CUS1500M

EVALUATION DATA

型式データ

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2. 特性データ Characteristics

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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
Vstb	‥‥‥	スタンバイ電圧	Standby voltage
Istb	‥‥‥	スタンバイ電流	Standby current

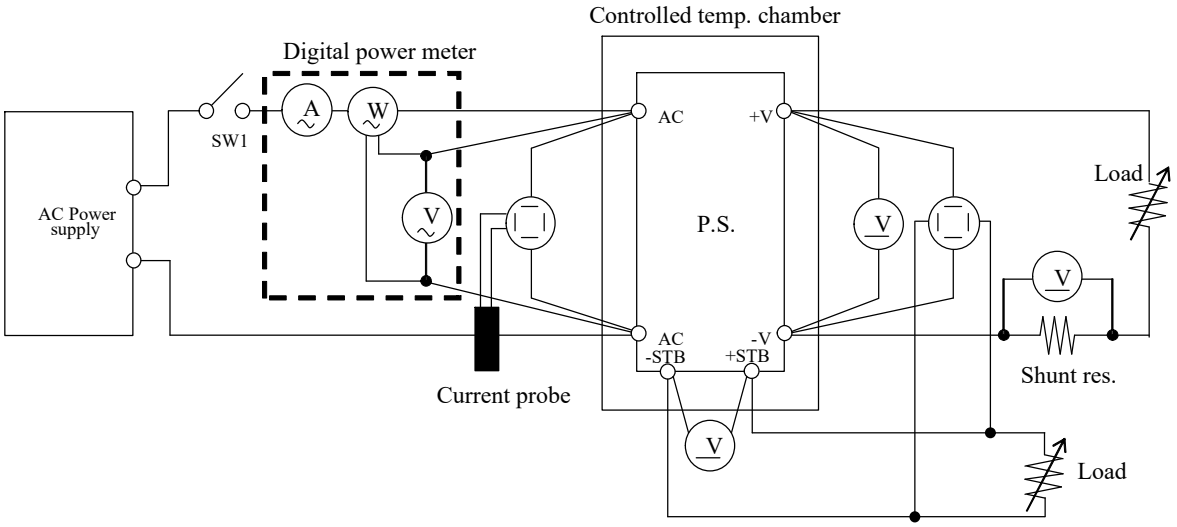
※ 当社測定条件における結果であり、参考値としてお考え願います。
Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

1-1. 測定回路 Circuit used for determination

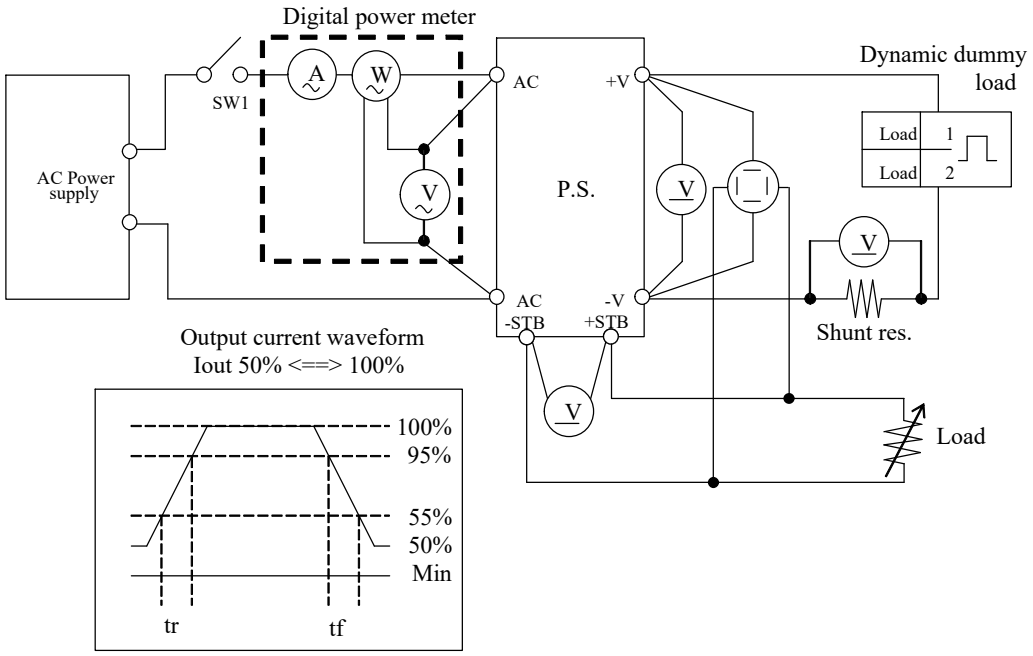
測定回路1 Circuit 1 used for determination

- 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
- 入力電圧瞬停特性 Response to brown out characteristics
- 入力電流波形 Input current waveform



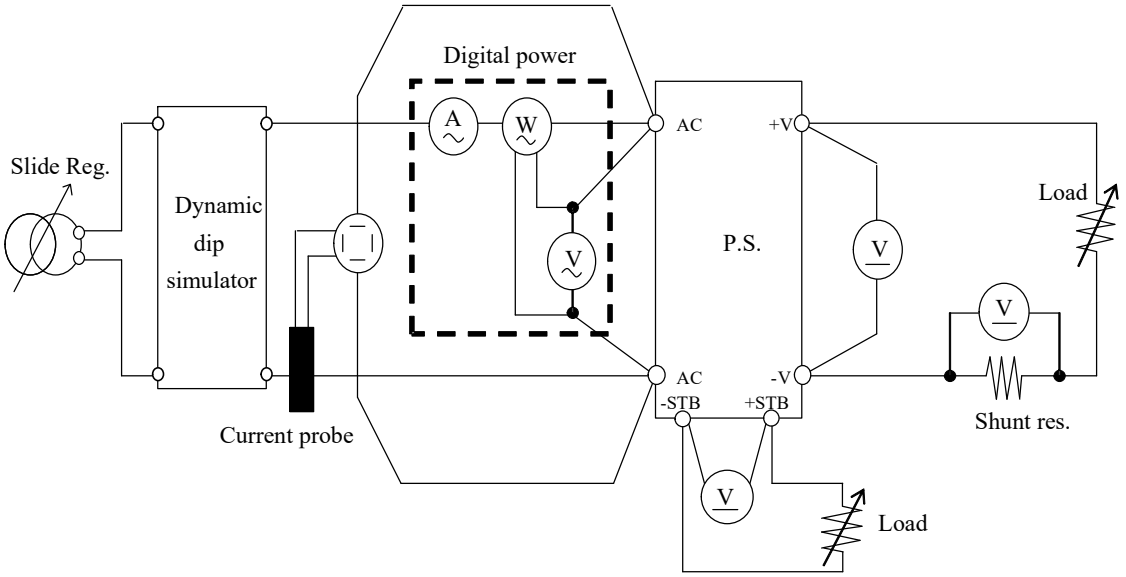
測定回路2 Circuit 2 used for determination

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



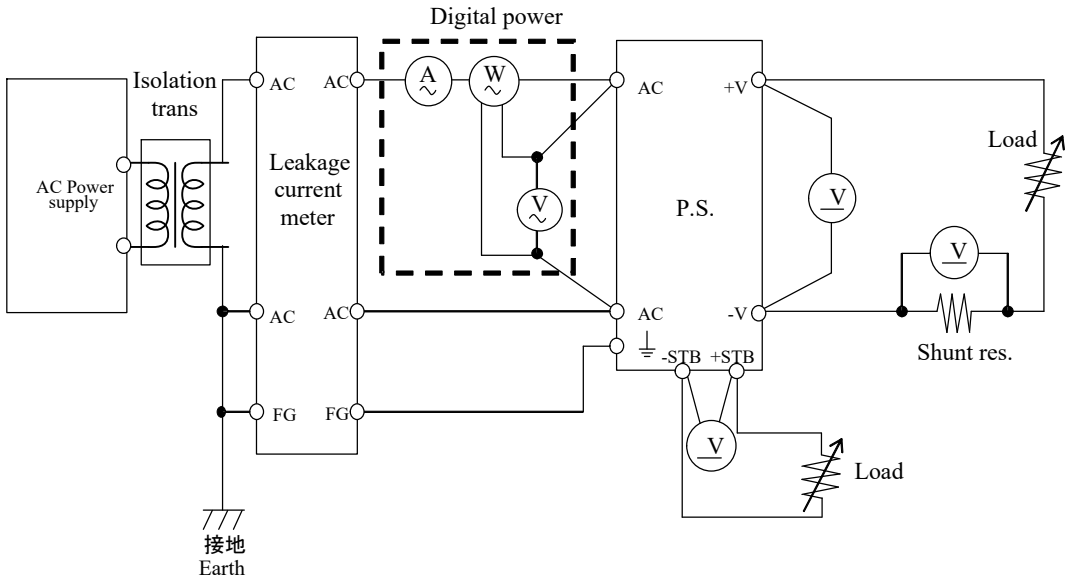
測定回路3　Circuit 3 used for determination

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



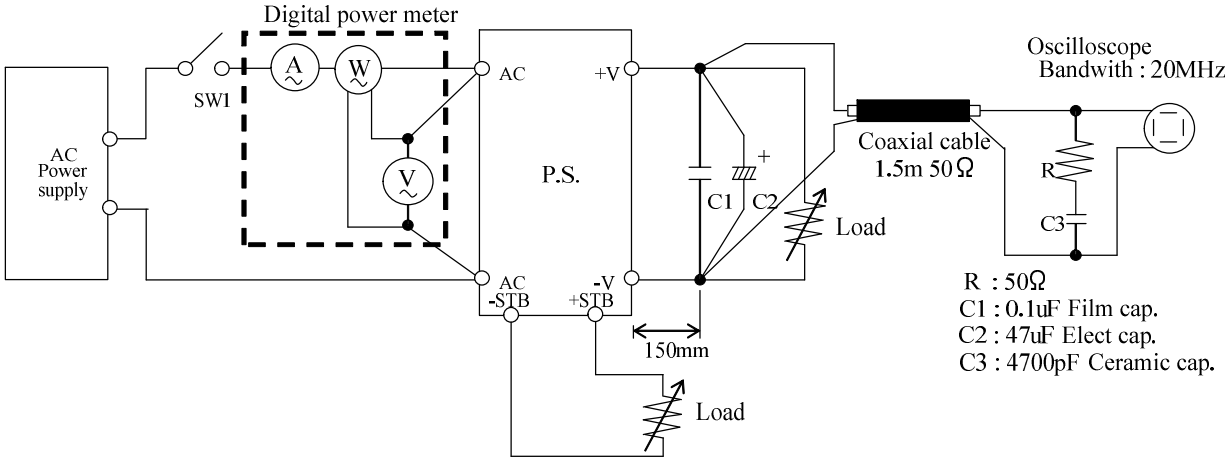
測定回路4　Circuit 4 used for determination

• リーク電流特性　Leakage current characteristics



測定回路5　Circuit 5 used for determination

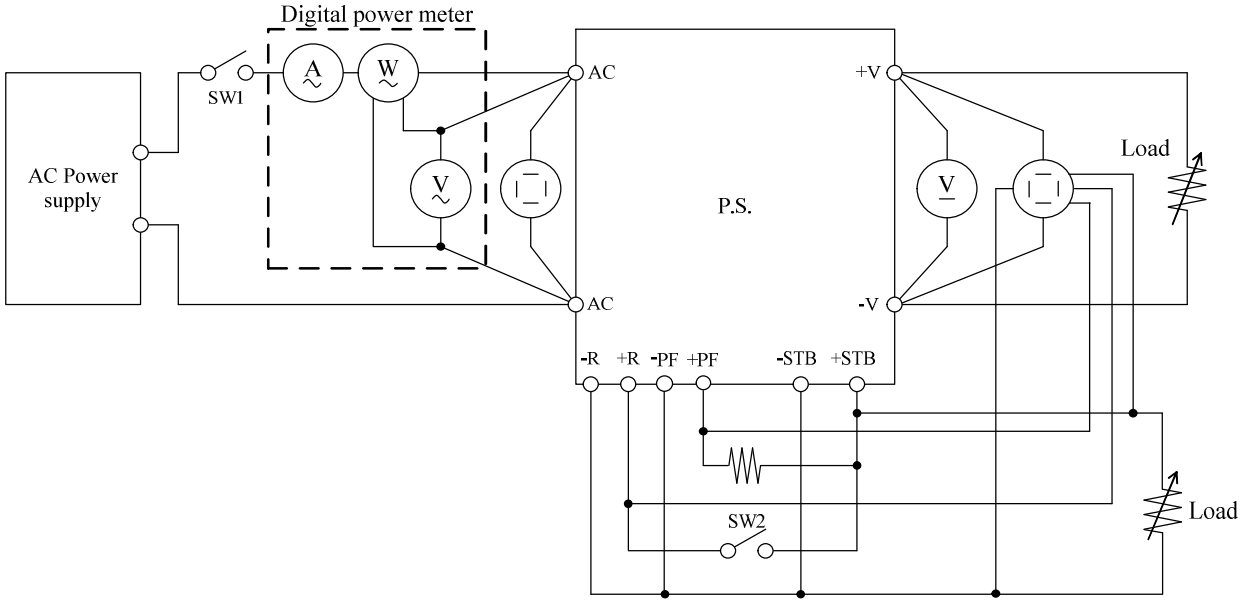
• 出力リップル、ノイズ波形　Output ripple and noise waveform



測定回路6　Circuit 6 used for determination

• ON／OFFコントロール時出力立ち上がり、立下がり特性

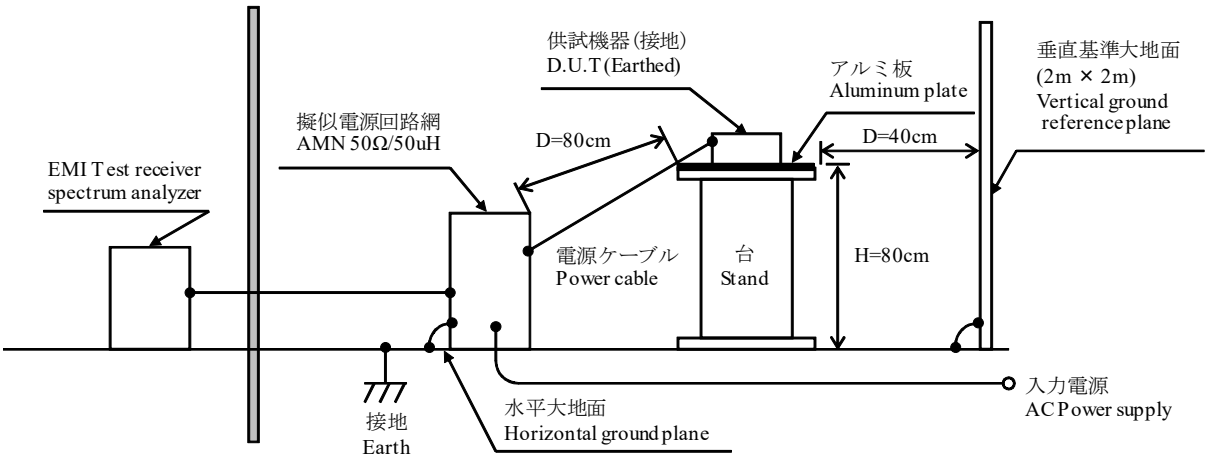
Output rise, fall characteristics with ON/OFF Control



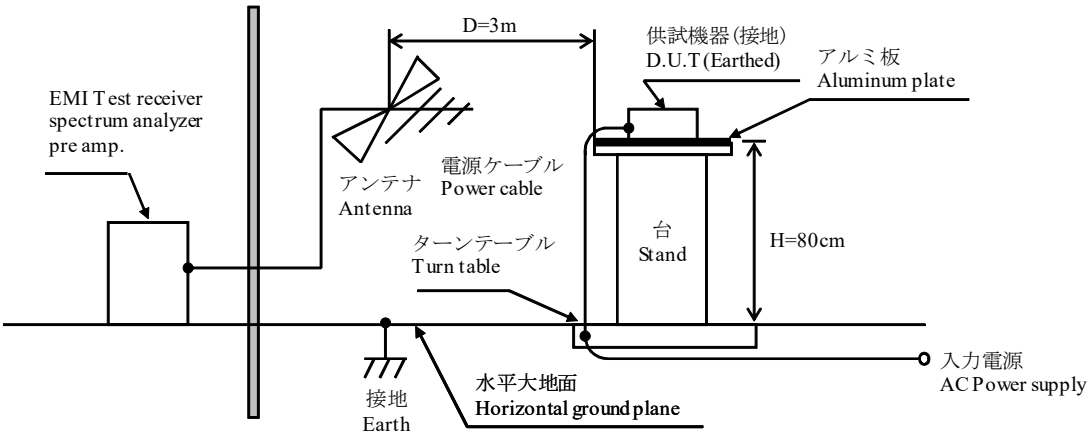
測定構成　Configuration used for determination

- 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.	DLM2054
2	DIGITAL MULTIMETER	AGILENT	34970A
3	DIGITAL POWER METER	YOKOGAWA ELECT.	WT310HC
4	DIGITAL POWER METER	HIOKI	3331 / 3332
5	CURRENT PROBE	YOKOGAWA ELECT.	701928 / 701930
6	DYNAMIC DUMMY LOAD	KIKUSI	PLZ1004W / PLZ2004WB
7	DYNAMIC DUMMY LOAD	TEXIO	LSG-1050
8	DYNAMIC DUMMY LOAD	TAKAZAGO	FK-200L / FK1000L
9	DUMMY LOAD	PCN	RHF250 SIRIES
10	SLIDE REGULATOR	MATSUNAGA	SD-2650
11	ISOLATION TRANS	MATSUNAGA	3WTC-50K
12	CVCF	KIKUSUI	PCR4000L / PCR4000LA
13	CVCF	KIKUSUI	PCR4000LE / PCR6000LE
14	LEAKAGE CURRENT METER	HIOKI	3156
15	DYNAMIC DIP SIMULATOR	TAKAMISAWA	PSA-210
16	CONTROLLED TEMP. CHAMBER	ESPEC	PL-1KP
17	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESCI
18	PRE AMP.	SONOMA	310N
19	AMN	SCHWARZBECK	NNLK8121
20	ANTENNA	SCHWARZBECK	CBL6111D
21	HARMONIC / FLICKER ANALYZER	KIKUSUI	KHA1000
22	SINGLE-PHASE MASTER	NF	4420
23	REFERENCE IMPEDANCE NETWORK 20A	NF	4150
24	MULTI OUTLET UNIT	KIKUSUI	OT01-KHA

2. 特性データ Characteristics

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

Condition Istb : 100 %

12V

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

Iout \ Vin	90VAC	100VAC	200VAC	265VAC	Line regulation	
0%	12.024V	12.023V	12.024V	12.024V	1mV	0.008%
50%	11.988V	11.989V	11.989V	11.990V	2mV	0.017%
100%	11.958V	11.958V	11.959V	11.959V	1mV	0.008%
Load regulation	66mV	65mV	65mV	65mV		
	0.550%	0.542%	0.542%	0.542%		

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

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	11.993V	11.958V	11.948V	45mV	0.375%

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

Start up voltage (Vin)	77VAC
Drop out voltage (Vin)	71VAC

24V

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

Iout \ Vin	90VAC	100VAC	200VAC	265VAC	Line regulation	
0%	23.967V	23.968V	23.969V	23.969V	2mV	0.008%
50%	23.945V	23.945V	23.945V	23.946V	1mV	0.004%
100%	23.930V	23.930V	23.931V	23.931V	1mV	0.004%
Load regulation	37mV	38mV	38mV	38mV		
	0.154%	0.158%	0.158%	0.158%		

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

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	23.916V	23.930V	23.946V	30mV	0.125%

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

Start up voltage (Vin)	78VAC
Drop out voltage (Vin)	72VAC

48V

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

Iout \ Vin	90VAC	100VAC	200VAC	265VAC	Line regulation	
0%	47.997V	47.997V	47.997V	47.997V	0mV	0.000%
50%	47.978V	47.978V	47.978V	47.979V	1mV	0.002%
100%	47.969V	47.969V	47.970V	47.970V	1mV	0.002%
Load regulation	28mV	28mV	27mV	27mV		
	0.058%	0.058%	0.056%	0.056%		

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

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	47.930V	47.969V	47.986V	56mV	0.117%

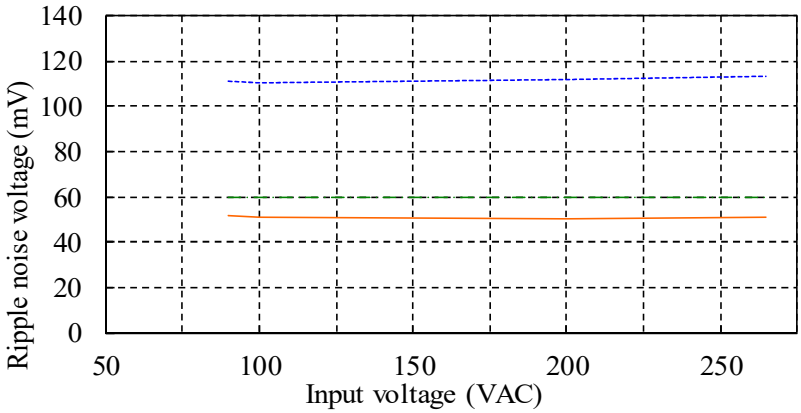
3. Start up voltage and Drop out voltage　　Conditions Ta : 25 °C
Iout : 100 %

Start up voltage (Vin)	78VAC
Drop out voltage (Vin)	71VAC

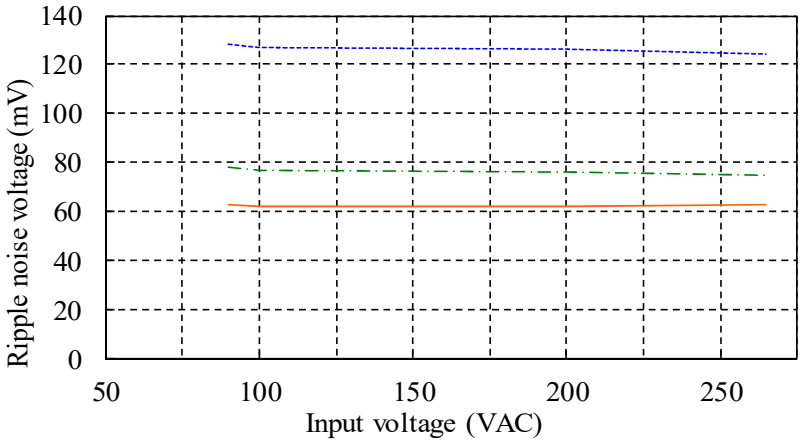
(2) リップルノイズ電圧対入力電圧　Ripple noise voltage vs. Input voltage

Conditions　Iout : 100 %
Istb : 100 %
Ta : -20 °C
25 °C
50 °C

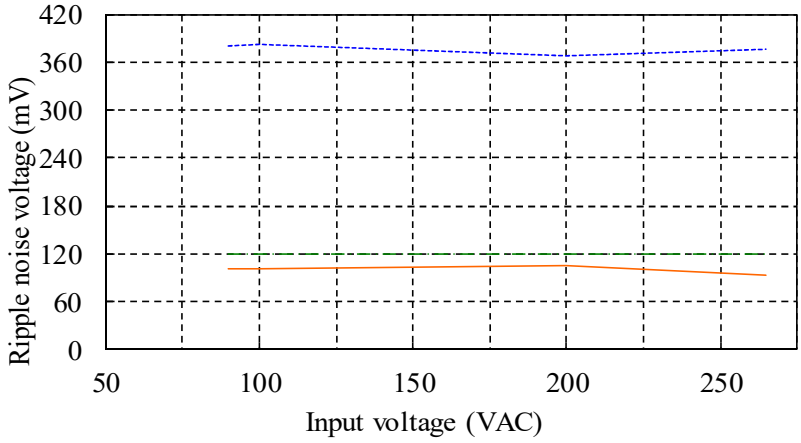
12V



24V



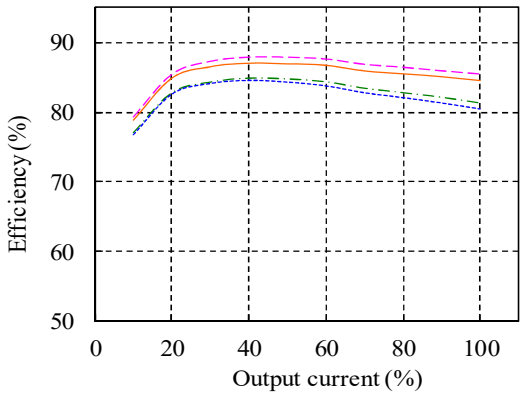
48V

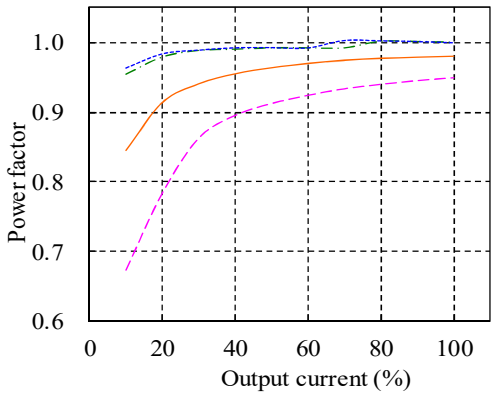


(3) 効率・力率対出力電流　Efficiency and Power factor vs. Output current

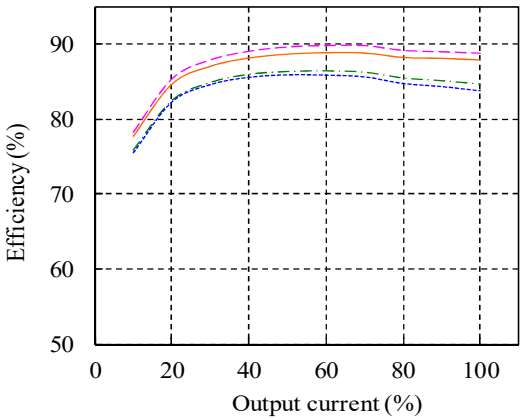
Conditions　Vin : 90 VAC
100 VAC
200 VAC
265 VAC
Istb : 100 %
Ta : 25 ℃

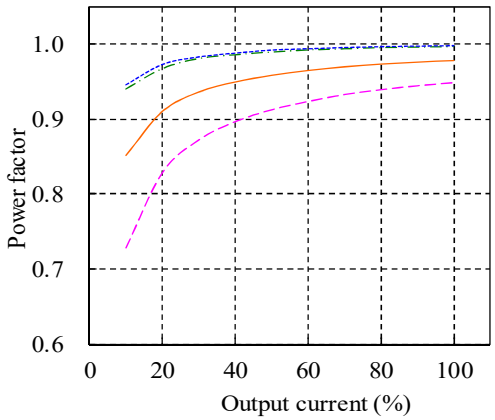
12V



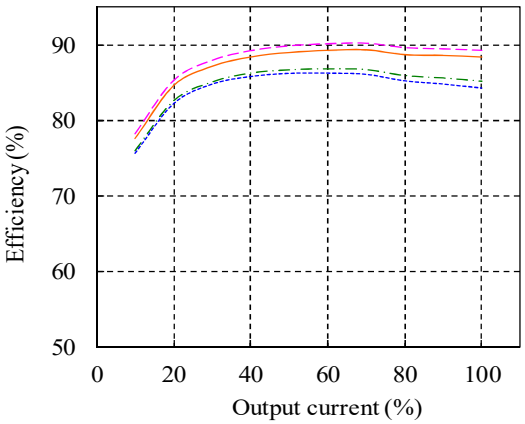


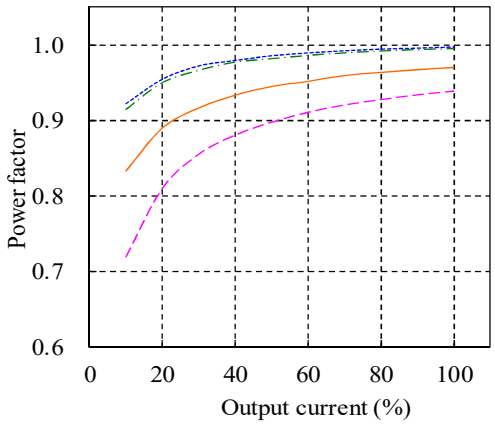
24V





48V



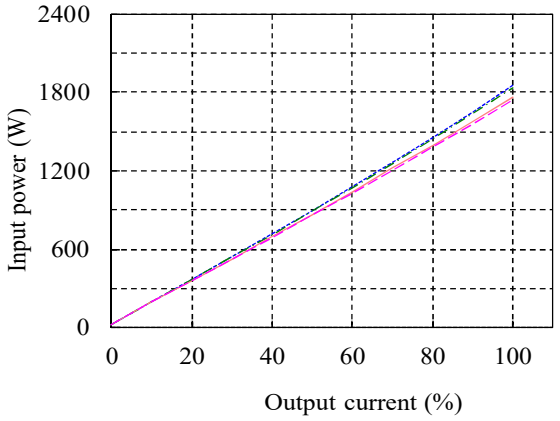


(4) 入力電力対出力電流 Input power vs. Output current

Conditions Vin : 90 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

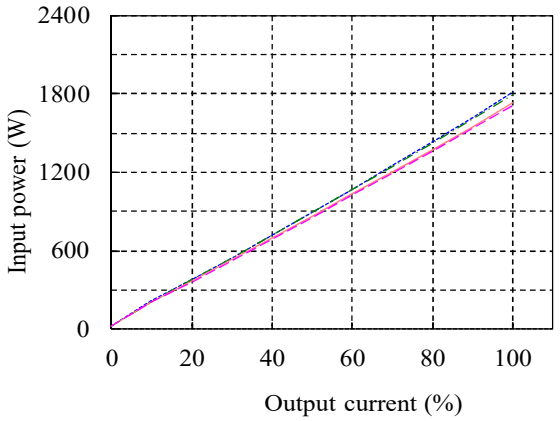
12V

Vin	Input power Istb : 0%	
	Iout : 0%	Control OFF
90VAC	24.1W	4.6W
100VAC	23.7W	4.6W
200VAC	23.2W	4.4W
265VAC	22.2W	4.1W



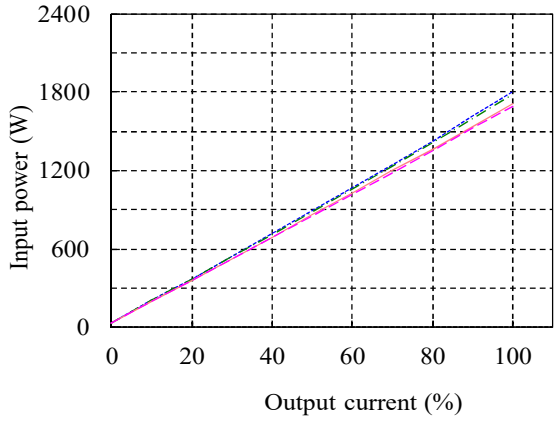
24V

Vin	Input power Istb : 0%	
	Iout : 0%	Control OFF
90VAC	25.3W	4.0W
100VAC	25.0W	4.0W
200VAC	24.8W	4.0W
265VAC	24.1W	4.0W



48V

Vin	Input power Istb : 0%	
	Iout : 0%	Control OFF
90VAC	30.8W	4.0W
100VAC	30.6W	3.9W
200VAC	30.3W	3.9W
265VAC	29.6W	4.0W

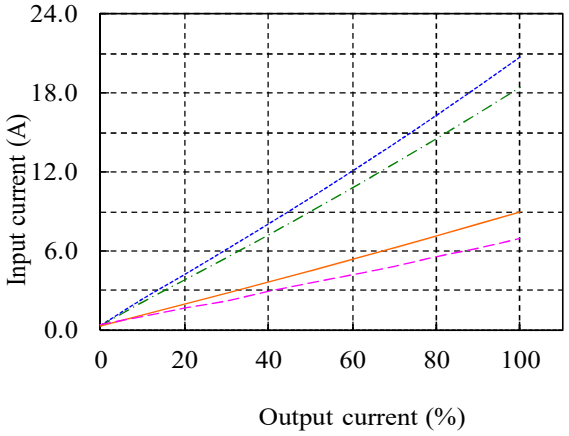


(5) 入力電流対出力電流 Input current vs. Output current

Conditions Vin : 90 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

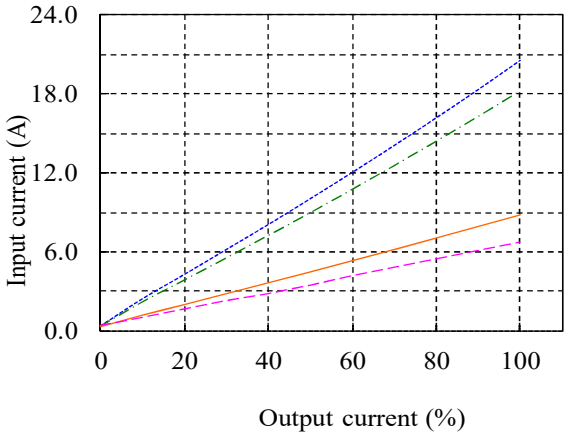
12V

Vin	Input current Istb : 0%	
	Iout : 0%	Control OFF
90VAC	0.33A	0.13A
100VAC	0.31A	0.14A
200VAC	0.31A	0.25A
265VAC	0.39A	0.33A



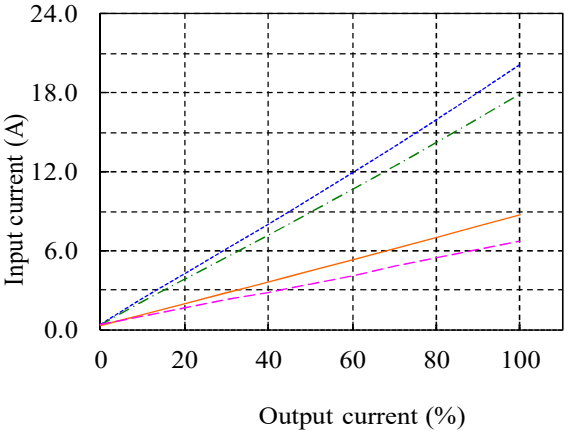
24V

Vin	Input current Istb : 0%	
	Iout : 0%	Control OFF
90VAC	0.36A	0.13A
100VAC	0.33A	0.14A
200VAC	0.32A	0.25A
265VAC	0.40A	0.33A



48V

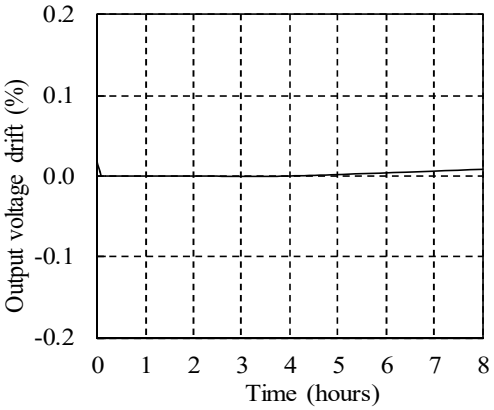
Vin	Input current Istb : 0%	
	Iout : 0%	Control OFF
90VAC	0.45A	0.13A
100VAC	0.41A	0.14A
200VAC	0.34A	0.25A
265VAC	0.41A	0.33A



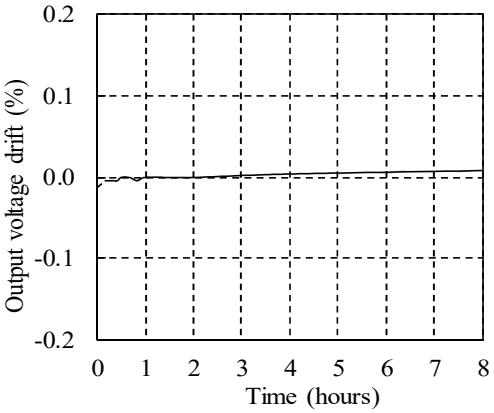
2-2. 通電ドリフト特性
Warm up voltage drift characteristics

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

12V



24V



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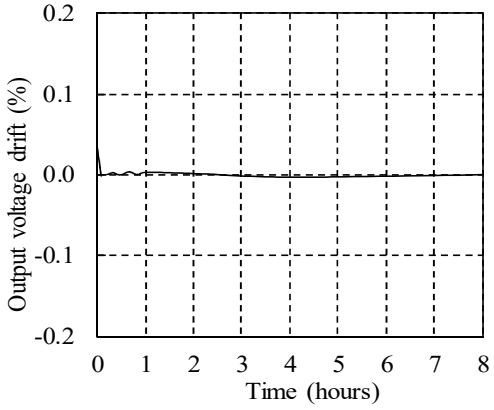
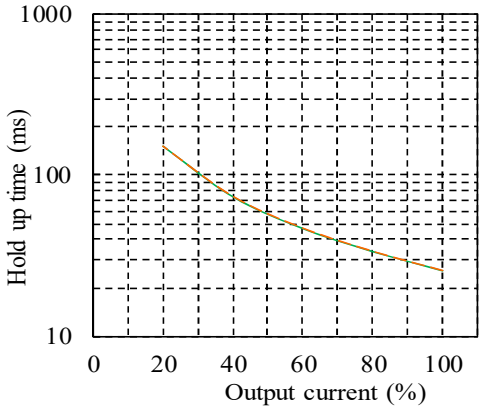
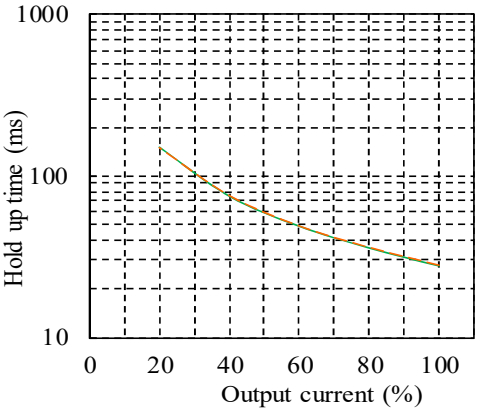
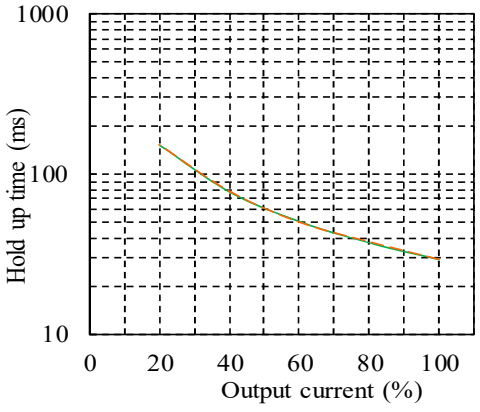


2-3. 出力保持時間特性
Hold up time characteristics

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



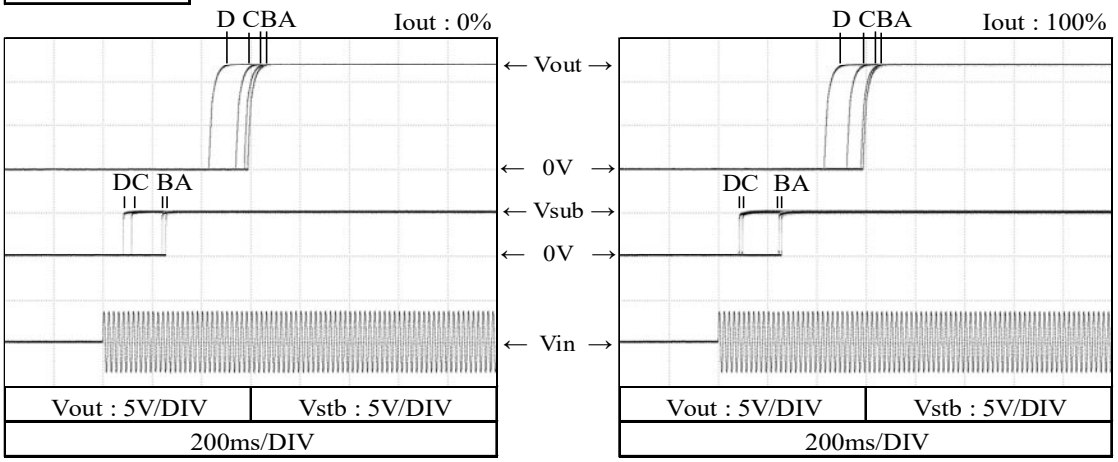




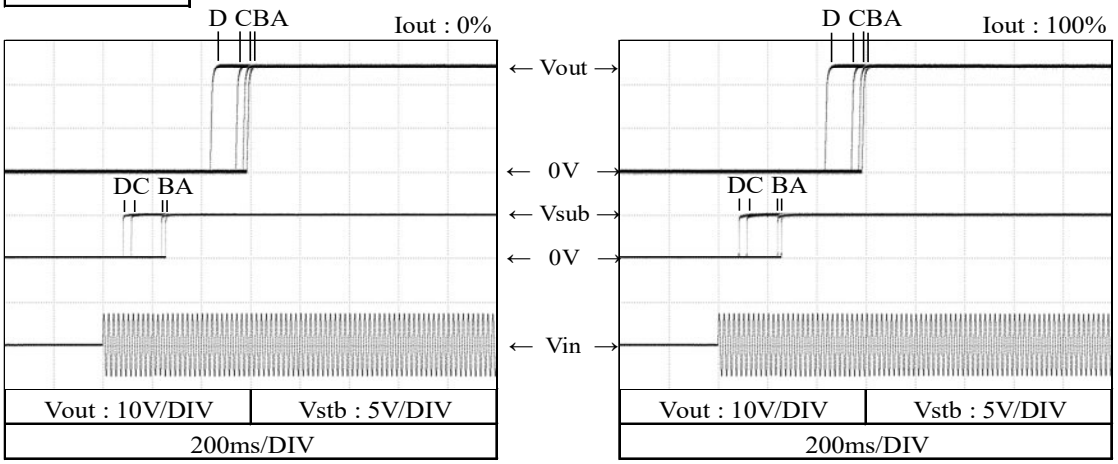
2-4. 出力立ち上がり特性 Output rise characteristics

Conditions Vin : 90 VAC (A)
100 VAC (B)
200 VAC (C)
265 VAC (D)
Istb : 100 %
Ta : 25 ℃

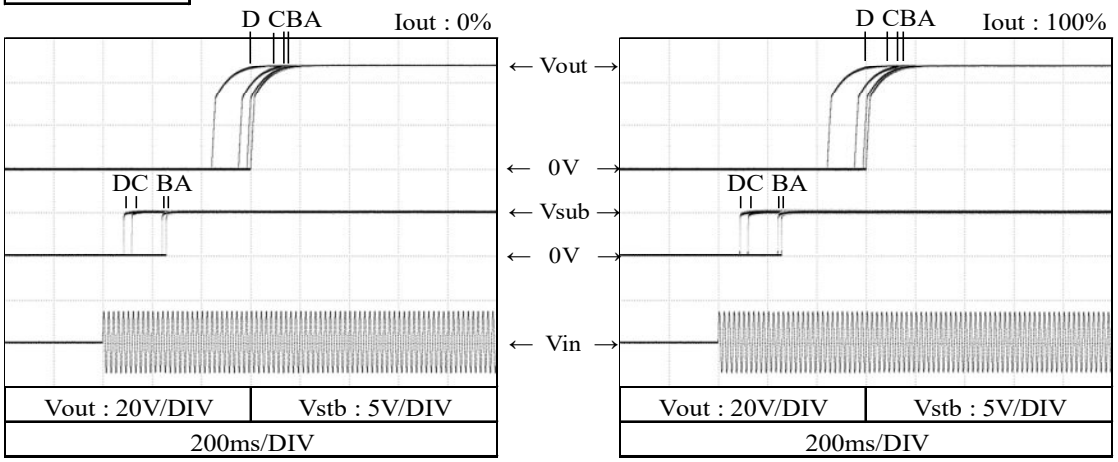
12V



24V



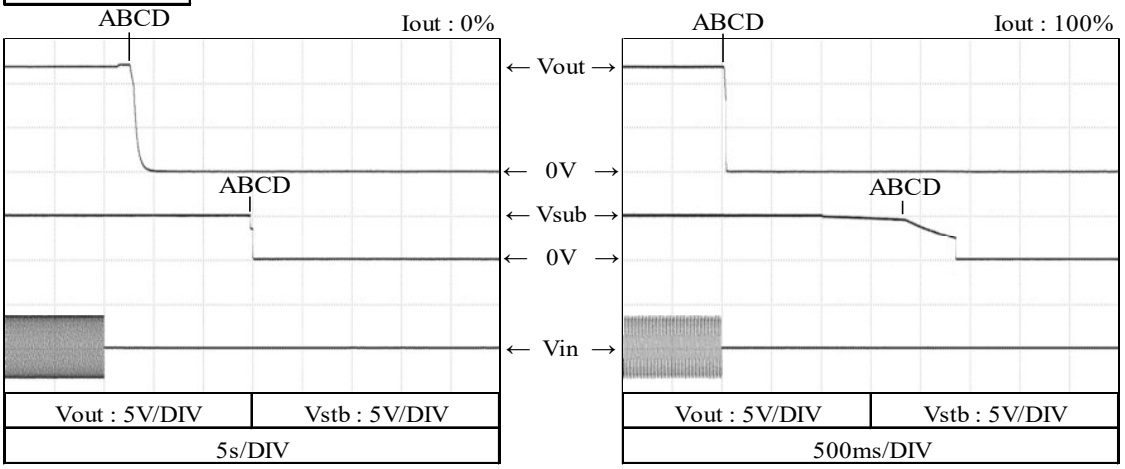
48V



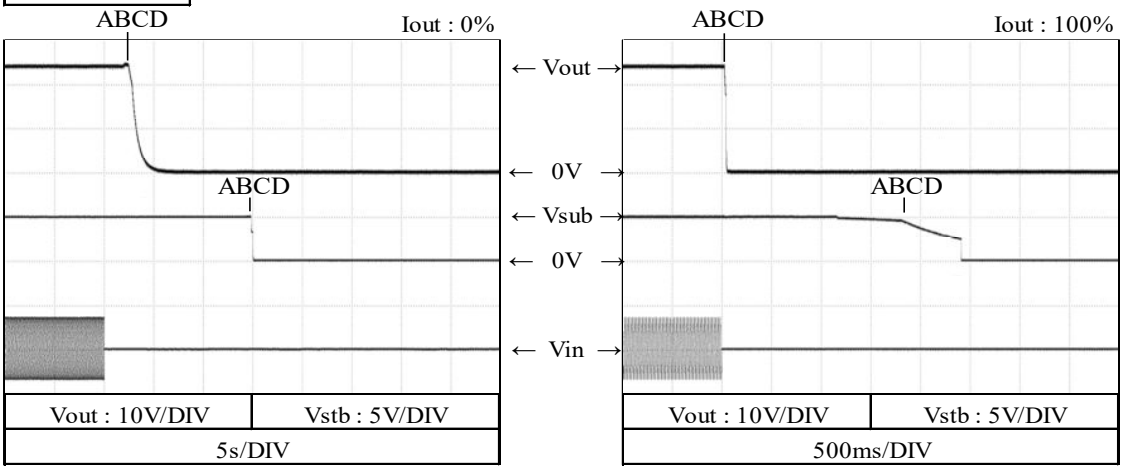
2-5. . 出力立ち下がり特性 Output fall characteristics .

Conditions Vin : 90 VAC (A)
100 VAC (B)
200 VAC (C)
265 VAC (D)
Istb : 100 %
Ta : 25 ℃

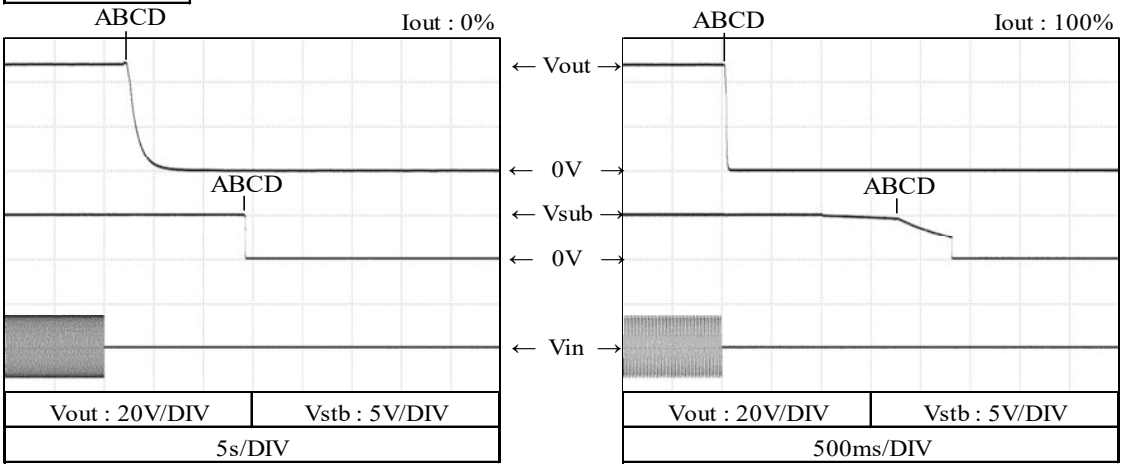
12V



24V



48V

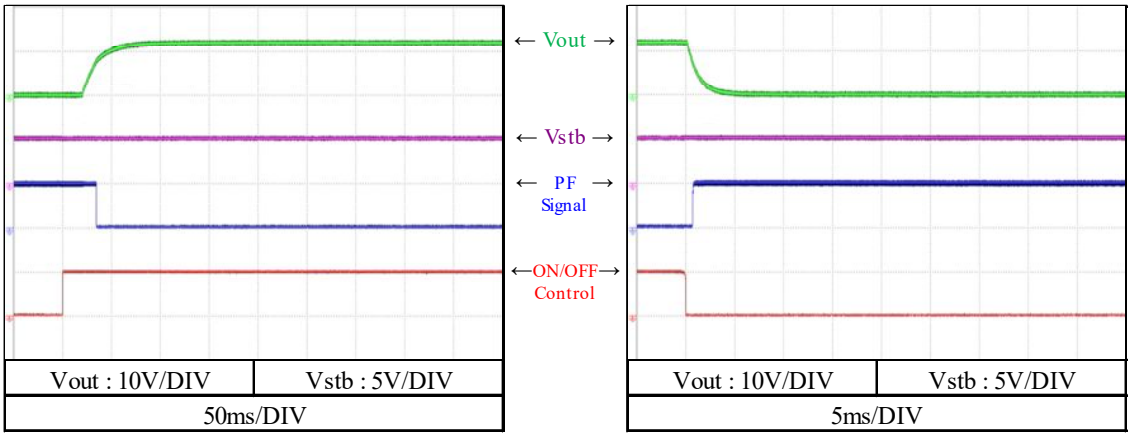


2-6. ON／OFFコントロール時出力立ち上がり、立下がり特性

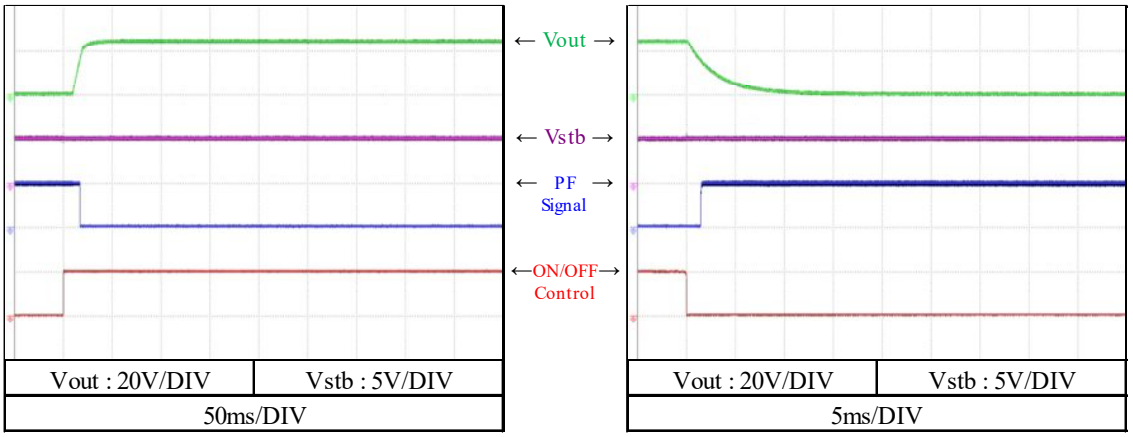
Output rise, fall characteristics with ON/OFF Control

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

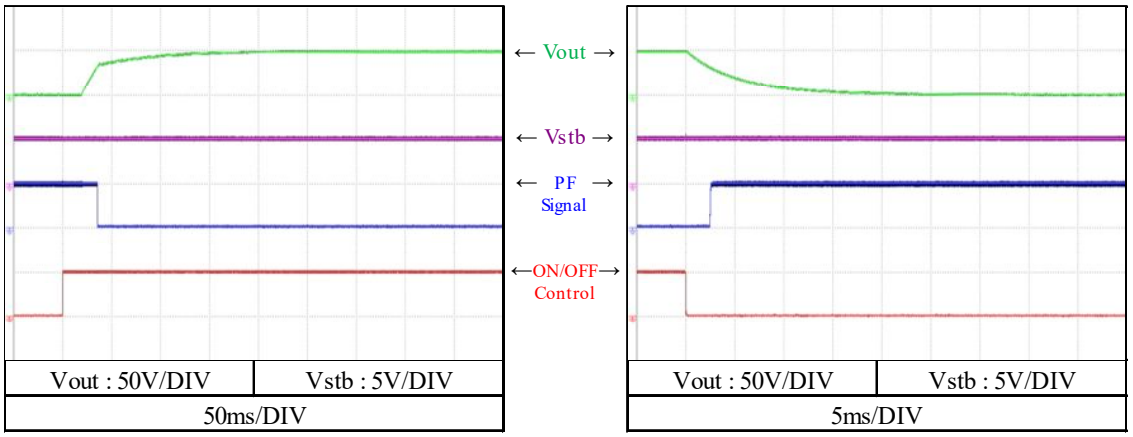
12V



24V



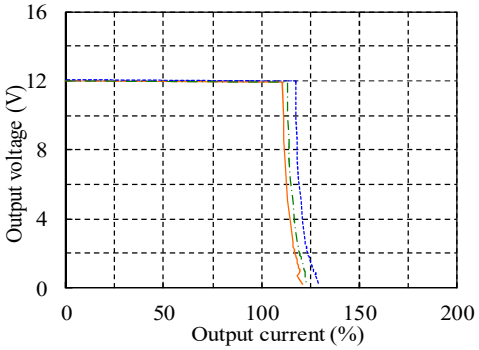
48V



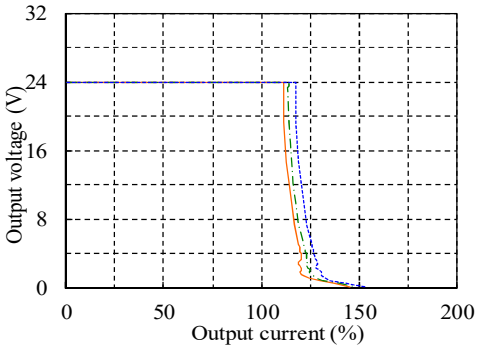
2-7. 過電流保護特性
Over current protection (OCP) characteristics

Conditions Vin : 100 VAC
Istb : 100 %
Ta : -20 ℃
25 ℃
50 ℃

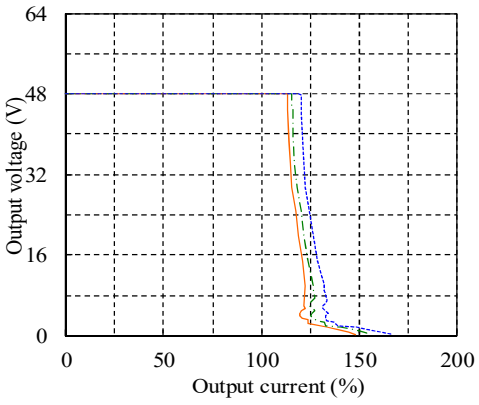
12V



24V

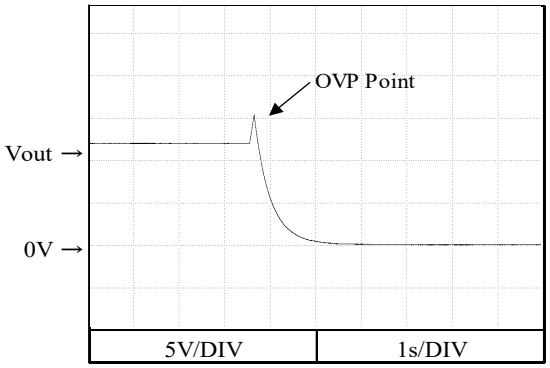


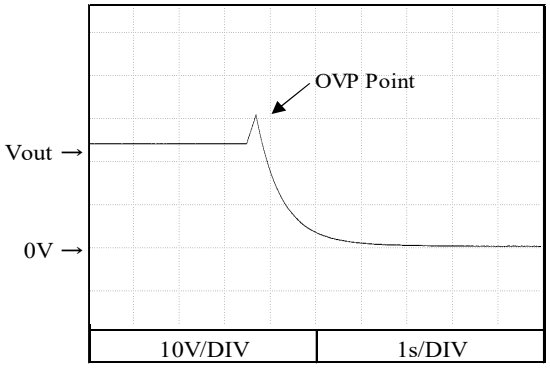
48V

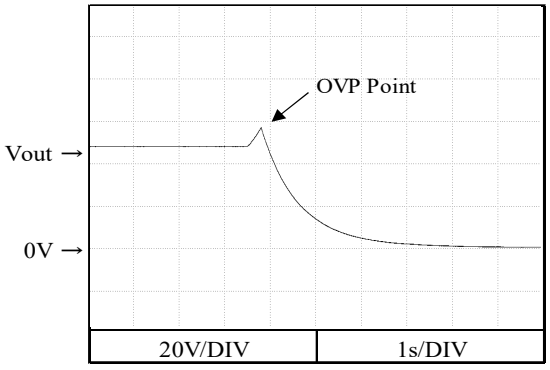


2-8. 過電圧保護特性
Over voltage protection (OVP) characteristics

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



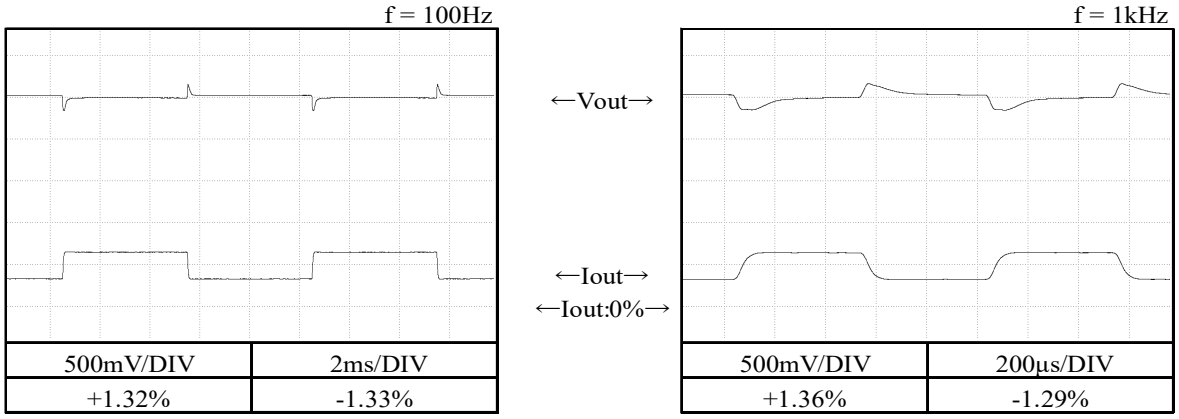




2-9. 過渡応答(負荷急変)特性 Dynamic load response characteristics

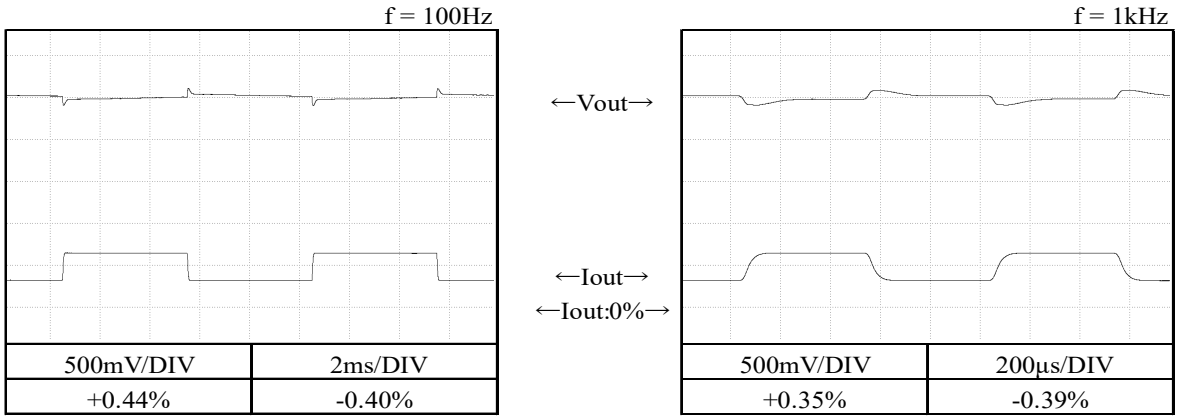
Conditions Vin : 100 VAC
Iout : 50 %⇔ 100 %
(tr = tf = 75us)
Istb : 100 %
Ta : 25 ℃

12V



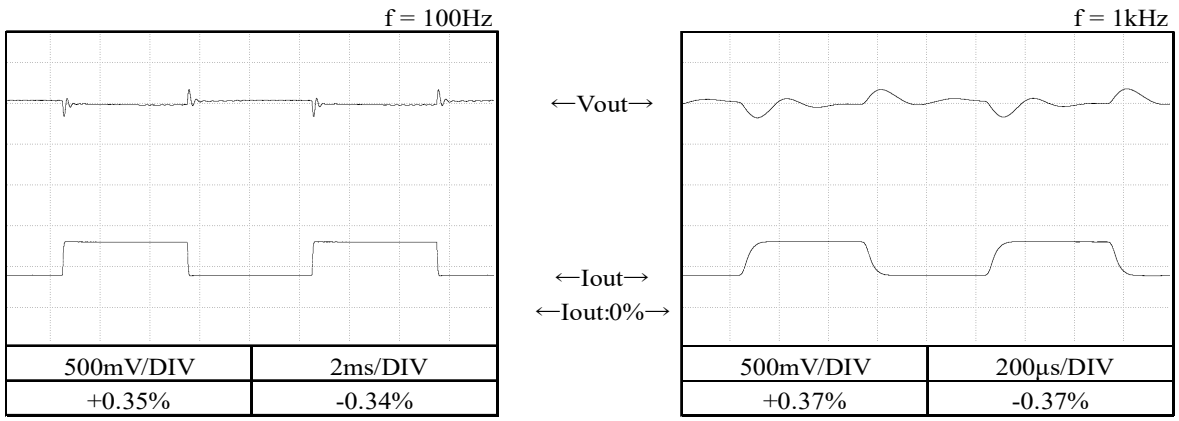
500mV/DIV	2ms/DIV	500mV/DIV	200µs/DIV
+1.32%	-1.33%	+1.36%	-1.29%

24V



500mV/DIV	2ms/DIV	500mV/DIV	200µs/DIV
+0.44%	-0.40%	+0.35%	-0.39%

48V



500mV/DIV	2ms/DIV	500mV/DIV	200µs/DIV
+0.35%	-0.34%	+0.37%	-0.37%

2-10.　入力電圧瞬停特性　Response to brown out characteristics

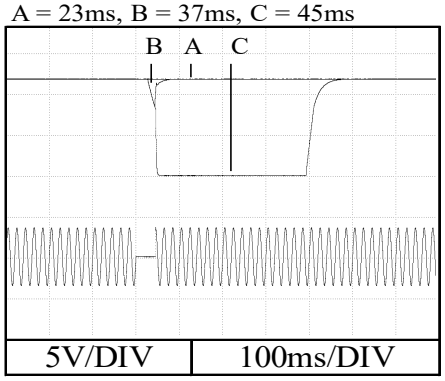
Conditions　Iout :　100%
Istb :　100%
Ta :　25 ℃

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.

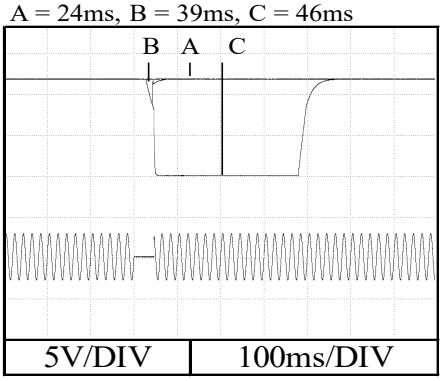
12V

Vin : 100VAC
A = 23ms, B = 37ms, C = 45ms



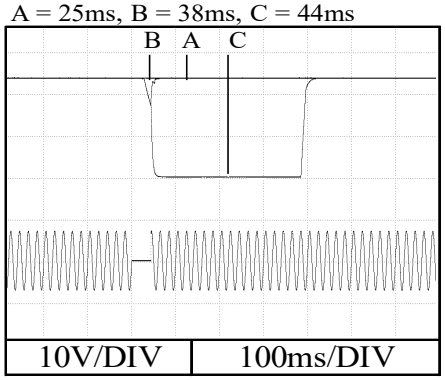
←Vout→
←0V→
←Vin→

Vin : 200VAC
A = 24ms, B = 39ms, C = 46ms



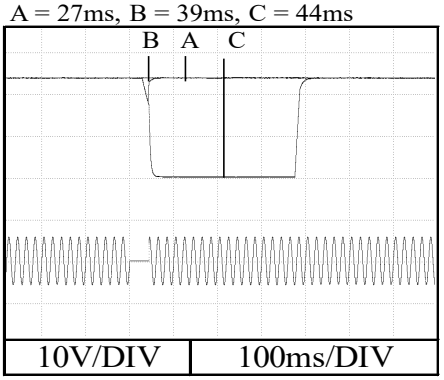
24V

Vin : 100VAC
A = 25ms, B = 38ms, C = 44ms



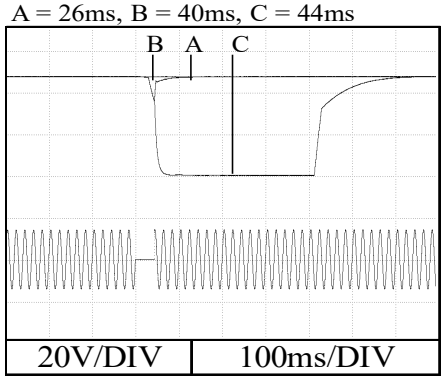
←Vout→
←0V→
←Vin→

Vin : 200VAC
A = 27ms, B = 39ms, C = 44ms



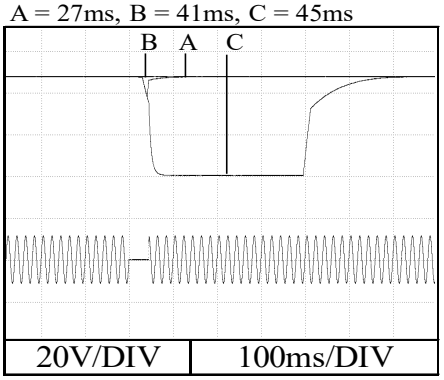
48V

Vin : 100VAC
A = 26ms, B = 40ms, C = 44ms



←Vout→
←0V→
←Vin→

Vin : 200VAC
A = 27ms, B = 41ms, C = 45ms

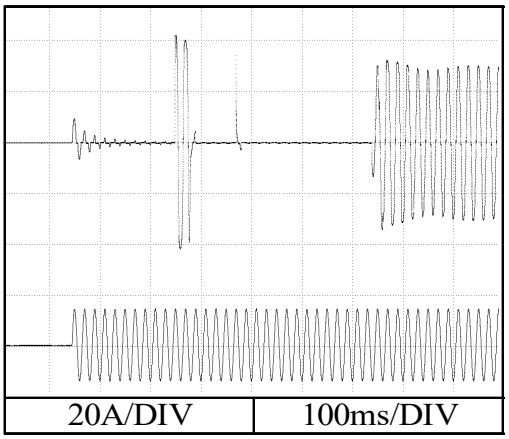


2-11. 入力サージ電流(突入電流)波形 Inrush current waveform

12V

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

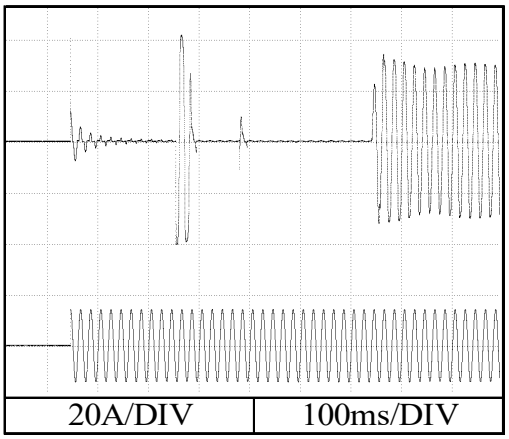
Switch on phase angle of input AC voltage
ϕ = 0°



← Iin →

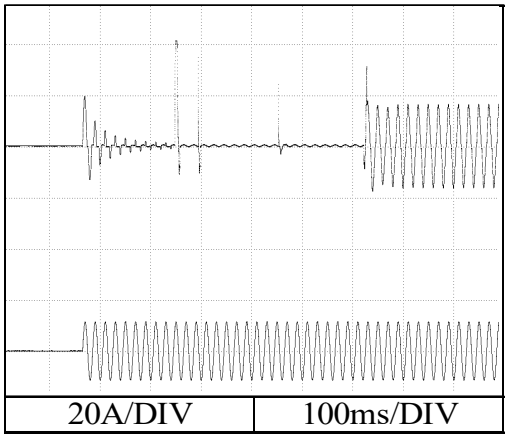
← Vin →

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



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

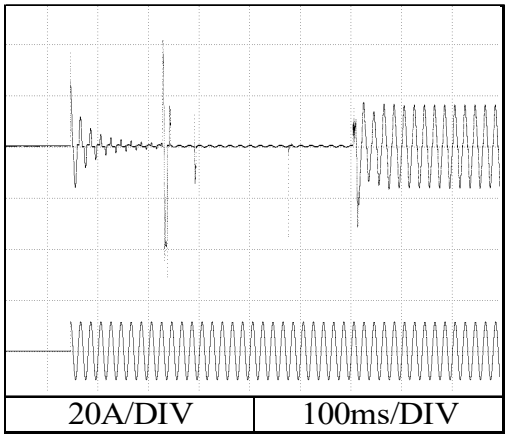
Switch on phase angle of input AC voltage
ϕ = 0°



← Iin →

← Vin →

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

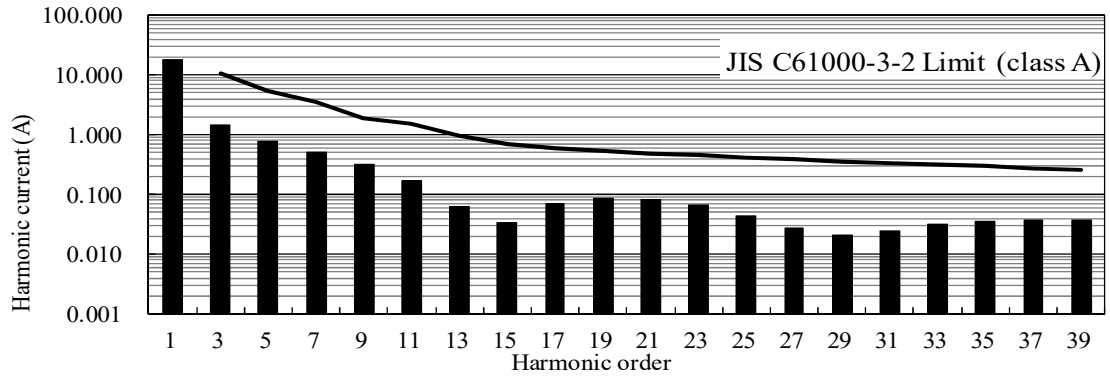


2-12. 高調波成分 Input current harmonics

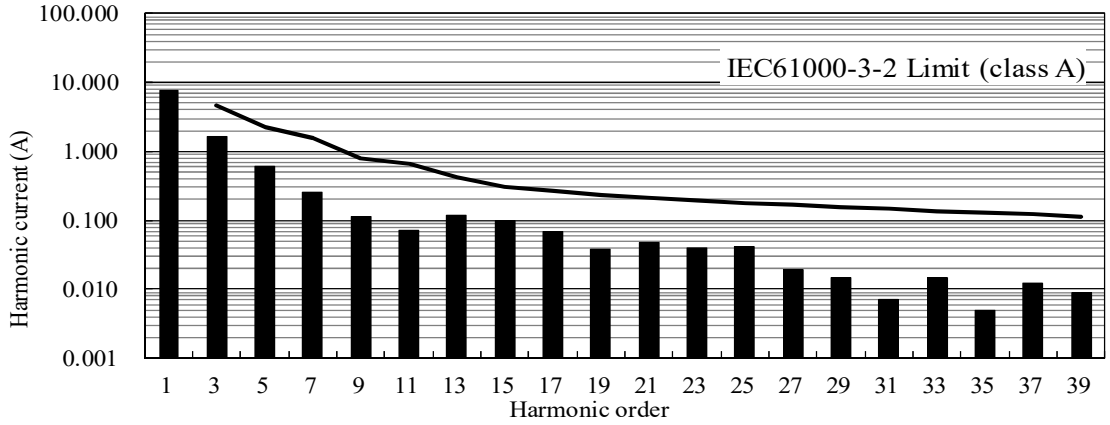
Conditions Iout : 100%
Istb : 100%
Ta : 25 ℃

12V

Vin : 100 VAC



Vin : 230 VAC

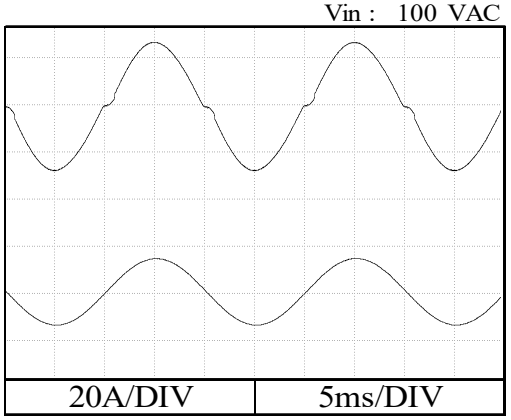


2-13. 入力電流波形 Input current waveform

Conditions Iout : 100%
Istb : 100%
Ta : 25 ℃

12V

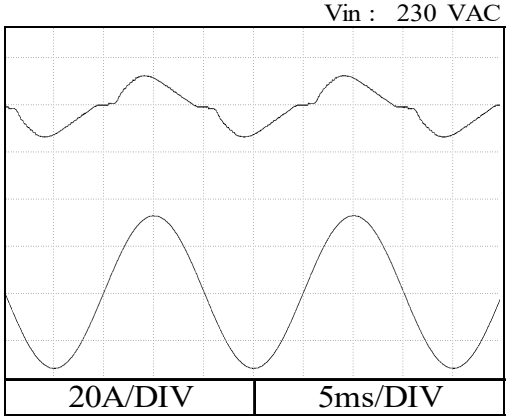
Vin : 100 VAC



←Iin→

←Vin→

Vin : 230 VAC

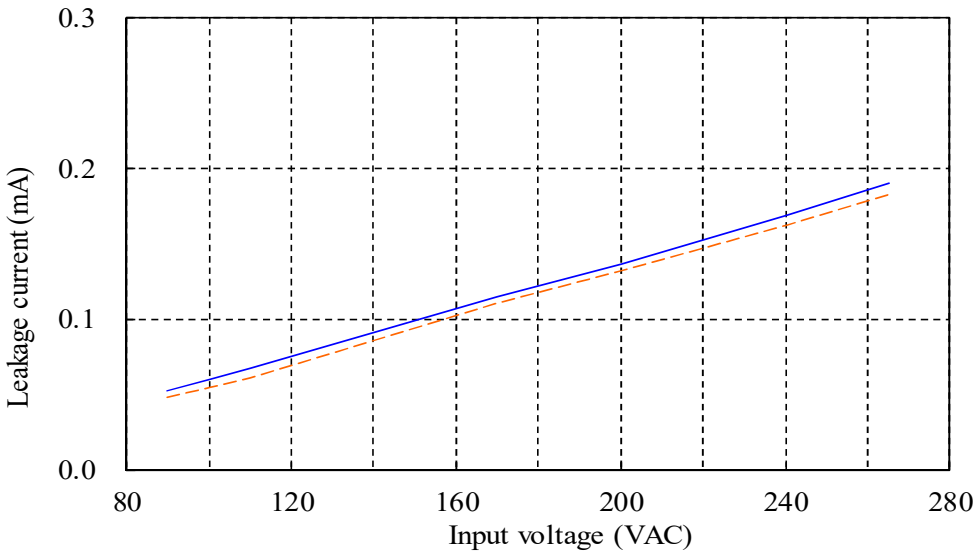


2-14. リーク電流特性 Leakage current characteristics

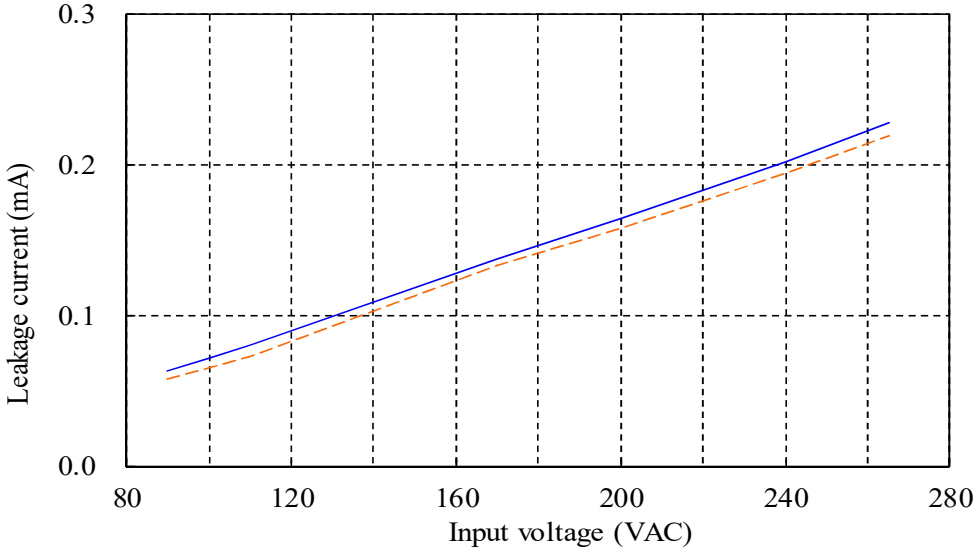
Conditions Iout : 0 %
100 %
Istb : 100 %
Ta : 25 °C
Equipment used : 3156 (HIOKI)

12V

f : 50 Hz



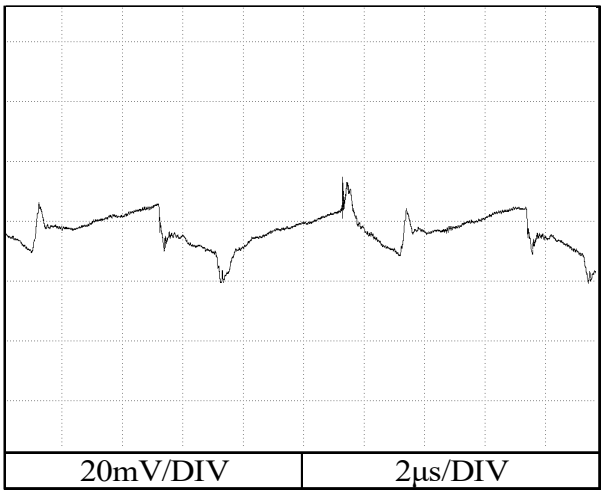
f : 60 Hz



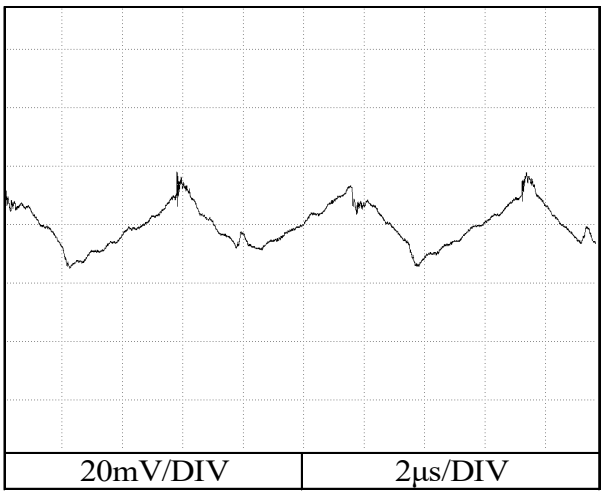
2-15. 出力リップル、ノイズ波形 Output ripple and noise waveform

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

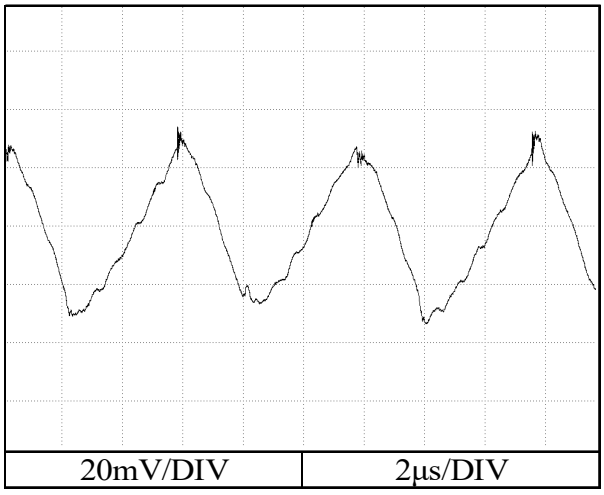
12V



24V



48V



2-16. EMI特性　Electro-Magnetic Interference characteristics

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

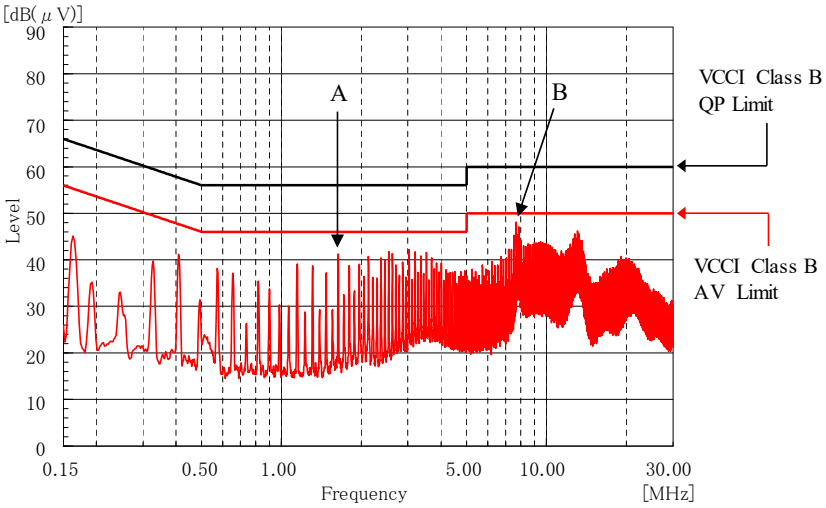
雑音端子電圧
Conducted Emission

12V

Phase : N

Ref. Data	Point A (1.6MHz) Limit (dB)	Measure (dB)
QP	56.0	42.0
AV	46.0	40.1

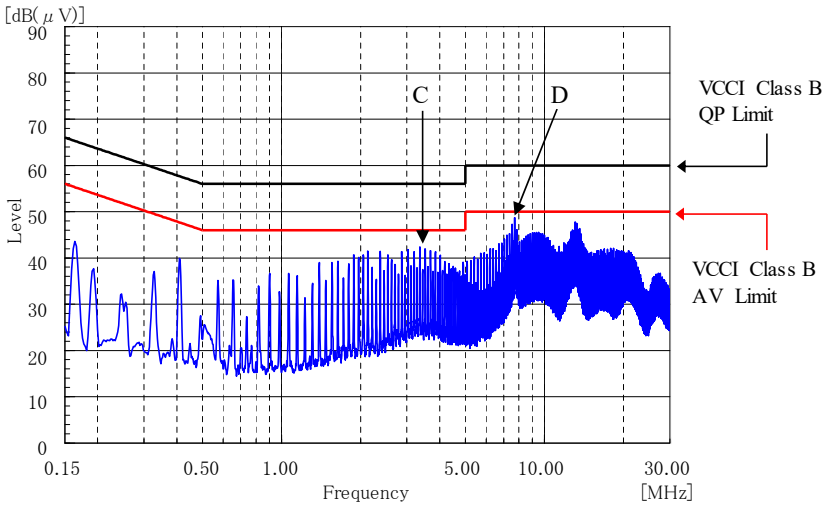
Ref. Data	Point B (7.9MHz) Limit (dB)	Measure (dB)
QP	60.0	48.0
AV	50.0	43.3



Phase : L

Ref. Data	Point C (3.5MHz) Limit (dB)	Measure (dB)
QP	56.0	43.0
AV	46.0	40.3

Ref. Data	Point D (7.7MHz) Limit (dB)	Measure (dB)
QP	60.0	49.0
AV	50.0	44.3



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.

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

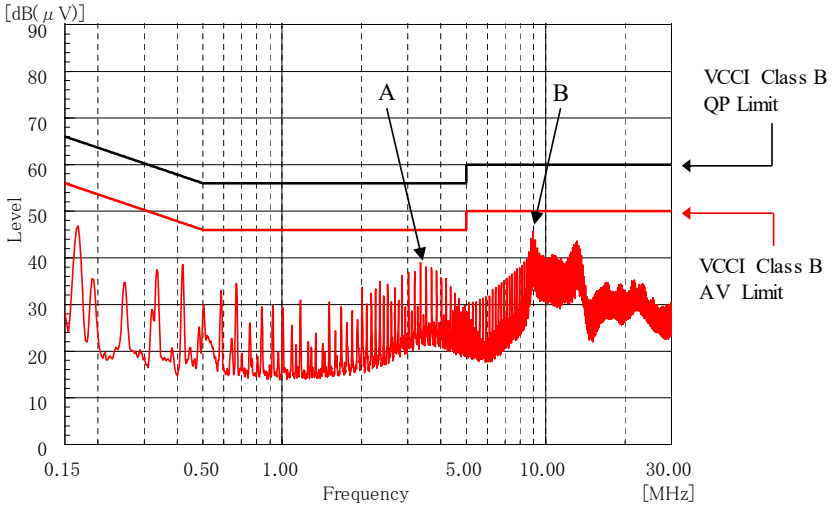
雑音端子電圧
Conducted Emission

24V

Phase : N

Ref. Data	Point A (3.4MHz) Limit (dB)	Measure (dB)
QP	56.0	39.0
AV	46.0	36.7

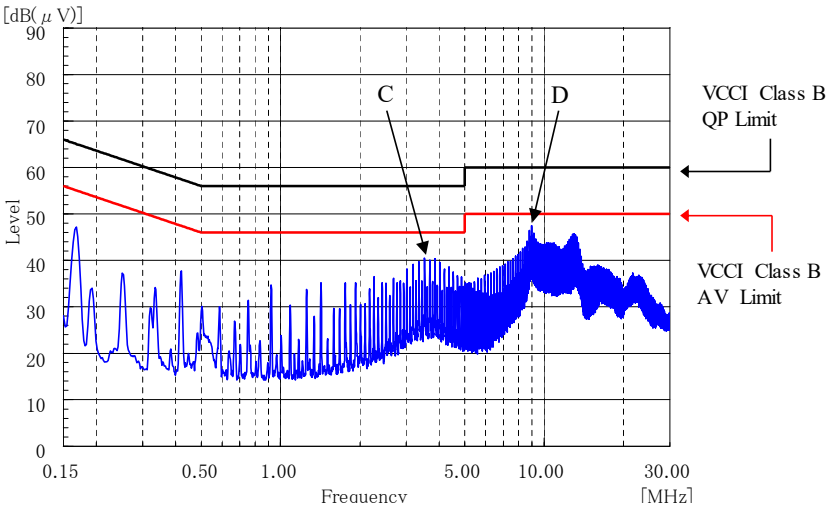
Ref. Data	Point B (9.0MHz) Limit (dB)	Measure (dB)
QP	60.0	46.0
AV	50.0	42.1



Phase : L

Ref. Data	Point C (3.5MHz) Limit (dB)	Measure (dB)
QP	56.0	41.0
AV	46.0	39.2

Ref. Data	Point D (9.0MHz) Limit (dB)	Measure (dB)
QP	60.0	48.0
AV	50.0	44.2



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.

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

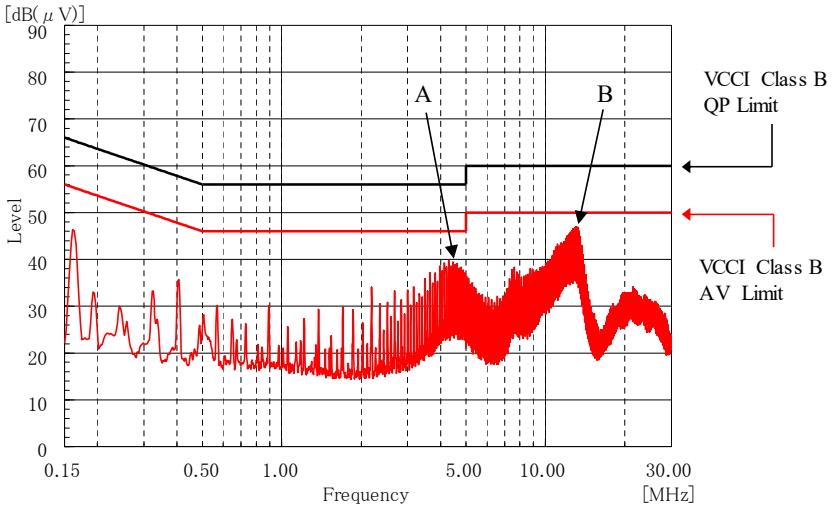
雑音端子電圧
Conducted Emission

48V

Ref. Data	Point A (4.5MHz) Limit (dB)	Measure (dB)
QP	56.0	40.0
AV	46.0	37.0

Ref. Data	Point B (13.1MHz) Limit (dB)	Measure (dB)
QP	60.0	48.0
AV	50.0	42.7

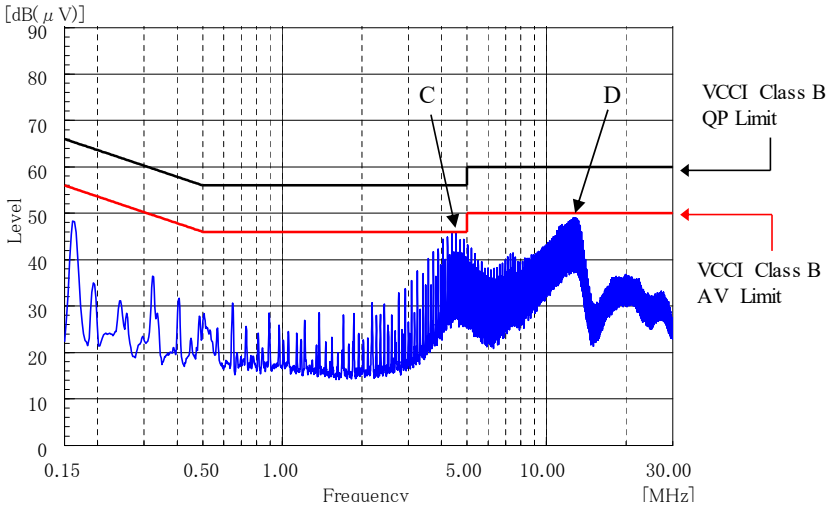
Phase : N



Ref. Data	Point C (4.5MHz) Limit (dB)	Measure (dB)
QP	56.0	46.0
AV	46.0	42.4

Ref. Data	Point D (12.7MHz) Limit (dB)	Measure (dB)
QP	60.0	50.0
AV	50.0	44.6

Phase : L



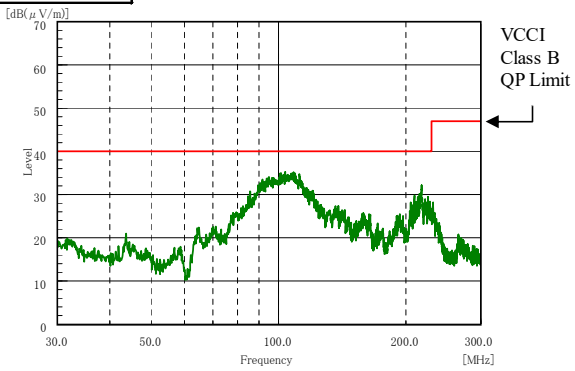
EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.

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

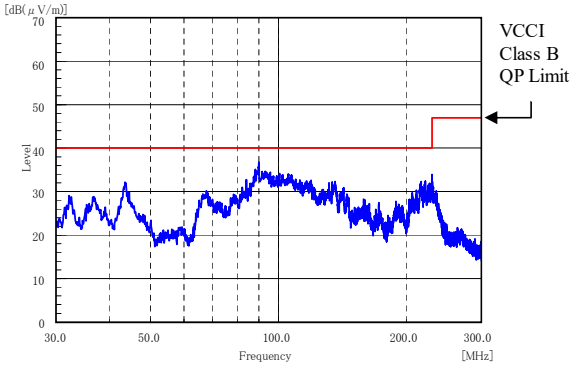
雑音電界強度
Radiated Emission

12V

HORIZONTAL

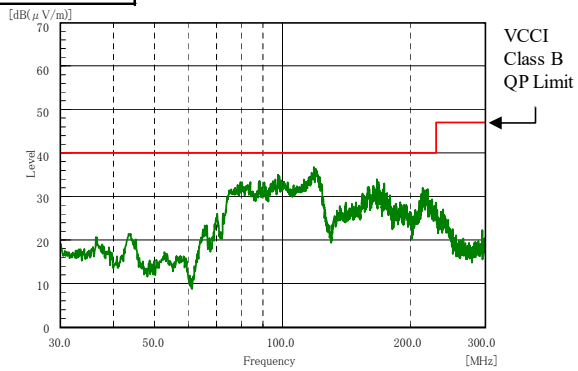


VERTICAL

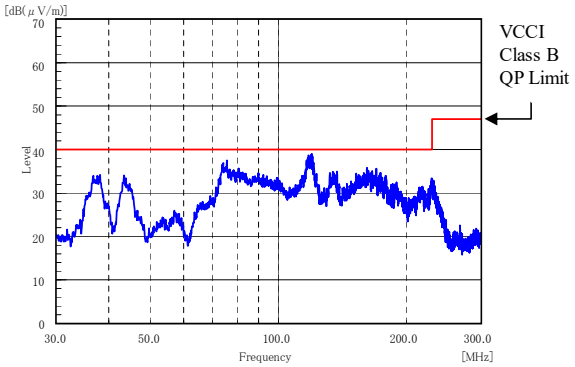


24V

HORIZONTAL

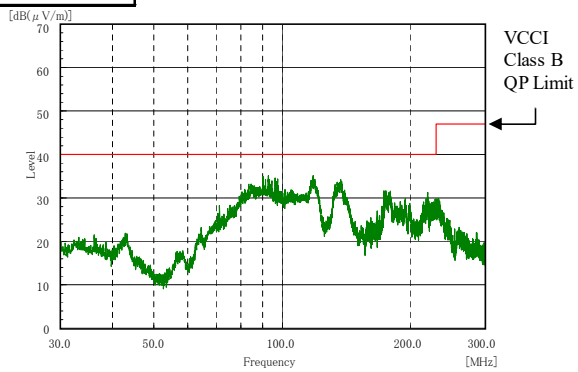


VERTICAL

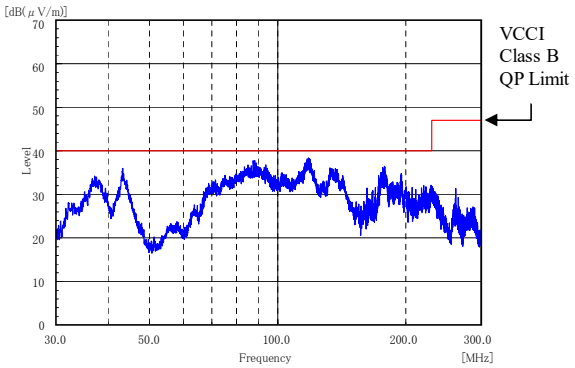


48V

HORIZONTAL



VERTICAL



測定条件は測定回路6を参照
Measurement condition refer Circuit 6 used for determination.

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.