

**ZWS150BAF**

**EVALUATION DATA**

**型式データ**

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## 使用記号 Terminology used

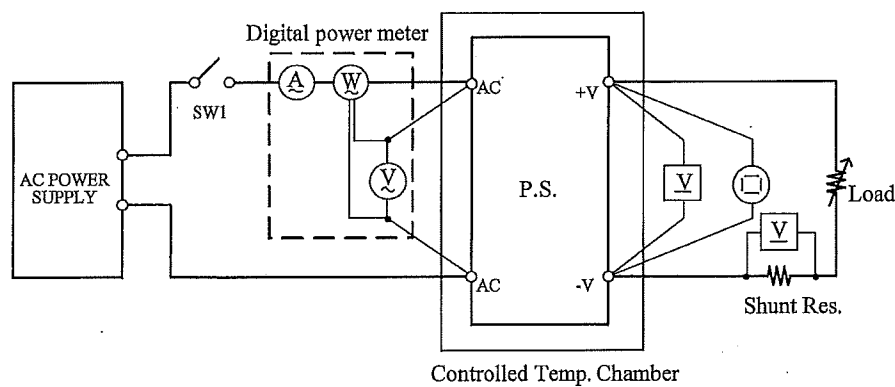
	定義	Definition
Vin	..... 入力電圧	Input voltage
Vout	..... 出力電圧	Output voltage
Iin	..... 入力電流	Input current
Iout	..... 出力電流	Output current
Ta	..... 周囲温度	Ambient temperature
f	..... 周波数	Frequency

1. 測定方法 Evaluation Method

1.1 測定回路 Circuit used for determination

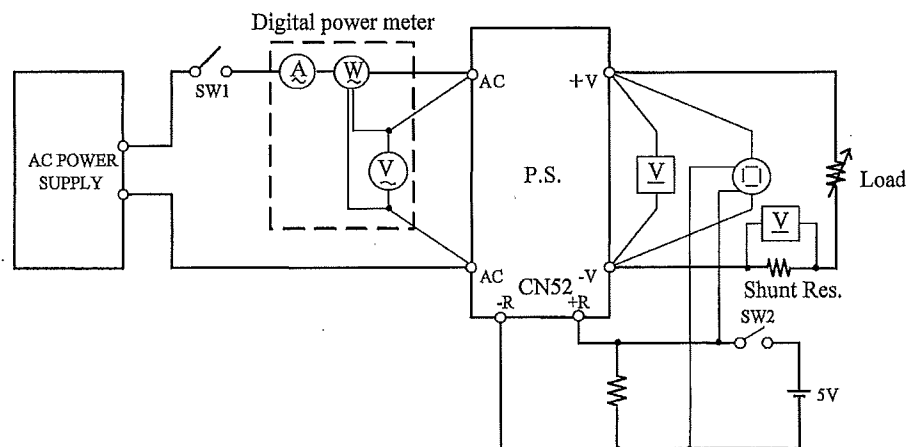
測定回路1 Circuit 1 used for determination

- ・静特性 Steady state data
- ・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



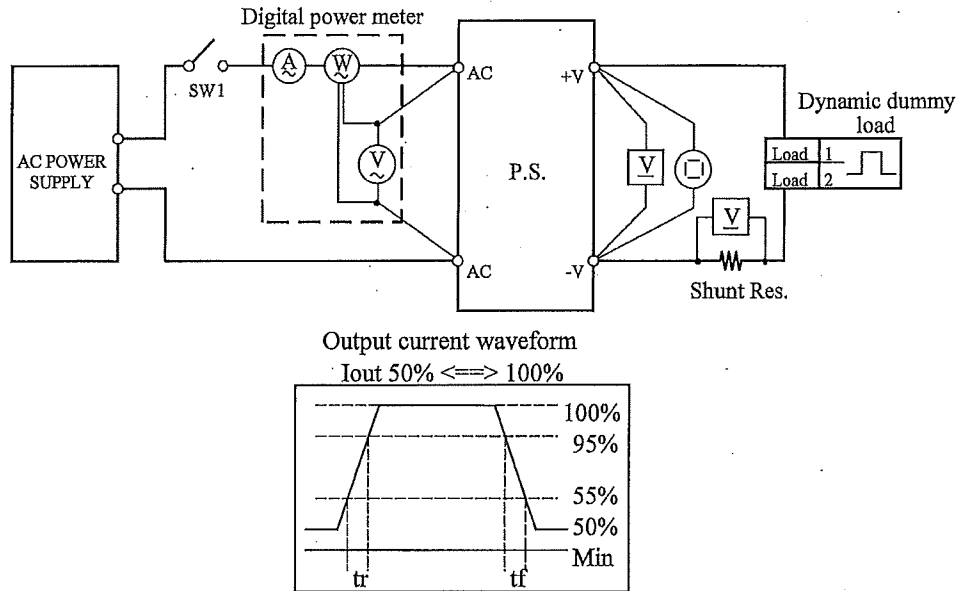
測定回路2 Circuit 2 used for determination

- ・ON/OFFコントロール時出力立ち上がり、立ち下がり特性  
Output rise, fall characteristics with ON/OFF Control
- 準標準品 ZWS150BAF-\*/R にて対応  
For alternative standard model ZWS150BAF-\*/R



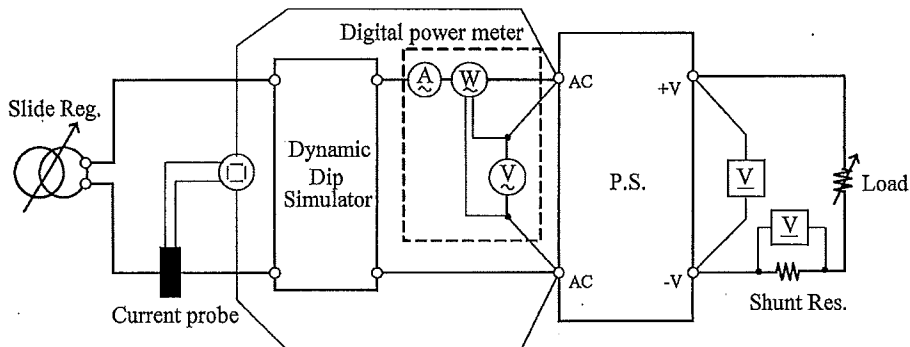
測定回路3 Circuit 3 used for determination

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



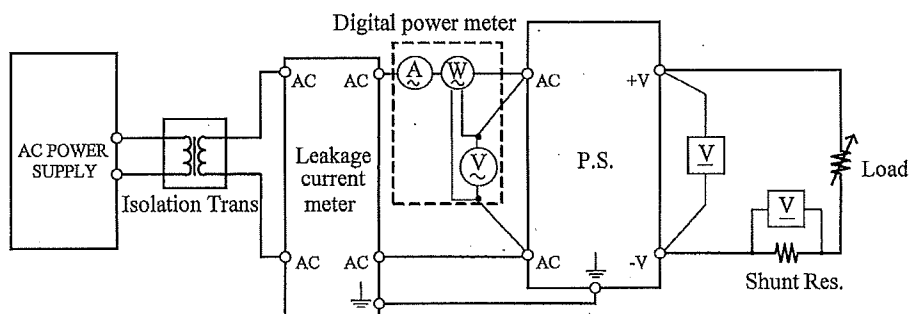
測定回路4 Circuit 4 used for determination

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



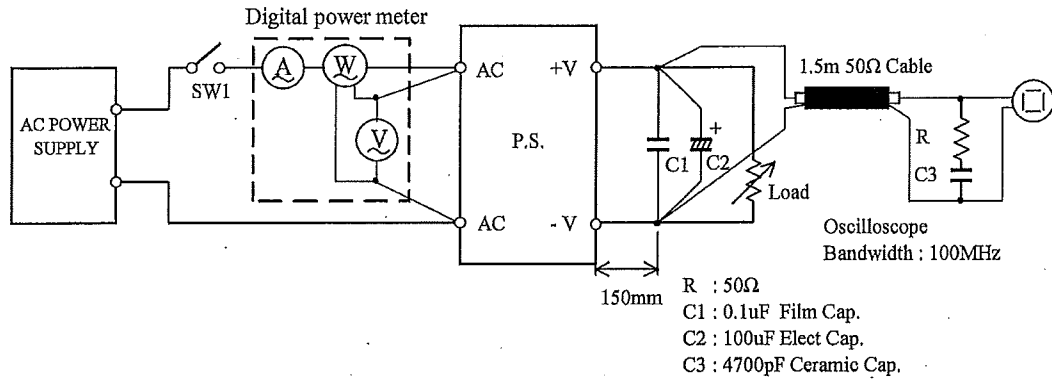
測定回路5 Circuit 5 used for determination

・リーク電流特性 Leakage current characteristics



測定回路6 Circuit 6 used for determination

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

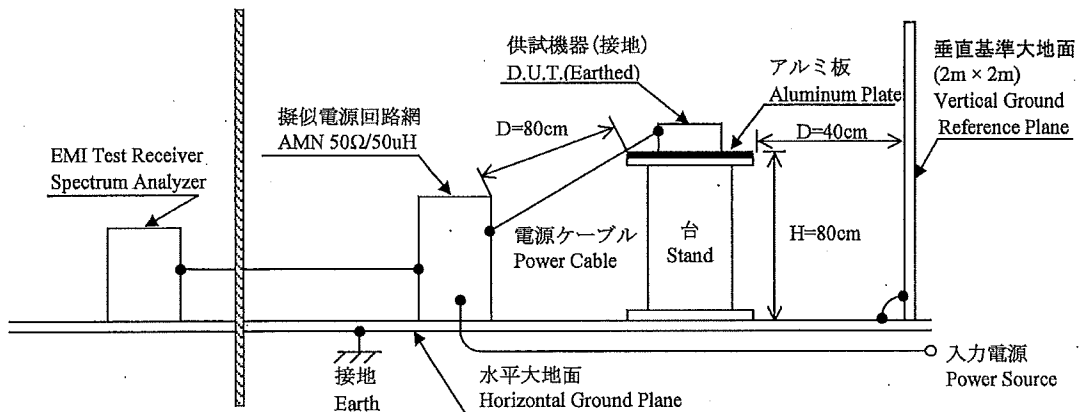


測定構成 Configuration used for determination

・EMI特性 Electro-Magnetic Interference characteristics

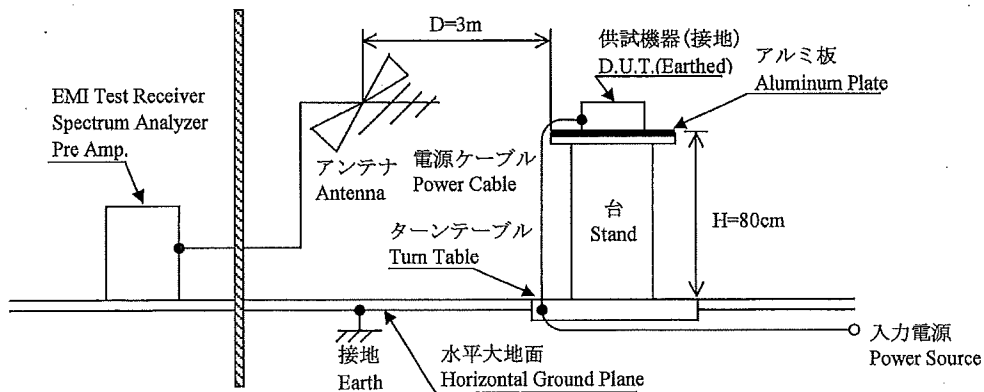
(a) 雑音端子電圧 (帰還ノイズ)

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	TDS3012
2	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA ELECT.	DL9040L
3	DIGITAL MULTIMETER	AGILENT	34970A
4	DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
5	CURRENT PROBE	YOKOGAWA ELECT.	701928 / 701930
6	DYNAMIC DUMMY LOAD	TAKASAGO	FK-200L / FK-400L
7	DUMMY LOAD	PCN	RHF250 SIRIES
8	SLIDE REGULATOR	MATSUNAGA	S3-24100
9	CVCF	TAKASAGO	AA2000XG
10	CVCF	NF	ES10000S
11	LEAKAGE CURRENT METER	HIOKI	3156
12	DYNAMIC DIP SIMULATOR	TAKAMISAWA	PSA-210
13	CONTROLLED TEMP. CHAMBER	ESPEC	SU-641 / SH-241
14	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESCI
15	PRE AMP.	SONOMA	310N
16	AMN	SCHWARZBECK	NNLK8121
17	ANTENNA	SCHWARZBECK	CBL6111D
18	HARMONIC / FLICKER ANALYZER	KIKUSUI	KHA1000
19	SINGLE-PHASE MASTER	NF	4420
20	REFERENCE IMPEDANCE NETWORK 20A	NF	4150
21	MULTI OUTLET UNIT	KIKUSUI	OT01-KHA

2. 特性データ Characteristics

ZWS150BAF

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%	5.030V	5.030V	5.030V	5.030V	0mV	0.000%
50%	5.027V	5.027V	5.027V	5.027V	0mV	0.000%
100%	5.023V	5.023V	5.023V	5.023V	0mV	0.000%
load	7mV	7mV	7mV	7mV		
regulation	0.140%	0.140%	0.140%	0.140%		

2. Temperature drift

Conditions Vin : 100 VAC  
Iout : 100 %

Ta	-10°C	+25°C	+50°C	temperature stability	
Vout	4.996V	5.023V	5.023V	27mV	0.540%

3. Start up voltage and Drop out voltage

Conditions Ta : 25 °C  
Iout : 100 %

Start up voltage (Vin)	76VAC
Drop out voltage (Vin)	65VAC

**12V** 1. Regulation - line and load Condition Ta : 25 °C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	12.008V	12.008V	12.008V	12.008V	0mV	0.000%
50%	12.006V	12.006V	12.006V	12.006V	0mV	0.000%
100%	12.007V	12.007V	12.006V	12.007V	1mV	0.008%
load	2mV	2mV	2mV	2mV		
regulation	0.017%	0.017%	0.017%	0.017%		

2. Temperature drift

Conditions Vin : 100 VAC  
Iout : 100 %

Ta	-10°C	+25°C	+50°C	temperature stability	
Vout	12.000V	12.007V	11.989V	18mV	0.150%

3. Start up voltage and Drop out voltage

Conditions Ta : 25 °C  
Iout : 100 %

Start up voltage (Vin)	77VAC
Drop out voltage (Vin)	62VAC

**24V** 1. Regulation - line and load Condition Ta : 25 °C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	24.062V	24.062V	24.062V	24.062V	0mV	0.000%
50%	24.059V	24.059V	24.059V	24.059V	0mV	0.000%
100%	24.057V	24.057V	24.057V	24.057V	0mV	0.000%
load	5mV	5mV	5mV	5mV		
regulation	0.021%	0.021%	0.021%	0.021%		

2. Temperature drift

Conditions Vin : 100 VAC  
Iout : 100 %

Ta	-10°C	+25°C	+50°C	temperature stability	
Vout	24.041V	24.057V	24.055V	16mV	0.067%

3. Start up voltage and Drop out voltage

Conditions Ta : 25 °C  
Iout : 100 %

Start up voltage (Vin)	76VAC
Drop out voltage (Vin)	64VAC

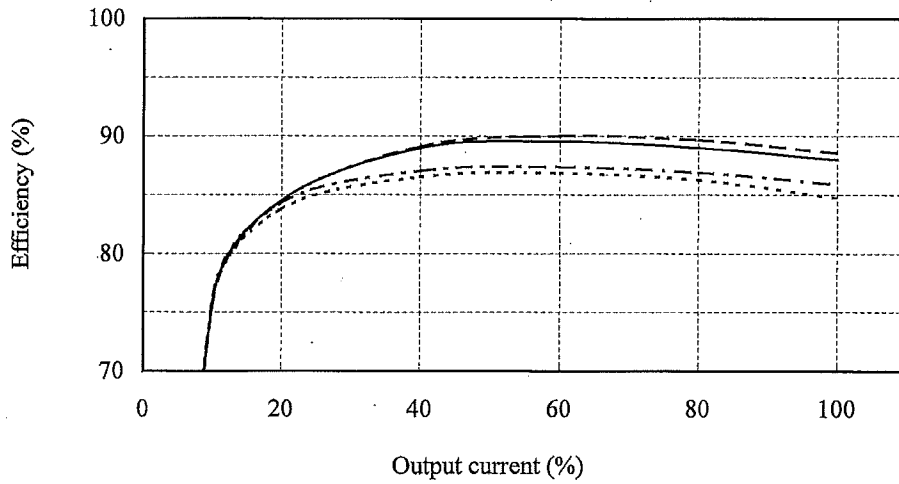


(2) 効率対出力電流

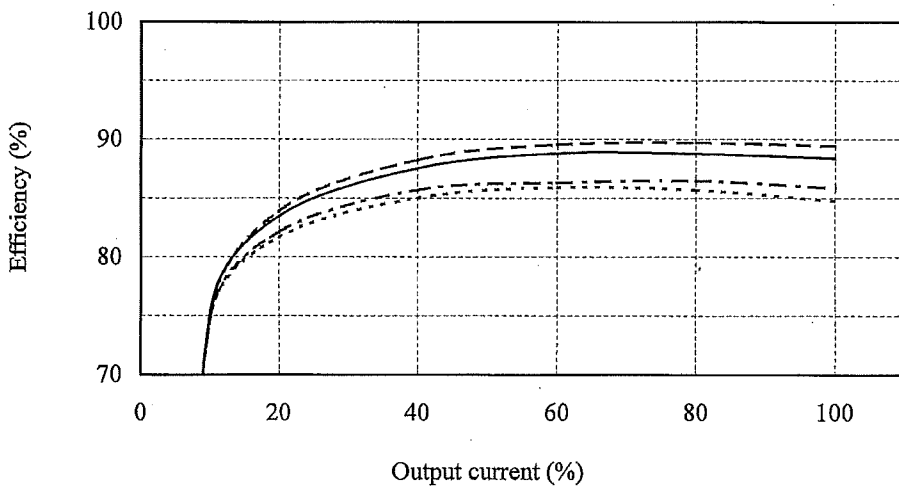
Efficiency vs. Output current

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

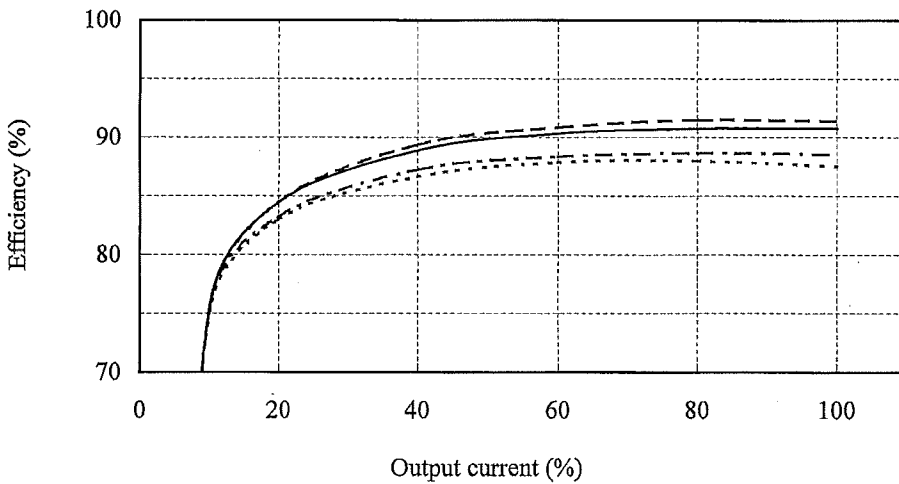
5V



12V



24V



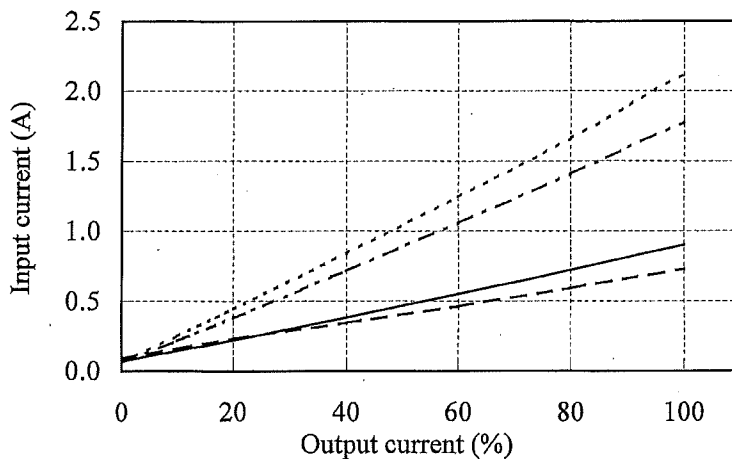
# ZWS150BAF

## (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

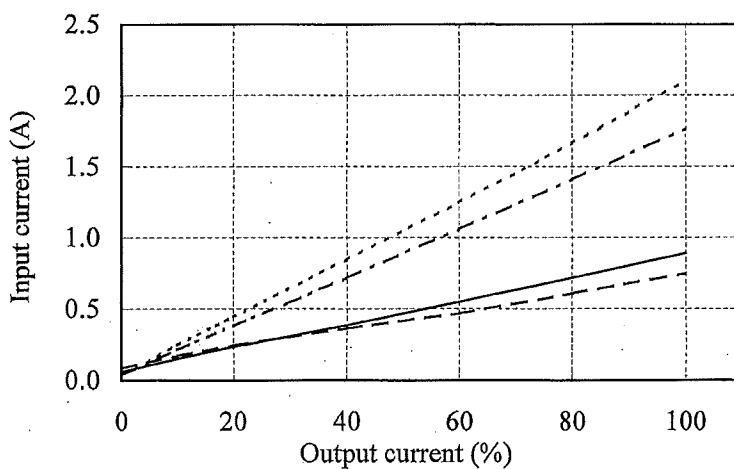
5V

Vin	Input current	
	Iout : 0%	Control OFF*
85VAC	0.06A	0.03A
100VAC	0.06A	0.04A
200VAC	0.07A	0.06A
265VAC	0.09A	0.08A



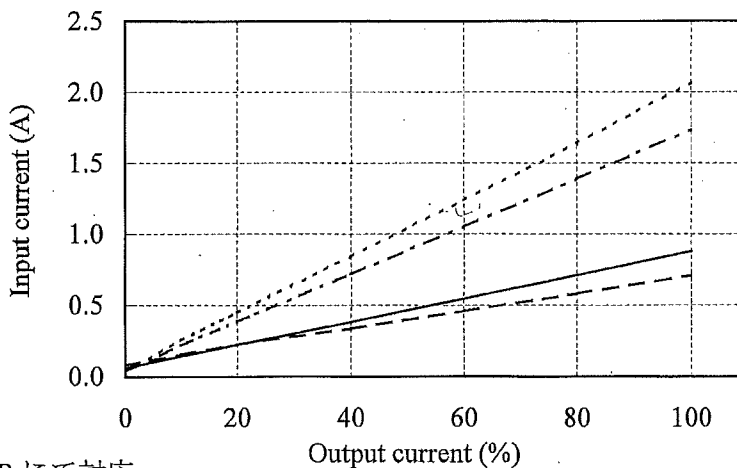
12V

Vin	Input current	
	Iout : 0%	Control OFF*
85VAC	0.03A	0.03A
100VAC	0.04A	0.04A
200VAC	0.06A	0.06A
265VAC	0.08A	0.08A



24V

Vin	Input current	
	Iout : 0%	Control OFF*
85VAC	0.03A	0.03A
100VAC	0.04A	0.04A
200VAC	0.06A	0.06A
265VAC	0.08A	0.08A



\* 標準品 ZWS150BAF-\*/R にて対応  
 For alternative standard model ZWS150BAF-\*/R

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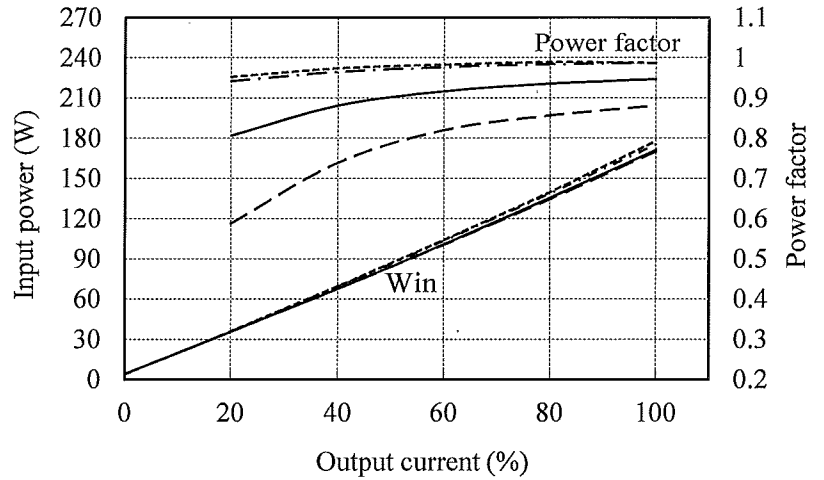
## (4) 入力電力・力率対出力電流

Input power and Power factor vs. Output current

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

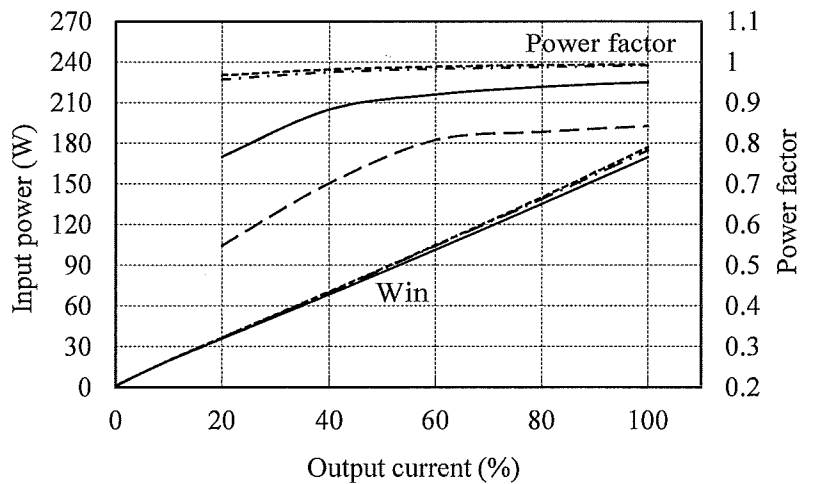
5V

Vin	Input power	
	Iout : 0%	Control OFF*
85VAC	4.0W	1.0W
100VAC	4.0W	1.2W
200VAC	4.4W	1.6W
265VAC	4.2W	1.8W



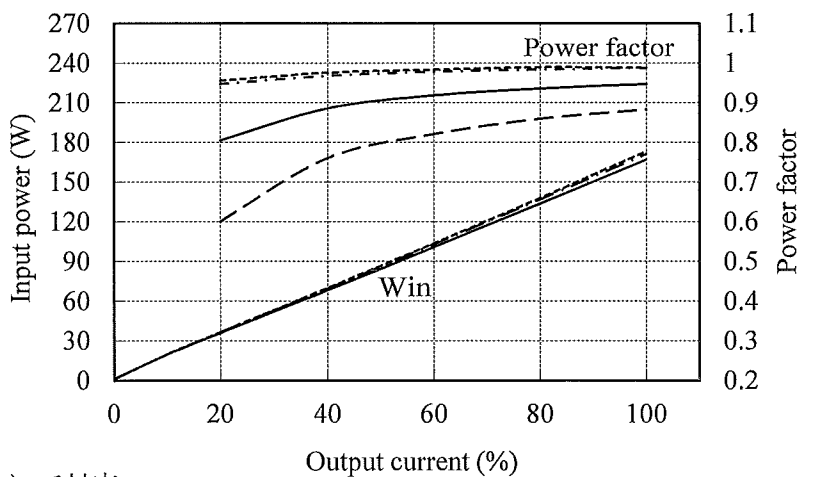
12V

Vin	Input power	
	Iout : 0%	Control OFF*
85VAC	1.1W	0.8W
100VAC	1.2W	0.9W
200VAC	1.5W	1.4W
265VAC	1.9W	1.7W



24V

Vin	Input power	
	Iout : 0%	Control OFF*
85VAC	1.1W	1.0W
100VAC	1.1W	1.1W
200VAC	1.5W	1.5W
265VAC	2.0W	1.9W



\* 準標準品 ZWS150BAF-\*/R にて対応  
 For alternative standard model ZWS150BAF-\*/R

## 2.2 過電流保護特性

Over current protection (OCP) characteristics

Conditions  $V_{in}$ : 100 VAC

$T_a$ : -10 °C

25 °C

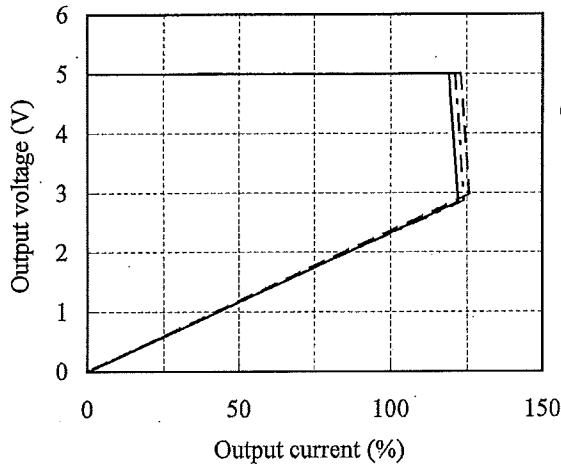
50 °C

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5V



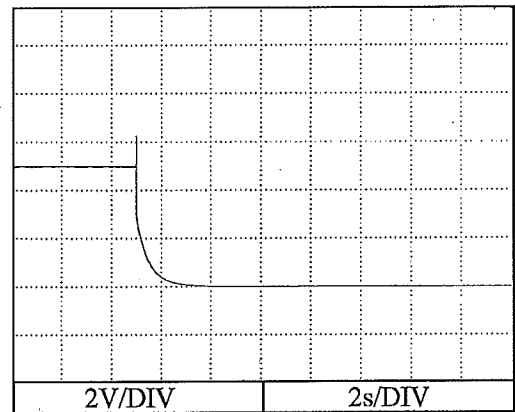
## 2.3 過電圧保護特性

Over voltage protection (OVP) characteristics

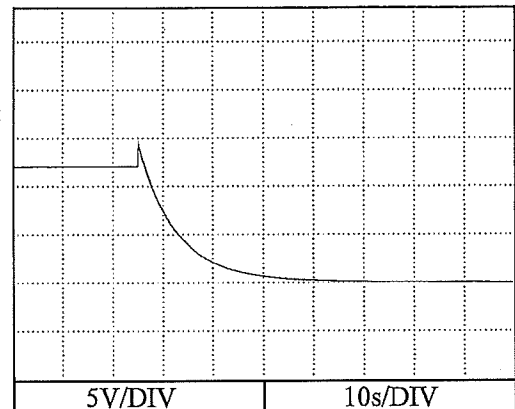
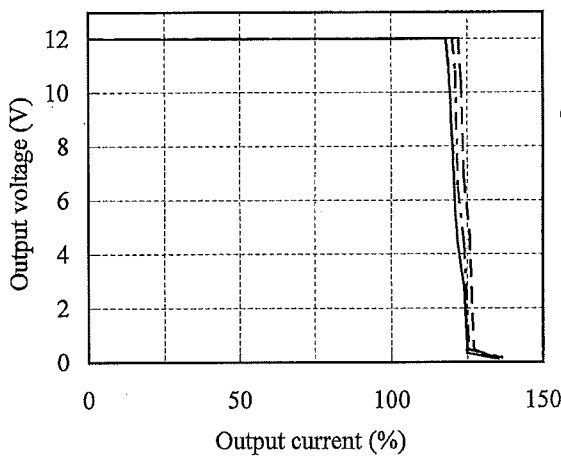
Conditions  $V_{in}$ : 100 VAC

$I_{out}$ : 0 %

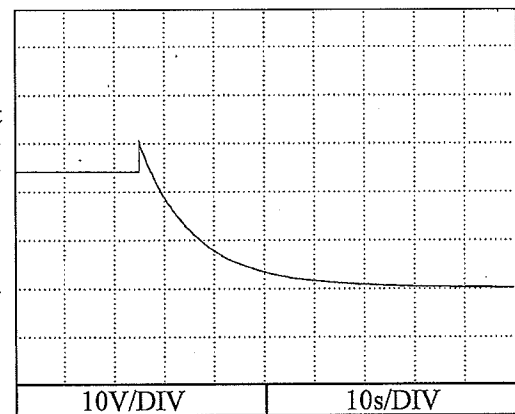
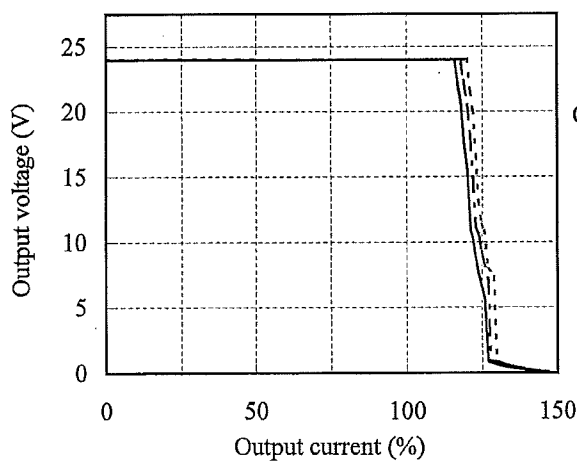
$T_a$ : 25 °C



12V



24V

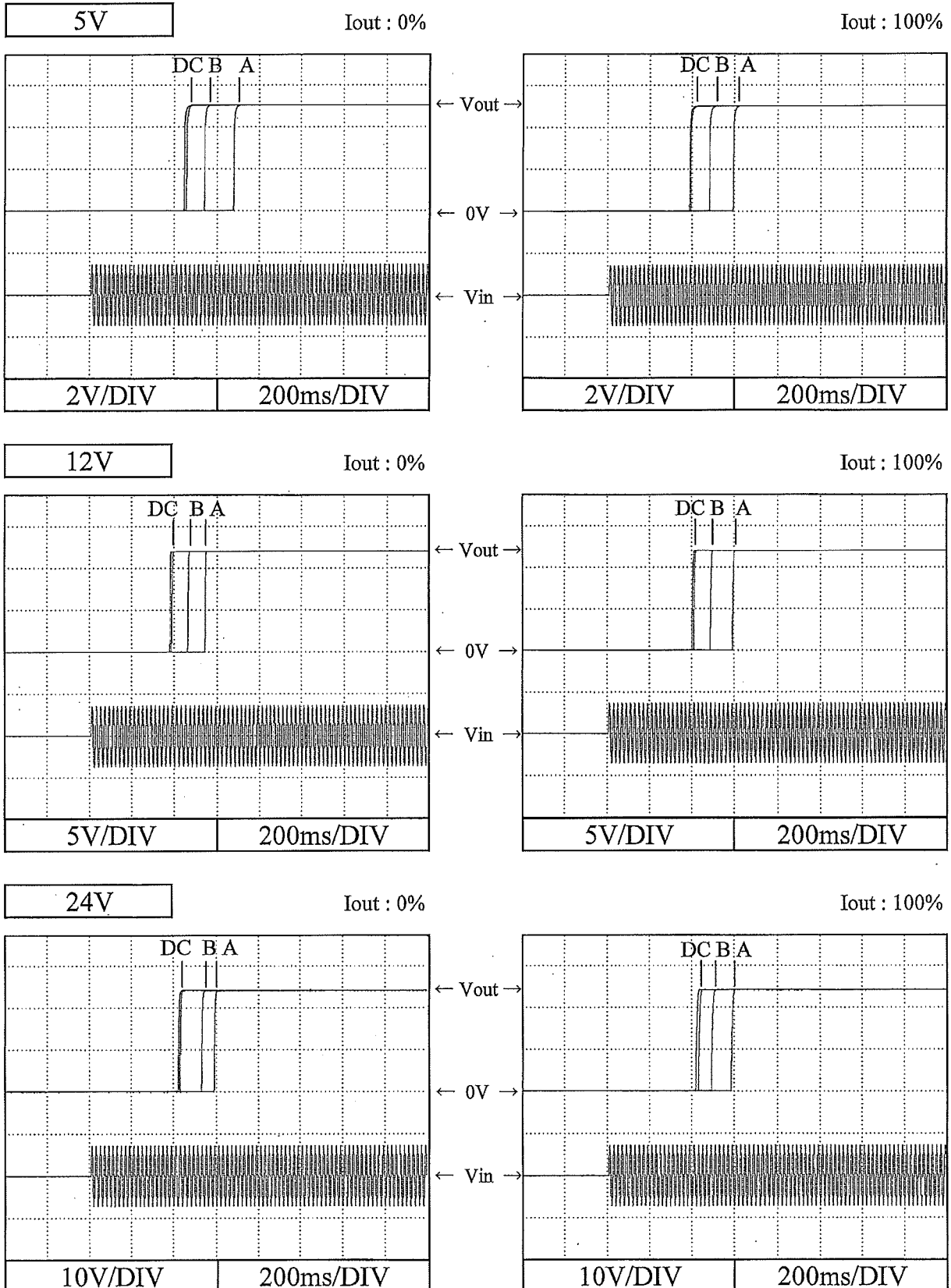


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## 2.4 出力立ち上がり特性

Output rise characteristics

Conditions  $V_{in}$  : 85 VAC (A)  
 100 VAC (B)  
 200 VAC (C)  
 265 VAC (D)  
 $T_a$  : 25 °C

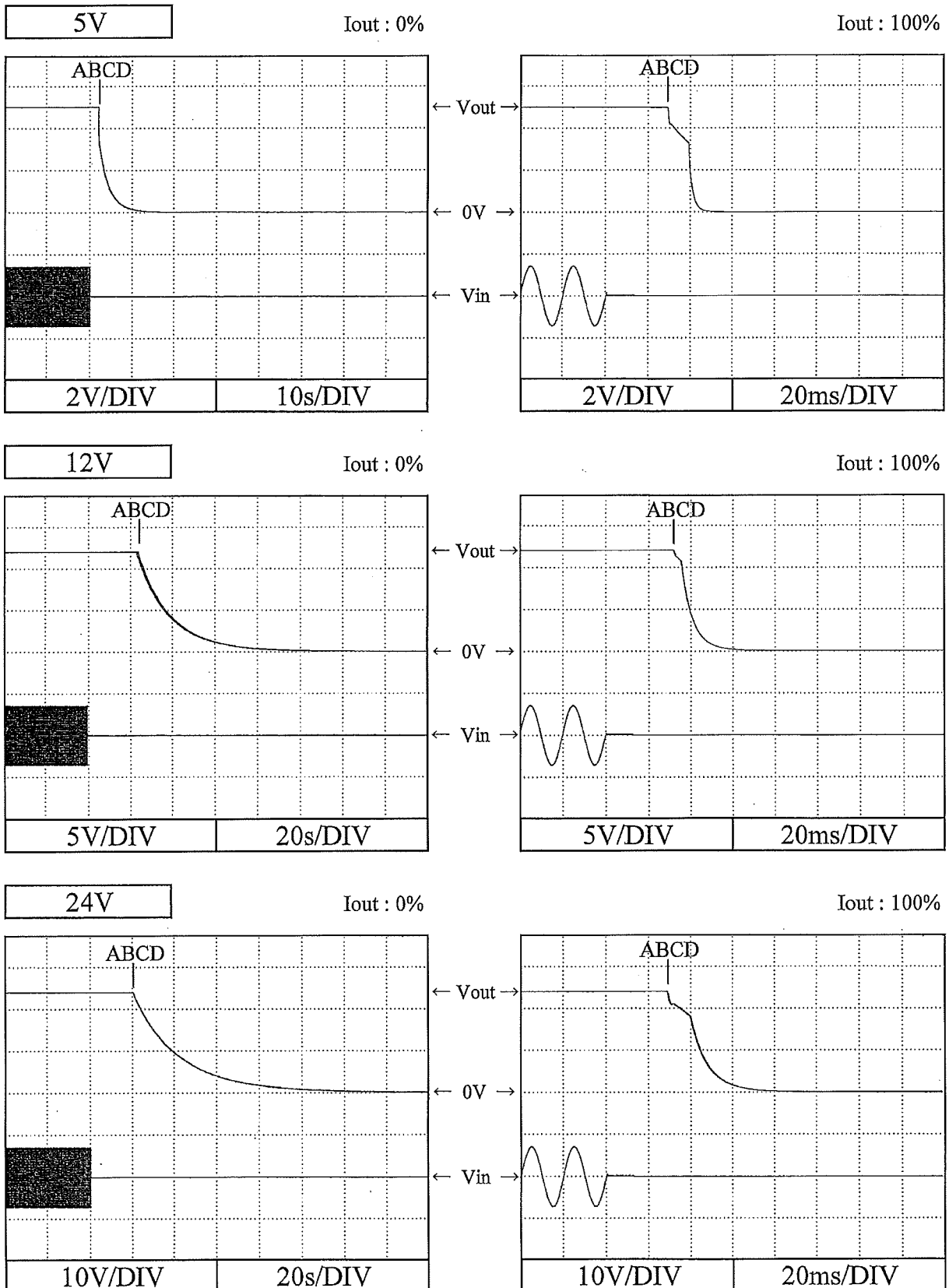


# ZWS150BAF

## 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

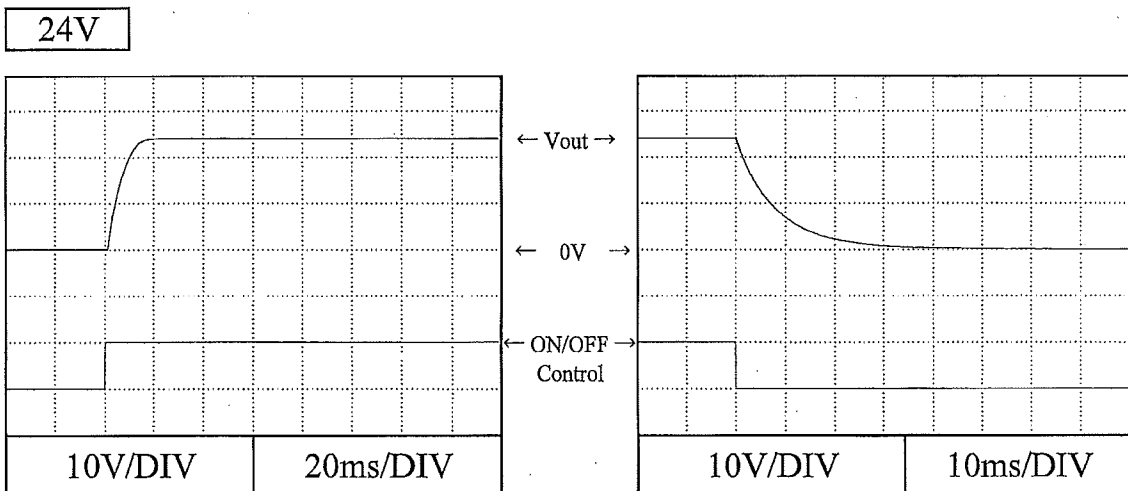
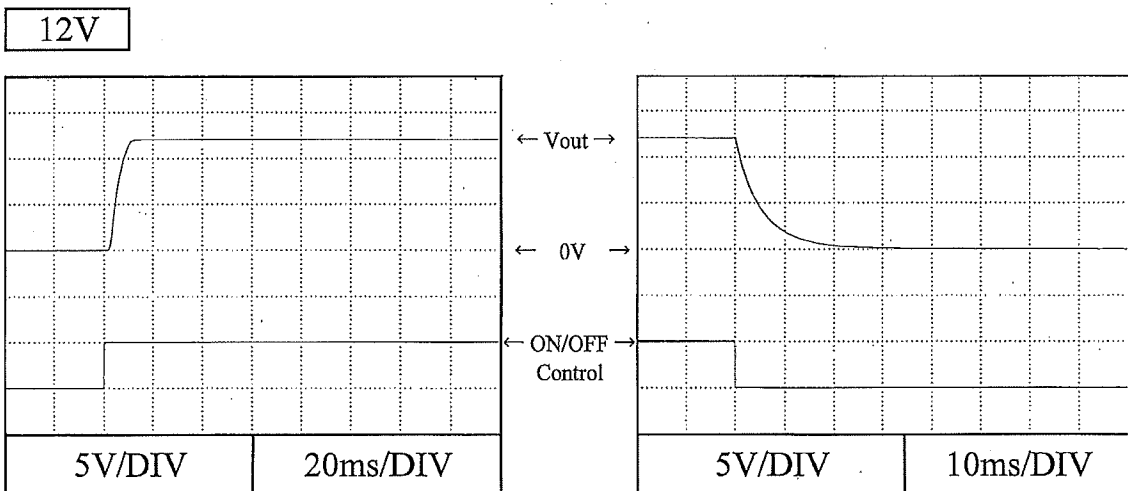
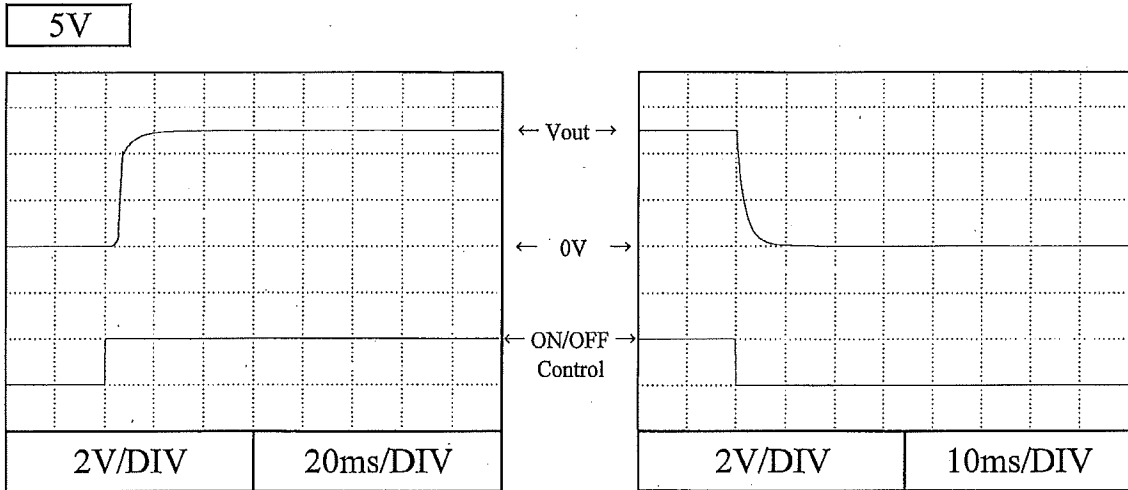


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## 2.6 ON/OFFコントロール時出力立ち上がり、立ち下がり特性 Output rise, fall characteristics with ON/OFF Control

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

標準品 ZWS150BAF-\*/R にて対応  
For alternative standard model ZWS150BAF-\*/R

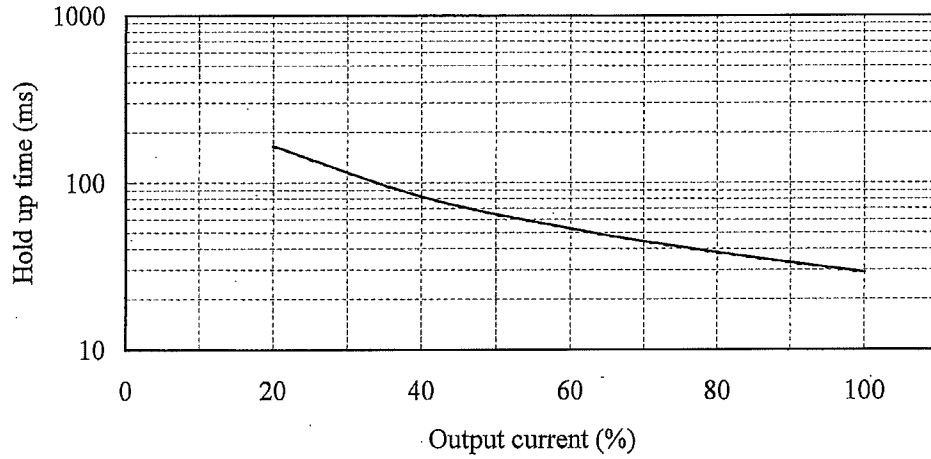


## 2.7 出力保持時間特性

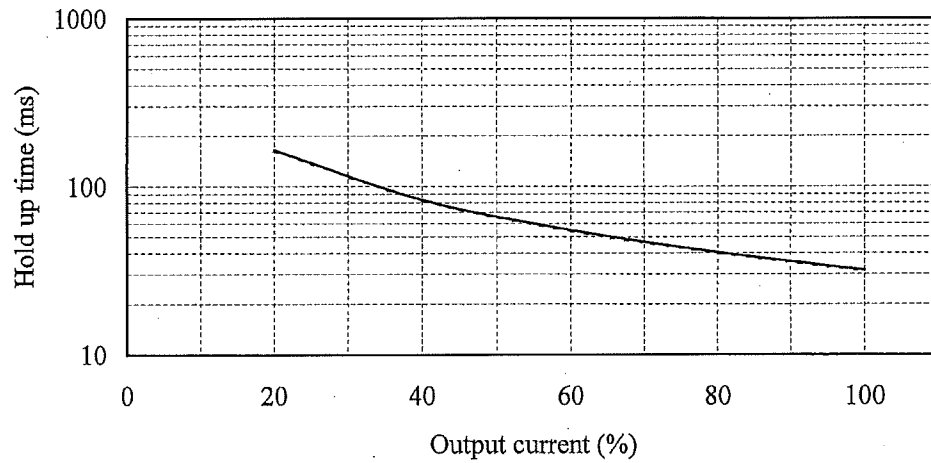
Hold up time characteristics

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

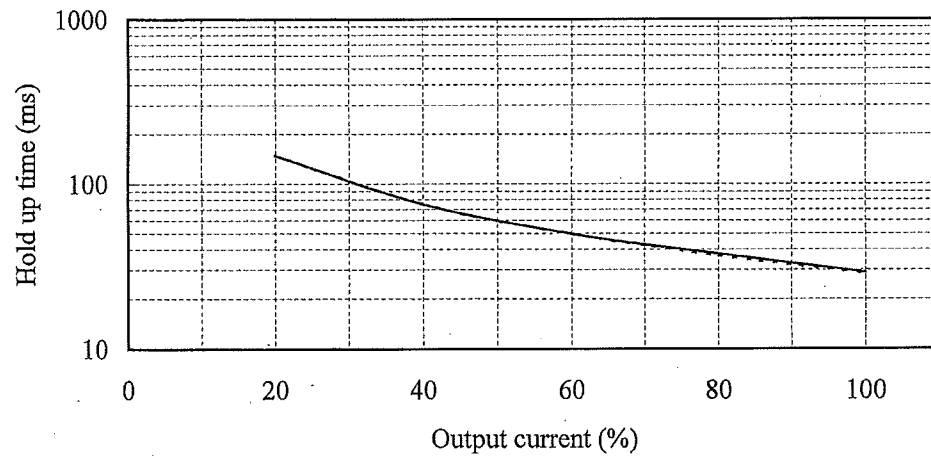
5V



12V



24V

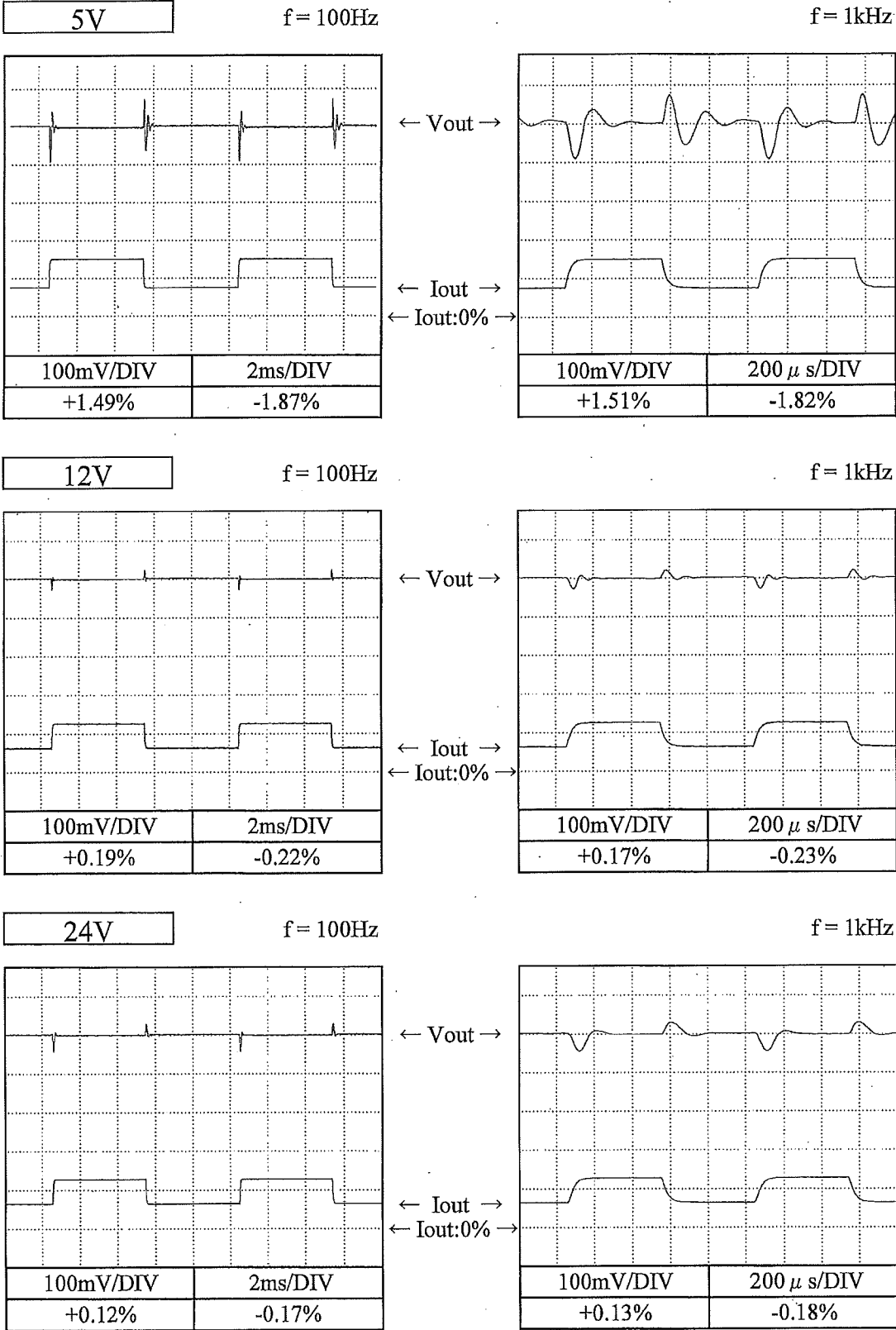




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## 2.8 過渡応答 (負荷急変) 特性 Dynamic load response characteristics

Conditions Vin : 100 VAC  
Iout : 50 % ↔ 100 %  
(tr = tf = 50us)  
Ta : 25 °C



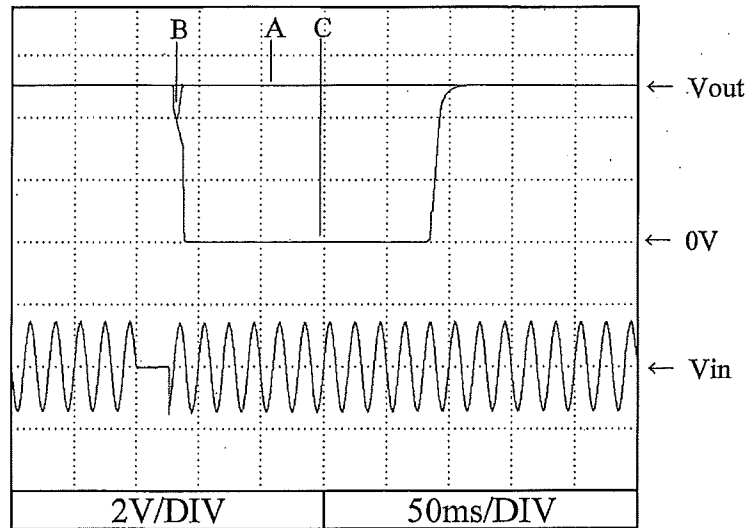
2.9 入力電圧瞬停特性

Response to brown out characteristics

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

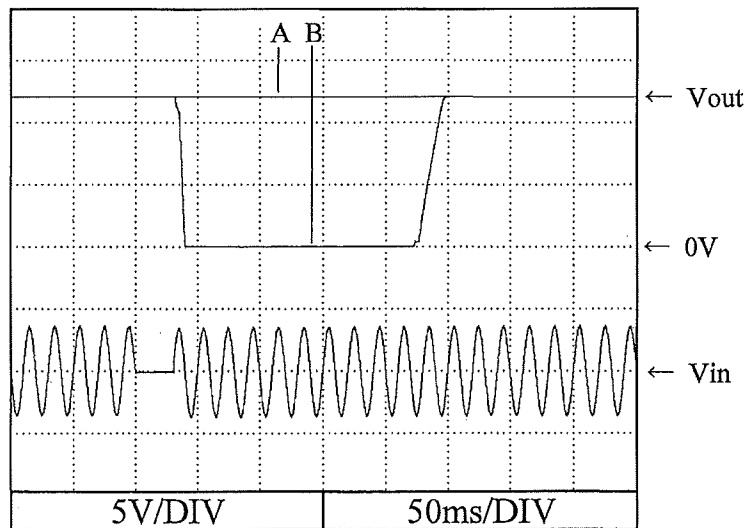
5V

A = 26ms  
B = 29ms  
C = 35ms



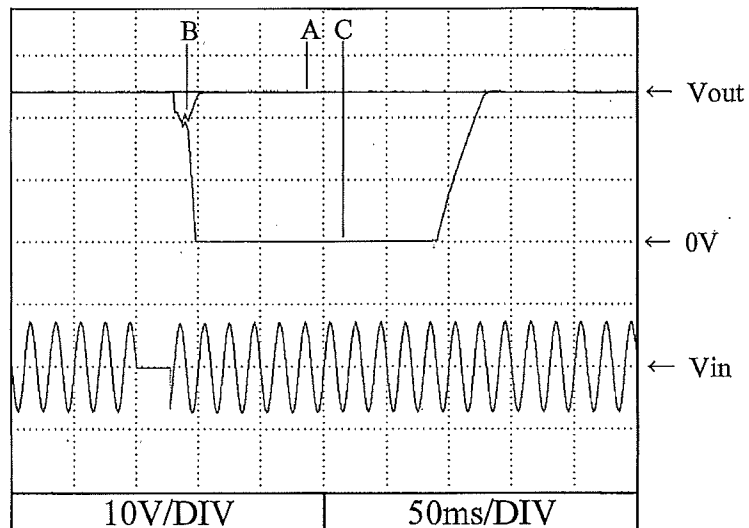
12V

A = 30ms  
B = 35ms



24V

A = 26ms  
B = 35ms  
C = 37ms



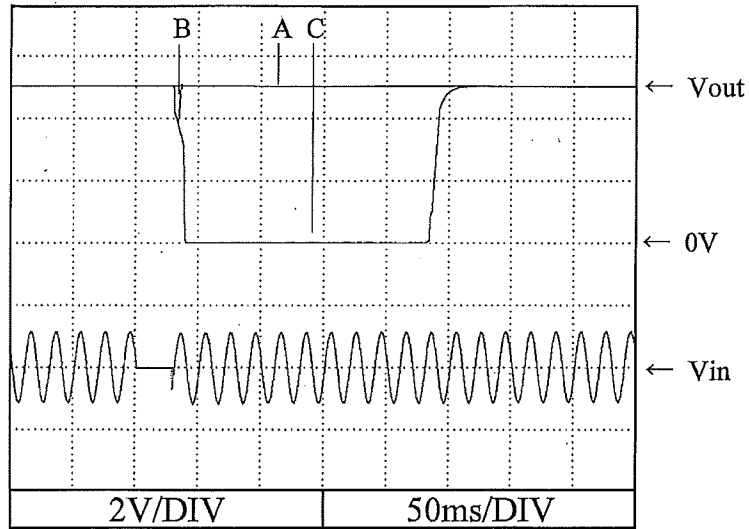
2.9 入力電圧瞬停特性

Response to brown out characteristics

Conditions Vin : 200 VAC  
Iout : 100 %  
Ta : 25 °C

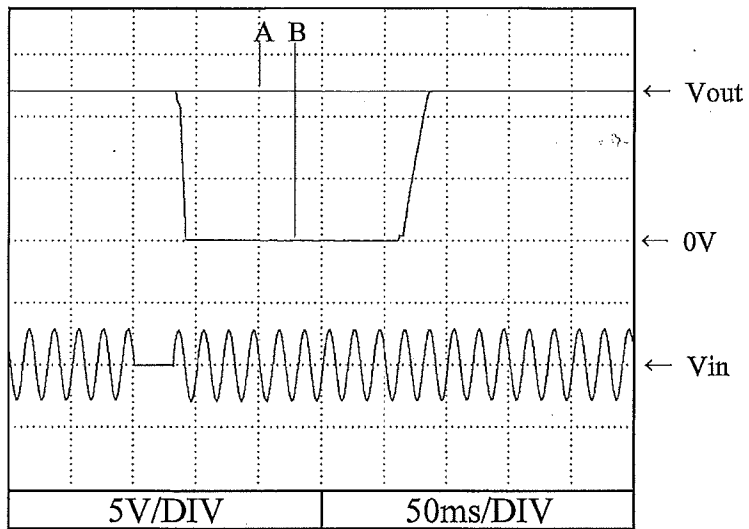
5V

A = 28ms  
B = 32ms  
C = 37ms



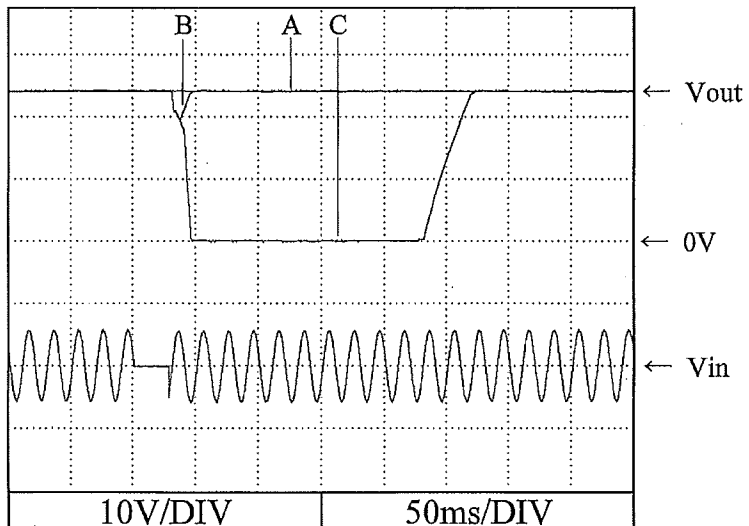
12V

A = 31ms  
B = 36ms



24V

A = 28ms  
B = 37ms  
C = 38ms

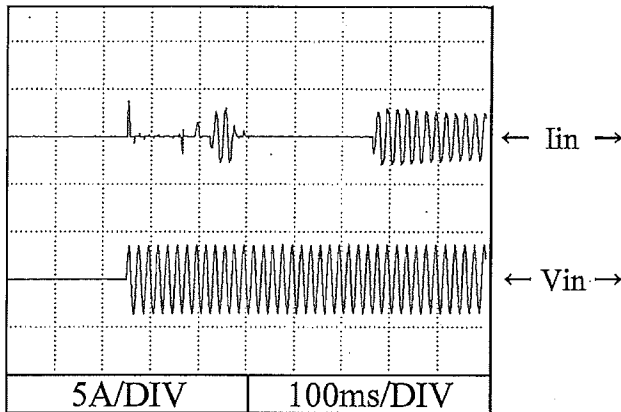


2.10 入力サージ電流 (突入電流) 波形  
Inrush current waveform

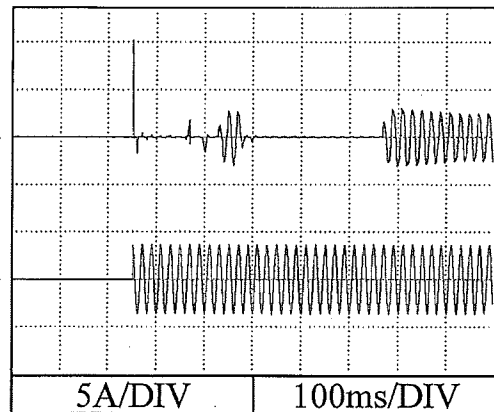
5V

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

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

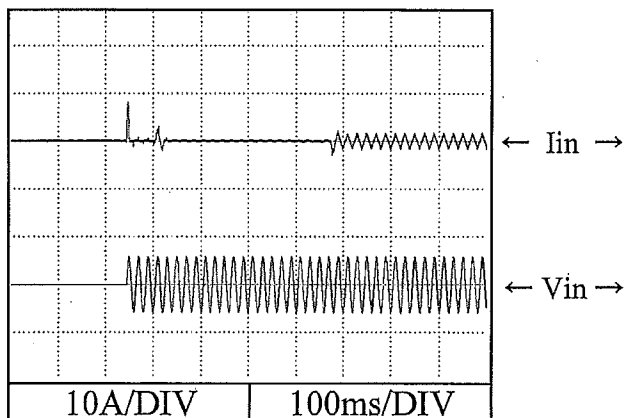


Switch on phase angle of input AC voltage  
 $\phi = 90^\circ$

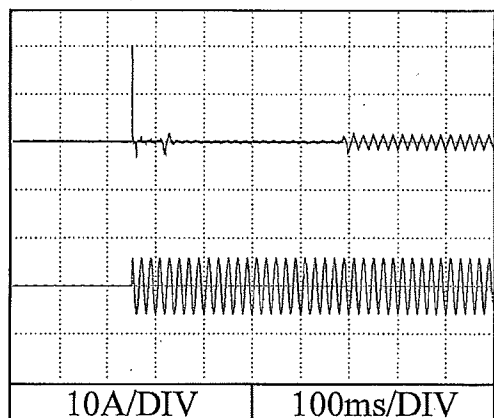


Conditions Vin : 200 VAC  
Iout : 100 %  
Ta : 25 °C

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



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



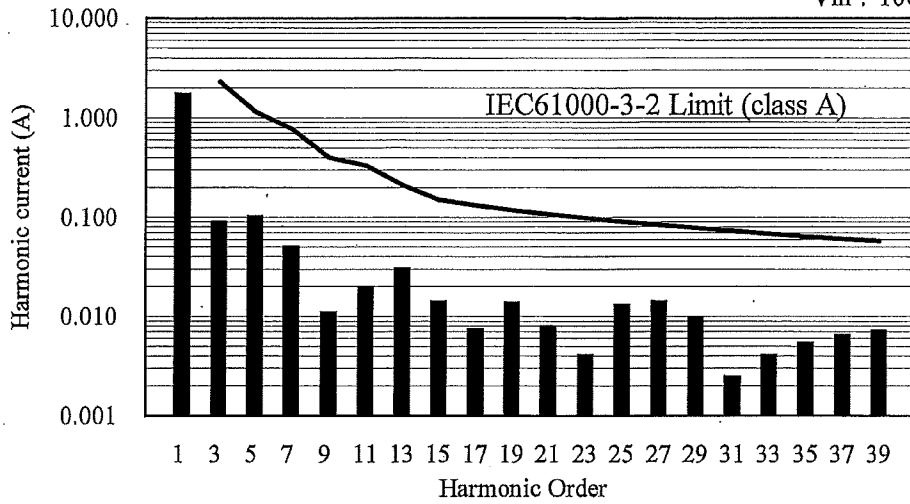
2.11 高調波成分

Input current harmonics

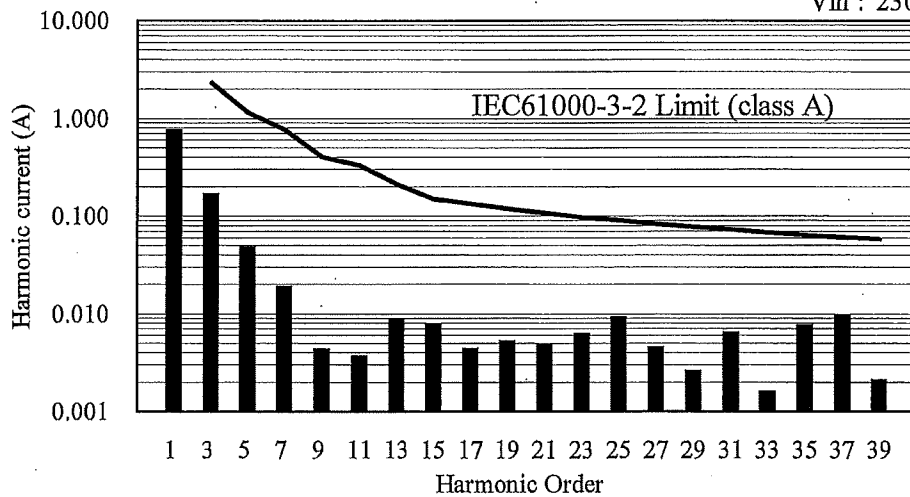
Conditions Iout : 100 %  
Ta : 25 °C

5V

Vin : 100 VAC



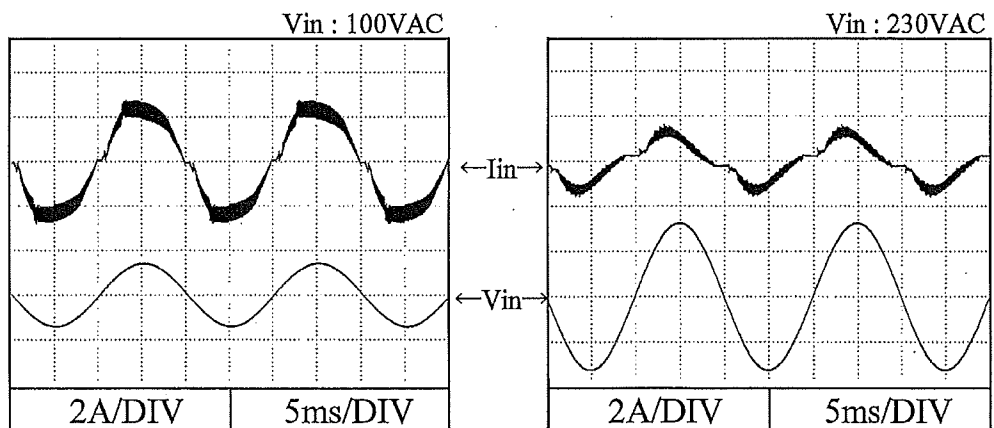
Vin : 230 VAC



2.12 入力電流波形

Input current waveform

Conditions Iout : 100 %  
Ta : 25 °C



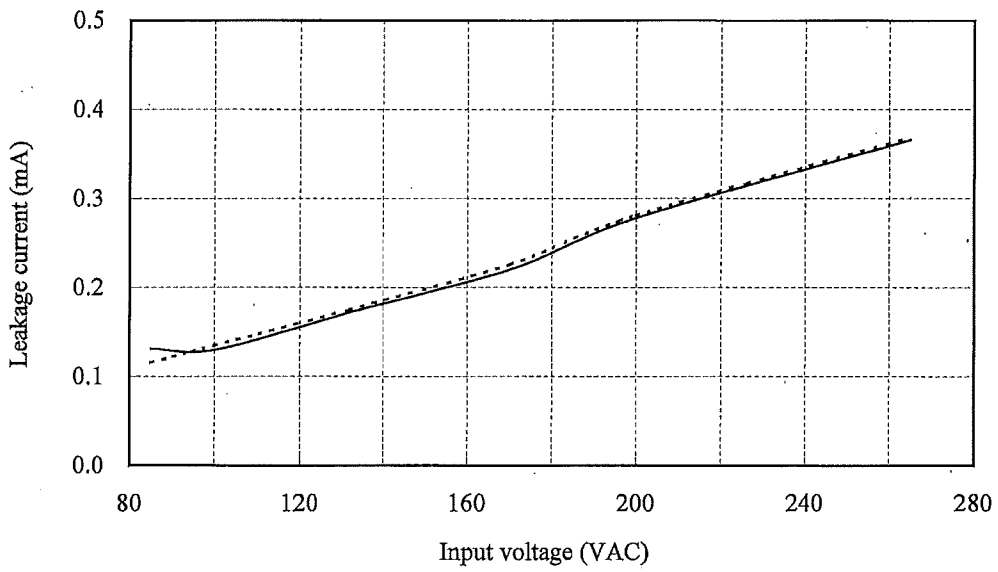
# ZWS150BAF

## 2.13 リーク電流特性 Leakage current characteristics

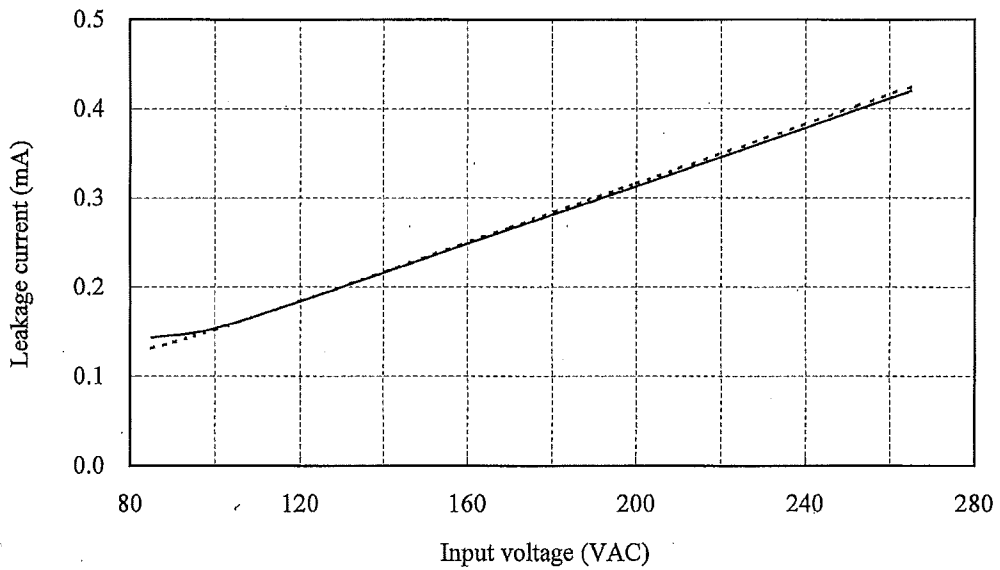
Conditions Iout : 0 % -----  
                  100 % ——  
                  Ta : 25 °C  
Equipment used : 3156 (HIOKI)

5V

f: 50 Hz



f: 60 Hz

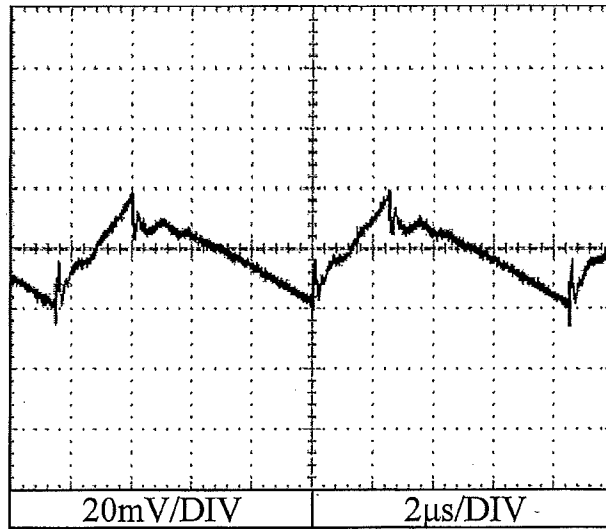


# ZWS150BAF

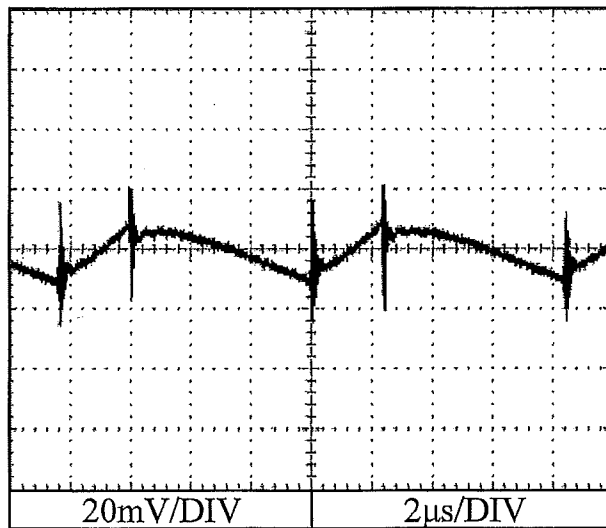
## 2.14 出力リップル、ノイズ波形 Output ripple and noise waveform

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

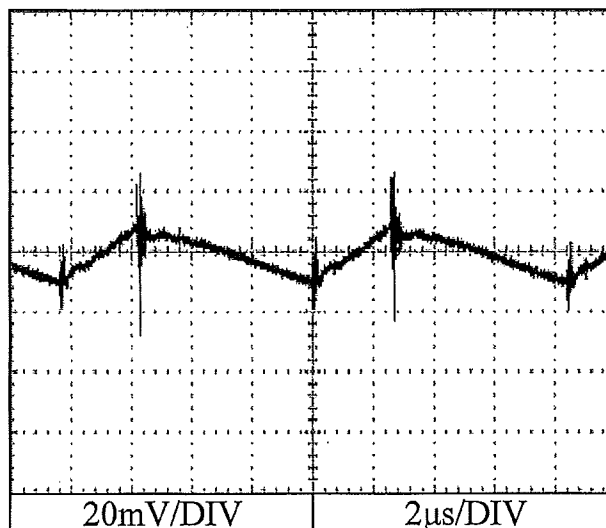
5V



12V



24V



# ZWS150BAF

## 2.15 EMI 特性

Electro-Magnetic Interference characteristics

Conditions Vin : 230 VAC

Iout : 100 %

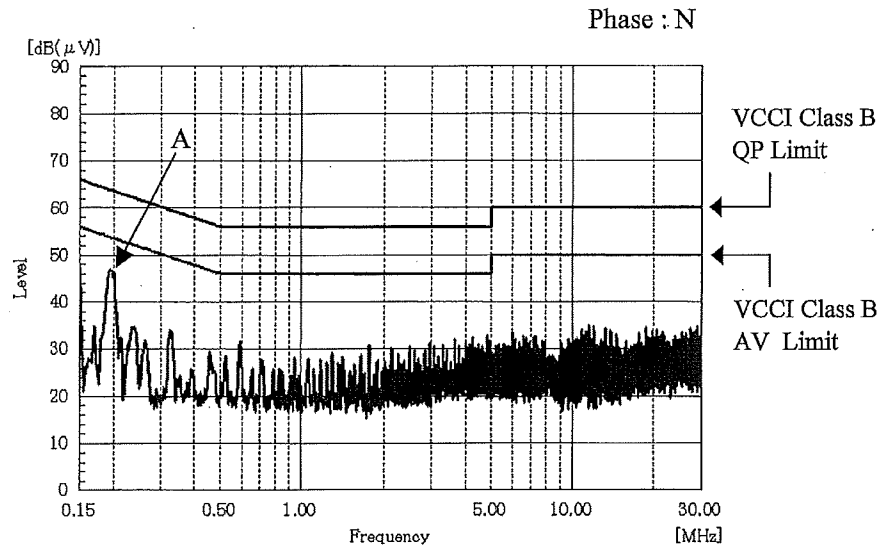
Ta : 25 °C

雑音端子電圧

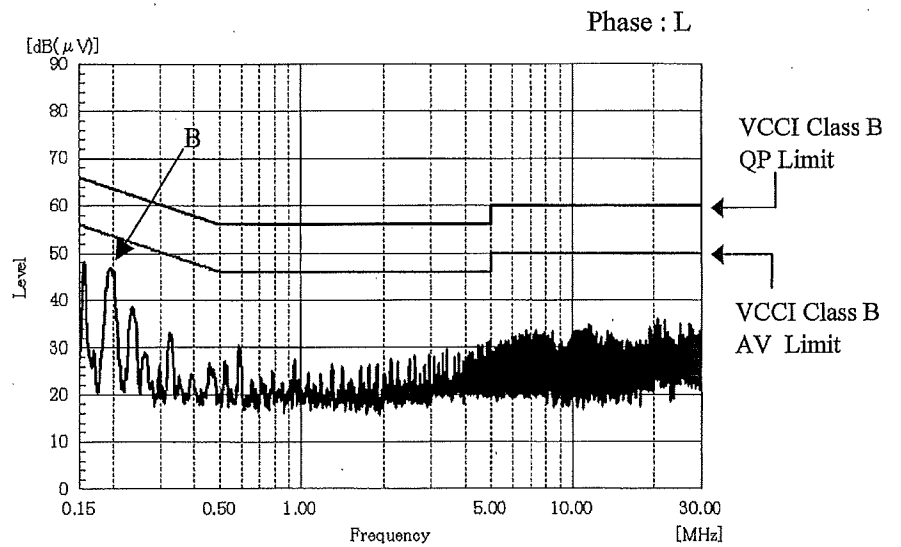
Conducted Emission

5V

Ref. Data	Point A (197kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.7	44.7
AV	53.7	39.0



Ref. Data	Point B (197kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	63.7	45.1
AV	53.7	39.6



EN55011-B,EN55022-B,FCC-Bの限界値はVCCI class Bの限界値と同じ  
Limit of EN55011-B,EN55022-B,FCC-B are same as its VCCI class B.



# ZWS150BAF

## 2.15 EMI 特性

Electro-Magnetic Interference characteristics

Conditions Vin : 230 VAC

Iout : 100 %

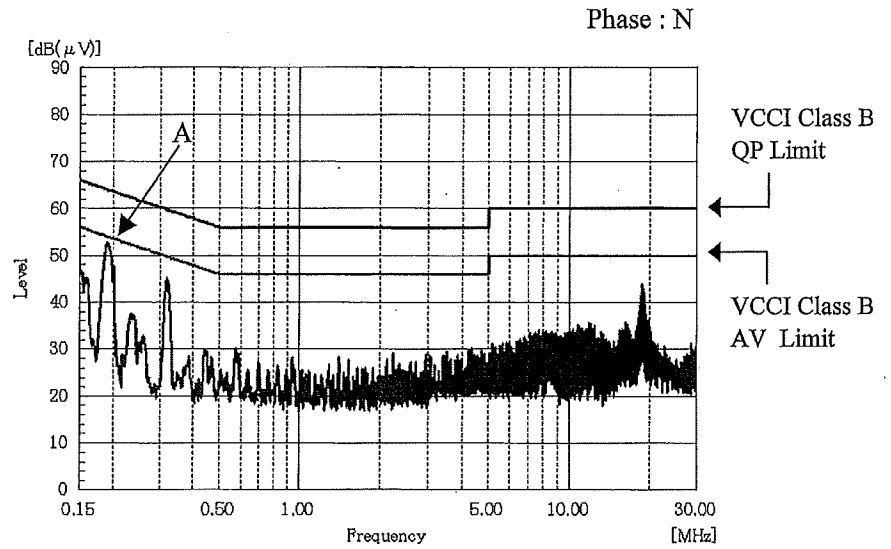
Ta : 25 °C

雑音端子電圧

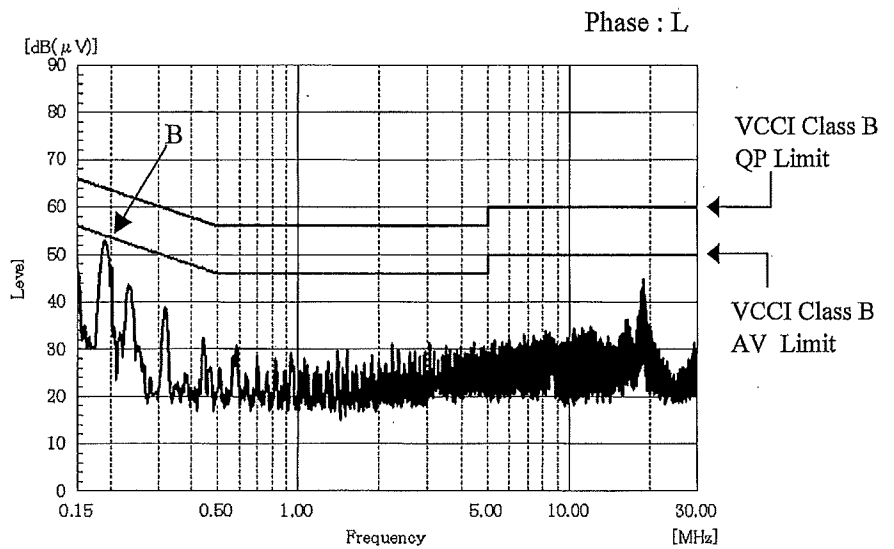
Conducted Emission

12V

Point A (192kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	64.0	51.8
AV	54.0	45.6



Point B (191kHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	64.0	51.8
AV	54.0	45.5



EN55011-B,EN55022-B,FCC-Bの限界値はVCCI class Bの限界値と同じ  
Limit of EN55011-B,EN55022-B,FCC-B are same as its VCCI class B.

## 2.15 EMI 特性

Electro-Magnetic Interference characteristics

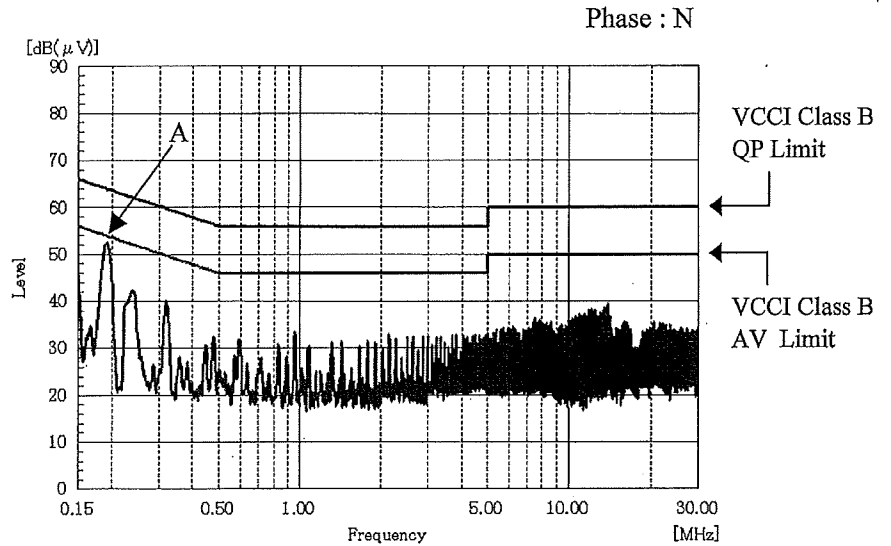
Conditions Vin : 230 VAC  
Iout : 100 %  
Ta : 25 °C

雑音端子電圧

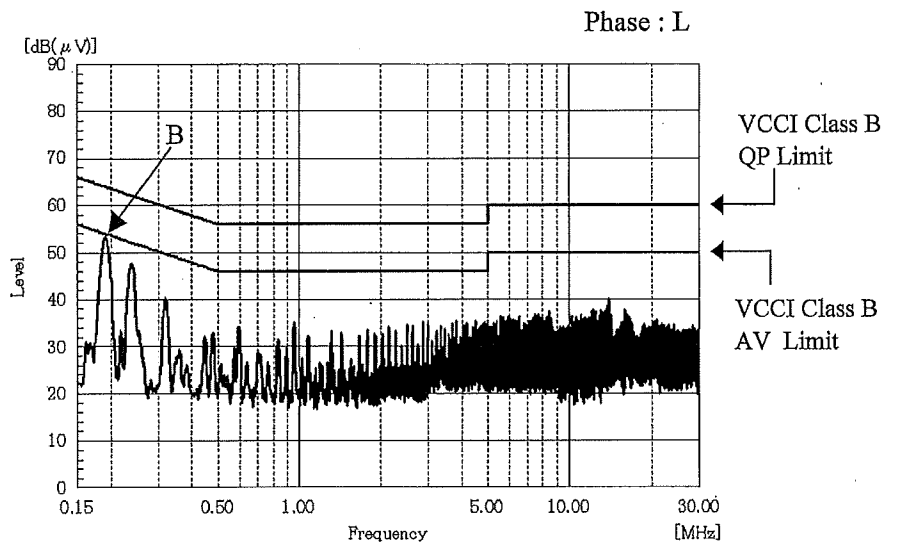
Conducted Emission

24V

Ref. Data	Point A (188kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	64.1	50.6
AV	54.1	44.8



Ref. Data	Point B (192kHz)	
	Limit (dBuV)	Measure (dBuV)
QP	64.0	50.9
AV	54.0	45.2



EN55011-B,EN55022-B,FCC-Bの限界値はVCCI class Bの限界値と同じ  
Limit of EN55011-B,EN55022-B,FCC-B are same as its VCCI class B.

## 2.15 EMI 特性

Electro-Magnetic Interference characteristics

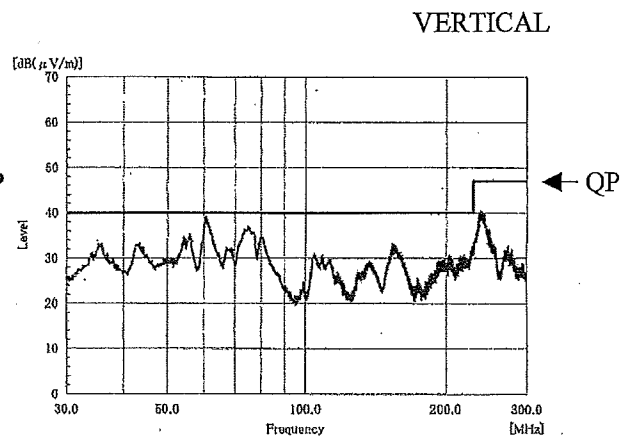
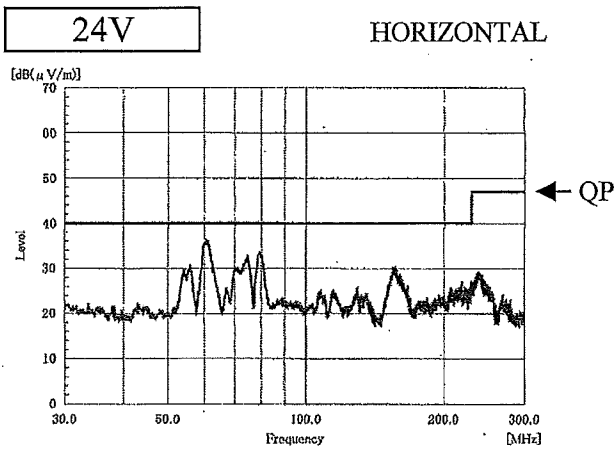
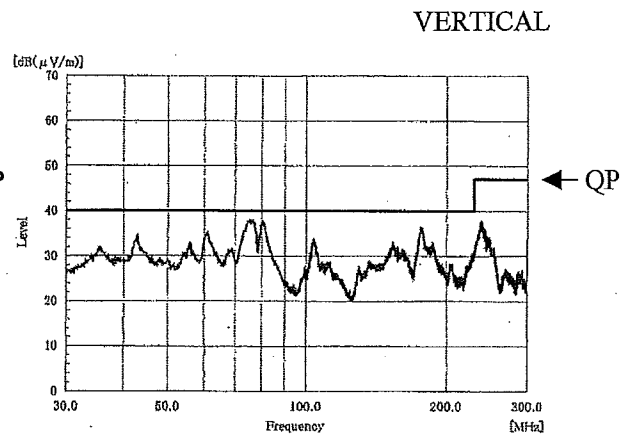
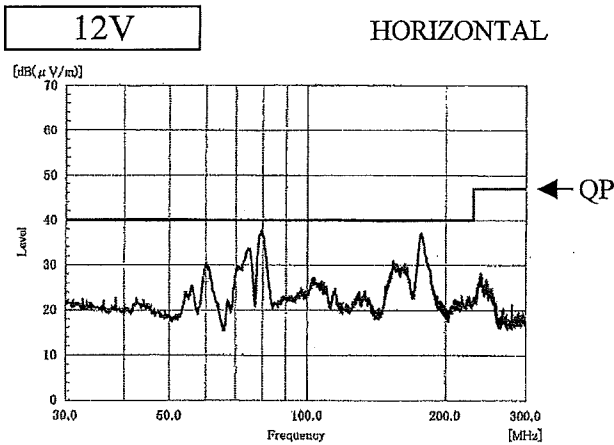
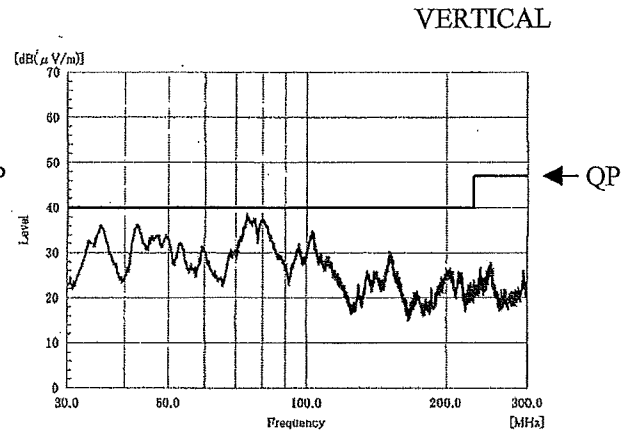
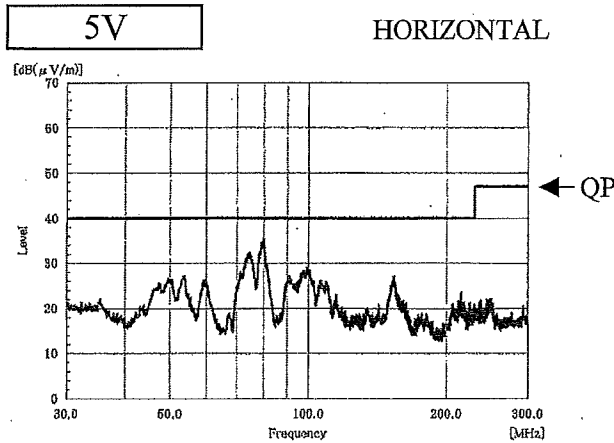
Conditions Vin : 230 VAC

Io : 100 %

Ta : 25 °C

雑音電界強度

Radiated Emission



EN55011-B,EN55022-Bの限界値はVCCI class Bの限界値と同じ  
Limit of EN55011-B,EN55022-B are same as its VCCI class B.

表示はピーク値  
Indication is peak values.

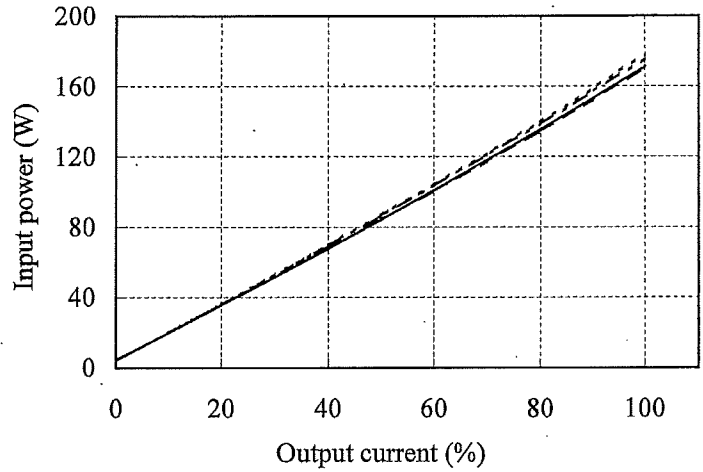
# ZWS150BAF

## (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

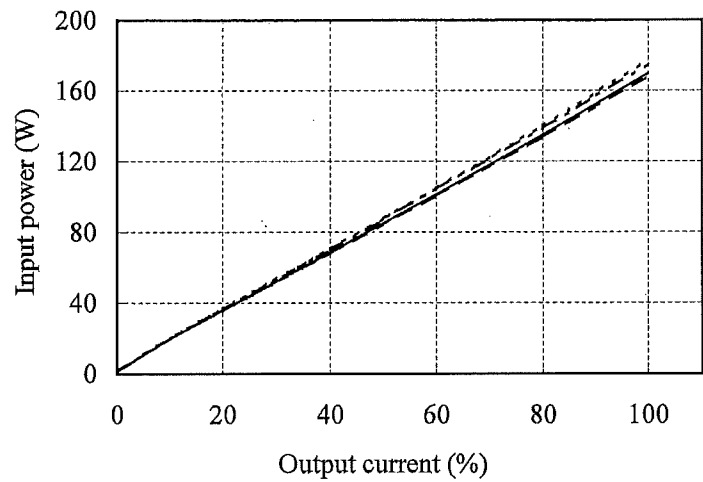
5V

Vin	Input power	
	Iout : 0%	Control OFF*
85VAC	4.0W	1.0W
100VAC	4.0W	1.2W
200VAC	4.4W	1.6W
265VAC	4.2W	1.8W



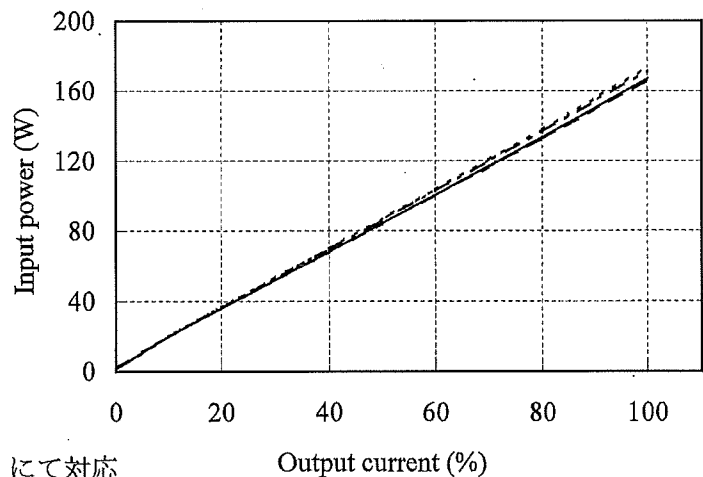
12V

Vin	Input power	
	Iout : 0%	Control OFF*
85VAC	1.1W	0.8W
100VAC	1.2W	0.9W
200VAC	1.5W	1.4W
265VAC	1.9W	1.7W



24V

Vin	Input power	
	Iout : 0%	Control OFF*
85VAC	1.1W	1.0W
100VAC	1.1W	1.1W
200VAC	1.5W	1.5W
265VAC	2.0W	1.9W



\* 標準品 ZWS150BAF-\*/R にて対応  
 For alternative standard model ZWS150BAF-\*/R