

ZWS15B

EVALUATION DATA

型式データ

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使用記号 Terminology used

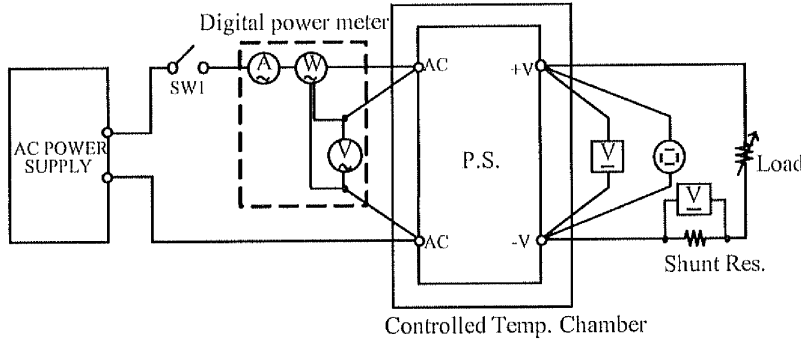
	定義	Definition
V _{in} 入力電圧	Input voltage
V _{out} 出力電圧	Output voltage
I _{in} 入力電流	Input current
I _{out} 出力電流	Output current
T _a 周囲温度	Ambient temperature
f 周波数	Frequency

1. 測定方法 Evaluation Method

1.1 測定回路 Circuit used for determination

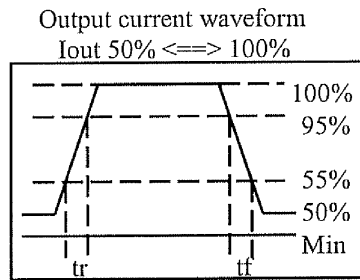
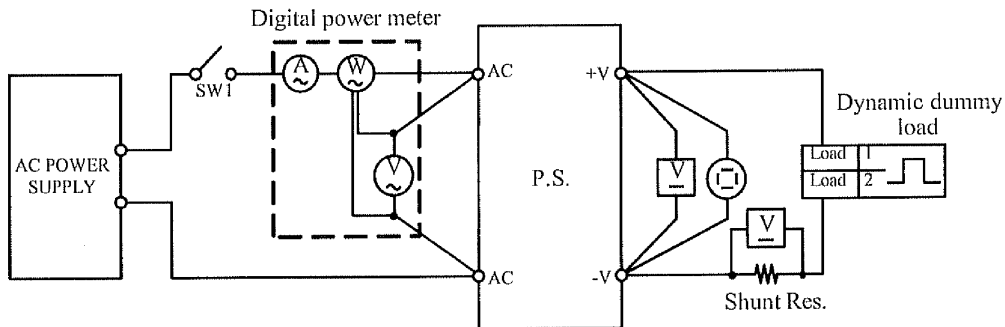
測定回路1 Circuit 1 used for determination

- ・ 静特性 Steady state data
- ・ 過電流保護特性 Over current protection (OCP) characteristics
- ・ 過電圧保護特性 Over voltage protection (OVP) 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
- ・ 出力保持時間特性 Hold up time characteristics



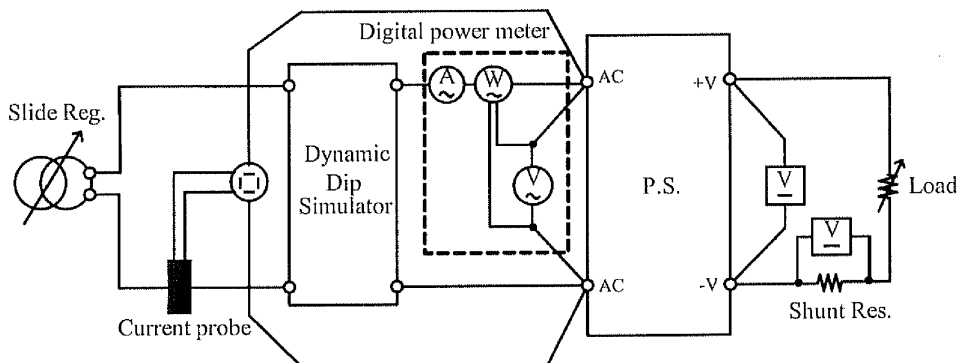
測定回路2 Circuit 2 used for determination

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



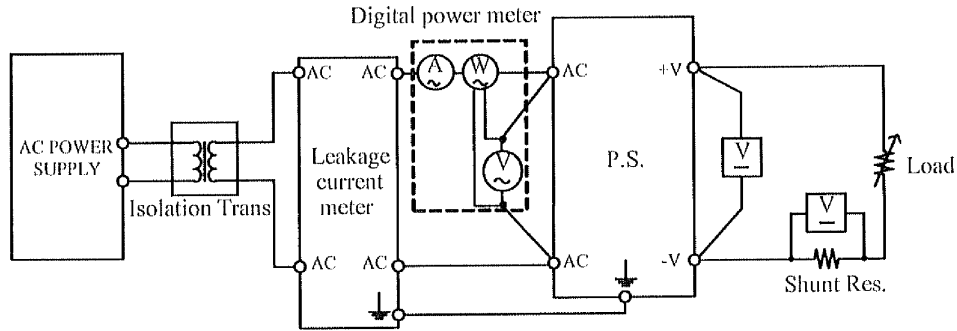
測定回路3 Circuit 3 used for determination

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



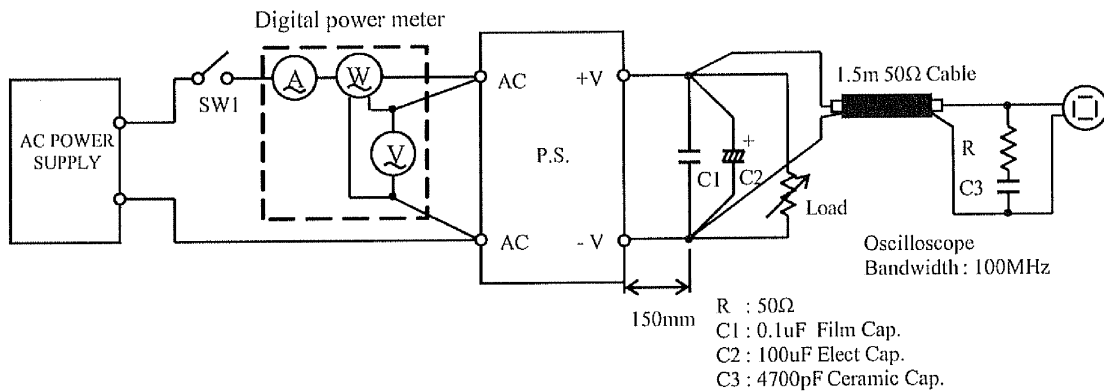
測定回路4 Circuit 4 used for determination

- ・リーク電流特性 Leakage current characteristics



測定回路5 Circuit 5 used for determination

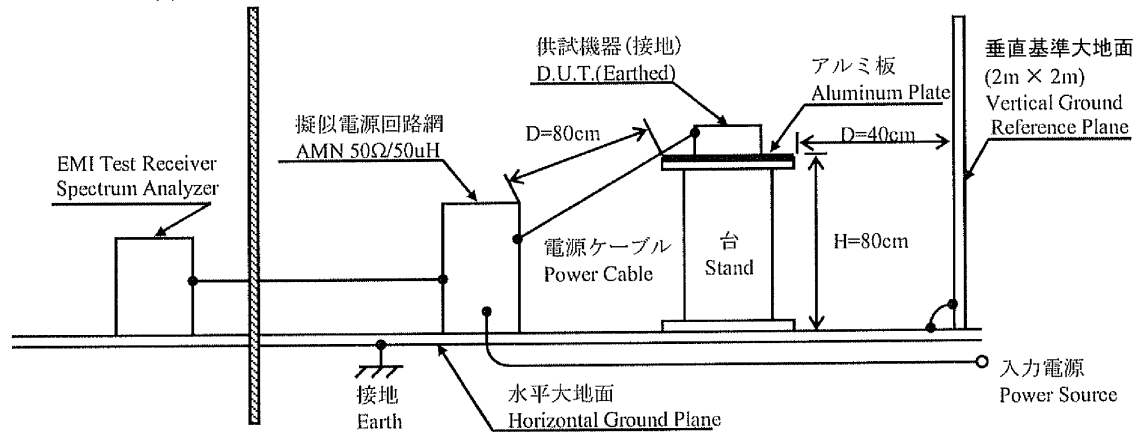
- ・出力リップル、ノイズ波形 Output ripple and noise waveform



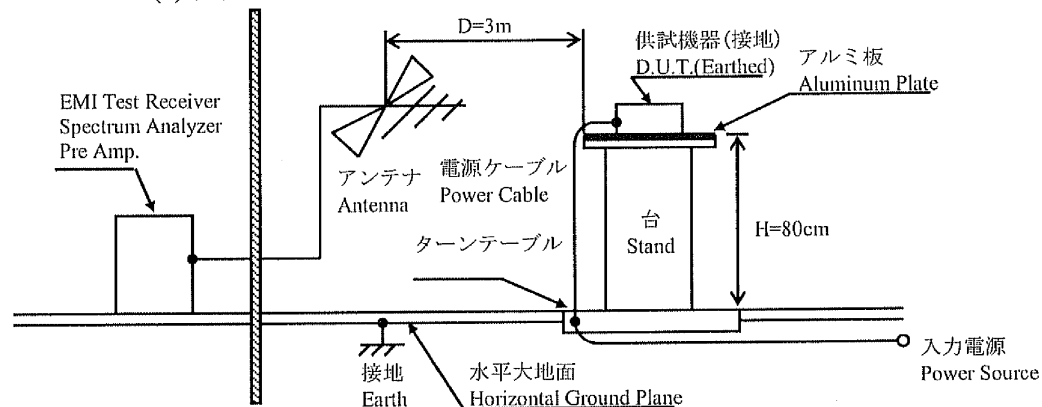
測定構成 Configuration used for determination

- ・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	TEKTRONIX	TDS 540A
2	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DL1720E
3	DIGITAL MULTIMETER	FLUKE	45
4	DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
5	CURRENT PROBE	TEKTRONIX	63202
6	DC AMPERE METER	TEKTRONIX	P5100
7	DYNAMIC DUMMY LOAD	CHROMA	63030
8	CVCF	KIKUSUI	PCR2000L
9	LEAKAGE CURRENT METER	SIMPSON	228
10	CONTROLLED TEMP. CHAMBER	TABAI-ESPEC	63203
11	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCI-03
12	LISN	ROHDE & SCHWARZ	ENV216
13	BICONICAL ANTENNA	EMCO	63208

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 °C	
Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation		
0%	5.000V	5.000V	5.000V	5.000V	0mV	0.000%	
50%	4.998V	4.998V	4.998V	4.997V	1mV	0.020%	
100%	4.995V	4.995V	4.995V	4.995V	0mV	0.000%	
load	5mV	5mV	5mV	5mV			
regulation	0.100%	0.100%	0.100%	0.100%			

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

Ta	-10°C	+25°C	+50°C	temperature stability
Vout	4.997V	4.995V	4.993V	4mV 0.080%

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

Start up voltage (Vin)	48VAC
Drop out voltage (Vin)	48VAC

12V		1. Regulation - line and load				Condition Ta : 25 °C	
Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation		
0%	12.000V	12.001V	12.002V	12.002V	2mV	0.017%	
50%	12.000V	12.000V	12.000V	12.000V	0mV	0.000%	
100%	11.997V	11.997V	11.996V	11.996V	1mV	0.008%	
load	3mV	4mV	6mV	6mV			
regulation	0.025%	0.033%	0.050%	0.050%			

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

Ta	-10°C	+25°C	+50°C	temperature stability
Vout	12.010V	11.997V	11.986V	24mV 0.200%

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

Start up voltage (Vin)	48VAC
Drop out voltage (Vin)	47VAC

24V		1. Regulation - line and load				Condition Ta : 25 °C	
Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation		
0%	23.991V	23.992V	23.993V	23.994V	3mV	0.013%	
50%	23.997V	23.997V	23.996V	23.996V	1mV	0.004%	
100%	23.989V	23.988V	23.988V	23.987V	2mV	0.008%	
load	8mV	9mV	8mV	9mV			
regulation	0.033%	0.038%	0.033%	0.038%			

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

Ta	-10°C	+25°C	+50°C	temperature stability
Vout	24.049V	23.988V	23.941V	108mV 0.450%

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

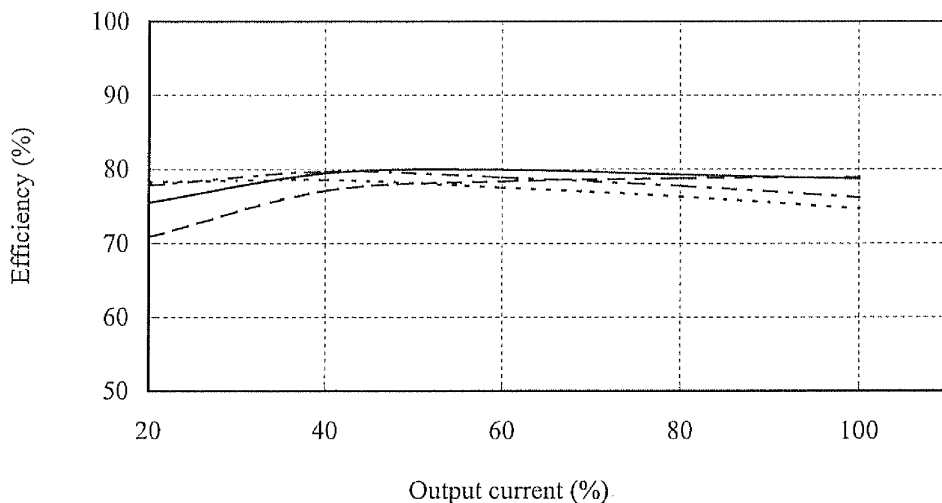
Start up voltage (Vin)	53VAC
Drop out voltage (Vin)	46VAC

(2) 効率対出力電流

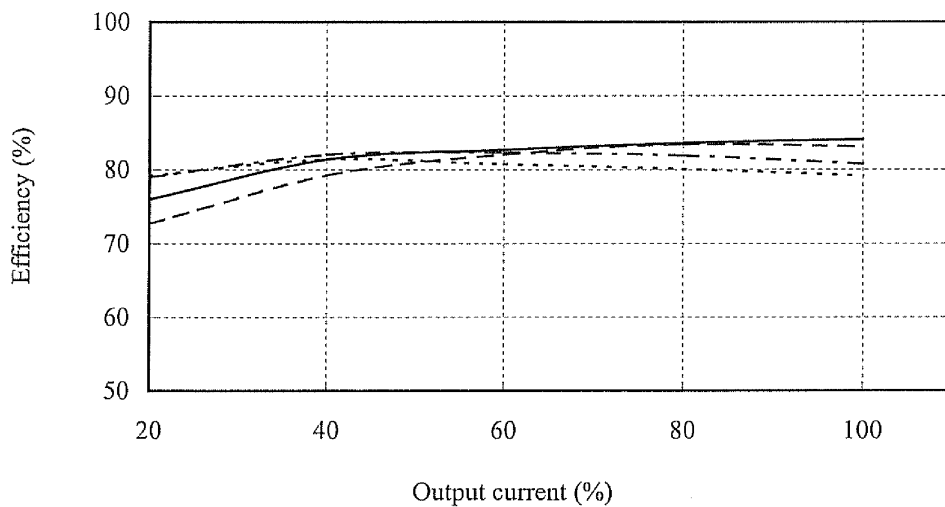
Efficiency vs. Output current

Conditions Vin : 85 VAC -----
 : 100 VAC - - - - -
 : 200 VAC ————
 : 265 VAC - - - - -
 Ta : 25 °C

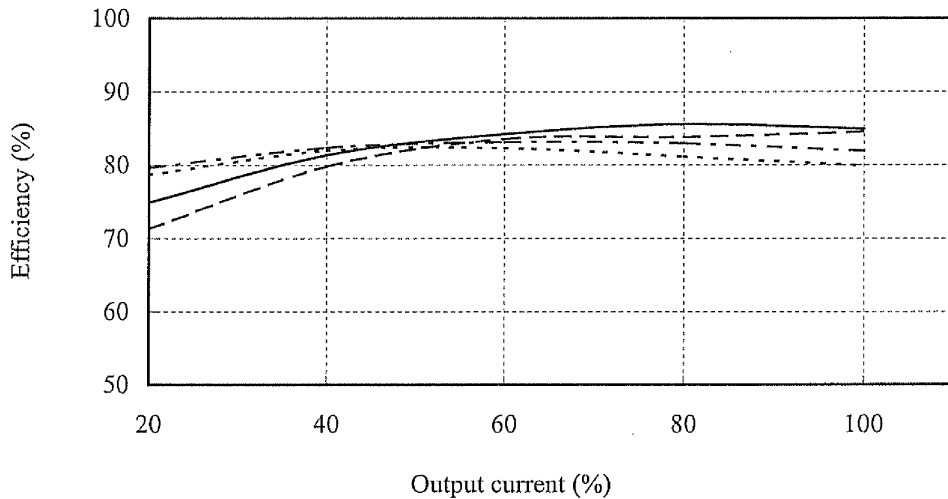
5V



12V



24V



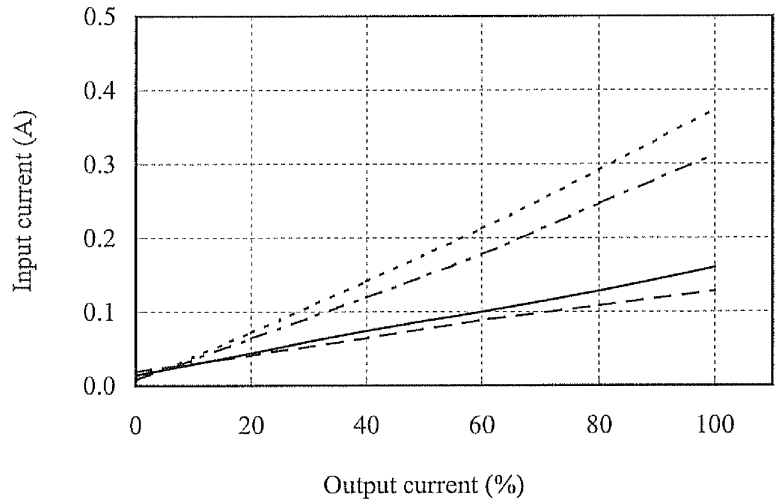
(3) 入力電流対出力電流
Input current vs. Output current

Conditions Vin : 85 VAC -----
 : 100 VAC - - - - -
 : 200 VAC ————
 : 265 VAC - - - - -
 Ta : 25 °C

5V

Io: 0%

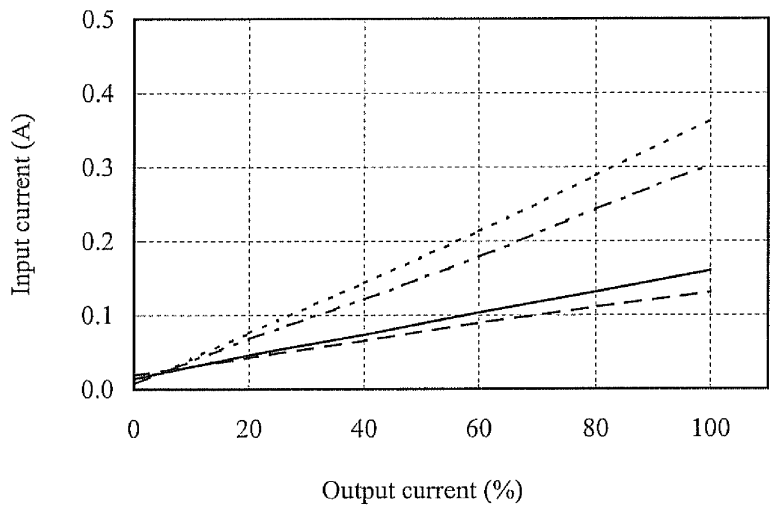
Vin	Input current
85VAC	0.007A
100VAC	0.008A
200VAC	0.014A
265VAC	0.019A



12V

Io: 0%

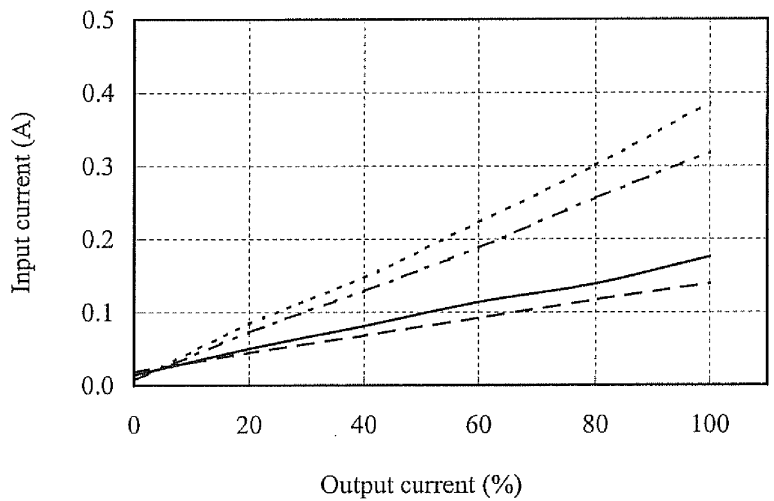
Vin	Input current
85VAC	0.007A
100VAC	0.008A
200VAC	0.014A
265VAC	0.019A



24V

Io: 0%

Vin	Input current
85VAC	0.007A
100VAC	0.008A
200VAC	0.014A
265VAC	0.019A



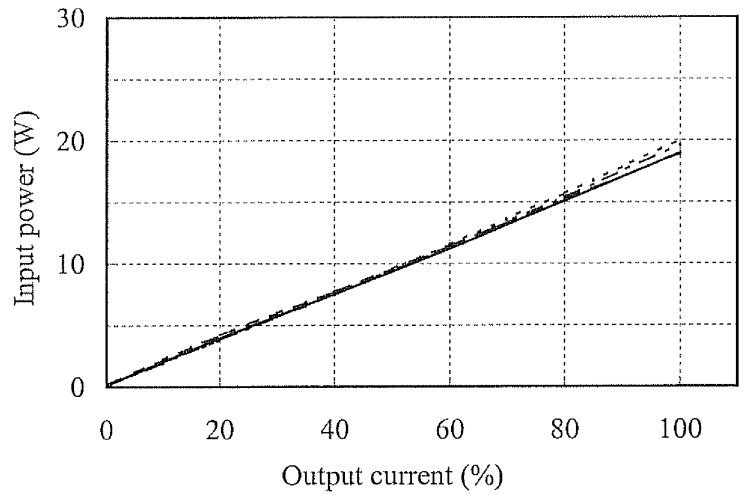
(4) 入力電力対出力電流
Input power vs. Output current

Conditions Vin : 85 VAC -----
 : 100 VAC - - - - -
 : 200 VAC ————
 : 265 VAC - - - - -
 Ta : 25 °C

5V

Io: 0%

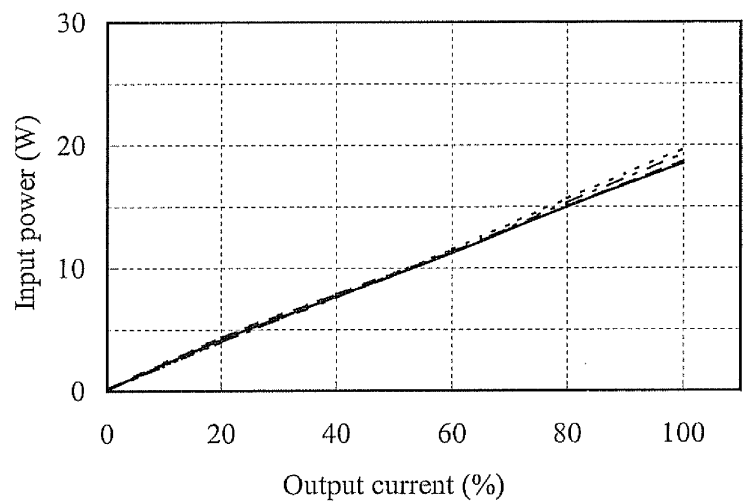
Vin	Input power
85VAC	0.09W
100VAC	0.09W
200VAC	0.13W
265VAC	0.17W



12V

Io: 0%

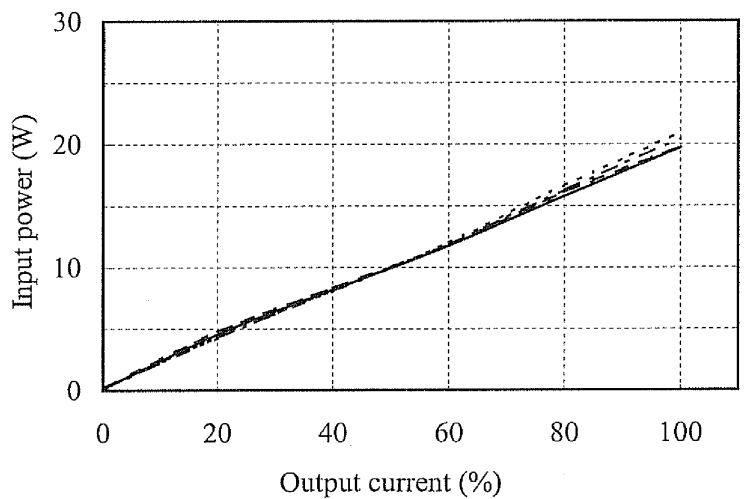
Vin	Input power
85VAC	0.07W
100VAC	0.07W
200VAC	0.11W
265VAC	0.16W



24V

Io: 0%

Vin	Input power
85VAC	0.10W
100VAC	0.10W
200VAC	0.14W
265VAC	0.17W



2.2 過電流保護特性

Over current protection (OCP) characteristics

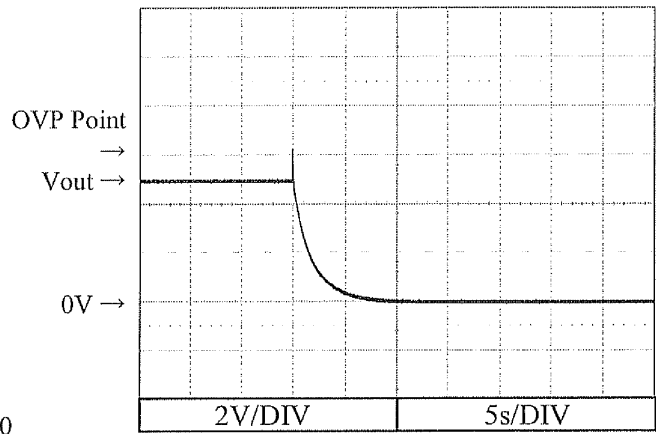
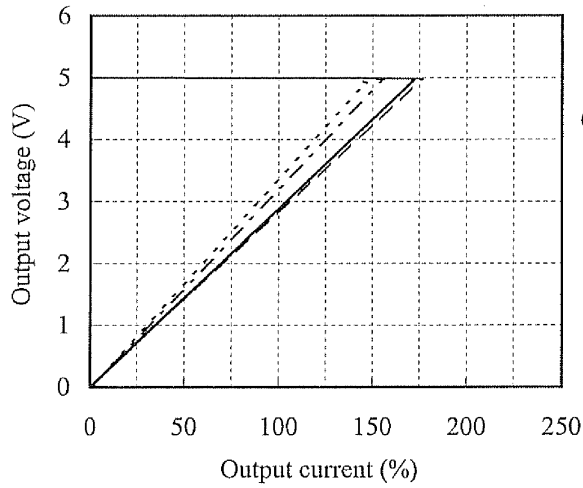
2.3 過電圧保護特性

Over voltage protection (OVP) characteristics

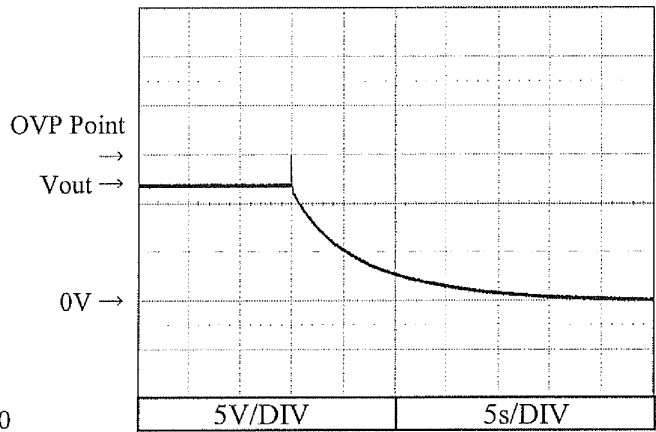
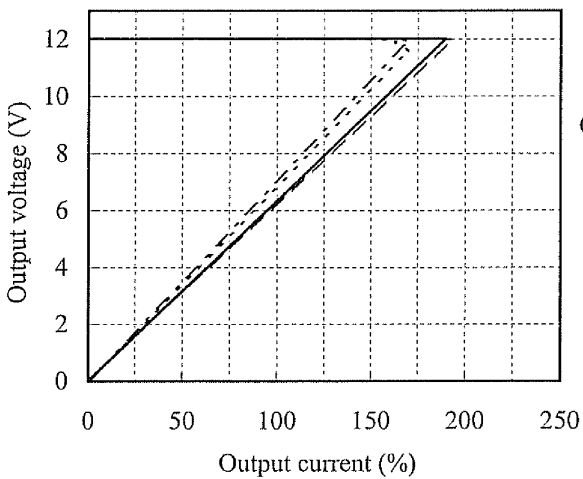
Conditions Vin : 85 VAC -----
 100 VAC - - - - -
 200 VAC ————
 265 VAC - - - - -
 Ta : 25 °C

Conditions Vin : 100 VAC
 Iout : 0 %
 Ta : 25 °C

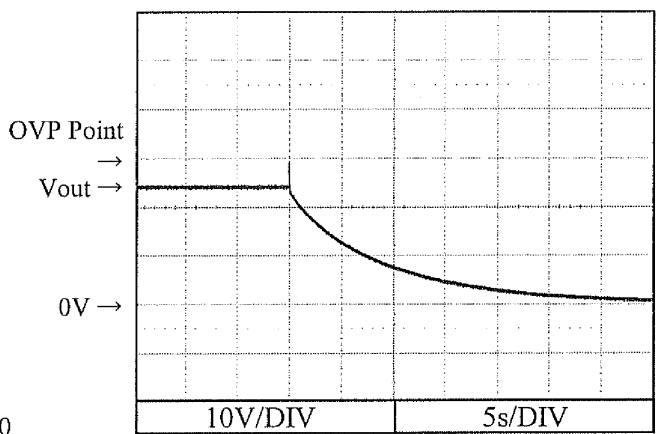
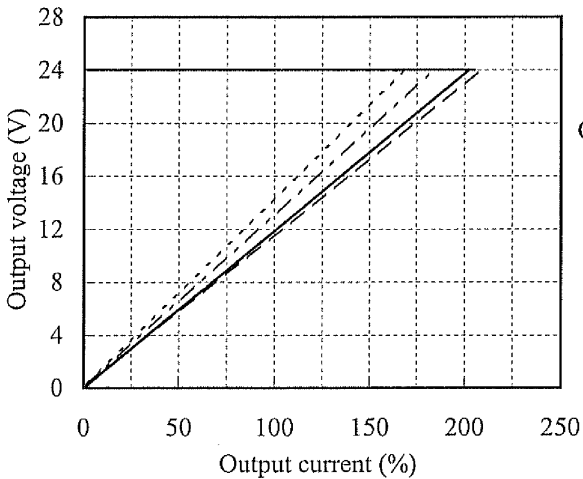
5V



12V



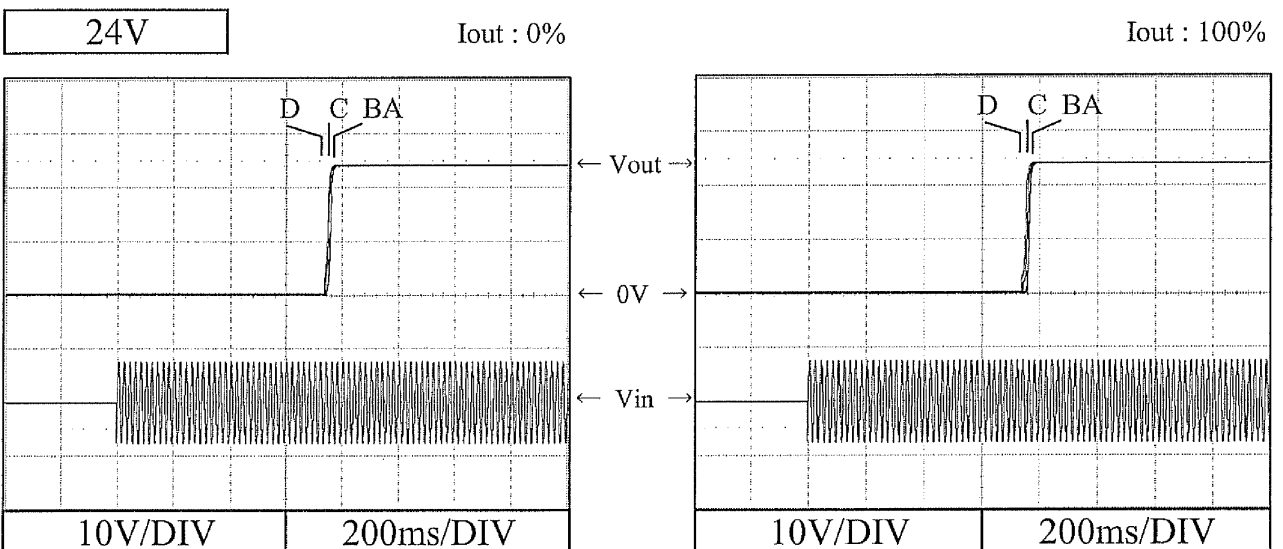
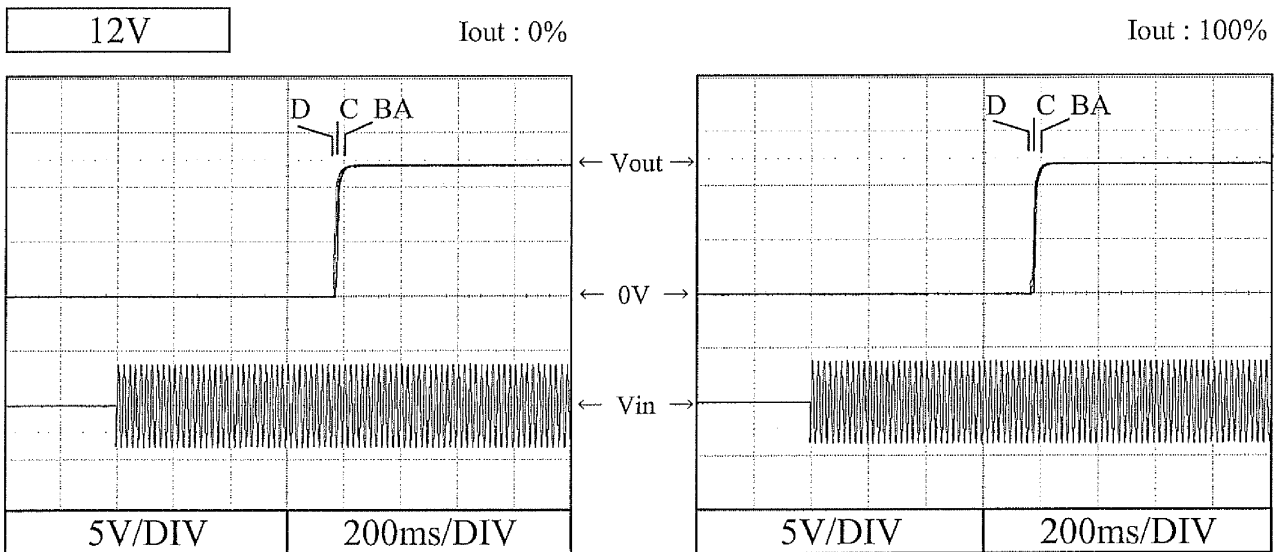
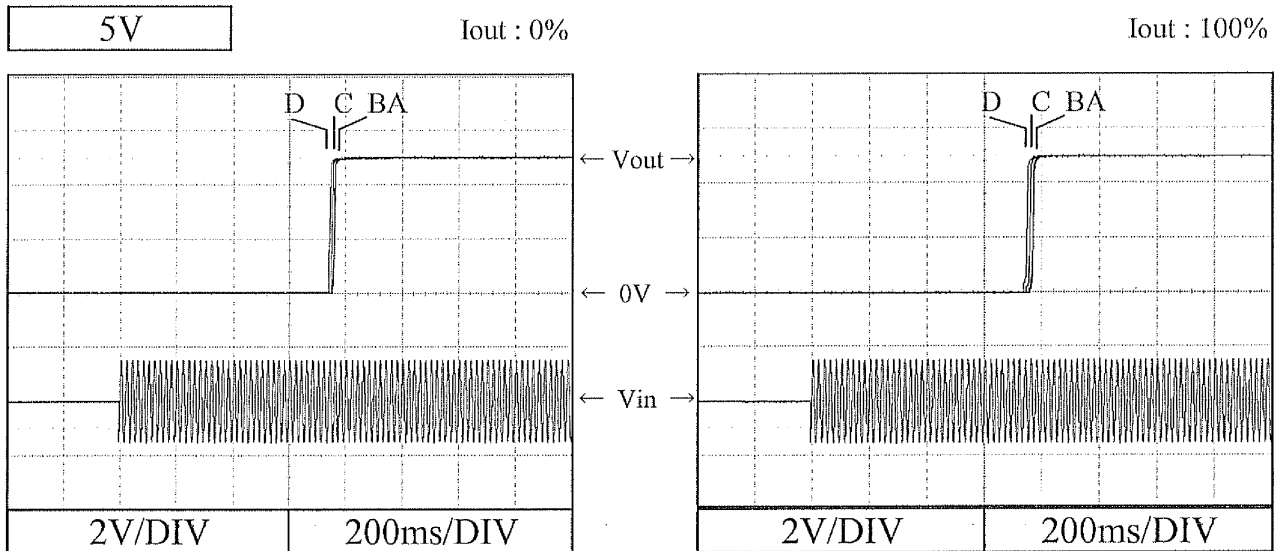
24V



2.4 出力立ち上がり特性

Output rise characteristics

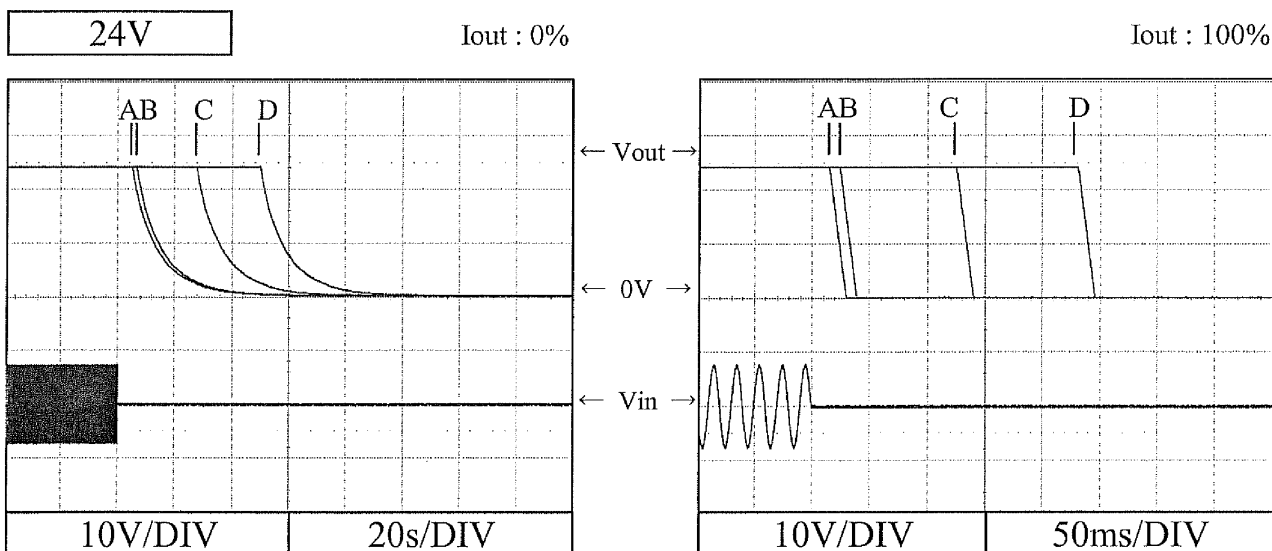
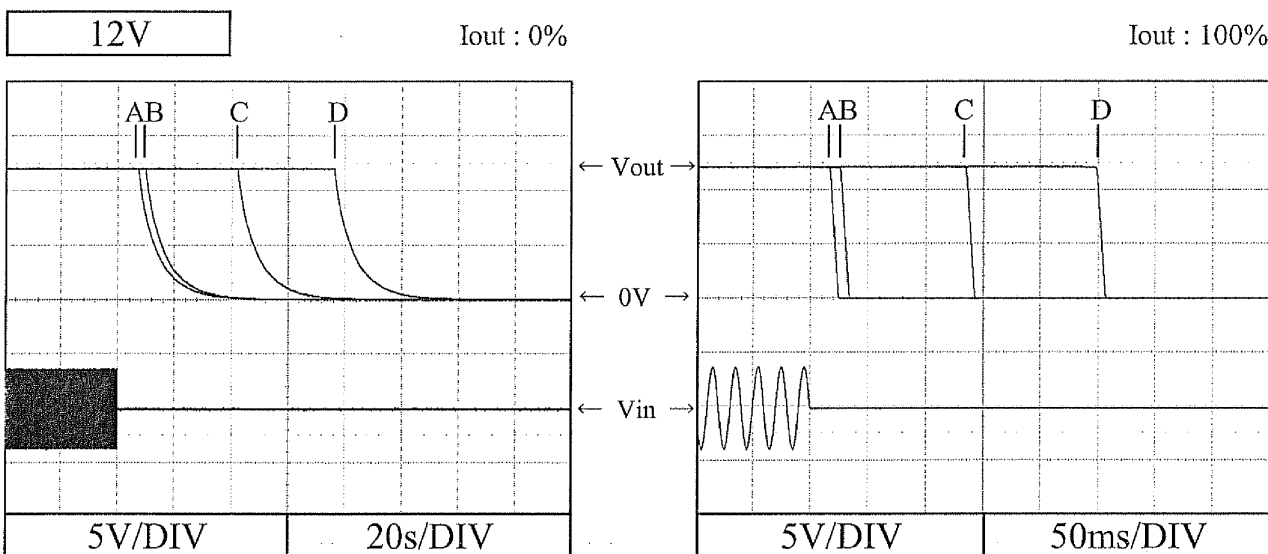
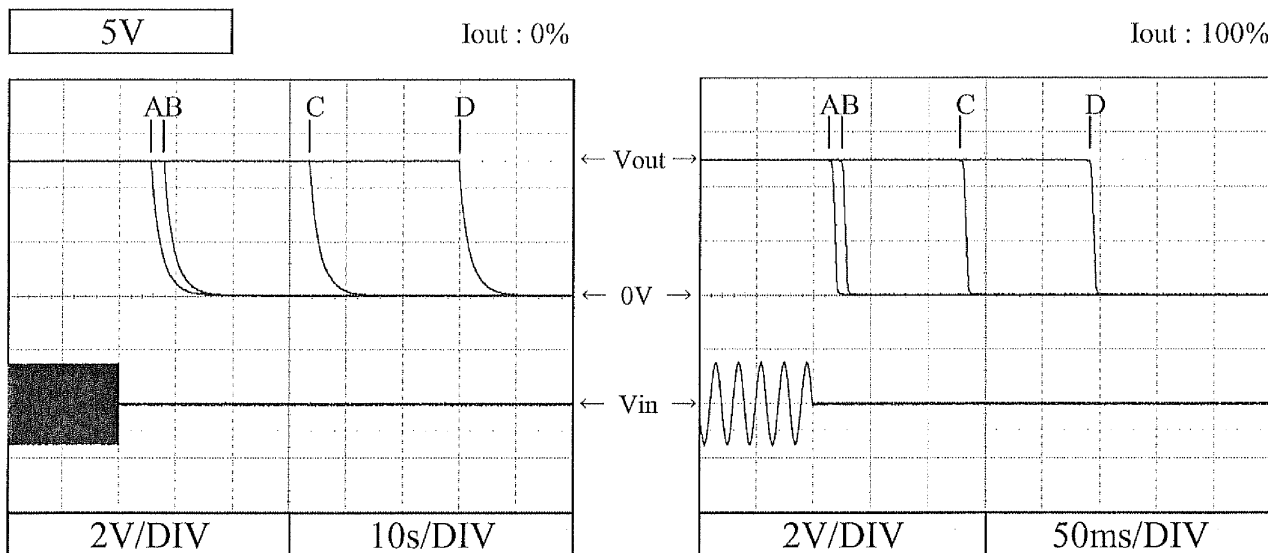
Conditions Vin : 85 VAC (A)
 100 VAC (B)
 200 VAC (C)
 265 VAC (D)
 Ta : 25 °C



2.5 出力立ち下がり特性

Output fall characteristics

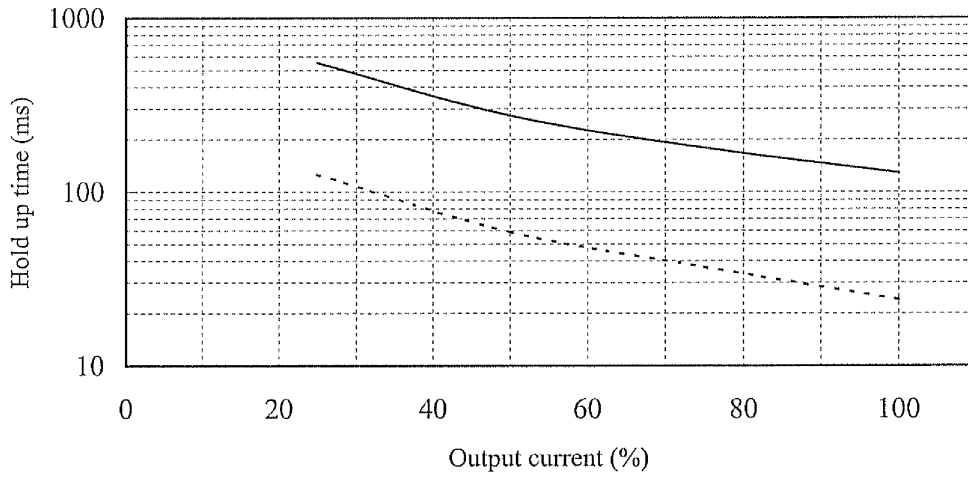
Conditions Vin : 85 VAC (A)
 100 VAC (B)
 200 VAC (C)
 265 VAC (D)
 Ta : 25 °C



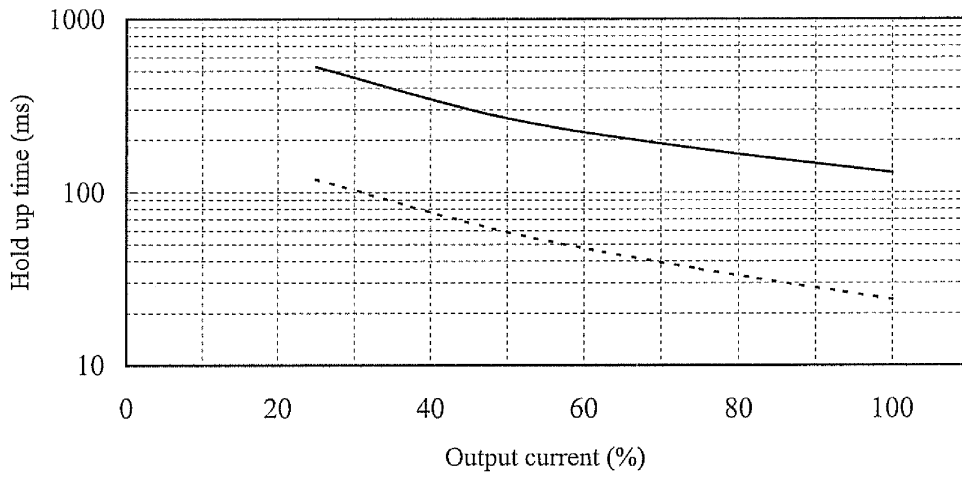
2.6 出力保持時間特性
Hold up time characteristics

Conditions Vin : 100 VAC -----
200 VAC ————
Ta : 25 °C

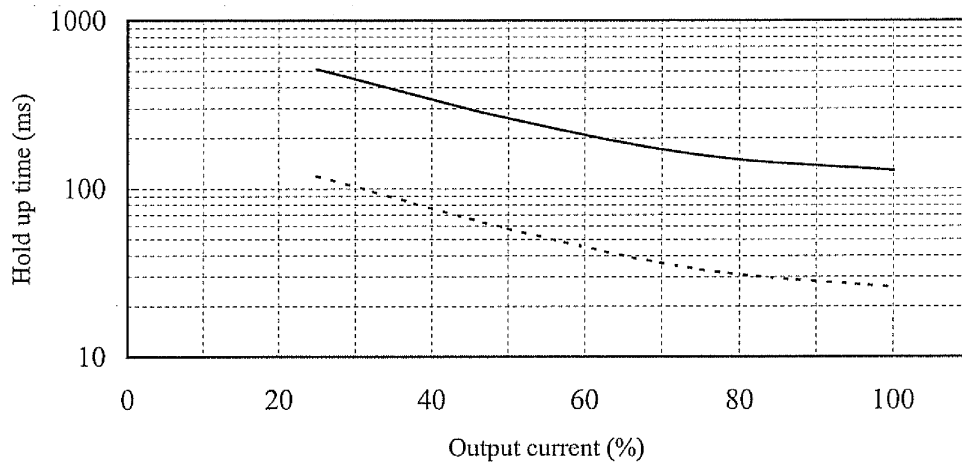
5V



12V



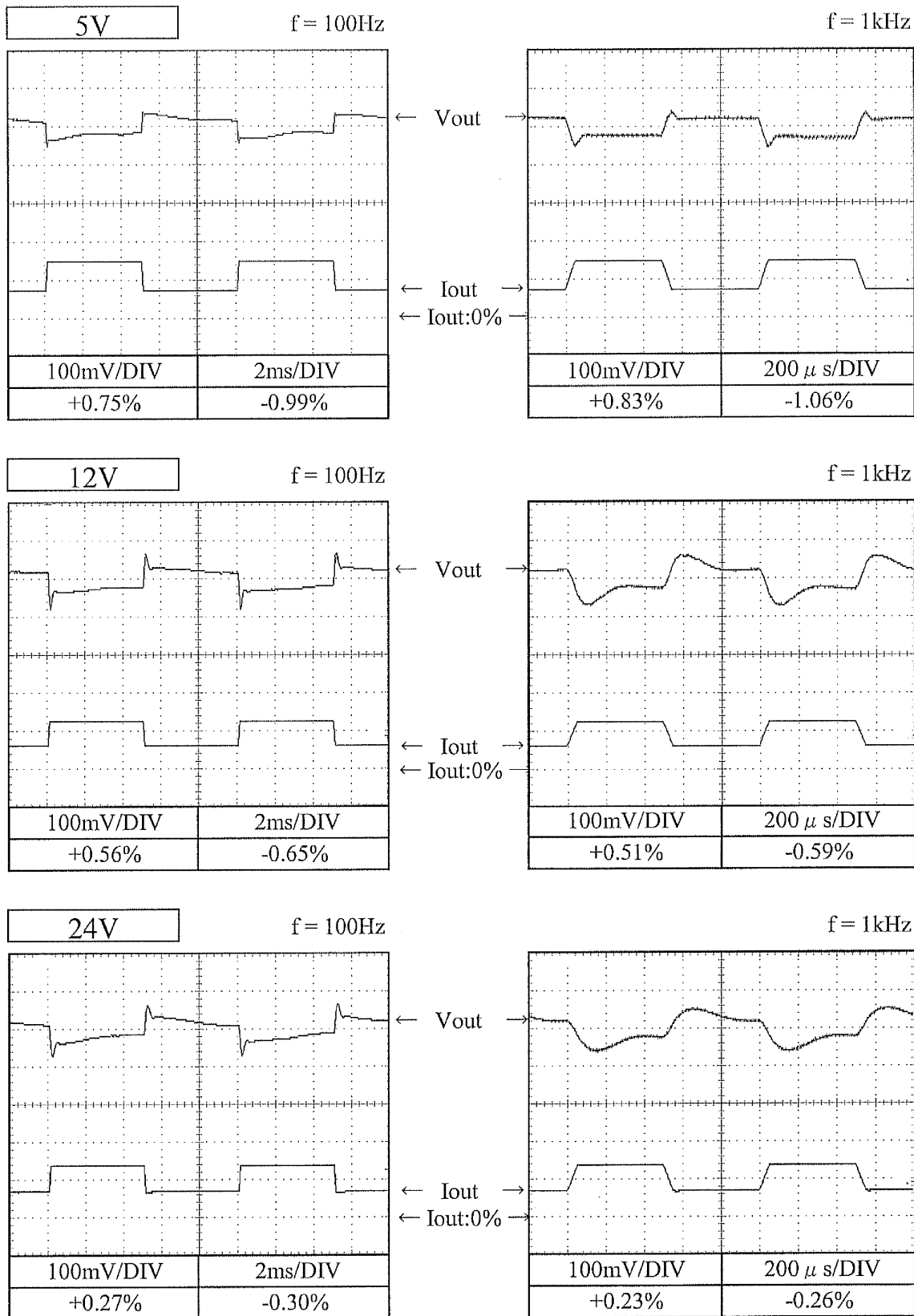
24V



2.7 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 °C



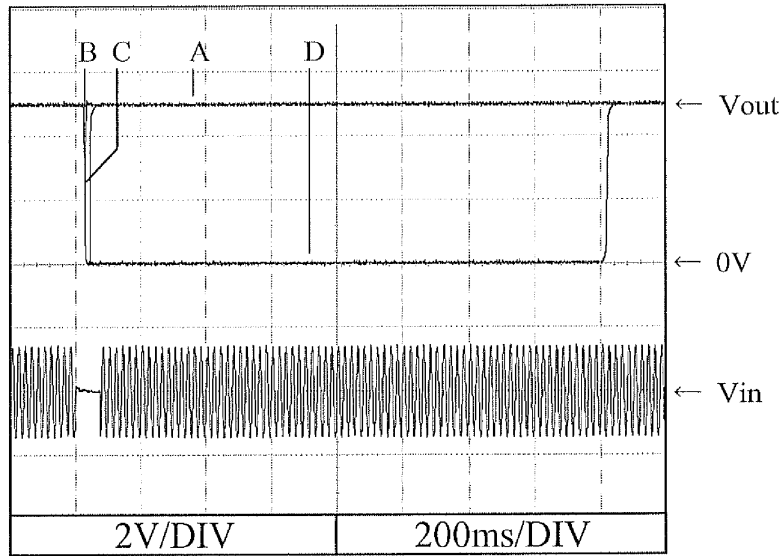
2.8 入力電圧瞬停特性

Response to brown out characteristics

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

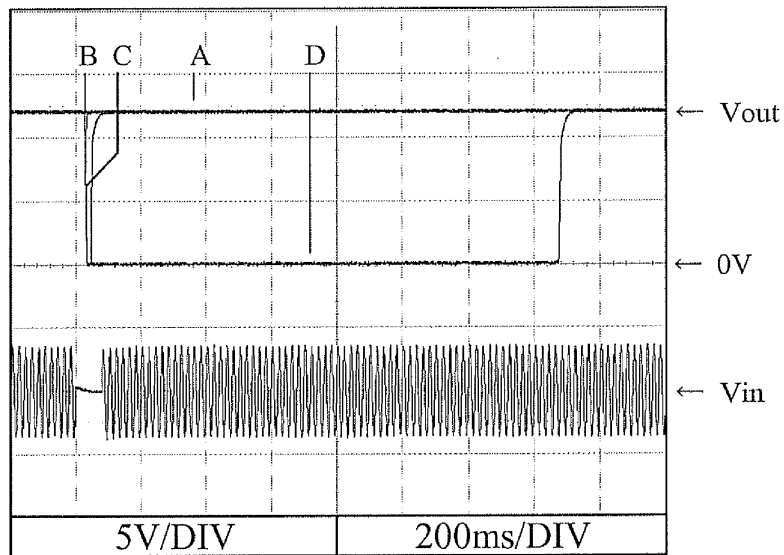
5V

A = 22ms
B = 29ms
C = 45ms
D = 76ms



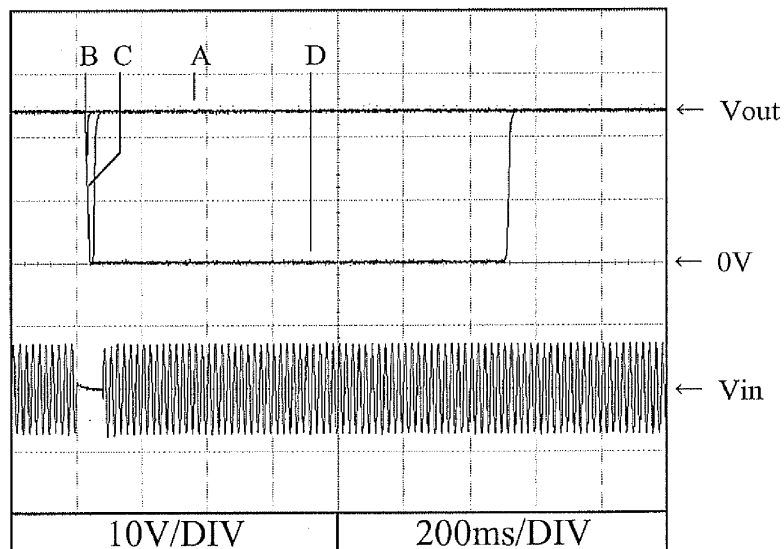
12V

A = 23ms
B = 30ms
C = 48ms
D = 81ms



24V

A = 22ms
B = 31ms
C = 50ms
D = 80ms



2.8 入力電圧瞬停特性

Response to brown out characteristics

Conditions $V_{in} : 200 \text{ VAC}$

$I_{out} : 100 \%$

$T_a : 25 \text{ }^\circ\text{C}$

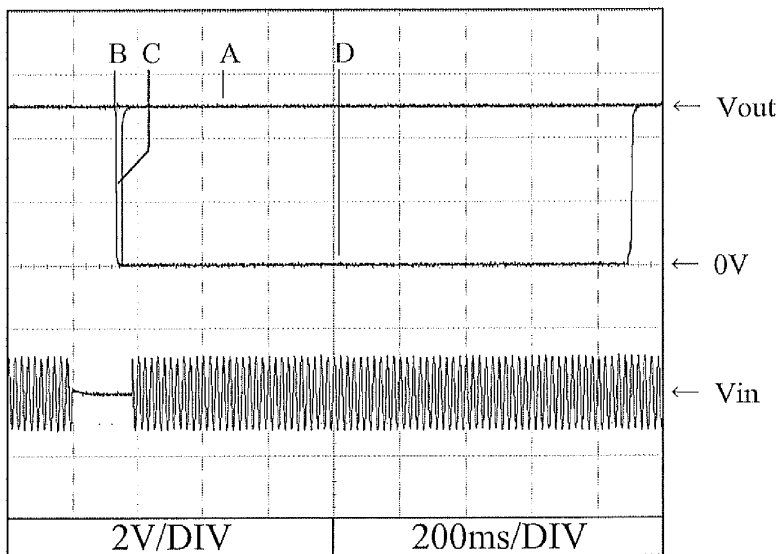
5V

A = 130ms

B = 137ms

C = 154ms

D = 186ms



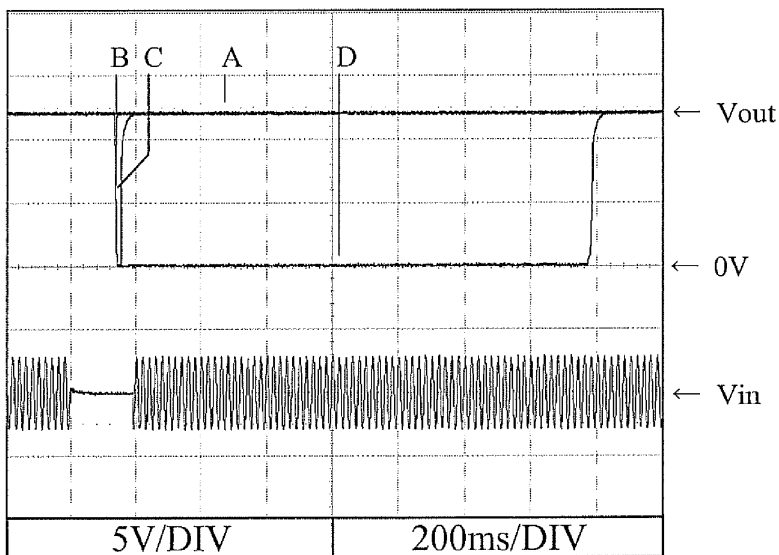
12V

A = 136ms

B = 142ms

C = 158ms

D = 196ms



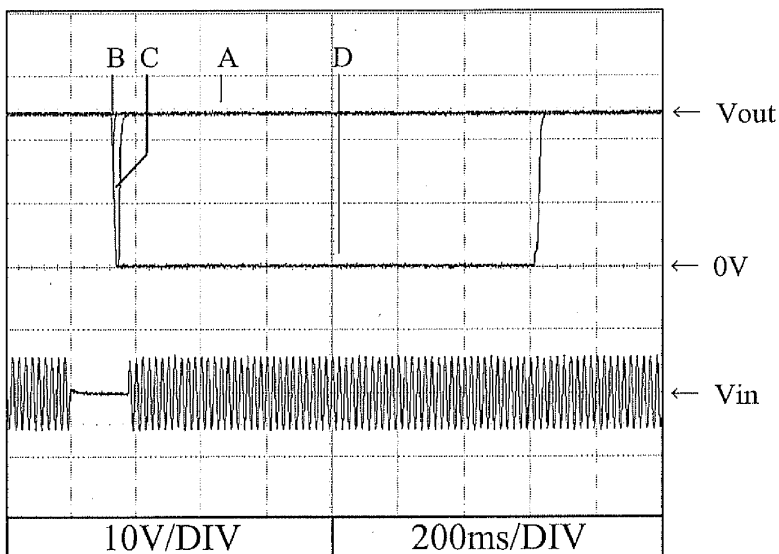
24V

A = 120ms

B = 134ms

C = 152ms

D = 182ms

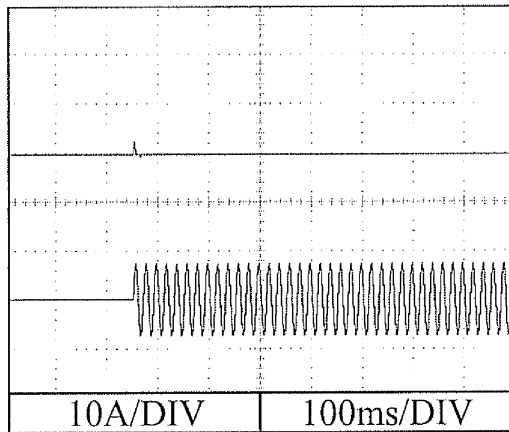


2.9 入力サージ電流（突入電流）波形
Inrush current waveform

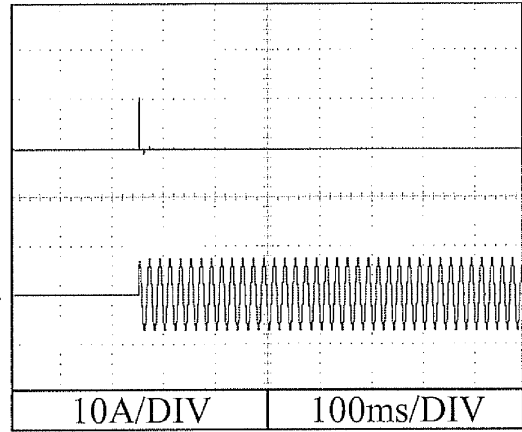
5V

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

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

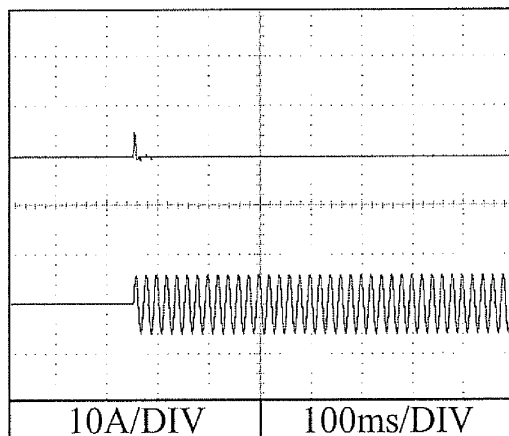


Switch on phase angle of input AC voltage
 $\phi = 90^\circ$

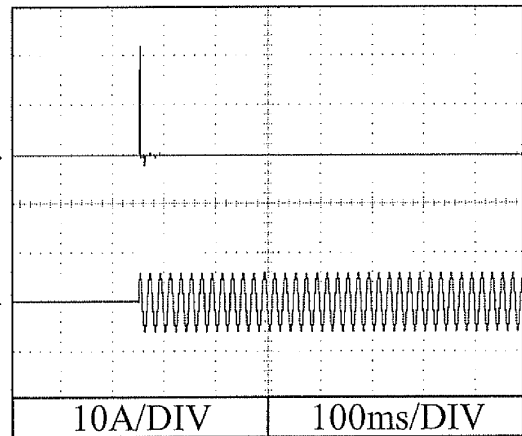


Conditions V_{in} : 200 VAC
 I_{out} : 100 %
 T_a : 25 °C

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



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

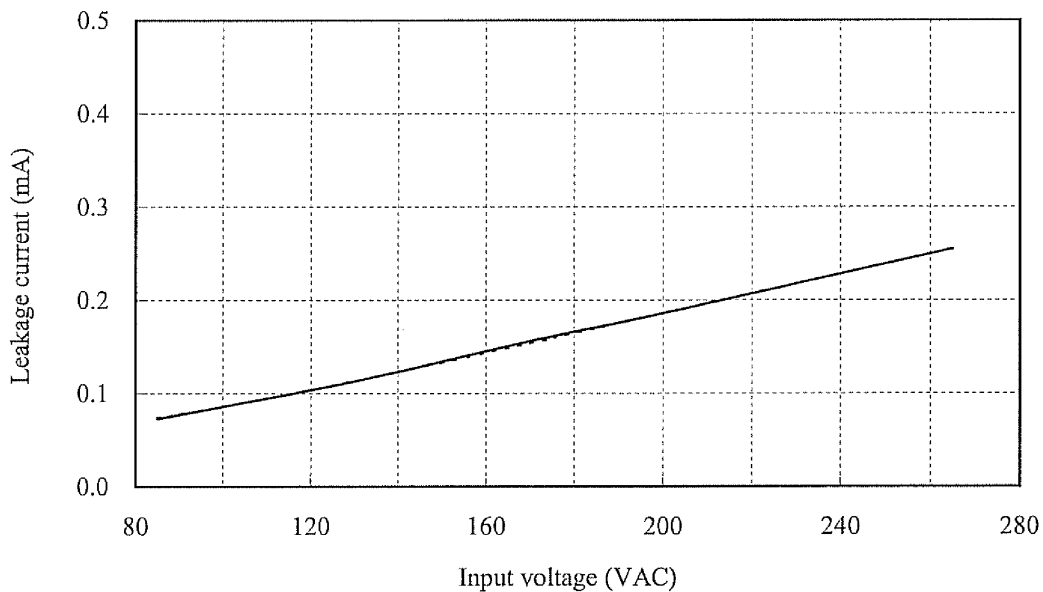


2.10 リーク電流特性
Leakage current characteristics

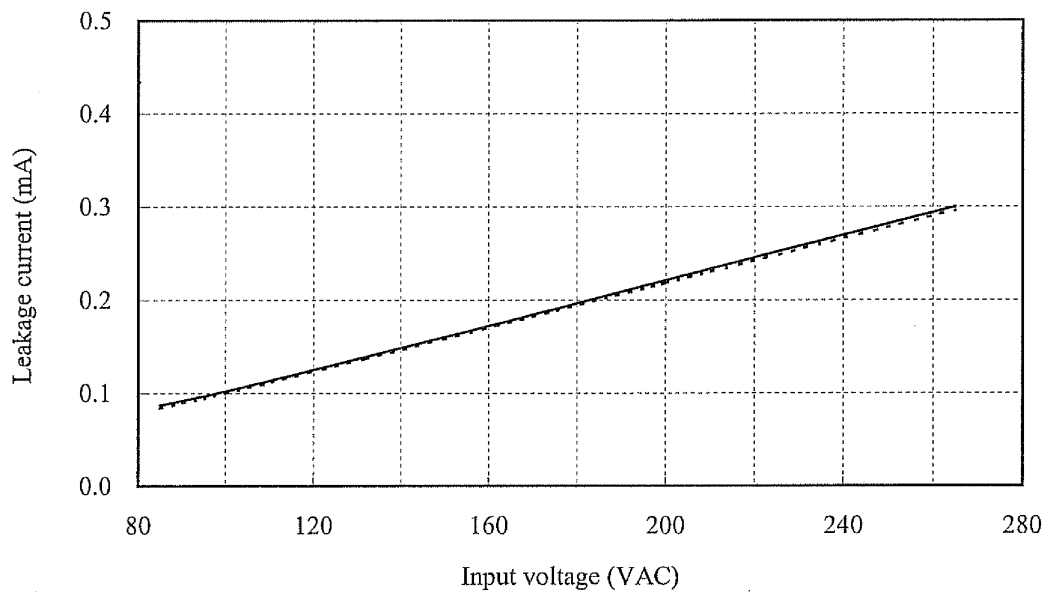
Conditions Iout : 0 % -----
 100 % ——
 Ta : 25 °C
Equipment used : 228 (Simpson)

5V

f : 50 Hz

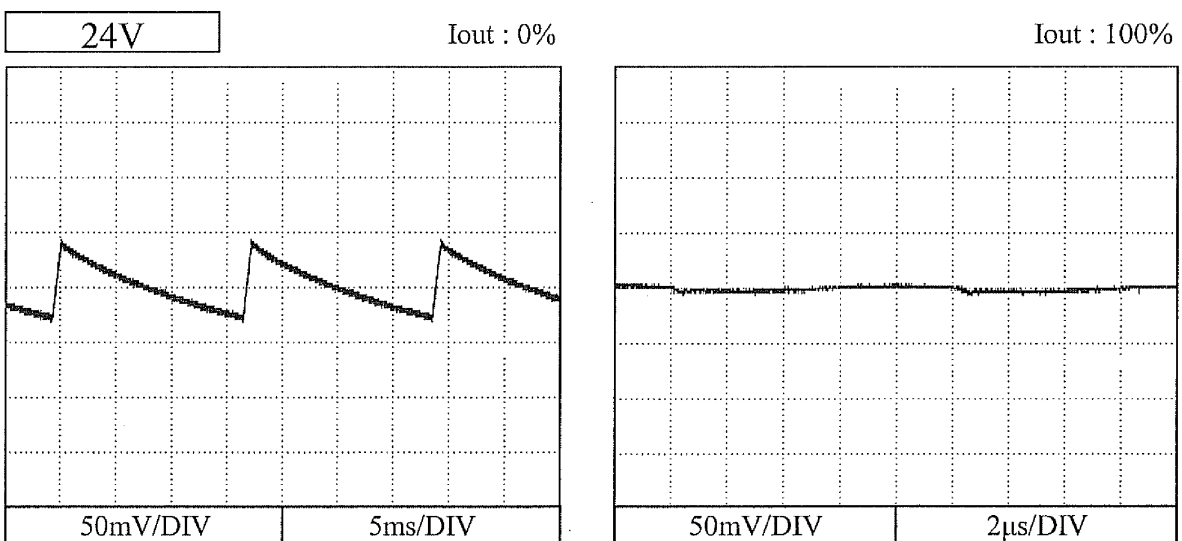
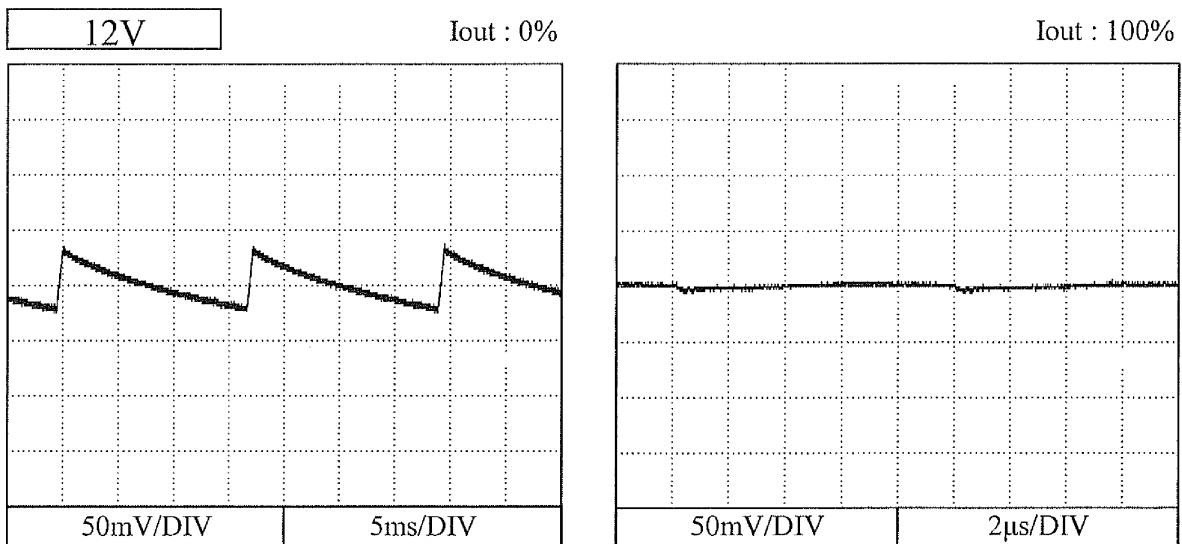
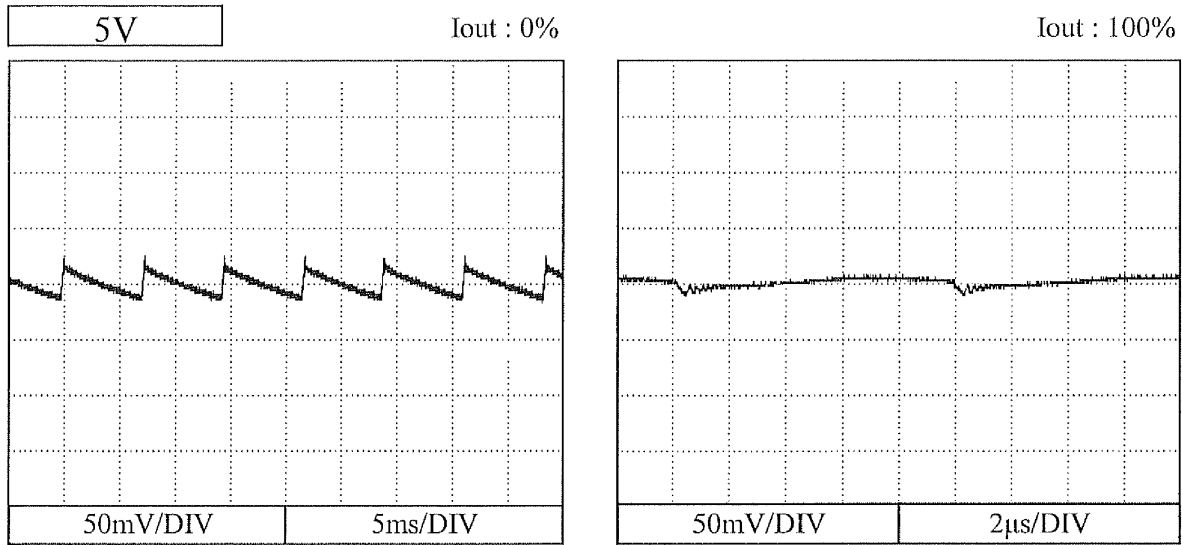


f : 60 Hz



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

Conditions Vin : 100 VAC
Ta : 25 °C



2.12 EMI 特性

Electro-Magnetic Interference characteristics

ZWS15B

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

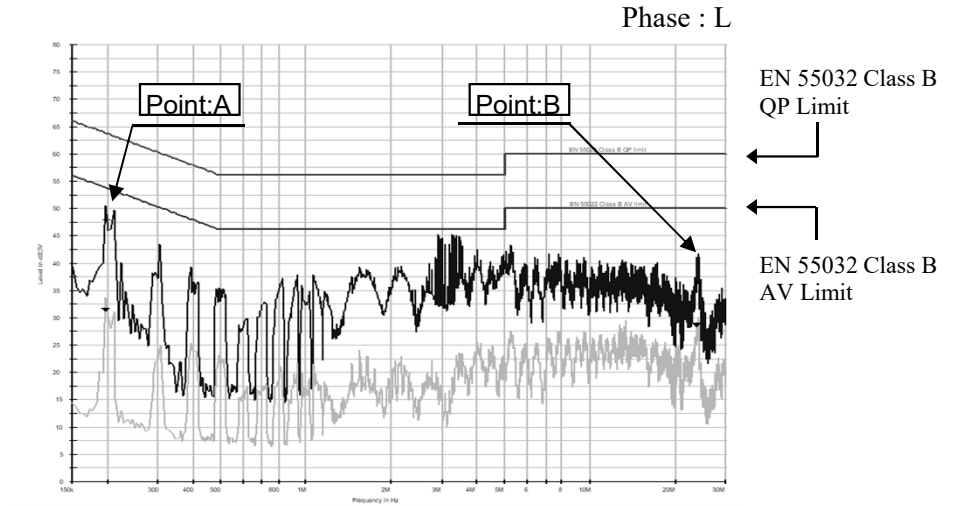
雑音端子電圧

Conducted Emission

5V

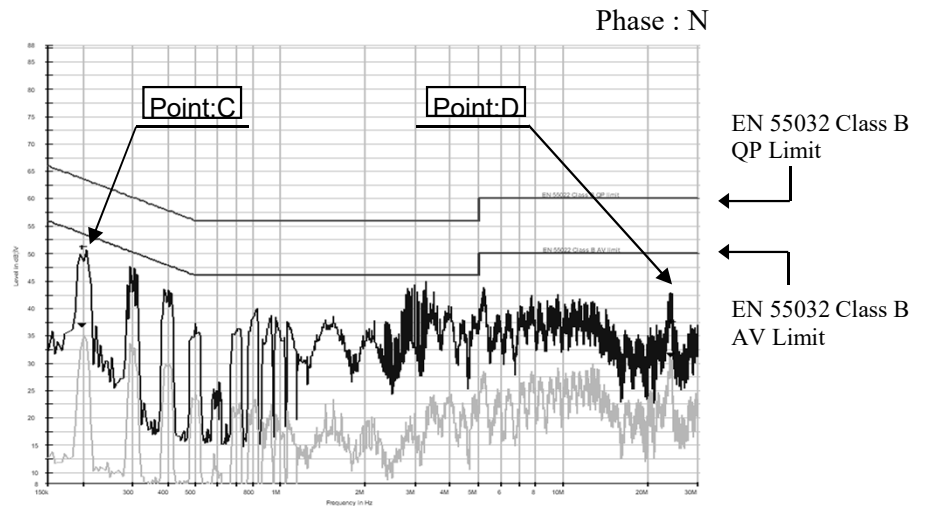
Point A (195kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.8	47.8
AV	53.8	31.4

Point B (23.904MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	36.3
AV	50.0	28.5



Point C (198.5kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.7	51.2
AV	53.7	36.9

Point D (24.093MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	37.6
AV	50.0	31.5



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

2.12 EMI 特性

Electro-Magnetic Interference characteristics

ZWS15B

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

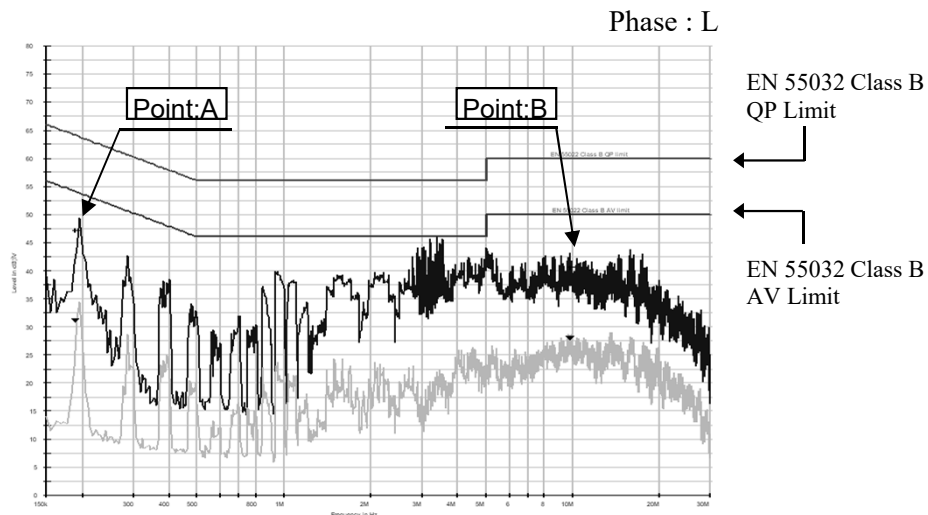
雑音端子電圧

Conducted Emission

12V

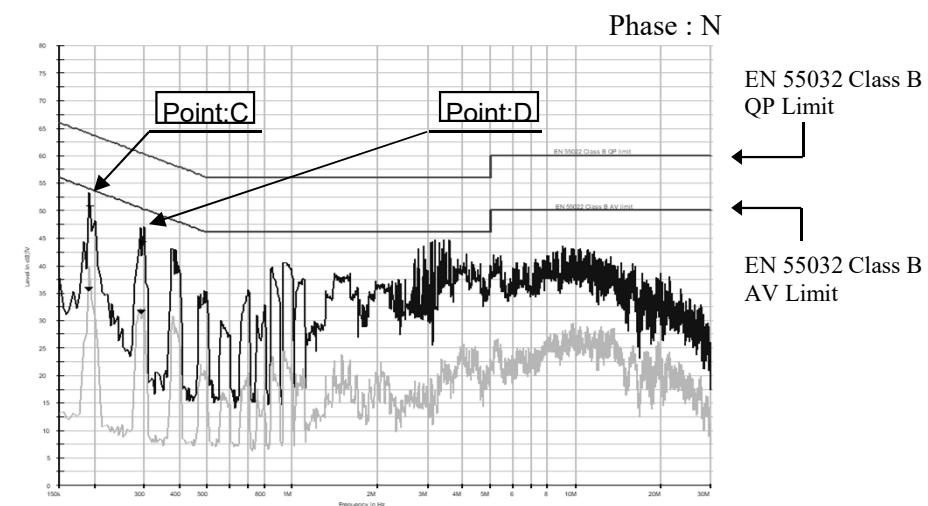
Point A (189kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	64.1	47.3
AV	54.1	31.0

Point B (9.8MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	40.6
AV	50.0	28.0



Point C (190.5kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	64.0	50.9
AV	54.0	35.6

Point D (291.5kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.5	44.2
AV	50.5	31.6



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

2.12 EMI 特性

Electro-Magnetic Interference characteristics

ZWS15B

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

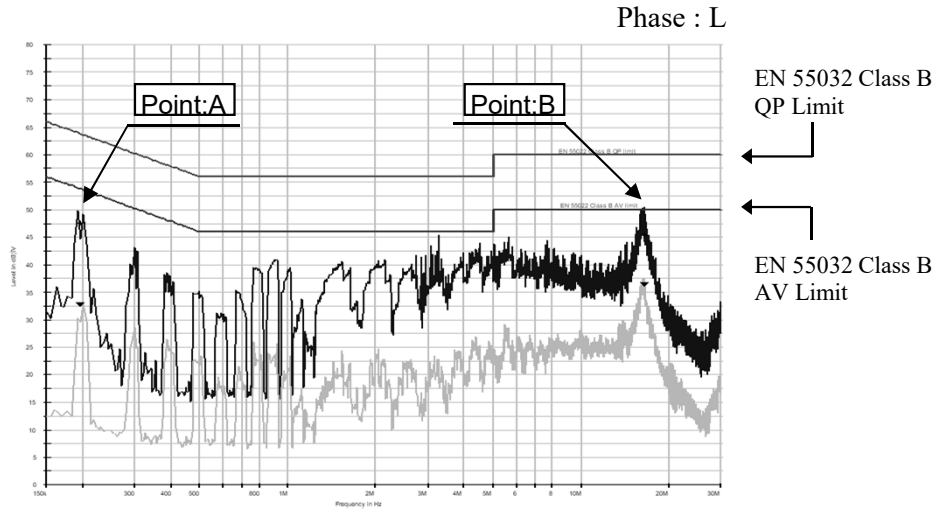
雑音端子電圧

Conducted Emission

24V

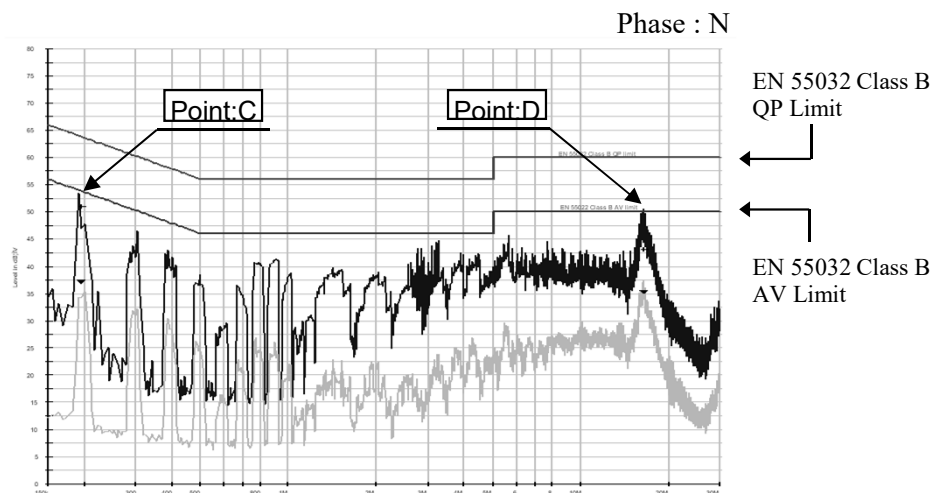
Point A (195kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.8	47.6
AV	53.8	32.7

Point B (16.54MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	45.5
AV	50.0	36.4



Point C (195.5kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.8	51.0
AV	53.8	37.2

Point D (16.426MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	60.0	43.1
AV	50.0	35.2



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

2.12 EMI 特性

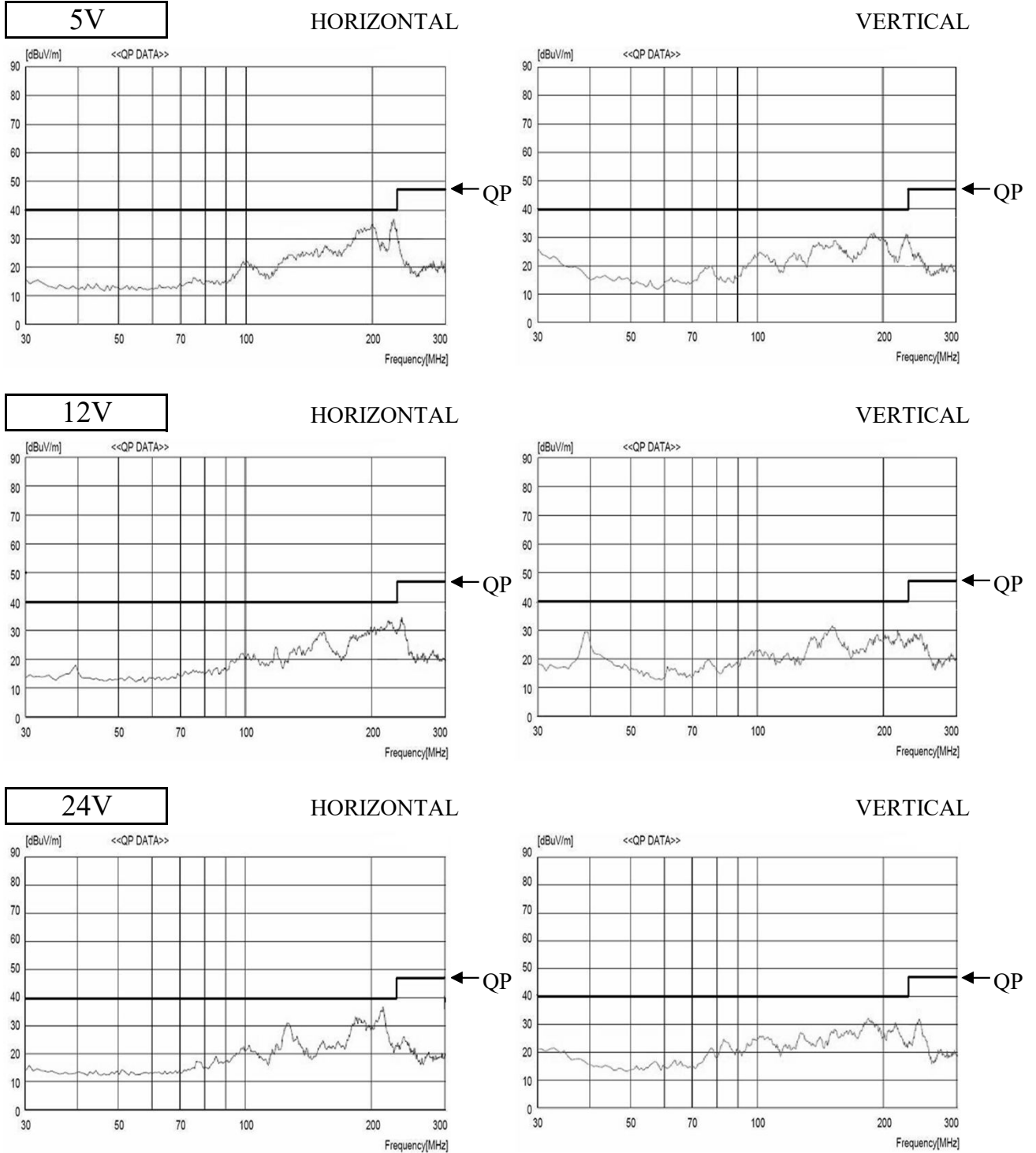
Electro-Magnetic Interference characteristics

ZWS15B

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

雑音電界強度

Radiated Emission



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.