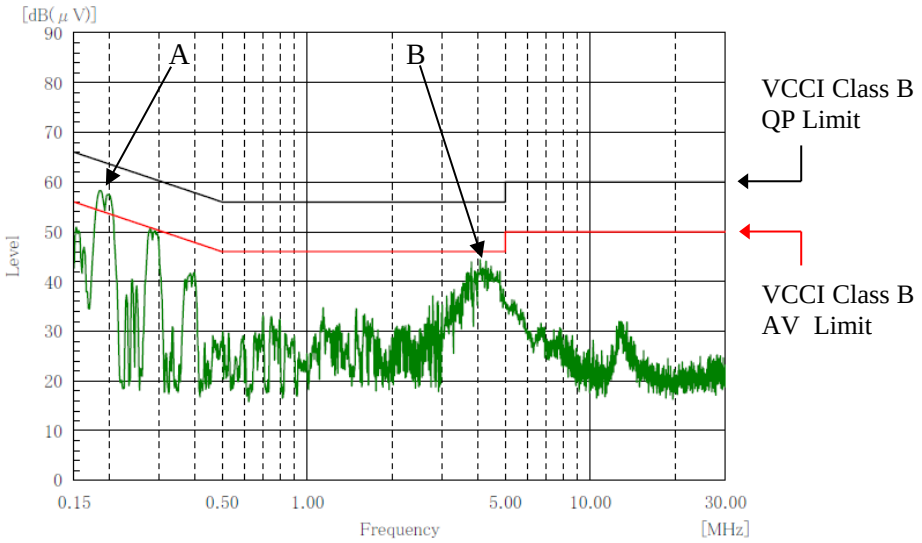
Conducted Emission

5V

Ref. Data	Point A (199kHz) Limit (dB)	Measure (dB)
QP	63.6	55.4
AV	53.6	36.2

Ref. Data	Point B (4MHz) Limit (dB)	Measure (dB)
QP	56.0	36.8
AV	46.0	21.5

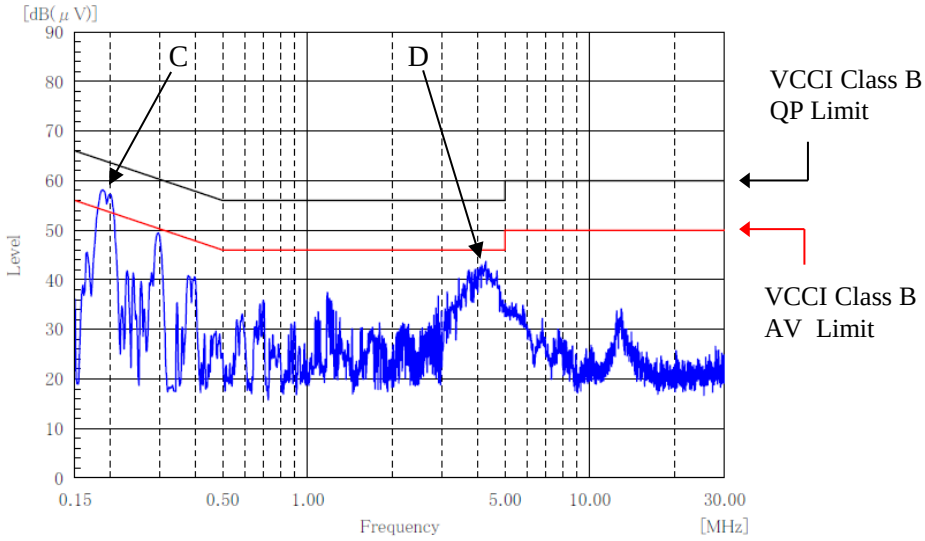
Phase : N



Ref. Data	Point C (190kHz) Limit (dB)	Measure (dB)
QP	64.0	55.4
AV	54.0	39.2

Ref. Data	Point D (4MHz) Limit (dB)	Measure (dB)
QP	56.0	35.2
AV	46.0	20.9

Phase : L



EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.

2.16 ＥＭＩ特性

Electro-Magnetic Interference characteristics

Conditions Vin : 230 VAC
Iout : 100 %
Ta : 25 ℃

雑音端子電圧

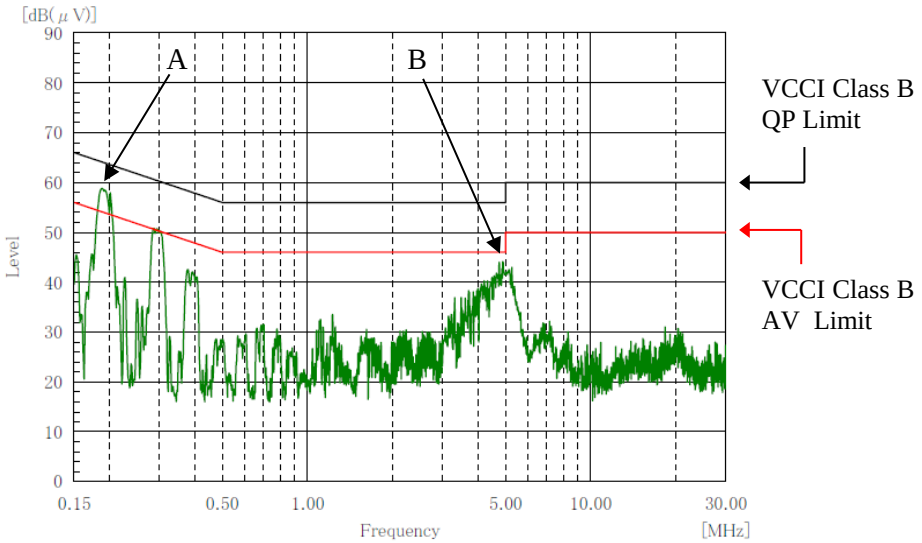
Conducted Emission

12V

Ref. Data	Point A (194kHz) Limit (dB)	Measure (dB)
QP	63.8	55.2
AV	53.8	37.9

Ref. Data	Point B (5MHz) Limit (dB)	Measure (dB)
QP	56.0	35.3
AV	46.0	21.9

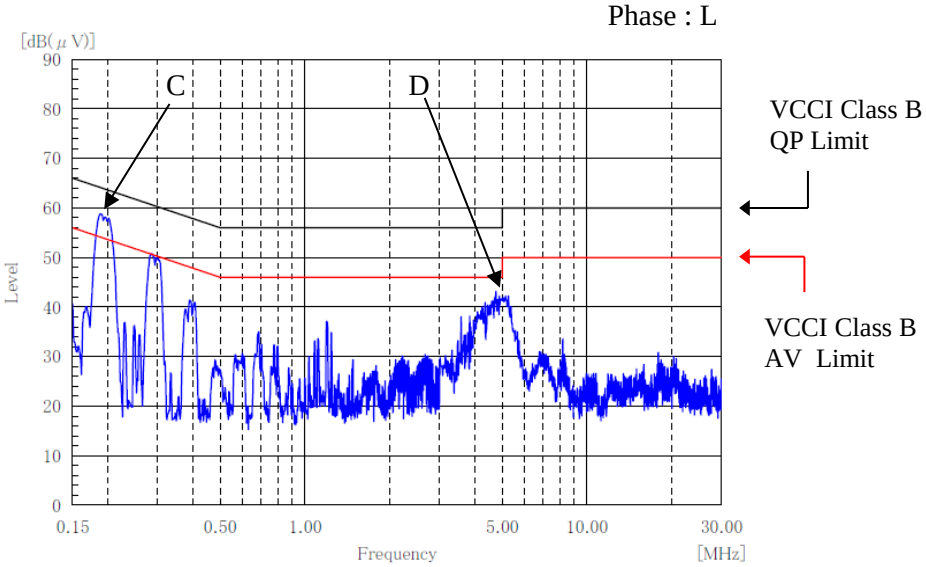
Phase : N



Ref. Data	Point C (192kHz) Limit (dB)	Measure (dB)
QP	63.9	55.3
AV	53.9	37.6

Ref. Data	Point D (5MHz) Limit (dB)	Measure (dB)
QP	56.0	38.2
AV	46.0	23.5

Phase : L



EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.

2.16 ＥＭＩ特性

Electro-Magnetic Interference characteristics

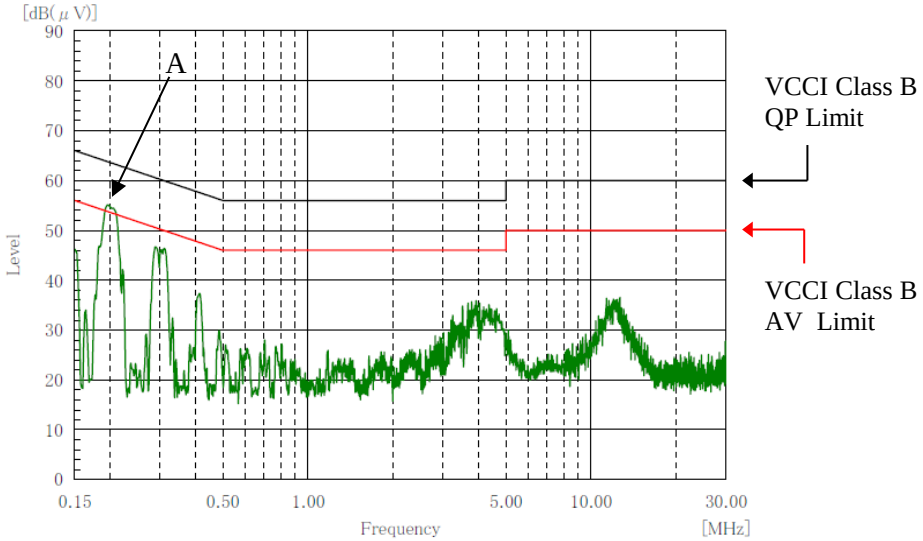
Conditions Vin : 230 VAC
Iout : 100 %
Ta : 25 ℃

雑音端子電圧

Conducted Emission

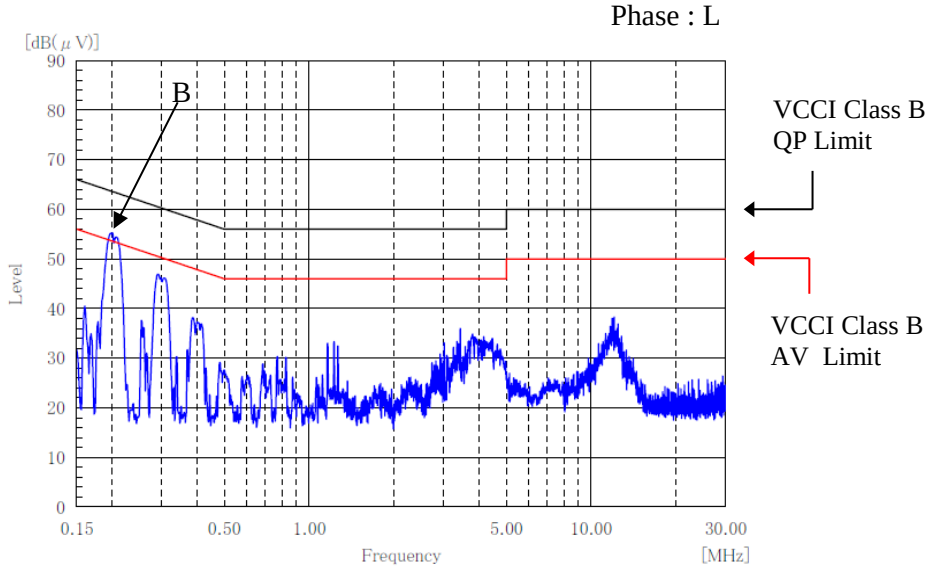
24V

Phase : N



Ref. Data	Point A (199kHz) Limit (dB)	Measure (dB)
QP	63.6	51.8
AV	53.6	33.8

Phase : L



Ref. Data	Point B (200kHz) Limit (dB)	Measure (dB)
QP	63.6	51.9
AV	53.6	33.4

EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.

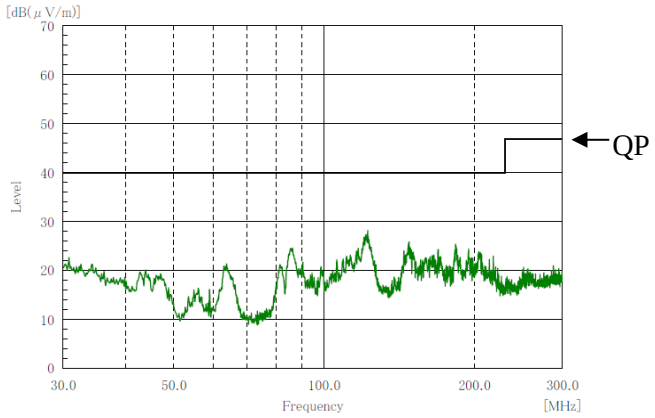
2.16 ＥＭＩ特性
Electro-Magnetic Interference characteristics

Conditions Vin : 230 VAC
Iout : 100 %
Ta : 25 ℃

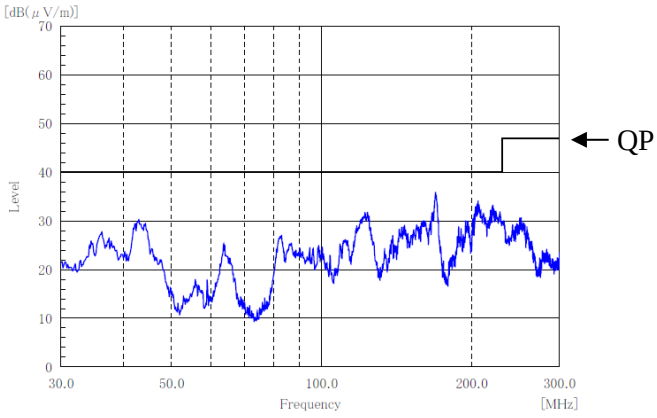
雑音電界強度
Radiated Emission

5V

HORIZONTAL

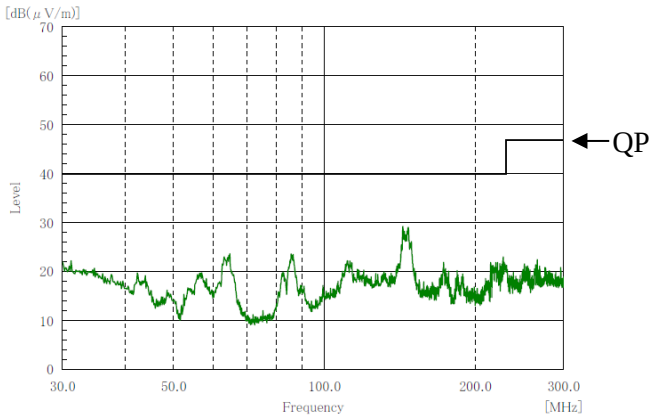


VERTICAL

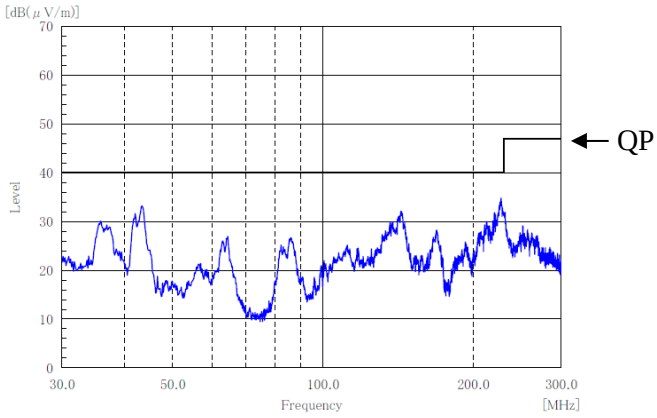


12V

HORIZONTAL

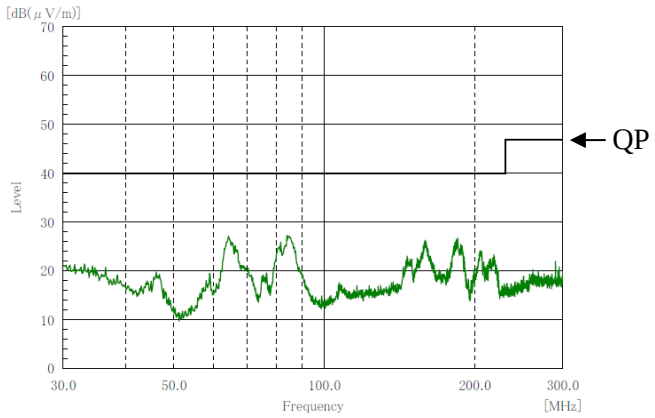


VERTICAL

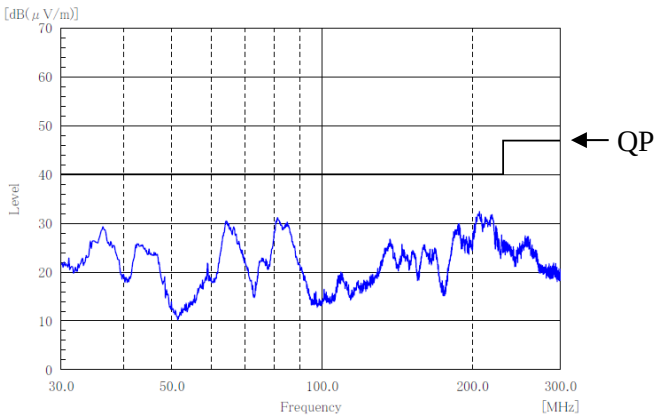


24V

HORIZONTAL



VERTICAL



EN55011-B,EN55032-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B are same as its VCCI class B.

表示はピーク値
Indication is peak values.