HWS3000G-130

EVALUATION DATA

型式データ

INDEX

使用記号Terminology used

Ta	: 周囲温度 Ambient temperature	f	: 周波数 Frequency
Vin	: 入力電圧 Input voltage	Iin	: 入力電流 Input current
Vout	: 出力電圧 Output voltage	Iout	: 出力電流 Output current
Vaux	: AUX電圧 AUX voltage	Iaux	: AUX電流 AUX current

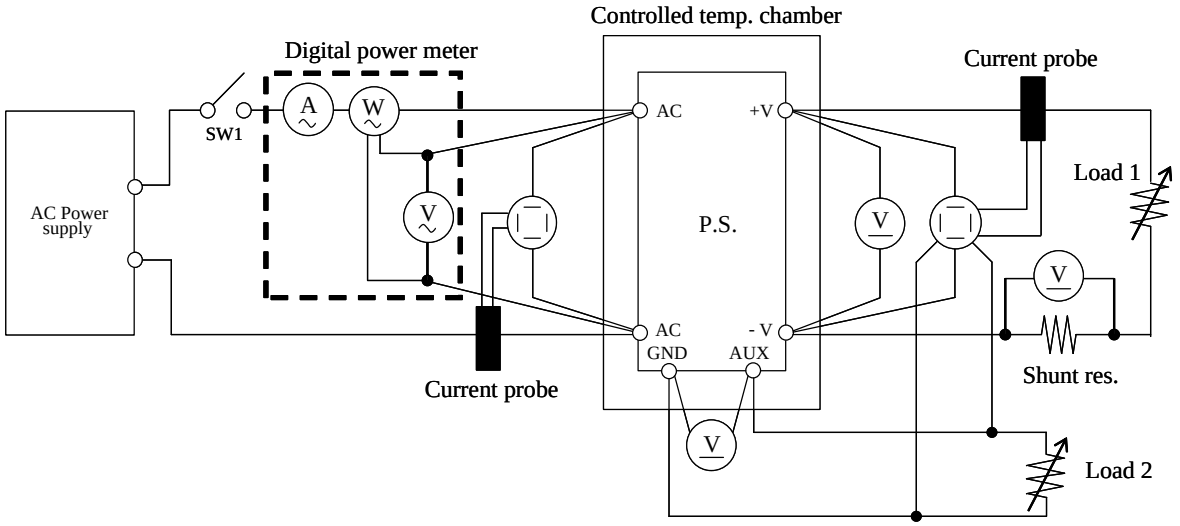
※ 当社測定条件における結果であり、参考値としてお考え願います。
Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

1-1. 測定回路 Circuit used for determination

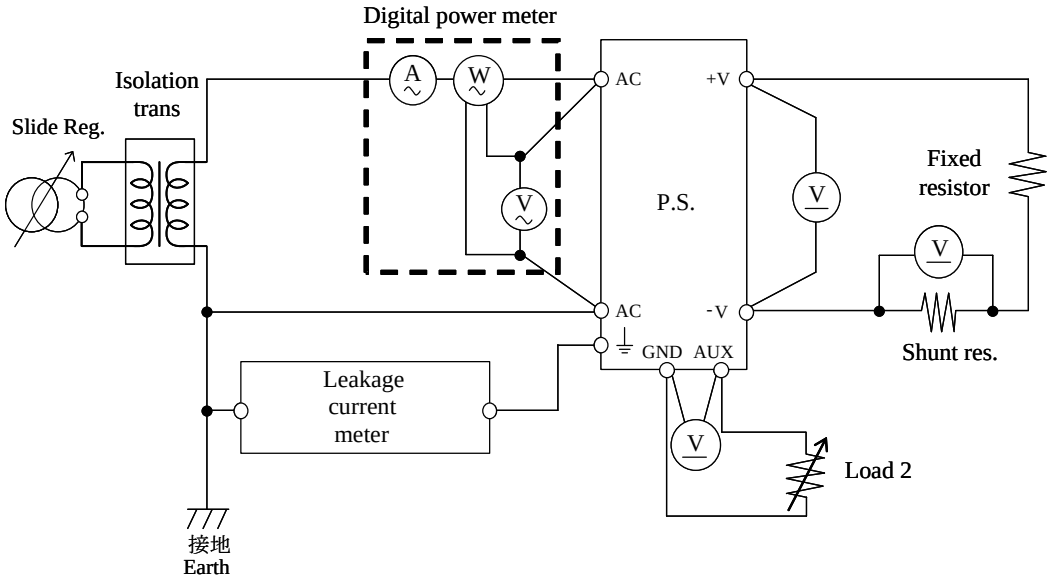
測定回路1 Circuit 1 used for determination

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
出力電圧立ち上がり/立ち下がり特性 Output voltage rise/fall characteristics
出力電流立ち上がり/立ち下がり特性 Output current rise/fall characteristics
過電流保護特性 Over current protection (OCP) characteristics
入力電圧瞬停特性 Response to brown out characteristics
入力電流波形 Input current waveform
過渡応答（負荷急変）特性 Dynamic load response characteristics
出力リップル、ノイズ電流波形 Output ripple and noise current waveform



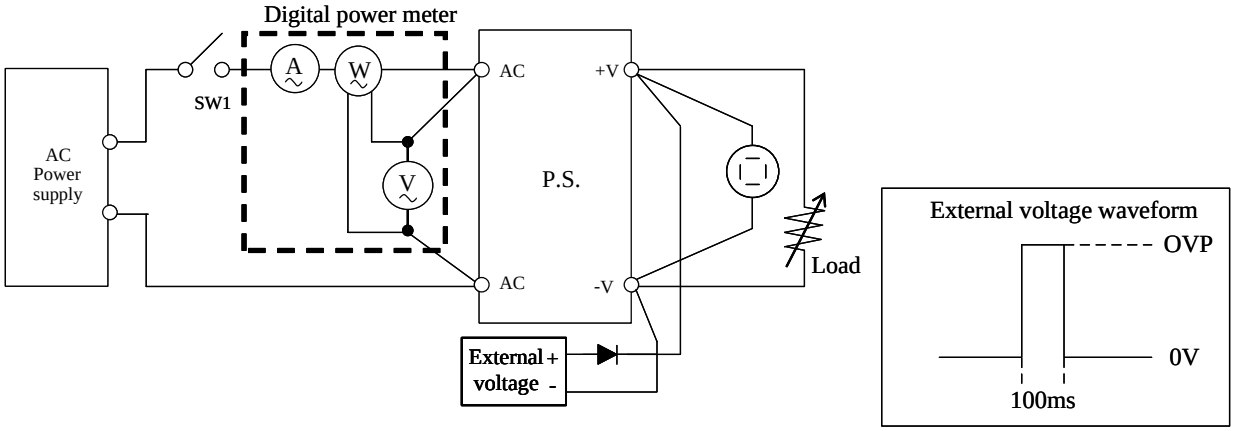
測定回路2 Circuit 2 used for determination

リーク電流特性 Leakage current characteristics



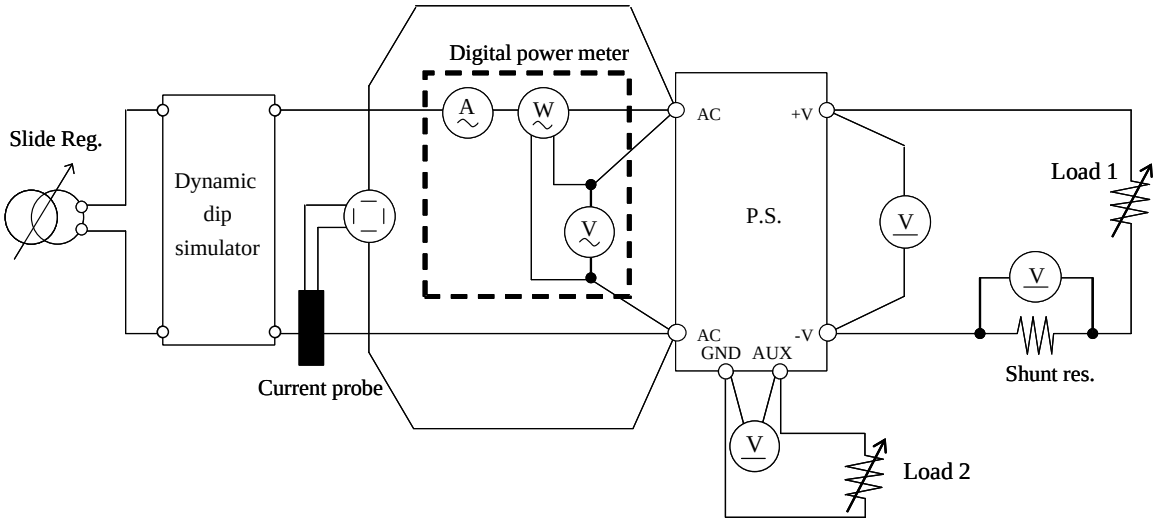
測定回路3　Circuit 3 used for determination

過電圧保護特性　Over voltage protection (OVP) characteristics



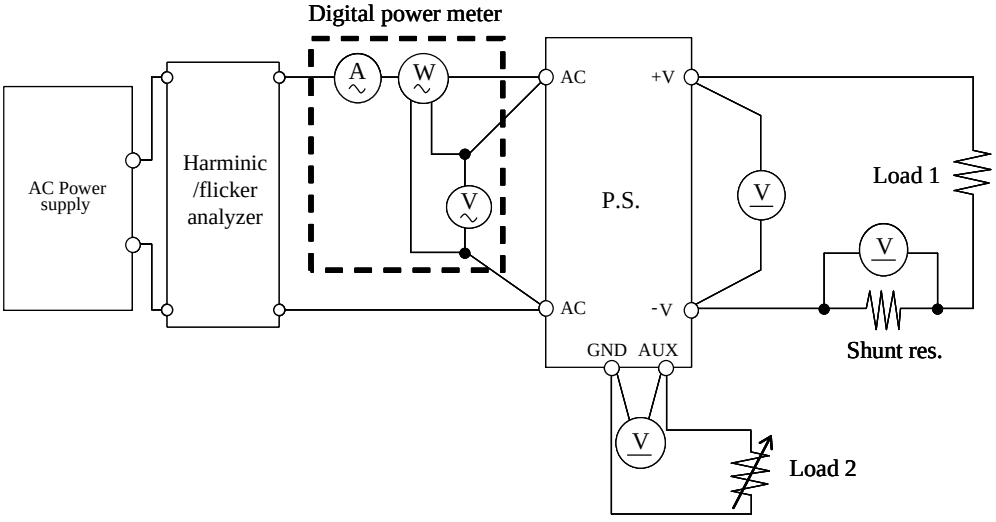
測定回路4　Circuit 4 used for determination

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

高調波成分　Input current harmonics



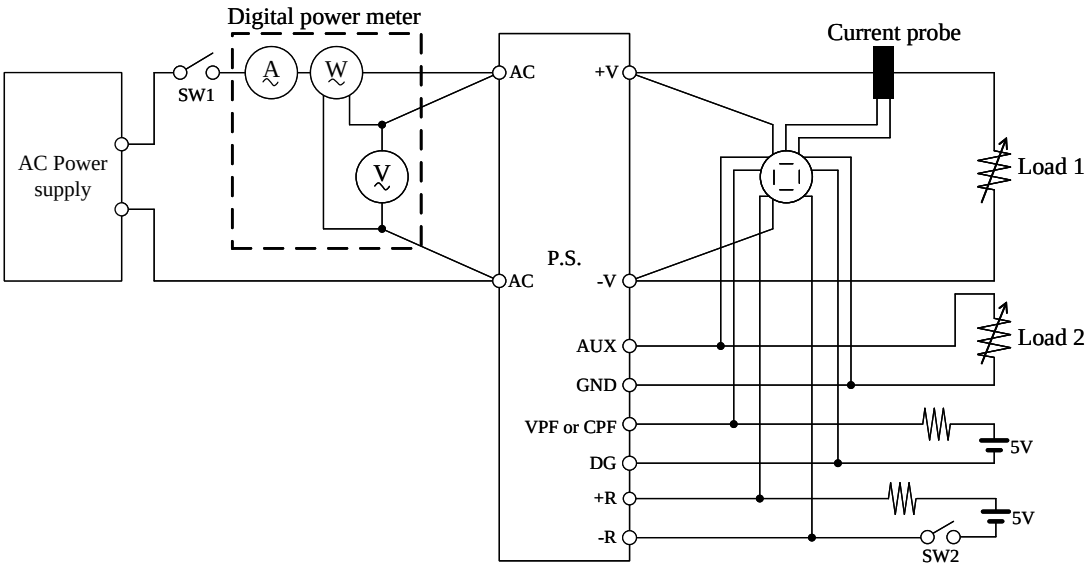
測定回路6　Circuit 6 used for determination

ＯＮ／ＯＦＦコントロール時出力立ち上がり、立ち下がり特性

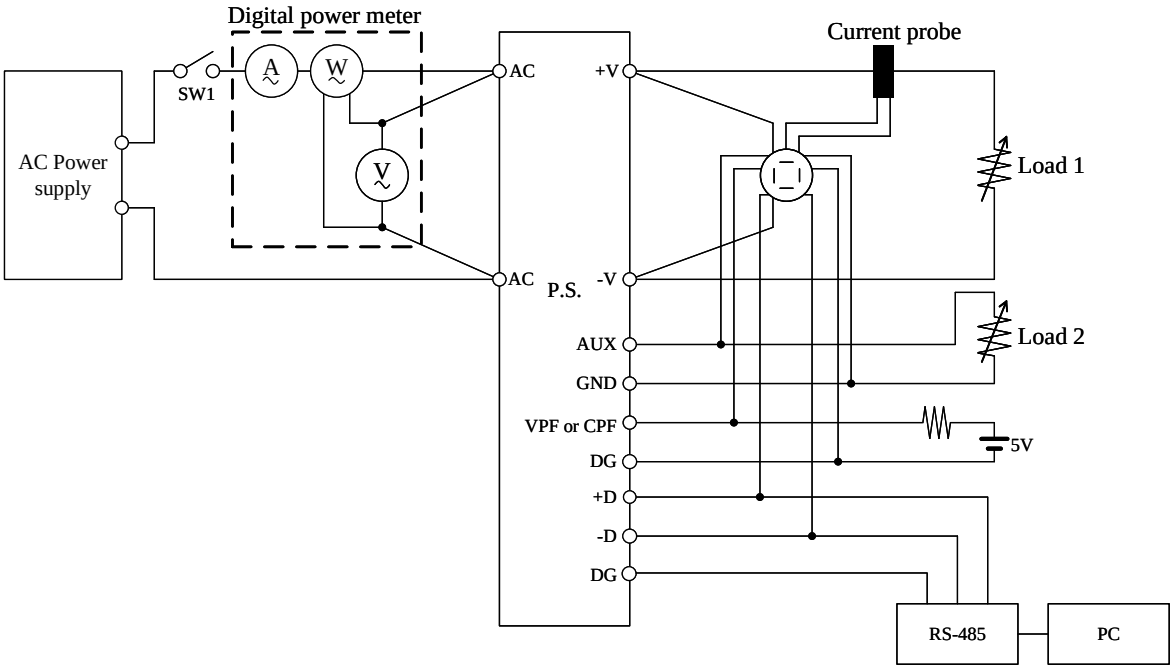
Output rise, fall characteristics with ON/OFF Control

(a) リモートON/OFFコントロール端子によるON/OFF

ON/OFF control by remote ON/OFF control terminal

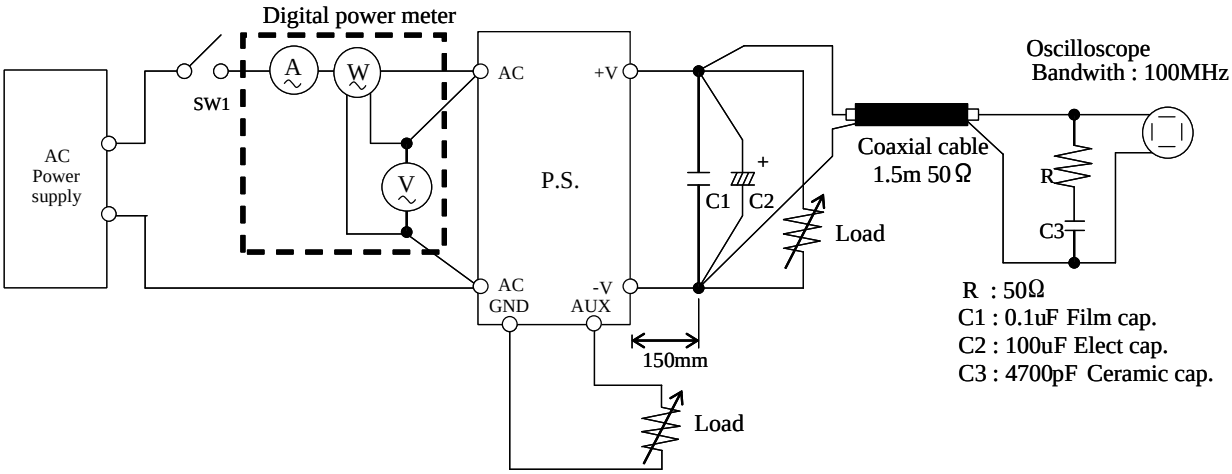


(b) RS-485通信によるON/OFF　ON/OFF control by RS-485



測定回路7　Circuit 7 used for determination

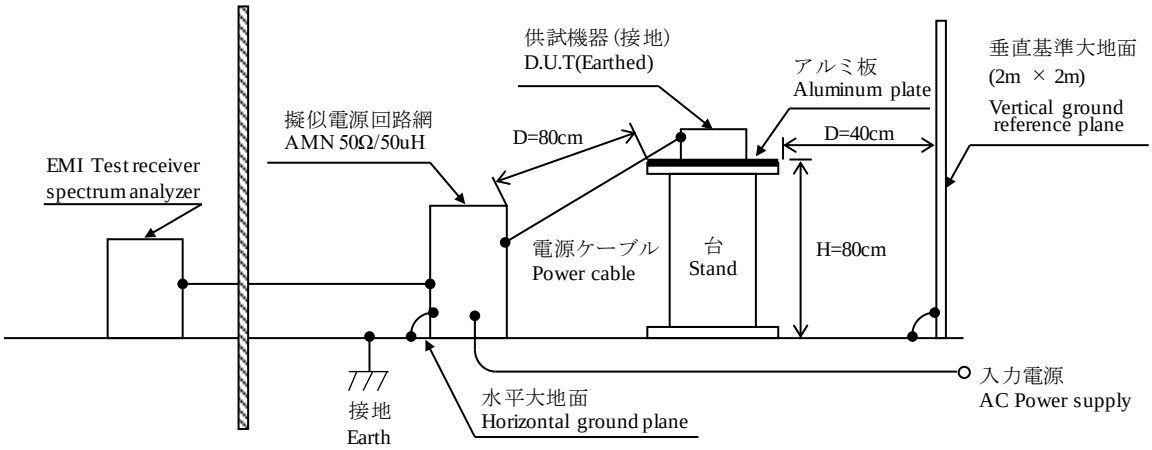
出力リップル、ノイズ電圧波形　Output ripple and noise voltage waveform



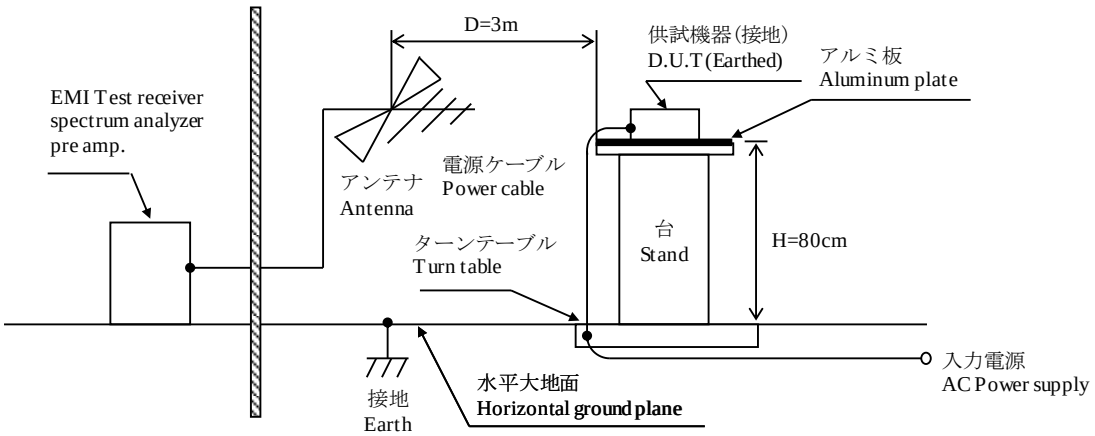
測定構成　Configuration used for determination

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	YOKOGAWA ELECT.	DLM2054
2	DIGITAL MULTIMETER	KEYSIGHT	34970A
3	DIGITAL POWER METER	HIOKI	PW3337
4	CURRENT PROBE	YOKOGAWA ELECT.	701930
5	DYNAMIC DUMMY LOAD	KIKUSI	PLZ10005WSR
6	CVCF	KIKUSUI	PCR18000WEA2R
7	CONTROLLED TEMP. CHAMBER	ESPEC	PSL-4J
8	DYNAMIC DUMMY LOAD	TAKASAGO	FK-200L
9	LEAKAGE CURRENT METER	HIOKI	ST5540
10	EMI TEST RECEIVER / SPECTRUM ANALYZER	ROHDE & SCHWARZ	ESR3
11	PRE AMP.	SONOMA	310N
12	AMN	SCHWARZBECK	NNLK8121
13	ANTENNA	TESEQ	CBL6111D
14	HARMONIC / FLICKER ANALYZER	KIKUSUI	KHA1000
15	SINGLE-PHASE MASTER	NF	4420
16	REFERENCE IMPEDANCE NETWORK 20A	NF	4150
17	MULTI OUTLET UNIT	KIKUSUI	OT01-KHA

2. 特性データ　Characteristics

2-1.　定電圧出力モード　Constant voltage output mode

2-1-1.　静特性　Steady state data

(1) 入力・負荷・温度変動　Regulation - line and load, Temperature drift

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

Iout \ Vin	85VAC	100VAC	115VAC	132VAC	Line regulation	
0A	130.159V	130.152V	130.152V	130.162V	10mV	0.008%
5.8A	129.863V	129.859V	129.867V	129.882V	23mV	0.018%
11.6A	129.904V	129.897V	129.902V	129.888V	16mV	0.012%
Load regulation	296mV	293mV	285mV	280mV		
	0.228%	0.225%	0.219%	0.215%		

Iout \ Vin	170VAC	200VAC	230VAC	265VAC	Line regulation	
0A	130.166V	130.191V	130.177V	130.155V	36mV	0.028%
11.6A	129.913V	129.908V	129.895V	129.883V	30mV	0.023%
23.2A	129.925V	129.927V	129.923V	129.918V	9mV	0.007%
Load regulation	253mV	283mV	282mV	272mV		
	0.195%	0.218%	0.217%	0.209%		

2. Temperature drift

Conditions　Vin：　100 VAC
Iout：　11.6 A

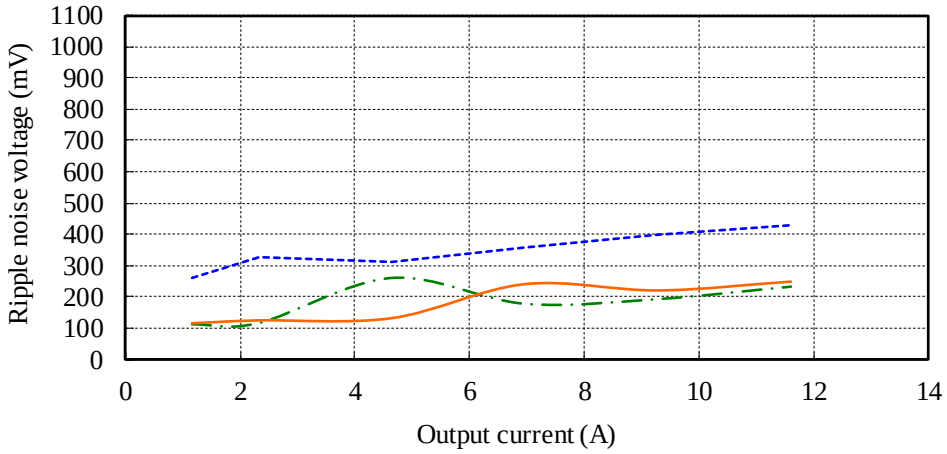
Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	129.838V	129.897V	130.052V	214mV	0.165%

Conditions　Vin：　200 VAC
Iout：　23.2 A

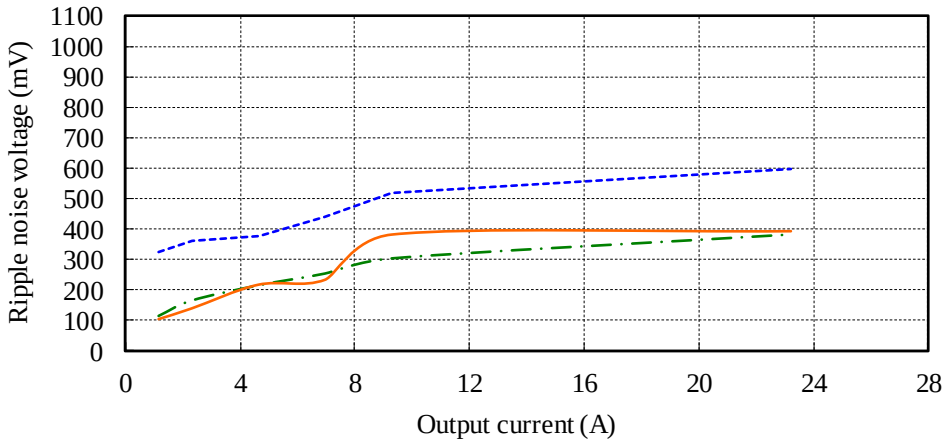
Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	129.934V	129.927V	130.016V	89mV	0.068%

(2) リップルノイズ電圧対出力電流　Ripple noise voltage vs. Output current

Conditions　Vin : 100 VAC
Vout : 130 V
Ta : -20 ℃
25 ℃
50 ℃

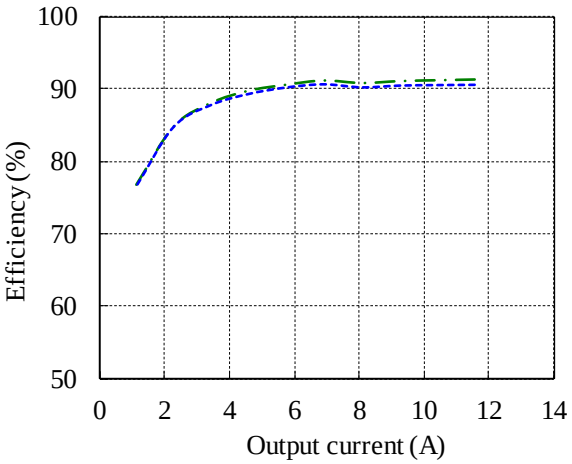


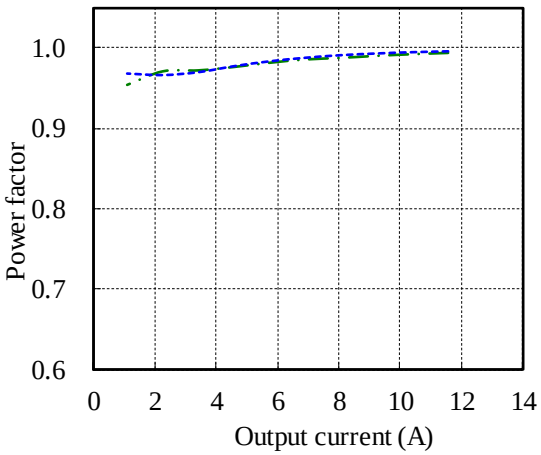
Conditions　Vin : 200 VAC
Vout : 130 V
Ta : -20 ℃
25 ℃
50 ℃



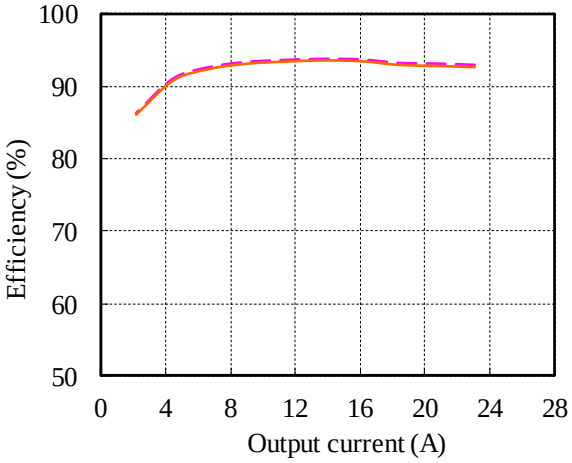
(3) 効率・力率対出力電流　Efficiency and Power factor vs. Output current

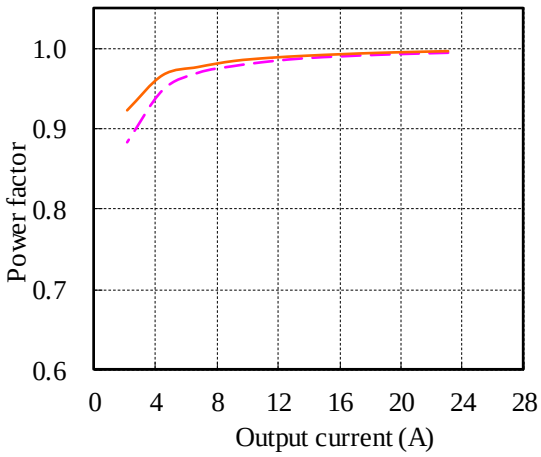
Conditions　Vin : 100 VAC
115 VAC
Vout : 130 V
Iaux : 0 %
Ta : 25 ℃





Conditions　Vin : 200 VAC
230 VAC
Vout : 130 V
Iaux : 0 %
Ta : 25 ℃

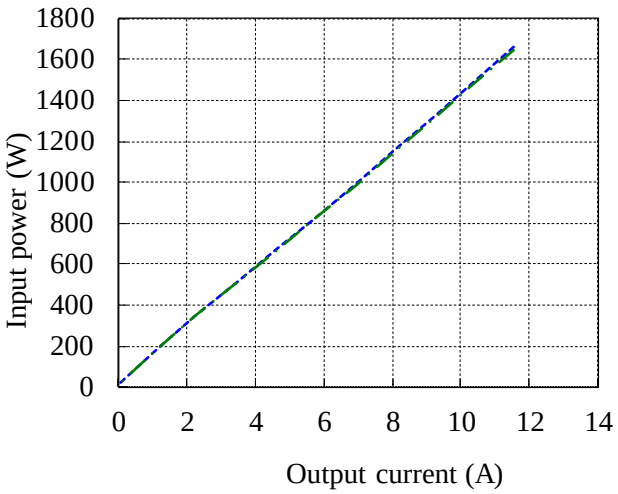




(4) 入力電力対出力電流　Input power vs. Output current

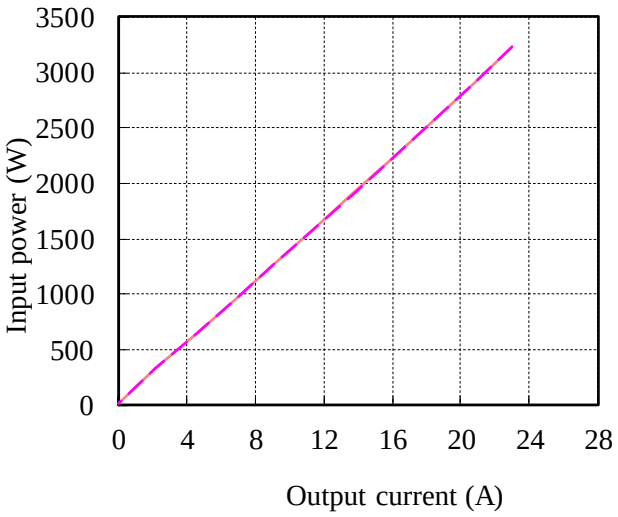
Conditions　Vin : 100 VAC
115 VAC
Vout : 130 V
Iaux : 0 %
Ta : 25 ℃

Vin	Input power	
	Iout : 0%	Control OFF
100VAC	12.3W	8.5W
115VAC	11.6W	8.0W



Conditions　Vin : 200 VAC
230 VAC
Vout : 130 V
Iaux : 0 %
Ta : 25 ℃

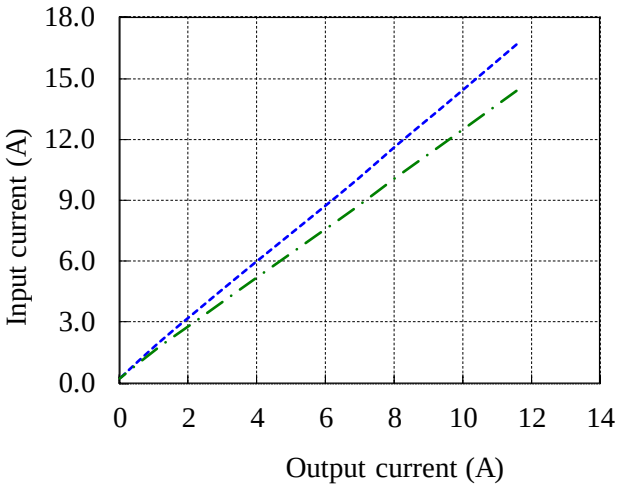
Vin	Input power	
	Iout : 0%	Control OFF
200VAC	9.9W	7.0W
230VAC	9.8W	7.0W



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

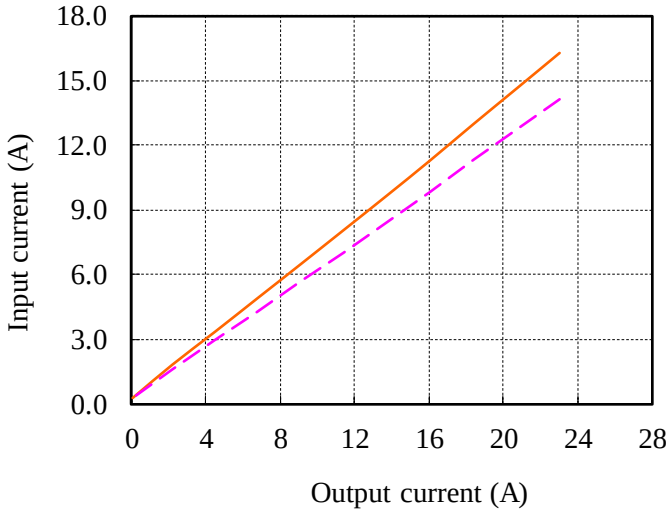
Conditions　Vin : 100 VAC
115 VAC
Vout : 130 V
Iaux : 0 %
Ta : 25 ℃

Vin	Input current	
	Iout : 0%	Control OFF
100VAC	0.24A	0.19A
115VAC	0.22A	0.18A



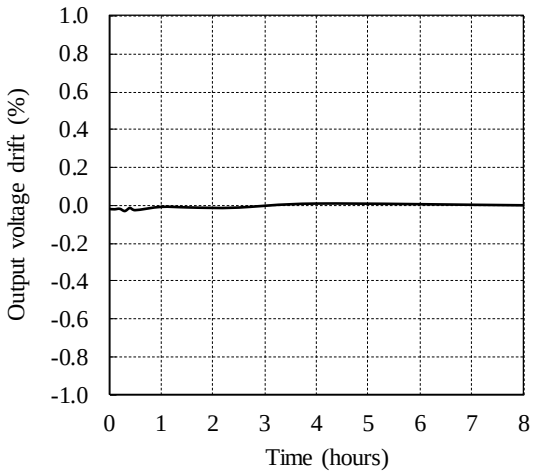
Conditions　Vin : 200 VAC
230 VAC
Vout : 130 V
Iaux : 0 %
Ta : 25 ℃

Vin	Input current	
	Iout : 0%	Control OFF
200VAC	0.24A	0.22A
230VAC	0.26A	0.25A

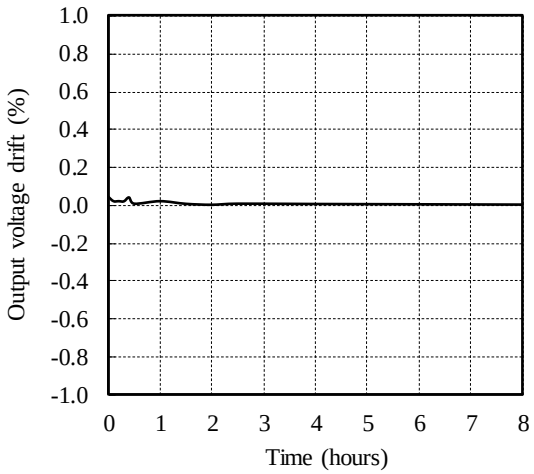


2-1-2. 通電ドリフト特性 Warm up voltage drift characteristics

Conditions Vin : 100 VAC
Vout : 130 V
Iout : 11.6 A
Ta : 25 ℃

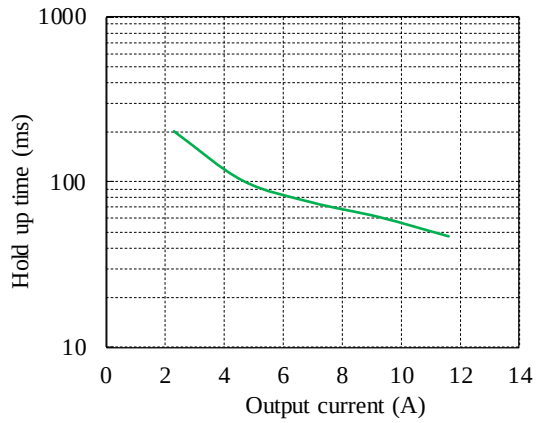


Conditions Vin : 200 VAC
Vout : 130 V
Iout : 23.2 A
Ta : 25 ℃

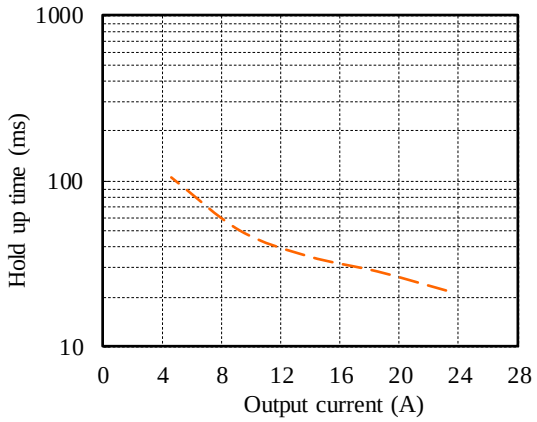


2-1-3. 出力保持時間特性 Hold up time characteristics

Conditions Vin : 100 VAC
Vout : 130 V
Ta : 25 ℃



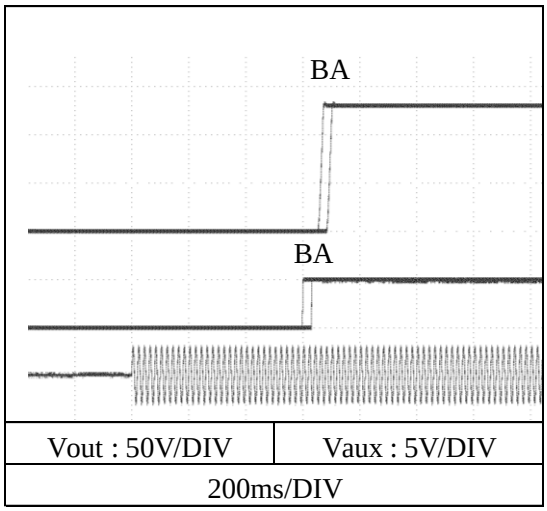
Conditions Vin : 200 VAC
Vout : 130 V
Ta : 25 ℃



2-1-4. 出力電圧立ち上がり特性 Output voltage rise characteristics

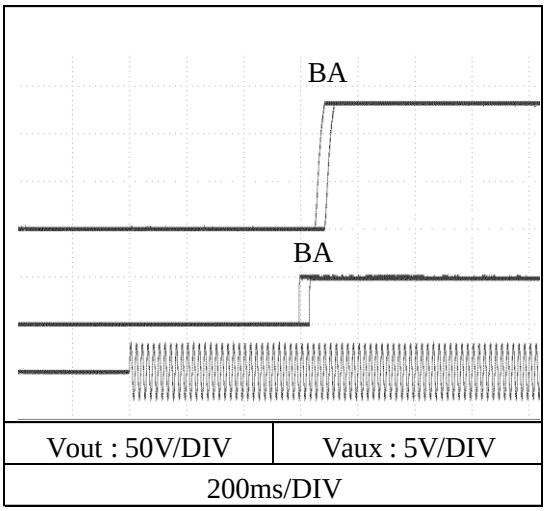
Conditions Vin : 100 VAC (A)
115 VAC (B)
Iaux : 100 %
Ta : 25 ℃

Iout : 0A



Vout : 50V/DIV | Vaux : 5V/DIV
200ms/DIV

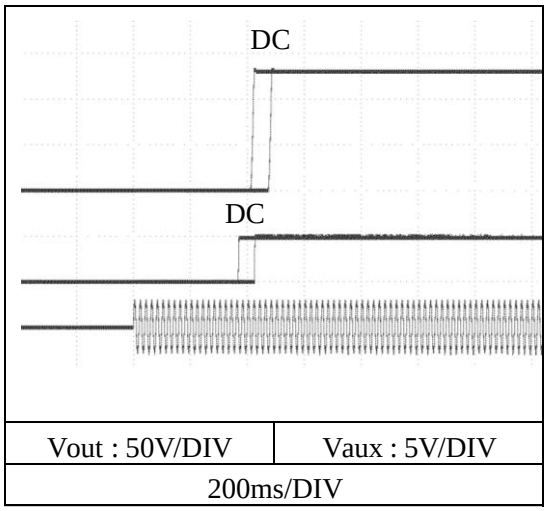
Iout : 11.6A



Vout : 50V/DIV | Vaux : 5V/DIV
200ms/DIV

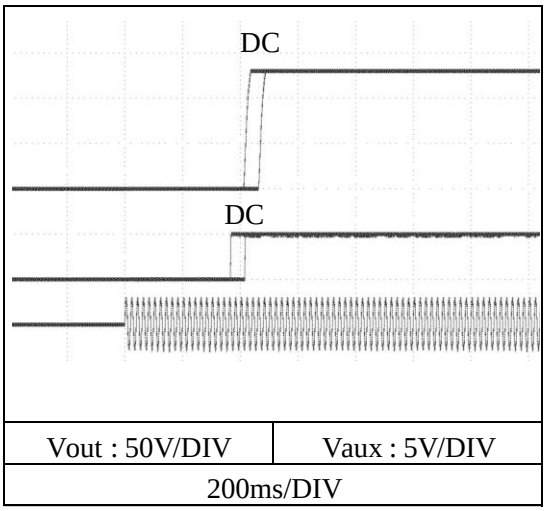
Conditions Vin : 200 VAC (C)
230 VAC (D)
Iaux : 100 %
Ta : 25 ℃

Iout : 0A



Vout : 50V/DIV | Vaux : 5V/DIV
200ms/DIV

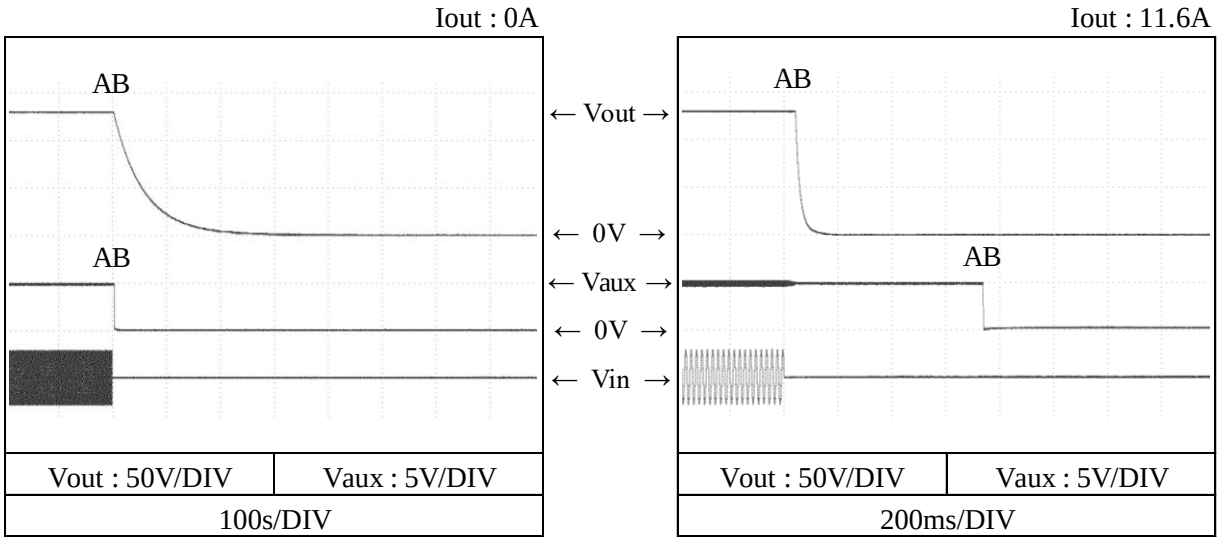
Iout : 23.2A



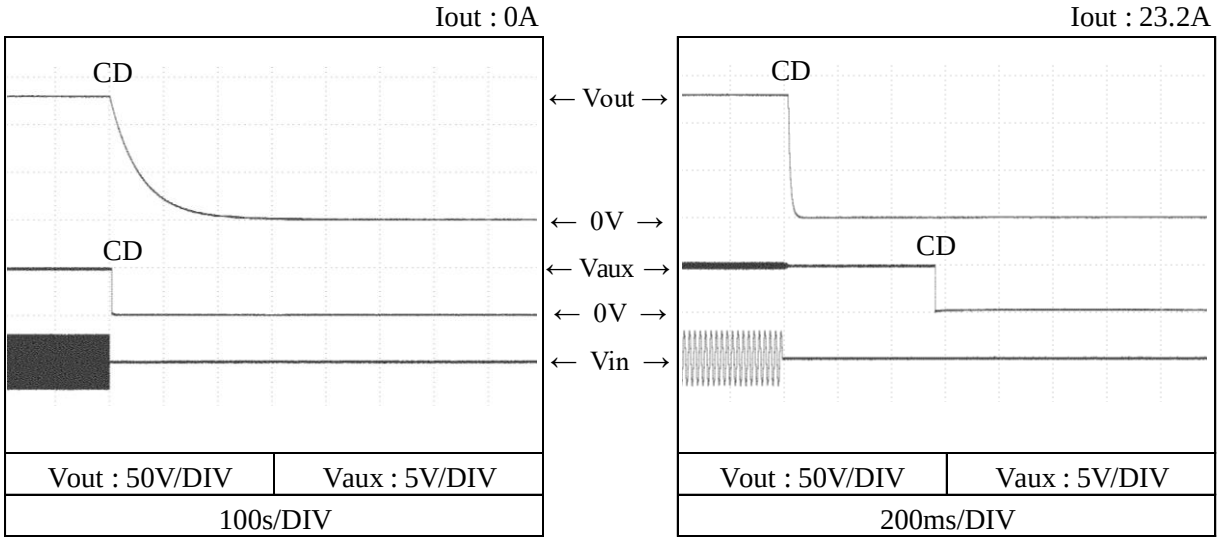
Vout : 50V/DIV | Vaux : 5V/DIV
200ms/DIV

2-1-5. 出力電圧立ち下がり特性 Output voltage fall characteristics

Conditions Vin : 100 VAC (A)
115 VAC (B)
Iaux : 100 %
Ta : 25 ℃



Conditions Vin : 200 VAC (C)
230 VAC (D)
Iaux : 100 %
Ta : 25 ℃



2-1-6. 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

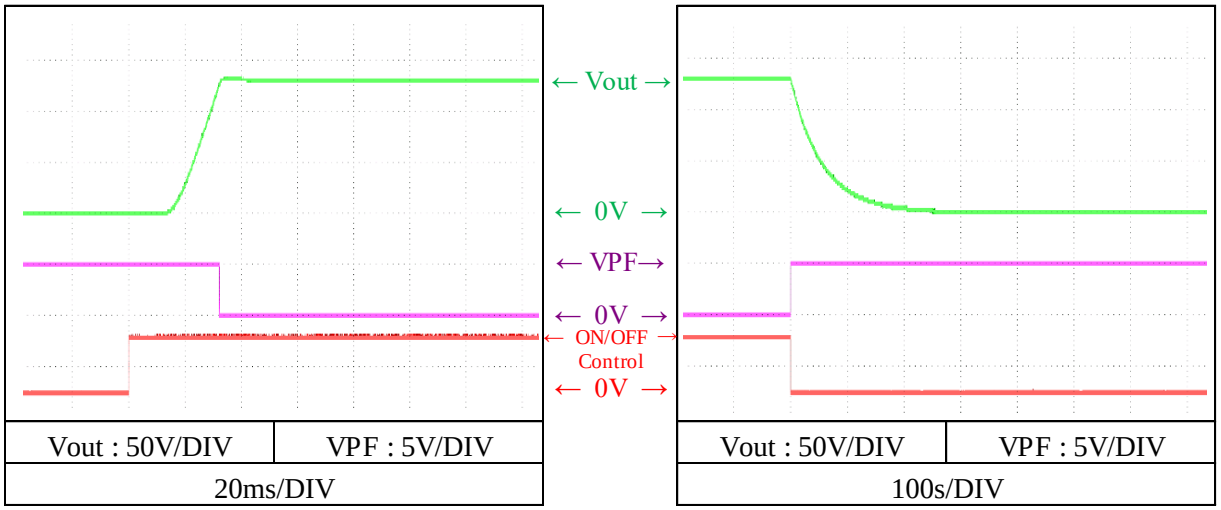
(a) リモートON/OFFコントロール端子によるON/OFF

ON/OFF control by remote ON/OFF control terminal

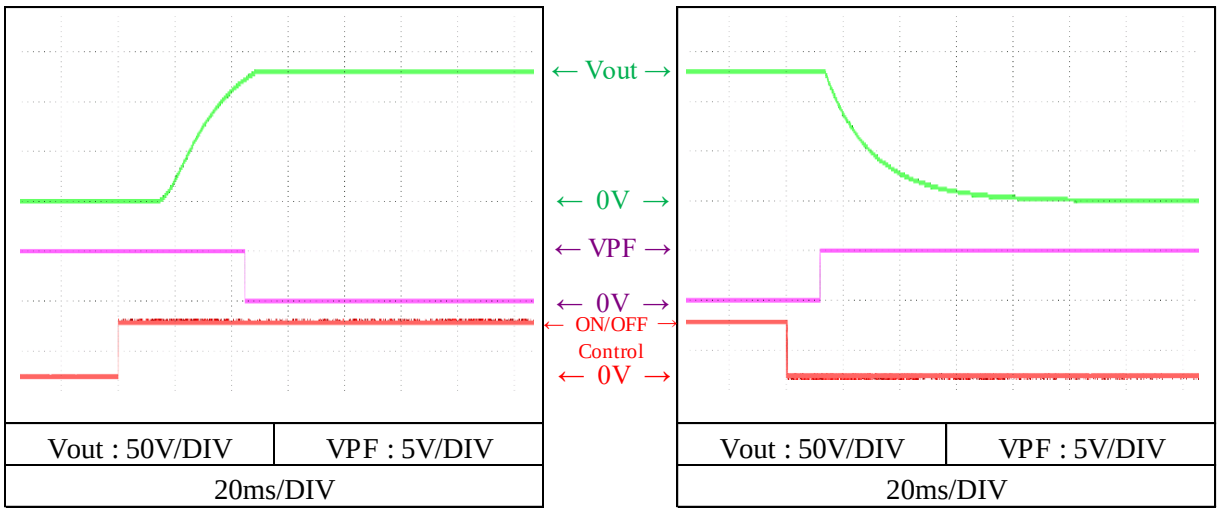
Conditions Vin : 100 VAC

Ta : 25 ℃

Iout : 0A



Iout : 11.6A



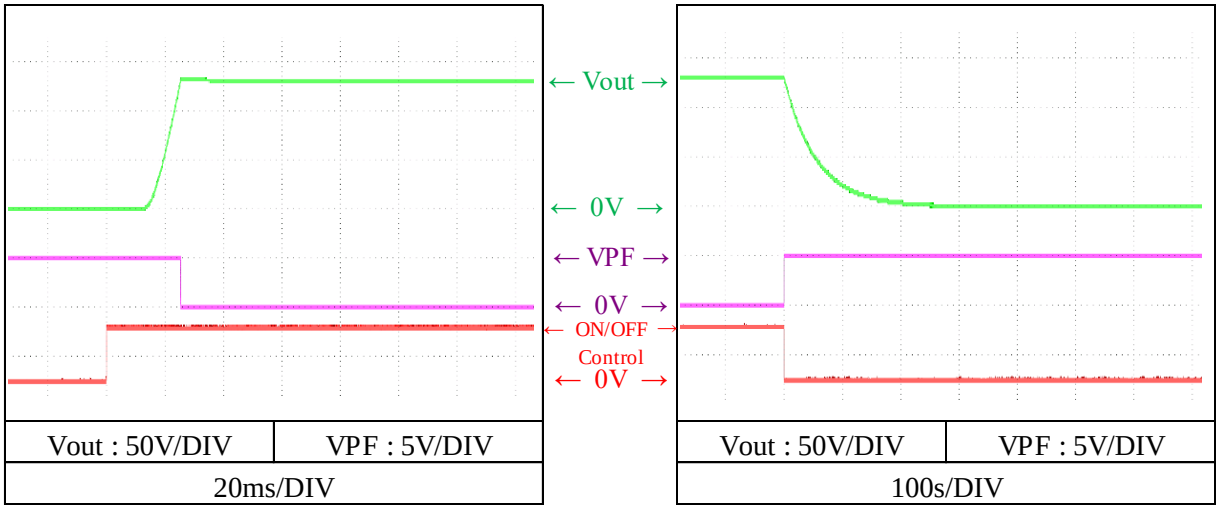
(a) リモートON/OFFコントロール端子によるON/OFF

ON/OFF control by remote ON/OFF control terminal

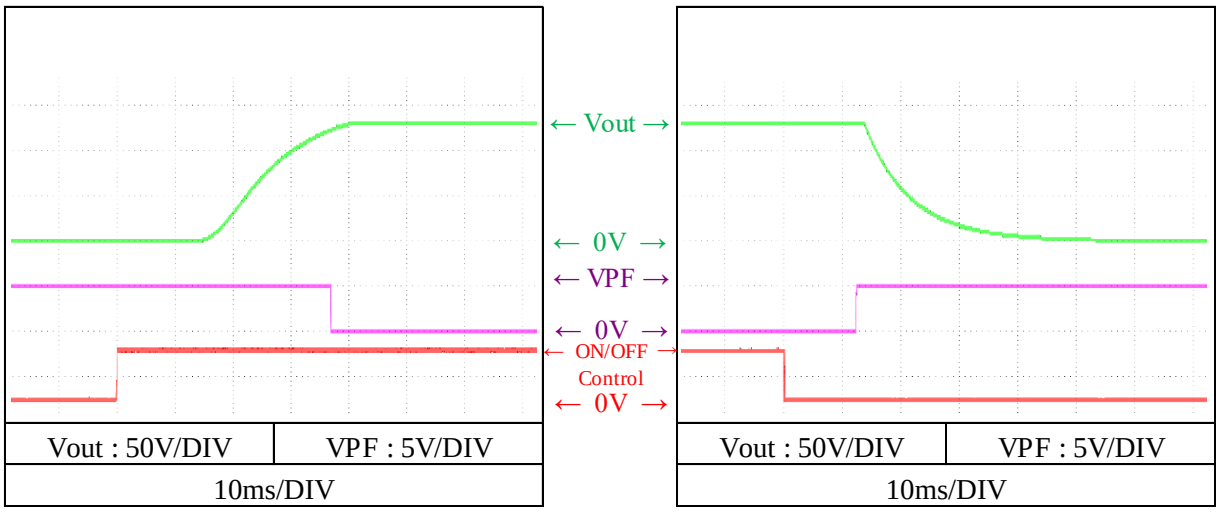
Conditions Vin : 200 VAC

Ta : 25 ℃

Iout : 0A



Iout : 23.2A



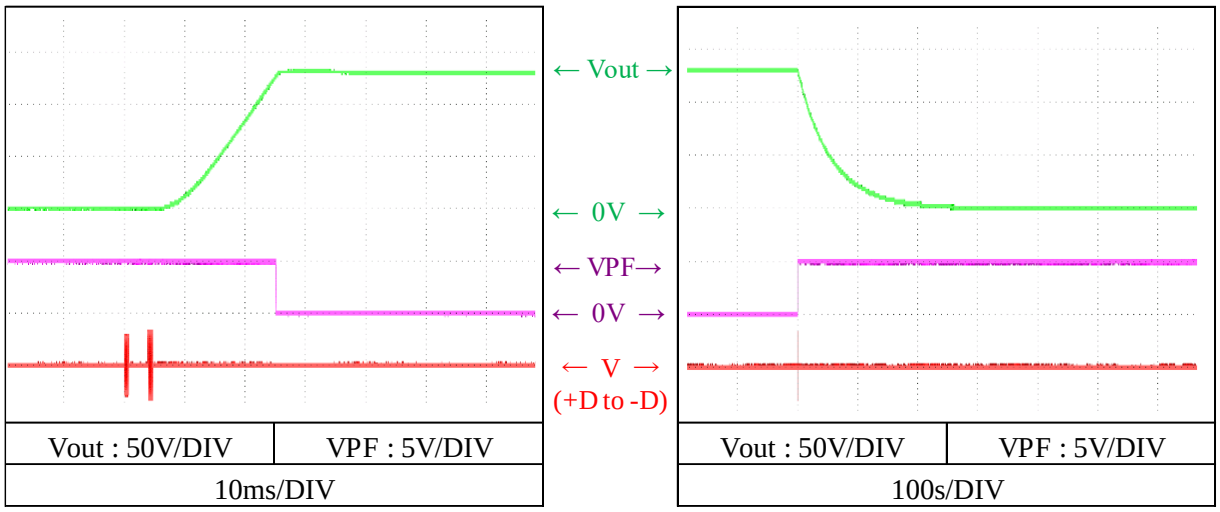
2-1-6. ON/OFFコントロール時出力立ち上がり、立ち下がり特性

Output rise, fall characteristics with ON/OFF Control

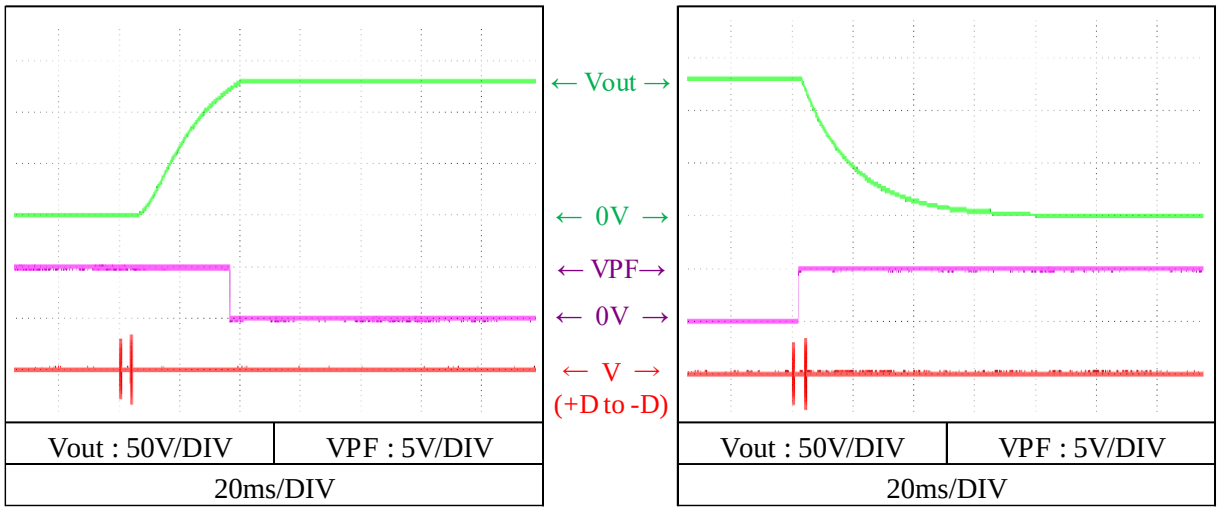
(b) RS-485通信によるON/OFF ON/OFF control by RS-485

Conditions Vin : 100 VAC
Ta : 25 ℃

Iout : 0A



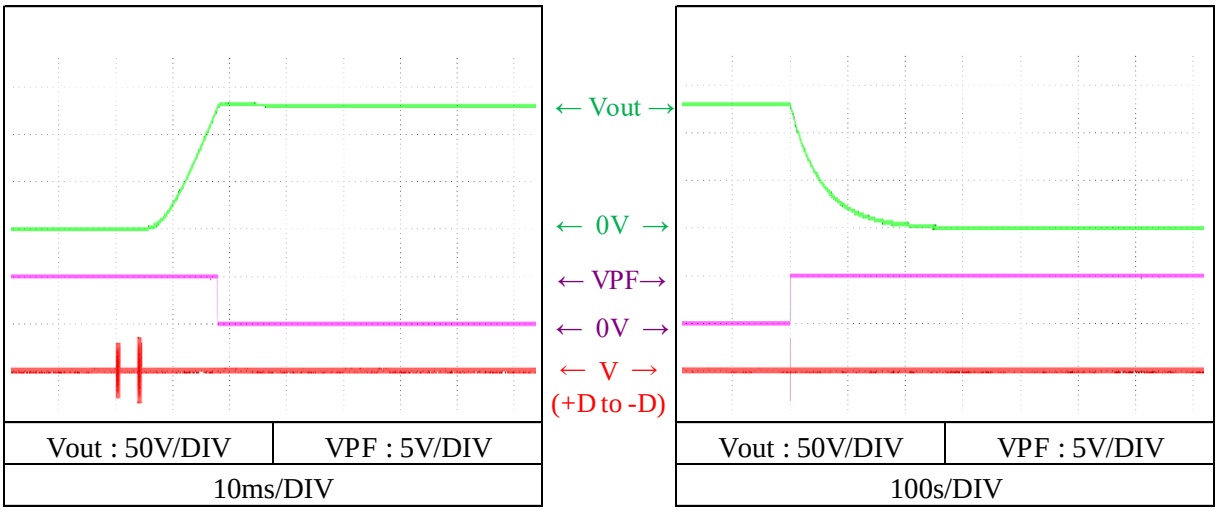
Iout : 11.6A



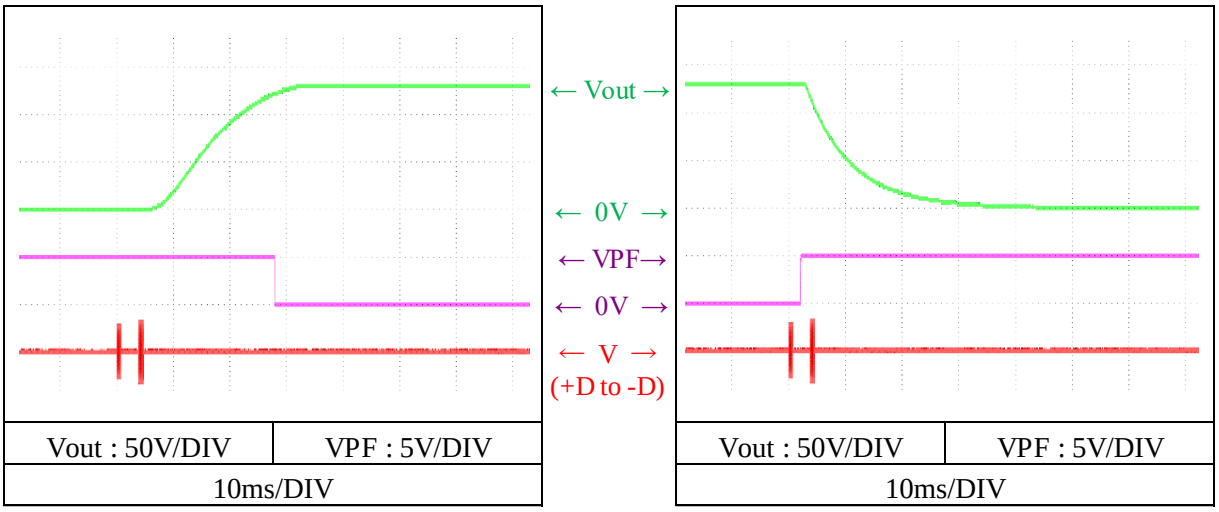
(b) RS-485通信によるON/OFF　ON/OFF control by RS-485

Conditions Vin : 200 VAC
Ta : 25 ℃

Iout : 0A



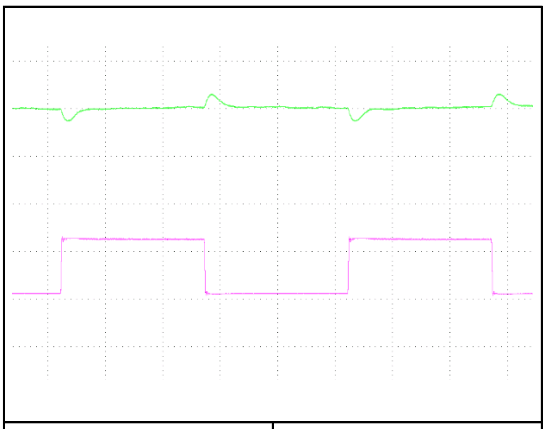
Iout : 23.2A



2-1-7. 過渡応答（負荷急変）特性 Dynamic load response characteristics

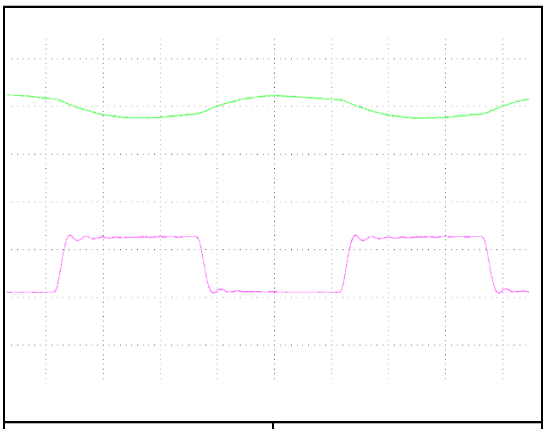
Conditions Vin : 100 VAC
Iout : 5.80A ⟷ 11.6A
(tr = tf = 50us)
Ta : 25 ℃

f = 100Hz



Vout : 2V/DIV	2ms/DIV
+0.48%	-0.41%

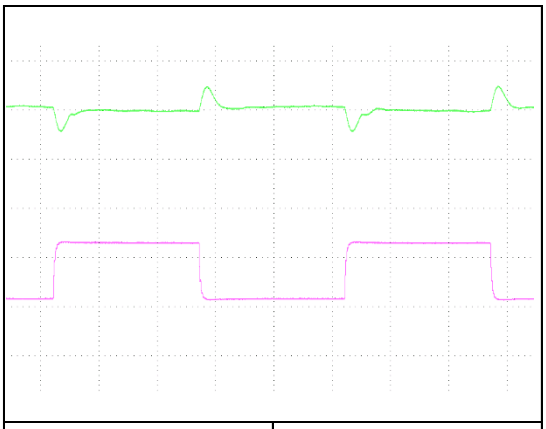
f = 1kHz



Vout : 2V/DIV	200µs/DIV
+0.40%	-0.38%

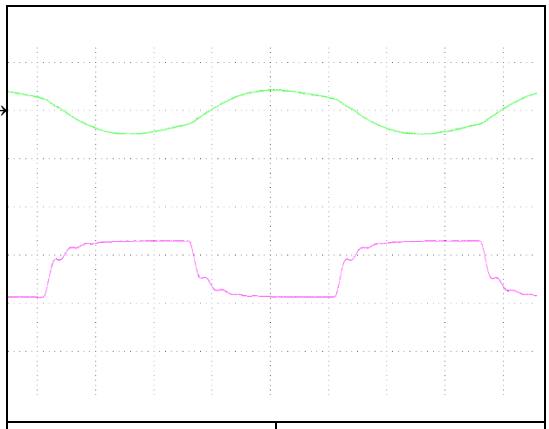
Conditions Vin : 200 VAC
Iout : 11.6A ⟷ 23.2A
(tr = tf = 50us)
Ta : 25 ℃

f = 100Hz



Vout : 2V/DIV	2ms/DIV
+0.74%	-0.67%

f = 1kHz



Vout : 2V/DIV	200µs/DIV
+0.69%	-0.76%

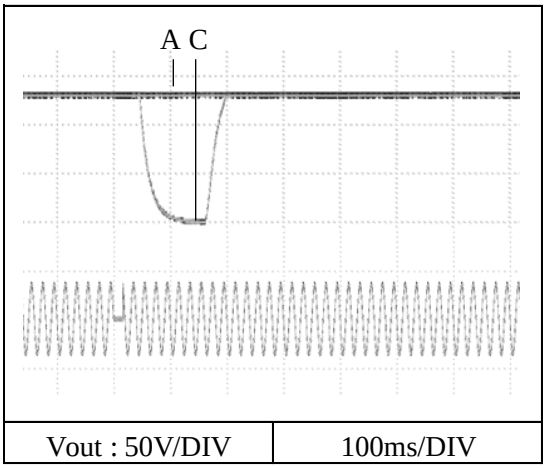
2-1-8.　入力電圧瞬停特性　Response to brown out characteristics

瞬停時間　Interruption time

A : 出力電圧の低下なし　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.

Conditions Vin : 100VAC
Iout : 11.6 A
Ta : 25 ℃

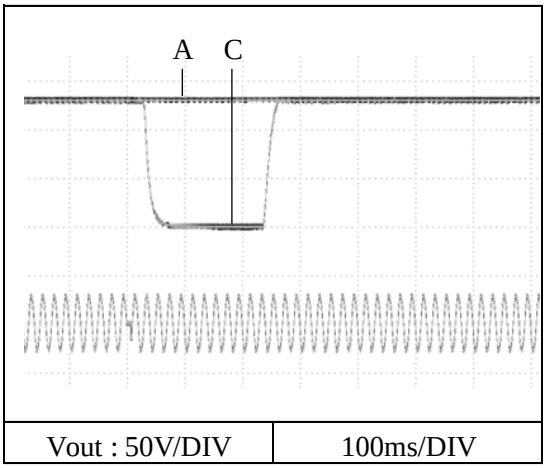
A = 15ms, C = 16ms



Vout : 50V/DIV	100ms/DIV

Conditions Vin : 200VAC
Iout : 23.2 A
Ta : 25 ℃

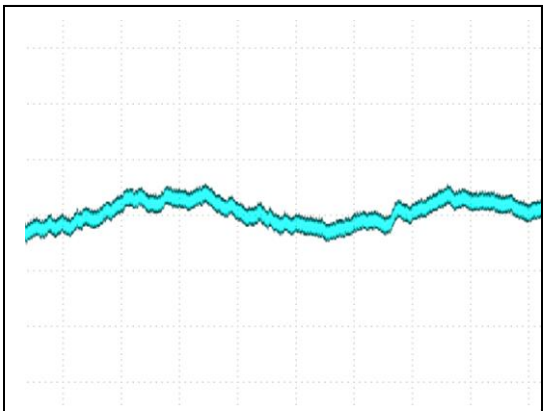
A = 7ms, C = 8ms



Vout : 50V/DIV	100ms/DIV

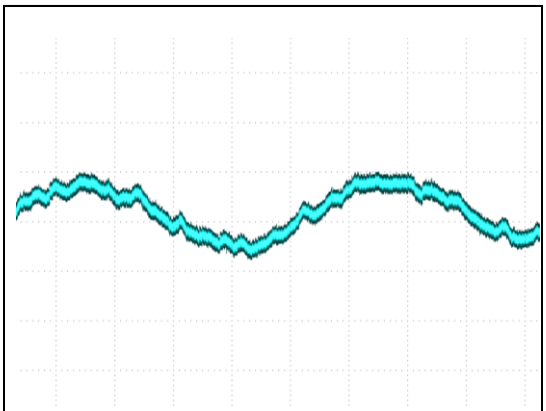
2-1-9.　出力リップル、ノイズ波形　Output ripple and noise waveform

Conditions Vin : 100VAC
Vout : 130 V
Iout : 11.6 A
Ta : 25 ℃



Vout : 200mV/DIV	2ms/DIV

Conditions Vin : 200VAC
Vout : 130 V
Iout : 23.2 A
Ta : 25 ℃



Vout : 200mV/DIV	2ms/DIV

2-2. 定電流出力モード Constant current output mode

2-2-1. 静特性 Steady state data

(1) 入力・負荷・温度変動 Regulation - line and load, Temperature drift

1. Regulation - line and load

Condition Ta： 25 ℃

Vout \ Vin	85VAC	100VAC	115VAC	132VAC	Line regulation	
13V	11.70A	11.70A	11.70A	11.70A	4mA	0.034%
65V	11.66A	11.66A	11.66A	11.65A	5mA	0.043%
130V	11.66A	11.67A	11.67A	11.67A	3mA	0.026%
Load regulation	40mA	44mA	39mA	48mA		
	0.345%	0.379%	0.336%	0.414%		

Vout \ Vin	170VAC	200VAC	230VAC	265VAC	Line regulation	
13V	23.28A	23.28A	23.28A	23.27A	6mA	0.026%
65V	23.23A	23.23A	23.23A	23.22A	10mA	0.043%
130V	23.23A	23.23A	23.24A	23.24A	11mA	0.047%
Load regulation	52mA	47mA	47mA	53mA		
	0.224%	0.203%	0.203%	0.228%		

2. Temperature drift

Conditions Vin： 100 VAC
Vout： 130 V

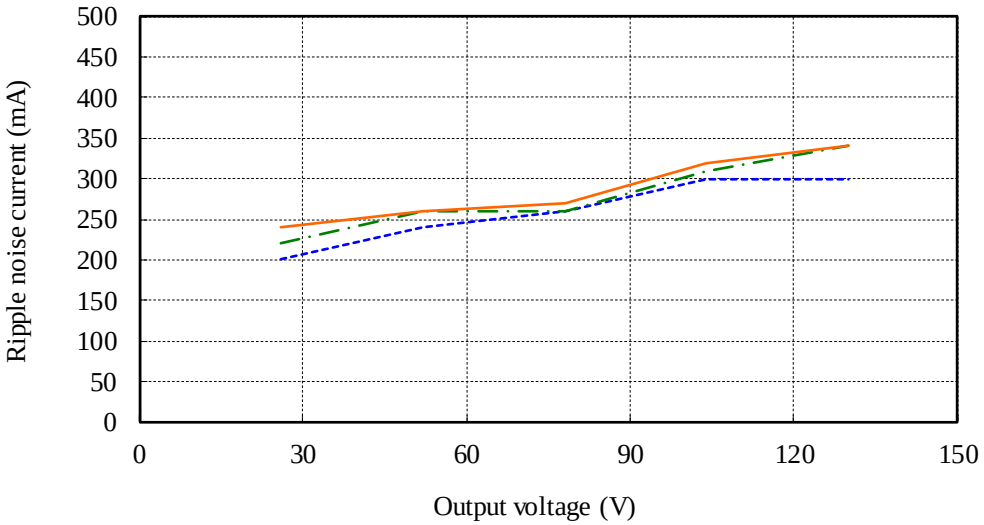
Ta	-20°C	+25°C	+50°C	Temperature stability	
Iout	11.68A	11.67A	11.68A	10mA	0.086%

Conditions Vin： 200 VAC
Vout： 130 V

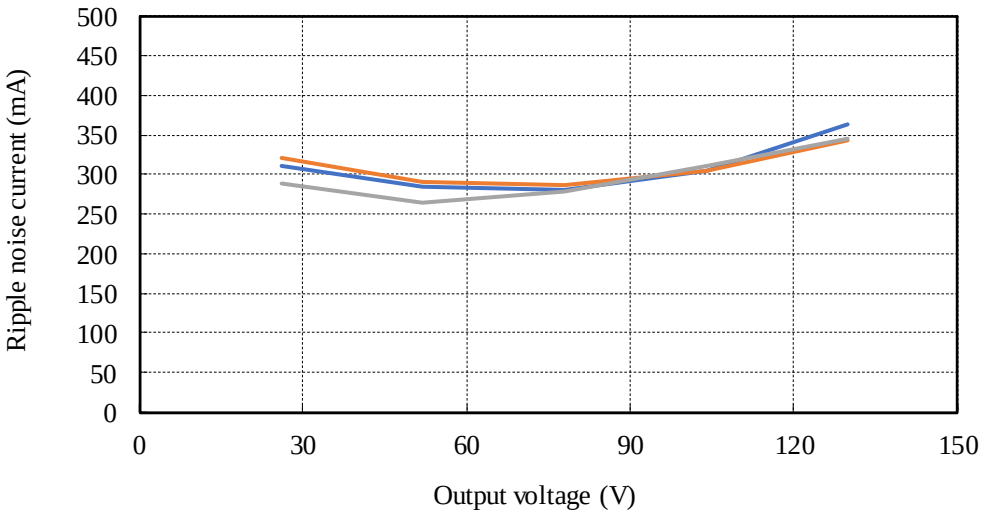
Ta	-20°C	+25°C	+50°C	Temperature stability	
Iout	23.24A	23.23A	23.25A	21mA	0.091%

(2) リップルノイズ電流対出力電圧　Ripple noise current vs. Output voltage

Conditions　Vin : 100 VAC
Iout : 11.6 A
Ta : -20 °C
25 °C
50 °C

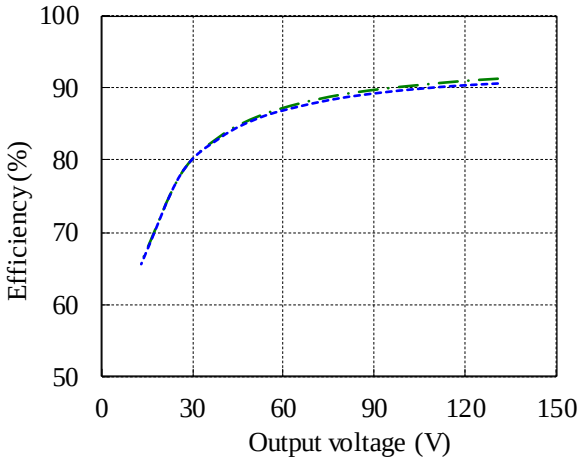


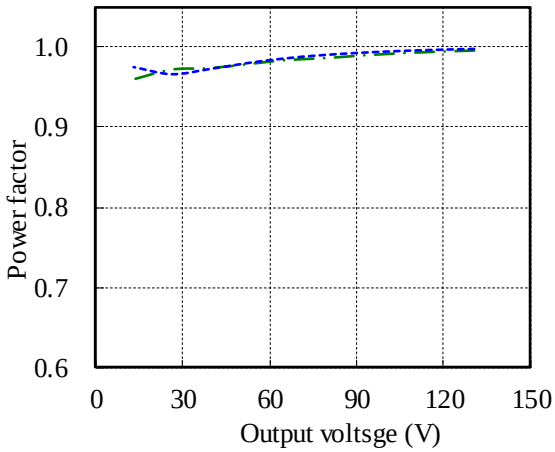
Conditions　Vin : 200 VAC
Iout : 23.2 A
Ta : -20 °C
25 °C
50 °C



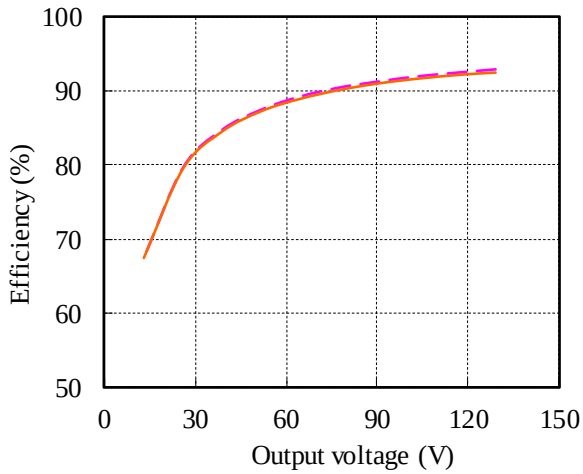
(3) 効率・力率対出力電圧　Efficiency and Power factor vs. Output voltage

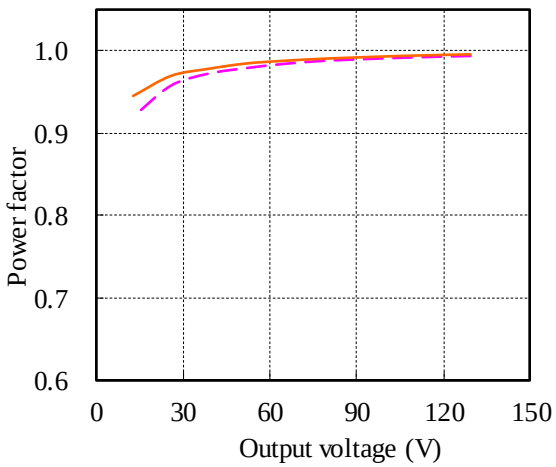
Conditions　Vin : 100 VAC - - - -
115 VAC - · - ·
Iout : 11.6 A
Iaux : 0 %
Ta : 25 ℃





Conditions　Vin : 200 VAC ——
230 VAC – – –
Iout : 23.2 A
Iaux : 0 %
Ta : 25 ℃

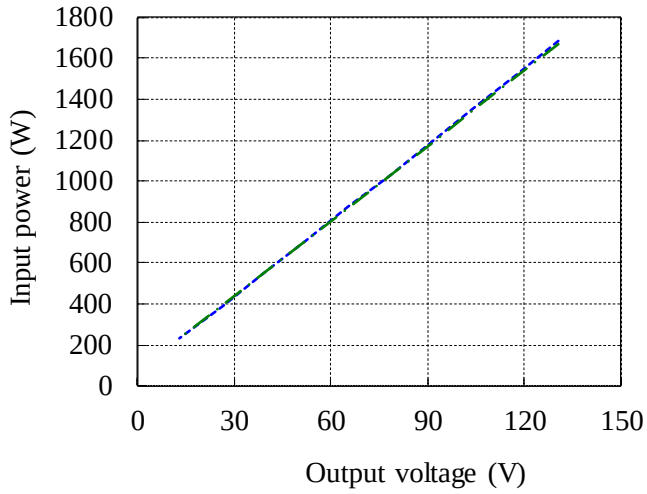




(4) 入力電力対出力電圧　Input power vs. Output voltage

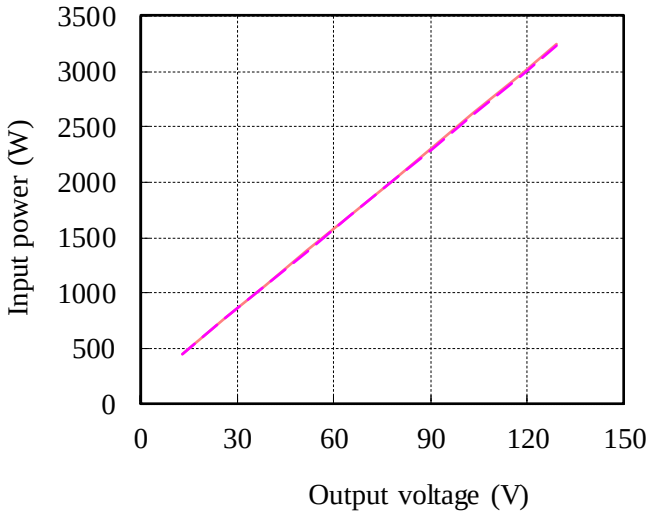
Conditions　Vin : 100 VAC
115 VAC
Iout : 11.6 A
Iaux : 0 %
Ta : 25 ℃

Vin	Input power
	Control OFF
100VAC	8.5W
115VAC	8.0W



Conditions　Vin : 200 VAC
230 VAC
Iout : 23.2 A
Iaux : 0 %
Ta : 25 ℃

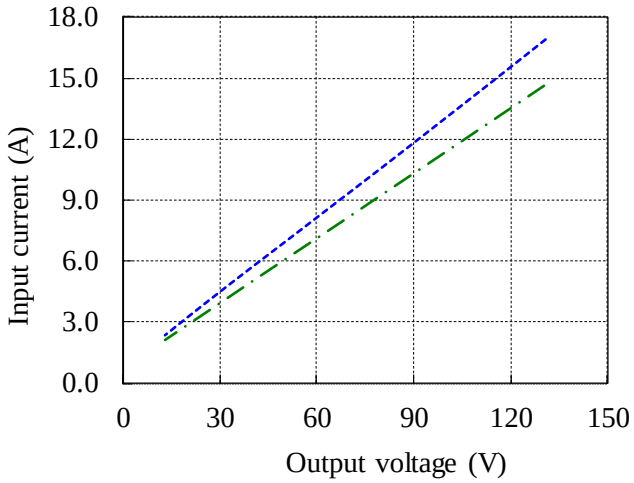
Vin	Input power
	Control OFF
200VAC	7.0W
230VAC	7.0W



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

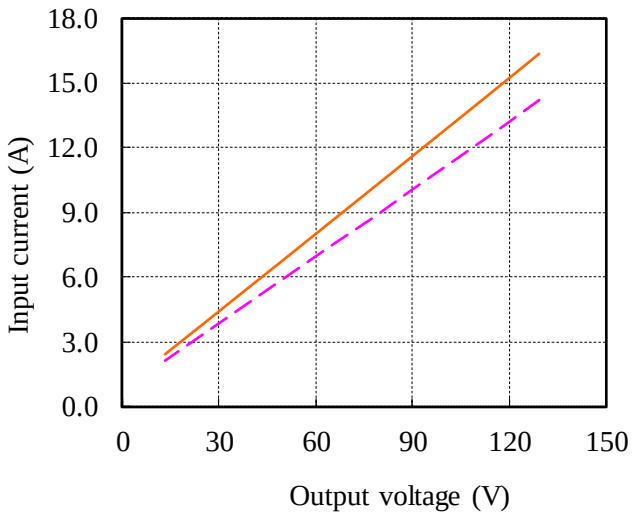
Conditions　Vin : 100 VAC
115 VAC
Iout : 11.6 A
Iaux : 0 %
Ta : 25 ℃

Vin	Input current
	Control OFF
100VAC	0.19A
115VAC	0.18A



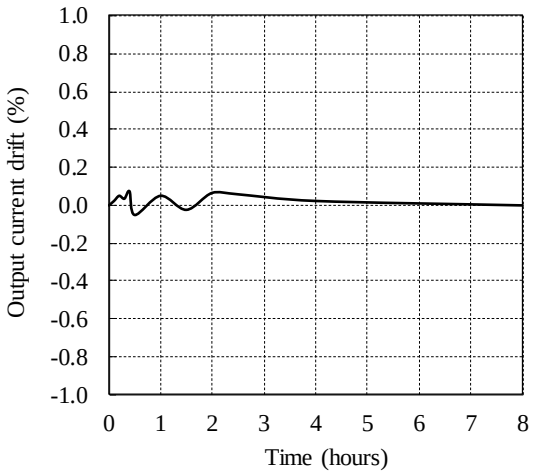
Conditions　Vin : 200 VAC
230 VAC
Iout : 23.2 A
Iaux : 0 %
Ta : 25 ℃

Vin	Input current
	Control OFF
200VAC	0.22A
230VAC	0.25A

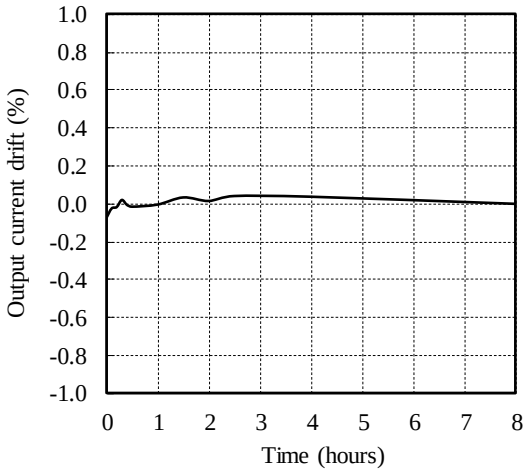


2-2-2. 通電ドリフト特性　Warm up current drift characteristics

Conditions　Vin : 100 VAC
Vout : 130 V
Iout : 11.6 A
Ta : 25 ℃



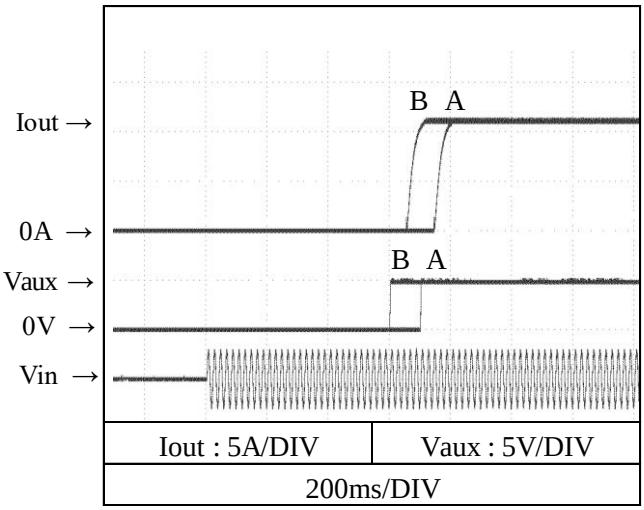
Conditions　Vin : 200 VAC
Vout : 130 V
Iout : 23.2 A
Ta : 25 ℃



2-2-3. 出力電流立ち上がり特性 Output current rise characteristics

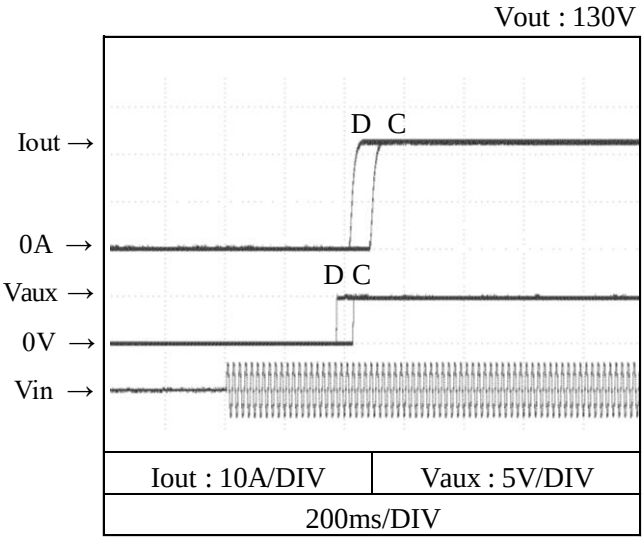
Conditions Vin : 100 VAC (A)
115 VAC (B)
Iaux : 100 %
Ta : 25 ℃

Vout : 130V



Conditions Vin : 200 VAC (C)
230 VAC (D)
Iaux : 100 %
Ta : 25 ℃

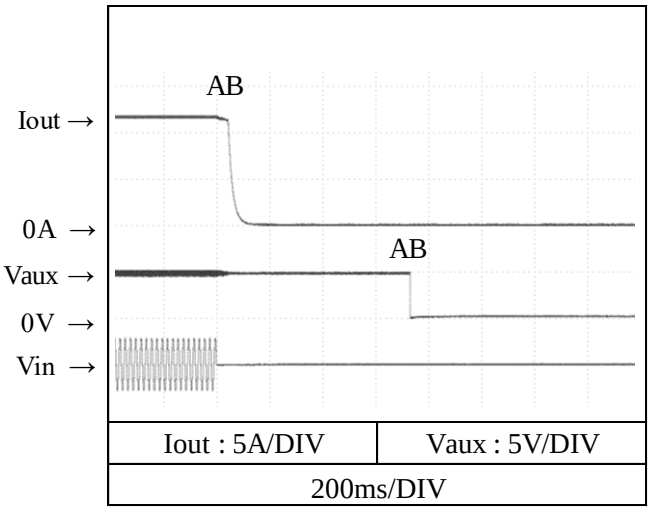
Vout : 130V



2-2-4. 出力電流立ち下がり特性 Output current fall characteristics

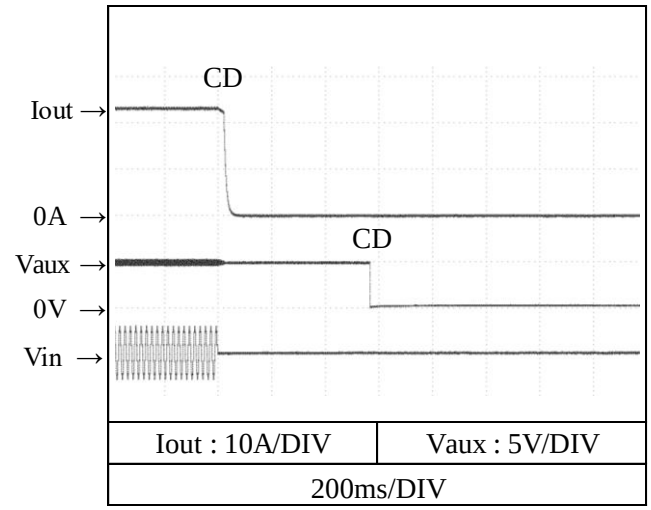
Conditions Vin : 100 VAC (A)
115 VAC (B)
Iaux : 100 %
Ta : 25 ℃

Vout : 130V



Conditions Vin : 200 VAC (C)
230 VAC (D)
Iaux : 100 %
Ta : 25 ℃

Vout : 130V



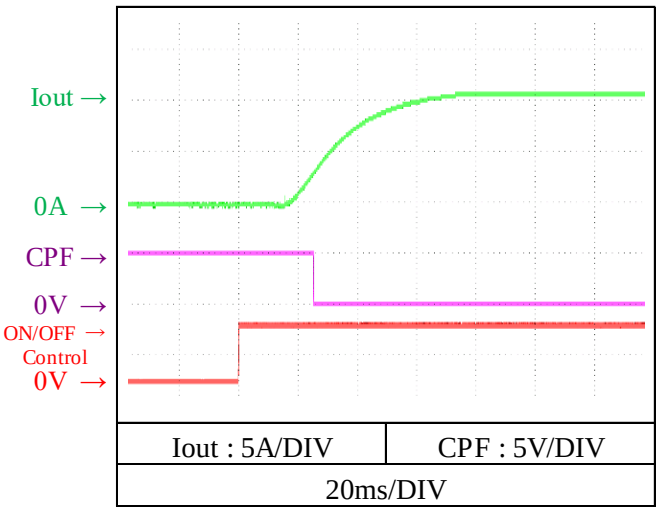
2-2-5. ON/OFFコントロール時出力立ち上がり、立ち下がり特性

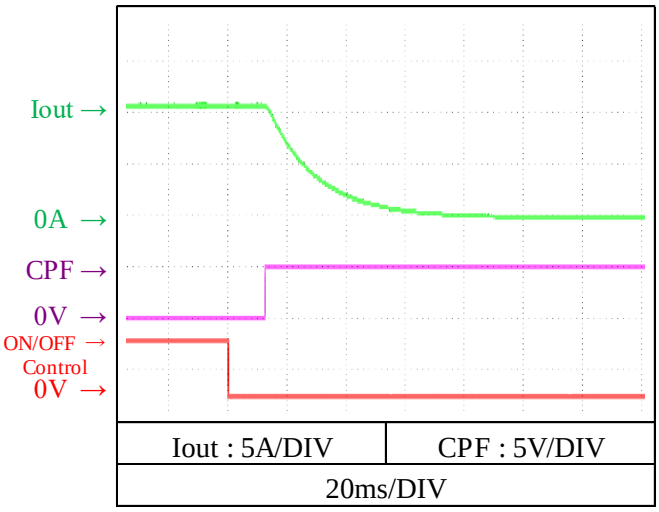
Output rise, fall characteristics with ON/OFF Control

(a) リモートON/OFFコントロール端子によるON/OFF

ON/OFF control by remote ON/OFF control terminal

Conditions Vin : 100 VAC
Vout : 130 V
Ta : 25 ℃

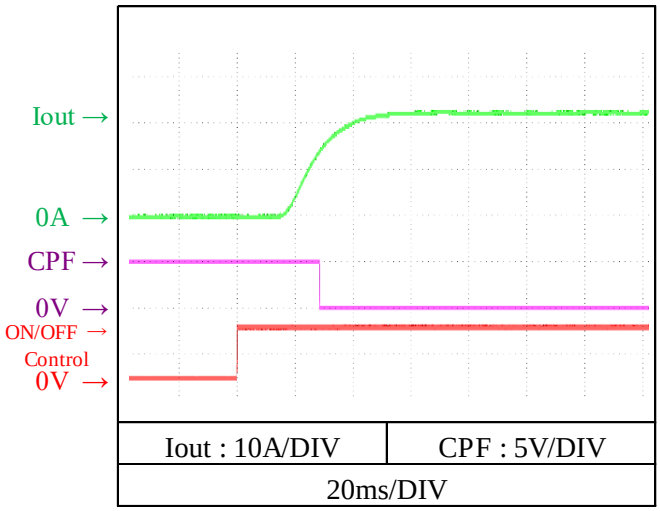


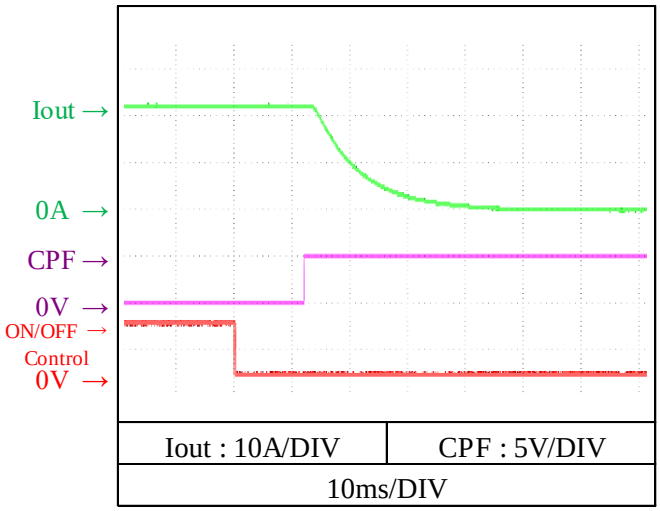


(a) リモートON/OFFコントロール端子によるON/OFF

ON/OFF control by remote ON/OFF control terminal

Conditions Vin : 200 VAC
Vout : 130 V
Ta : 25 ℃



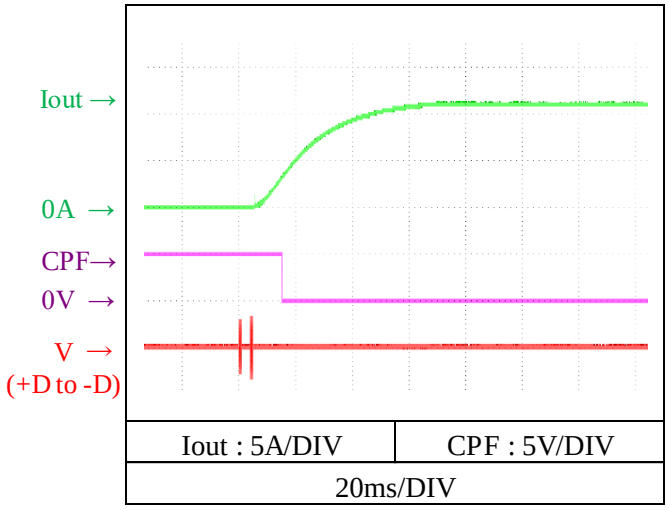


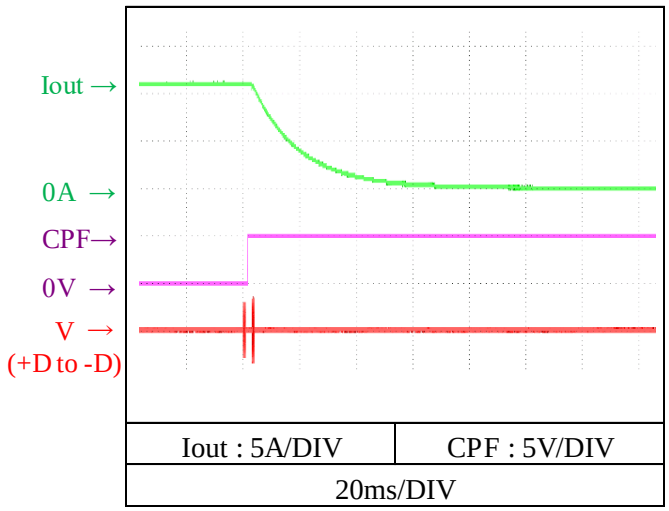
2-2-5. ON/OFFコントロール時出力立ち上がり、立ち下がり特性

Output rise, fall characteristics with ON/OFF Control

(b) RS-485通信によるON/OFF ON/OFF control by RS-485

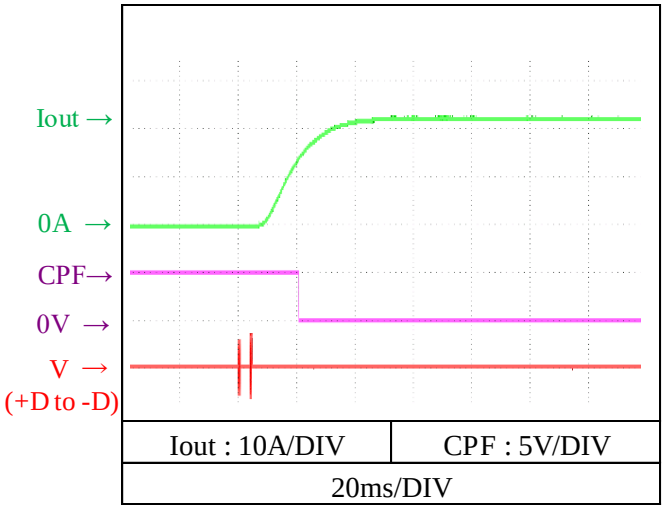
Conditions Vin : 100 VAC
Vout : 130 V
Ta : 25 ℃

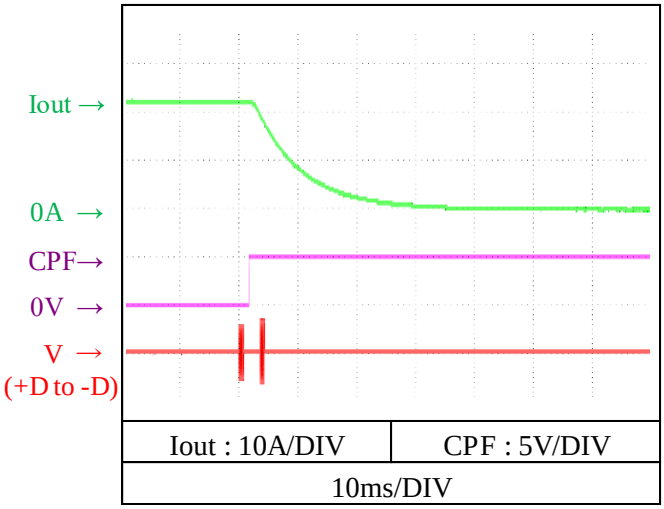




(b) RS-485通信によるON/OFF　ON/OFF control by RS-485

Conditions Vin : 200 VAC
Vout : 130 V
Ta : 25 ℃





2-2-6.　入力電圧瞬停特性　Response to brown out characteristics

瞬停時間　Interruption time

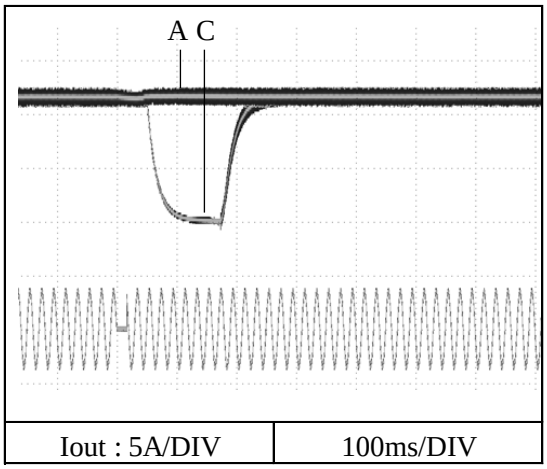
A : 出力電圧の低下なし　Output voltage does not drop.

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.

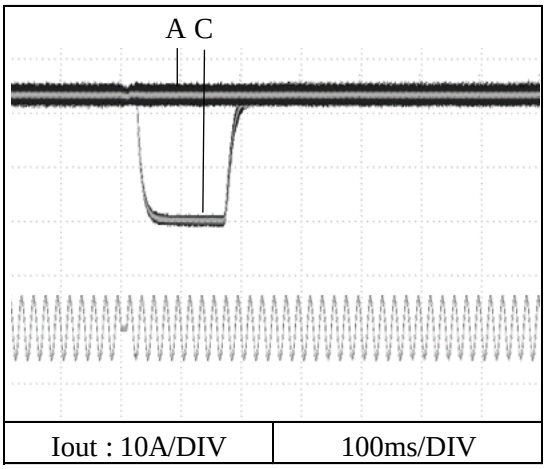
Conditions Vin : 100VAC
Vout : 130 V
Ta : 25 ℃

A = 16ms, C = 17ms



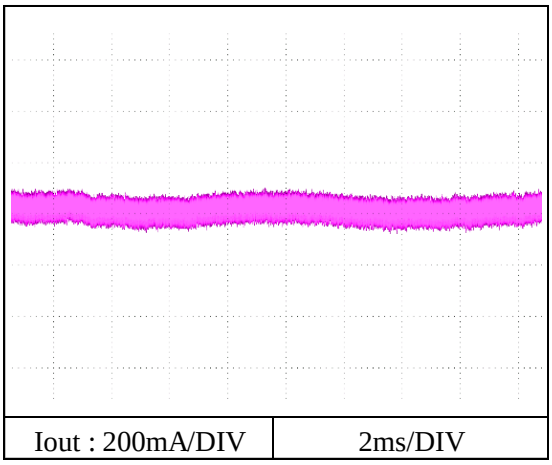
Conditions Vin : 200VAC
Vout : 130 V
Ta : 25 ℃

A = 9ms, C = 10ms

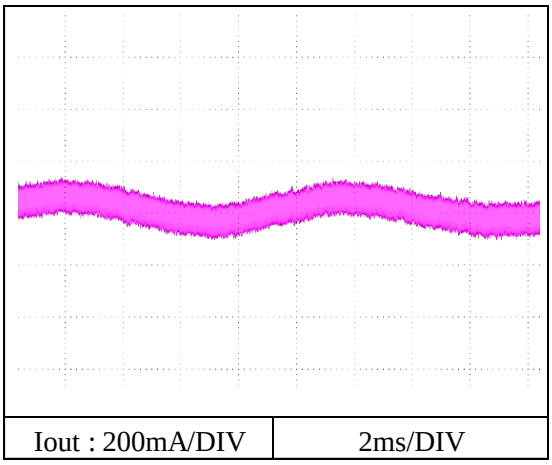


2-2-7.　出力リップル、ノイズ波形　Output ripple and noise waveform

Conditions Vin : 100VAC
Vout : 130 V
Iout : 11.6 A
Ta : 25 ℃

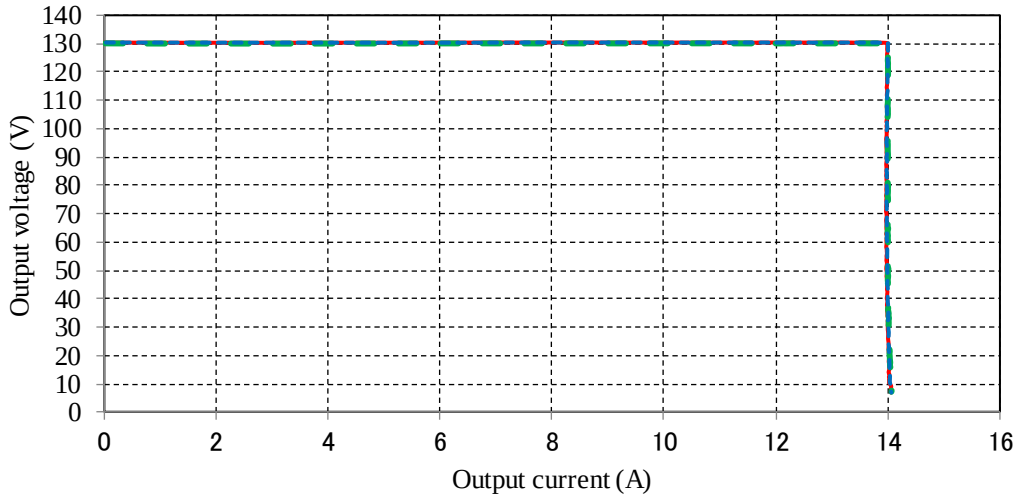


Conditions Vin : 200VAC
Vout : 130 V
Iout : 23.2 A
Ta : 25 ℃

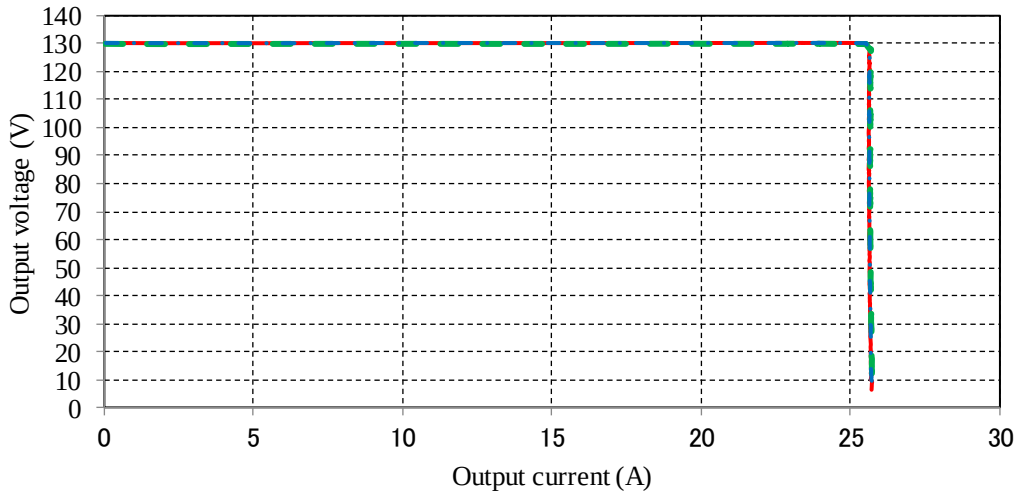


2-3. 過電流保護特性 Over current protection (OCP) characteristics

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

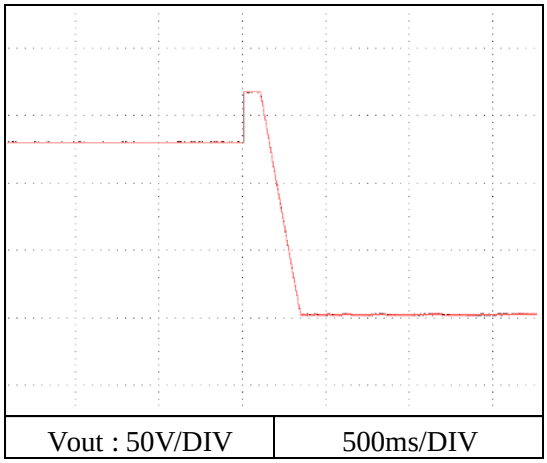


Conditions Vin : 200 VAC
Ta : -20 ℃
25 ℃
50 ℃



2-4. 過電圧保護特性　Over voltage protection (OVP) characteristics

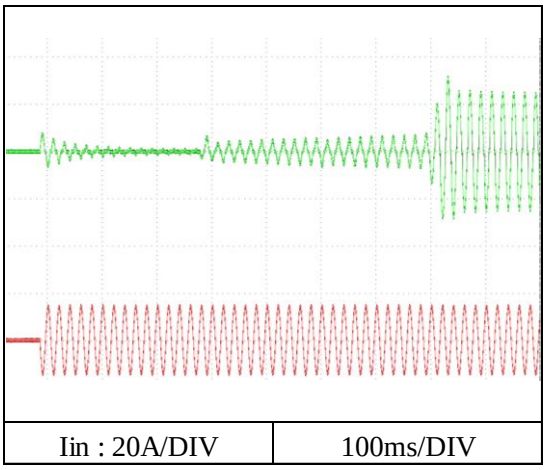
Conditions Vin : 200VAC
Iout : 1 A
Ta : 25 ℃



2-5. 入力サージ電流（突入電流）波形 Inrush current waveform

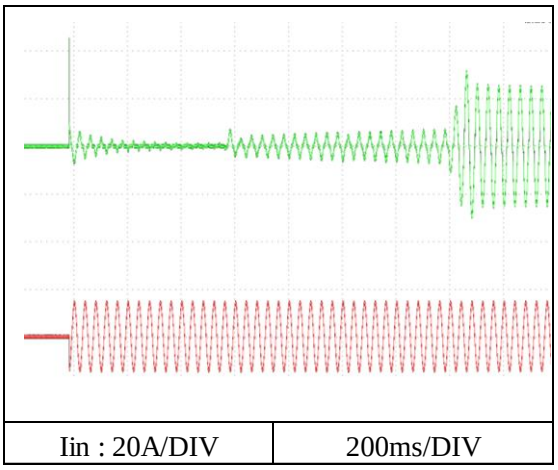
Conditions Vin : 100 VAC
Vout : Nominal output voltage
Iout : Maximum output current
Ta : 25 °C

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



Iin : 20A/DIV	100ms/DIV

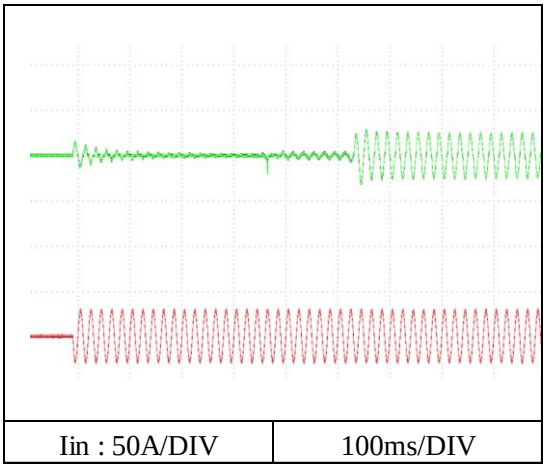
Switch on phase angle of input AC voltage
ϕ = 90°



Iin : 20A/DIV	200ms/DIV

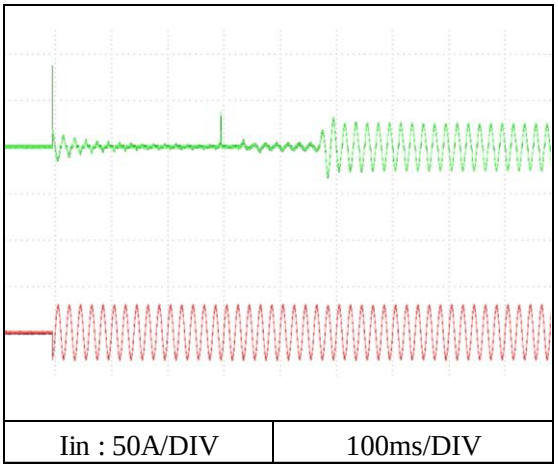
Conditions Vin : 200 VAC
Vout : Nominal output voltage
Iout : Maximum output current
Ta : 25 °C

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



Iin : 50A/DIV	100ms/DIV

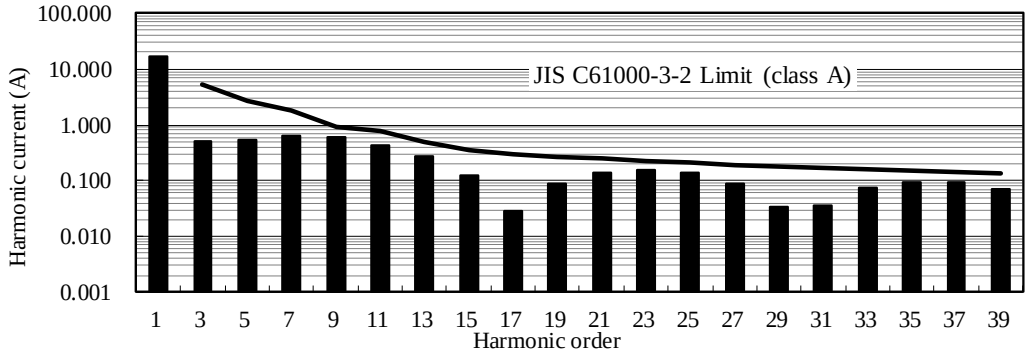
Switch on phase angle of input AC voltage
ϕ = 90°



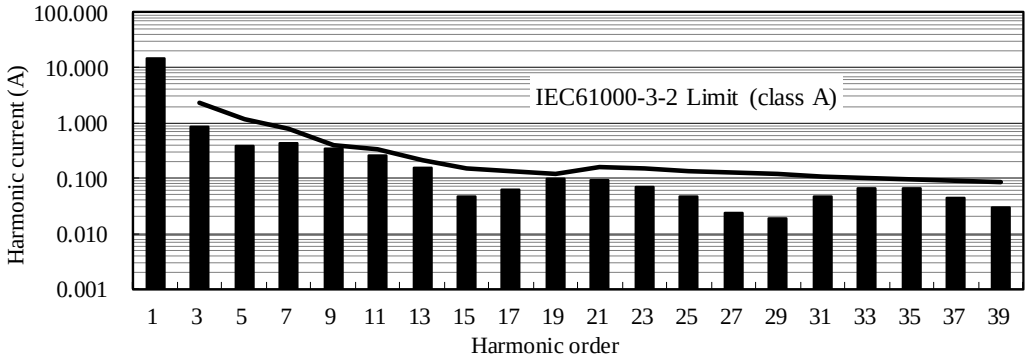
Iin : 50A/DIV	100ms/DIV

2-6. 高調波成分 Input current harmonics

Conditions Vin : 100 VAC
Vout : Nominal output voltage
Iout : Maximum output current
Ta : 25 °C



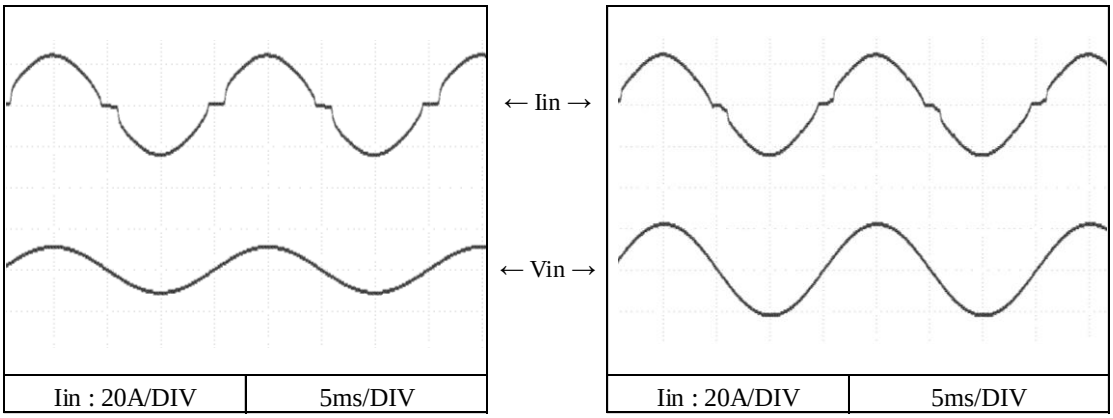
Conditions Vin : 230 VAC
Vout : Nominal output voltage
Iout : Maximum output current
Ta : 25 °C



2-7. 入力電流波形 Input current waveform

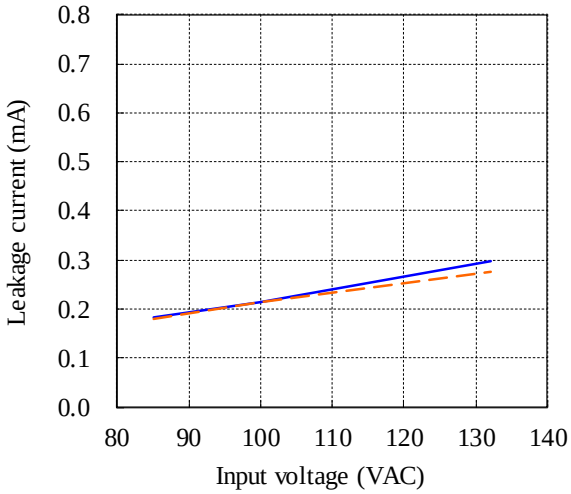
Conditions Vin : 100 VAC
Vout : Nominal output voltage
Iout : Maximum output current
Ta : 25 °C

Conditions Vin : 200 VAC
Vout : Nominal output voltage
Iout : Maximum output current
Ta : 25 °C

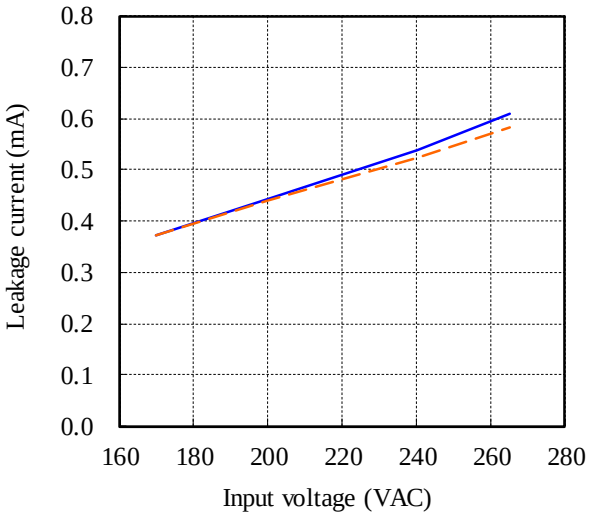


2-8. リーク電流特性 Leakage current characteristics

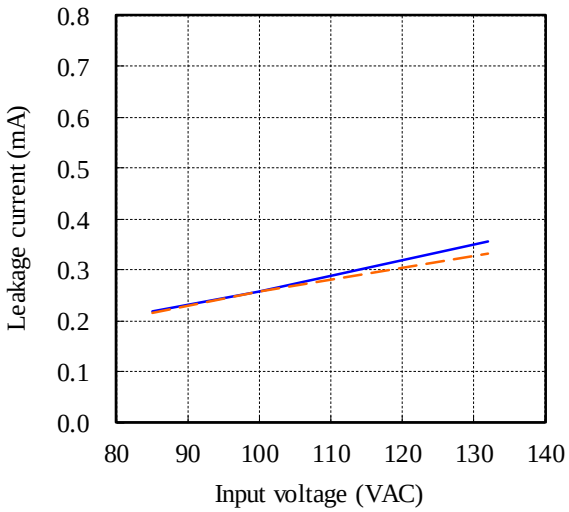
Conditions Vout : Nominal output voltage
Iout : 0 A
Maximum
Ta : 25 °C
f : 50 Hz



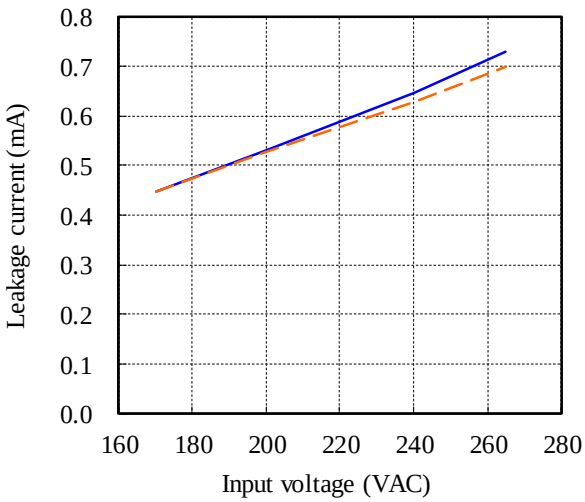
Conditions Vout : Nominal output voltage
Iout : 0 A
Maximum
Ta : 25 °C
f : 50 Hz



Conditions Vout : Nominal output voltage
Iout : 0 A
Maximum
Ta : 25 °C
f : 60 Hz



Conditions Vout : Nominal output voltage
Iout : 0 A
Maximum
Ta : 25 °C
f : 60 Hz



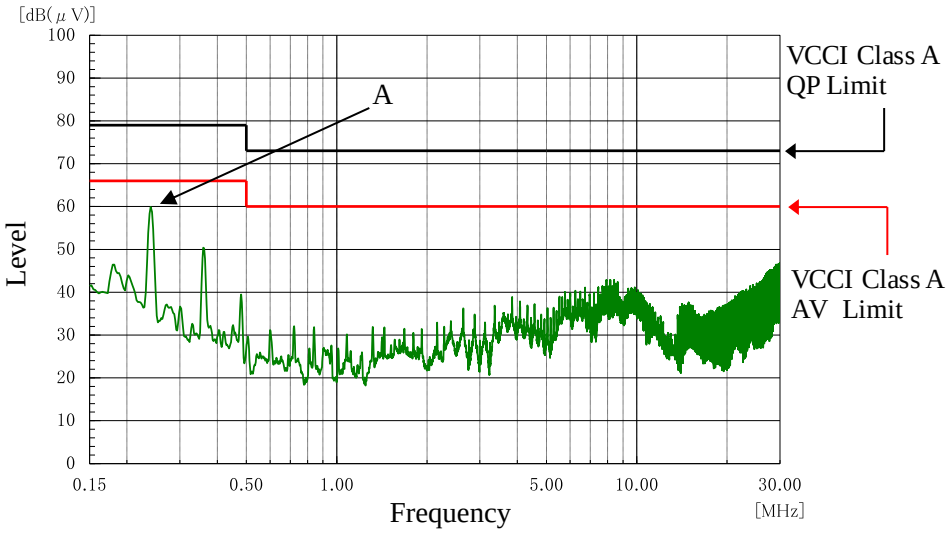
2-9. EMI特性　Electro Magnetic Interference characteristics

雑音端子電圧
Conducted Emission

Conditions　Vin :　100 VAC
Iout :　11.6 A
Iaux :　100 %
Ta :　25 ℃

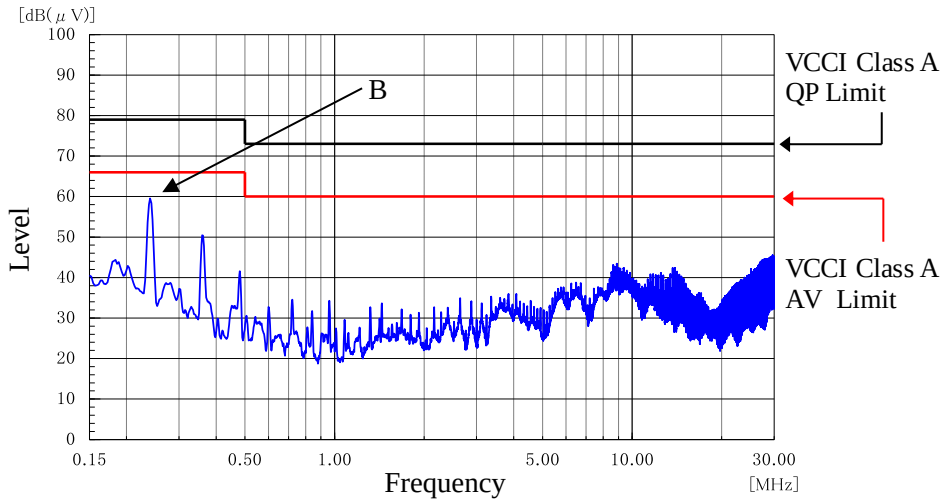
Phase : N

Ref. Data	Point A (0.24MHz) Limit (dB)	Measure (dB)
QP	79.0	59.2
AV	66.0	58.4



Phase : L

Ref. Data	Point B (0.24MHz) Limit (dB)	Measure (dB)
QP	79.0	59.5
AV	66.0	58.8



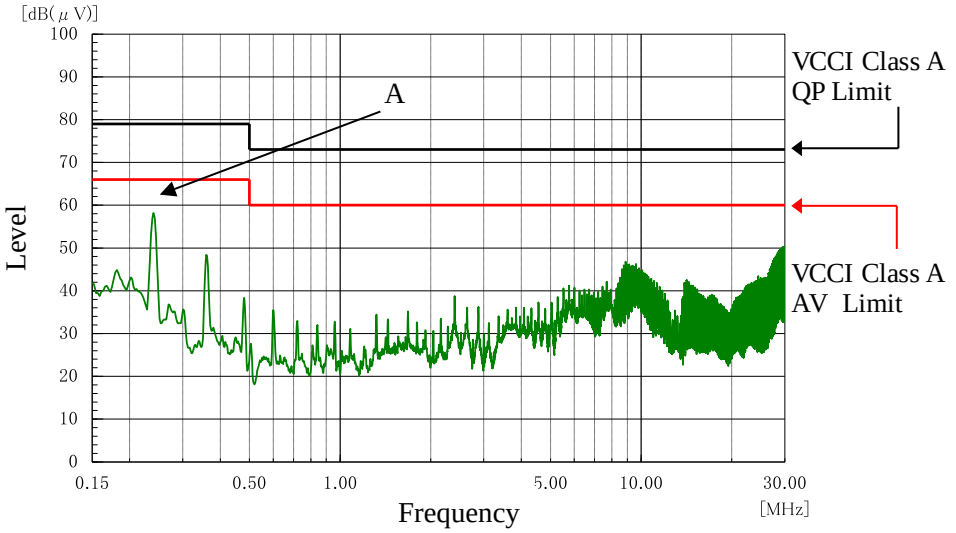
EN55011-A,EN55032-A,FCC-Aの限界値はVCCI class Aの限界値と同じ
Limit of EN55011-A,EN55032-A,FCC-A are same as its VCCI class A.
波形はピーク値
Waveform is peak values.

雑音端子電圧
Conducted Emission

Conditions Vin : 230 VAC
Iout : 23.2 A
Iaux : 100 %
Ta : 25 ℃

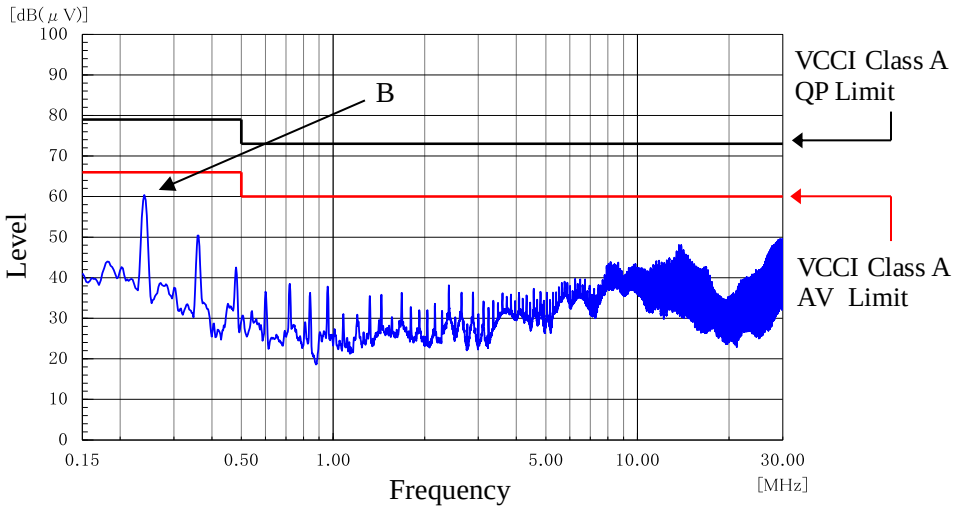
Phase : N

Ref. Data	Point A (0.24MHz) Limit (dB)	Measure (dB)
QP	79.0	59.3
AV	66.0	58.8



Phase : L

Ref. Data	Point B (0.24MHz) Limit (dB)	Measure (dB)
QP	79.0	58.2
AV	66.0	57.8



EN55011-A,EN55032-A,FCC-Aの限界値はVCCI class Aの限界値と同じ
Limit of EN55011-A,EN55032-A,FCC-A are same as its VCCI class A.
波形はピーク値
Waveform is peak values.

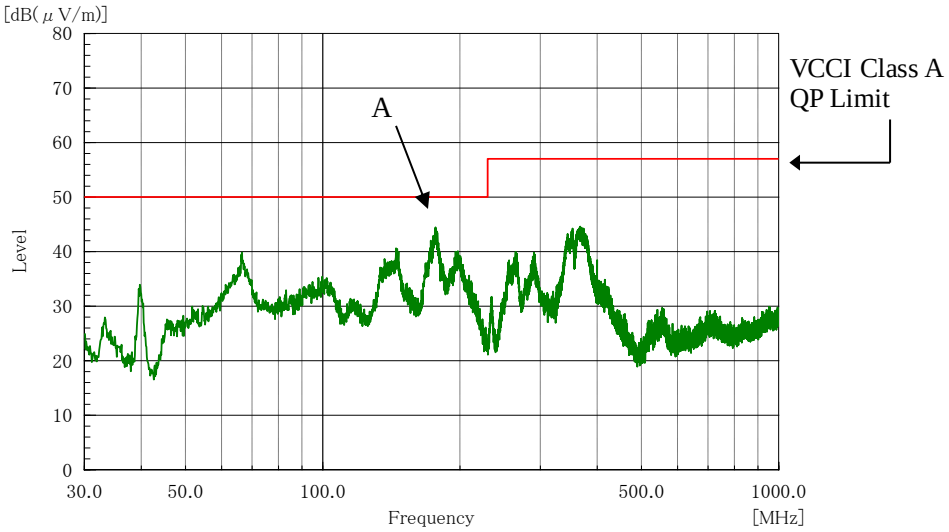
2-9. EMI特性　Electro Magnetic Interference characteristics

雑音電界強度
Radiated Emission

Conditions　Vin :　100 VAC
Iout :　11.6 A
Iaux :　100 %
Ta :　25 ℃

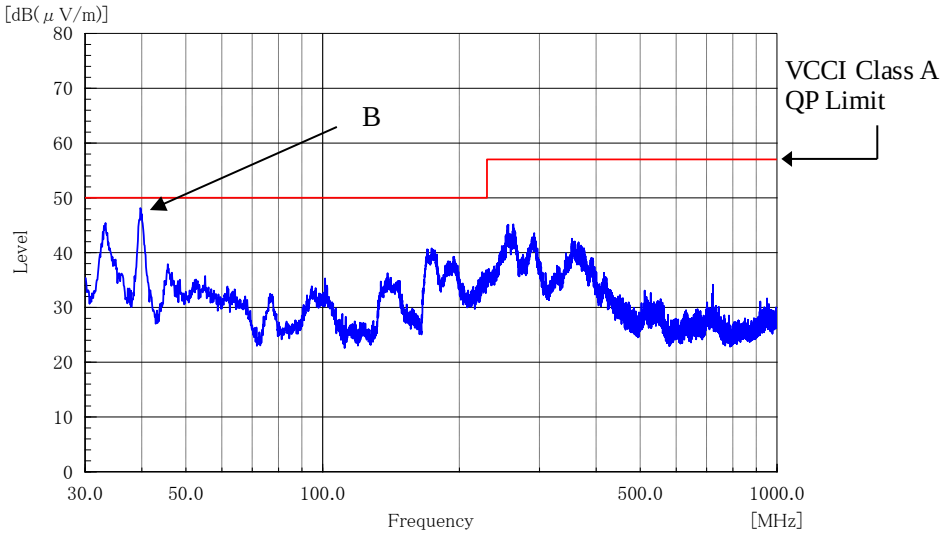
HORIZONTAL

Ref. Data	Point A (177MHz) Limit (dB)	Measure (dB)
QP	50.0	43.4



VERTICAL

Ref. Data	Point B (40MHz) Limit (dB)	Measure (dB)
QP	50.0	45.9



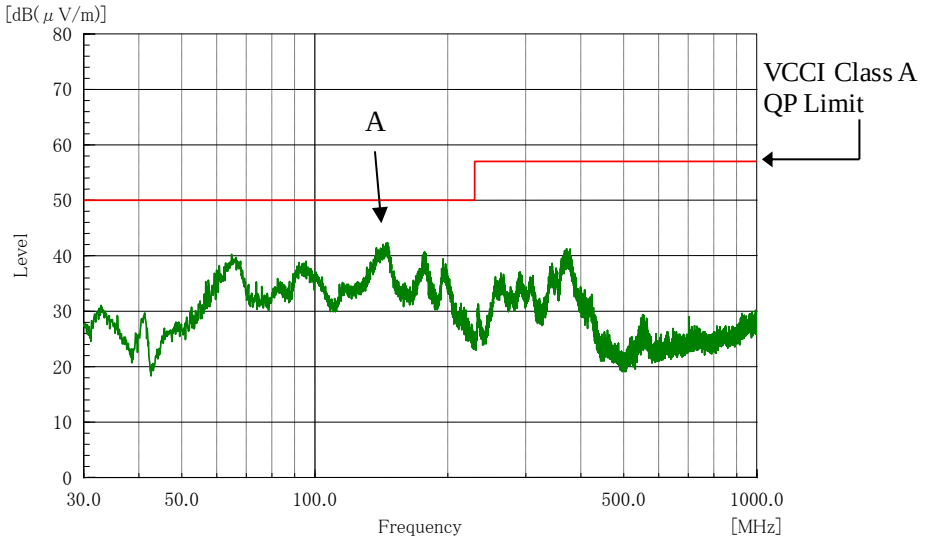
EN55011-A,EN55032-A,FCC-Aの限界値はVCCI class Aの限界値と同じ
Limit of EN55011-A,EN55032-A,FCC-A are same as its VCCI class A.
波形はピーク値
Waveform is peak values.

雑音電界強度
Radiated Emission

Conditions Vin : 230 VAC
Iout : 23.2 A
Iaux : 100 %
Ta : 25 ℃

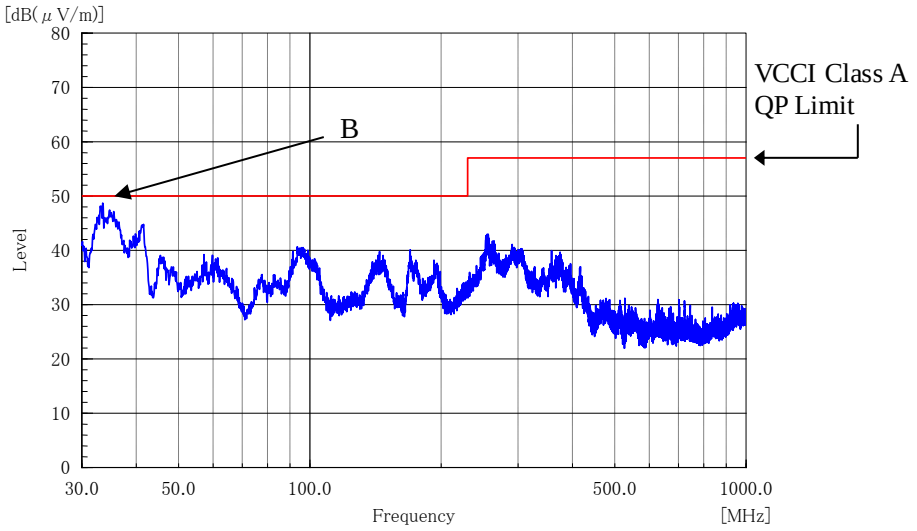
HORIZONTAL

	Point A (146MHz)	
Ref. Data	Limit (dB)	Measure (dB)
QP	50.0	39.7



VERTICAL

	Point B (34MHz)	
Ref. Data	Limit (dB)	Measure (dB)
QP	50.0	45.0



EN55011-A,EN55032-A,FCC-Aの限界値はVCCI class Aの限界値と同じ
Limit of EN55011-A,EN55032-A,FCC-A are same as its VCCI class A.
波形はピーク値
Waveform is peak values.