HWS650G-5

EVALUATION DATA

型式データ

INDEX

1 測定方法 Evaluation Method.....5

1.1 測定回路 Circuit used for determination 5
測定回路 1 Circuit 1 used for determination.....5
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.....5
リーク電流特性 Leakage current characteristics
測定回路 3 Circuit 3 used for determination.....6
過電圧保護特性 Over voltage protection (OVP) characteristics
測定回路 4 Circuit 4 used for determination.....6
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.....7
高調波成分 Input current harmonics
測定回路 6 Circuit 6 used for determination.....7
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
測定回路 7 Circuit 7 used for determination.....8
出力リップル、ノイズ電圧波形 Output ripple and noise voltage waveform
測定回路 8 Circuit 8 used for determination.....8
雑音端子電圧(帰還ノイズ) Conducted Emission
(a) EMC フィルタ未使用 Non-Use of an EMC filter
(b) EMC フィルタ使用 Use of an EMC filter

INDEX

測定構成　Configuration used for determination 9
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.....10

2 特性データ Characteristics.....11

2.1 定電圧出力モード Constant voltage output mode 11
2.1.1 静特性 Steady state data.....11
(1) 入力・負荷・温度変動 Regulation - line and load, Temperature drift 11
(2) リップルノイズ電圧対出力電流 Ripple noise voltage vs. Output current ..11
(3) 効率・力率対出力電流 Efficiency and Power factor vs. Output current....12
(4) 入力電力対出力電流 Input power vs. Output current 12
(5) 入力電流対出力電圧 Input current vs. Output voltage 13
2.1.2 通電ドリフト特性 Warm up voltage drift characteristics 14
2.1.3 出力保持時間特性 Hold up time characteristics.....14
2.1.4 出力電圧立ち上がり特性 Output voltage rise characteristics 15
2.1.5 出力電圧立ち下がり特性 Output voltage fall characteristics.....15
2.1.6 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 16
2.1.7 過渡応答（負荷急変）特性 Dynamic load response characteristics 17
2.1.8 入力電圧瞬停特性 Response to brown out characteristics 17
2.1.9 出力リップル、ノイズ波形 Output ripple and noise waveform.....18

2.2 定電流出力モード Constant current output mode 19
2.2.1 静特性 Steady state data 19
(1) 入力・負荷・温度変動 Regulation - line and load, Temperature drift 19
(2) リップルノイズ電流対出力電圧 Ripple noise current vs. Output voltage ...19
(3) 効率・力率対出力電圧 Efficiency and Power factor vs. Output voltage ...20
(4) 入力電力対出力電圧 Input power vs. Output voltage 20
(5) 入力電流対出力電圧 Input current vs. Output voltage 21
2.2.2 通電ドリフト特性 Warm up current drift characteristics.....22
2.2.3 出力電流立ち上がり特性 Output current rise characteristics.....23
2.2.4 出力電流立ち下がり特性 Output current fall characteristics 23

INDEX

2.2.5 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 24
2.2.6 入力電圧瞬停特性 Response to brown out characteristics 25
2.2.7 出力リップル、ノイズ波形 Output ripple and noise waveform.....25
2.3 過電流保護特性 Over current protection (OCP) characteristics.....26
2.4 過電圧保護特性 Over voltage protection (OVP) characteristics 26
2.5 入力サージ電流（突入電流）波形 Inrush current waveform 27
2.6 高調波成分 Input current harmonics 28
2.7 入力電流波形 Input current waveform 29
2.8 リーク電流特性 Leakage current characteristics 29
2.9 EMI 特性 Electro-Magnetic Interference characteristics 30

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。

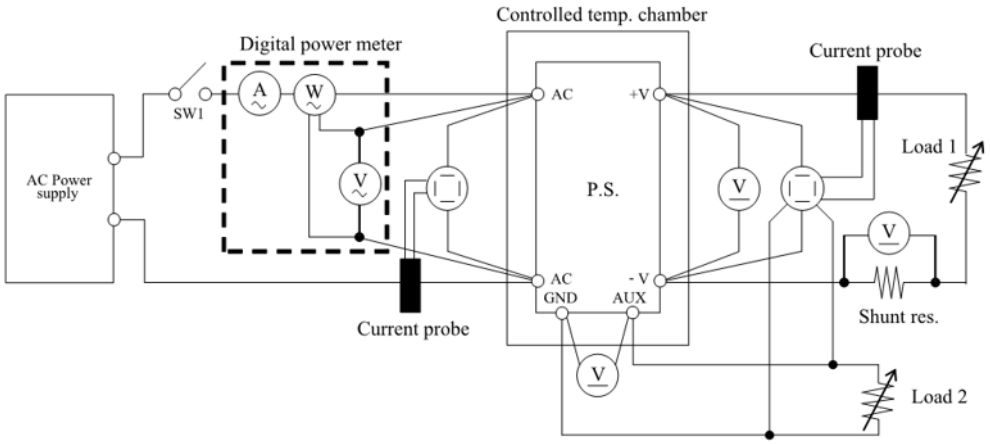
Test results are reference data based on our measurement condition.

1 測定方法 Evaluation Method

1.1 測定回路 Circuit used for determination

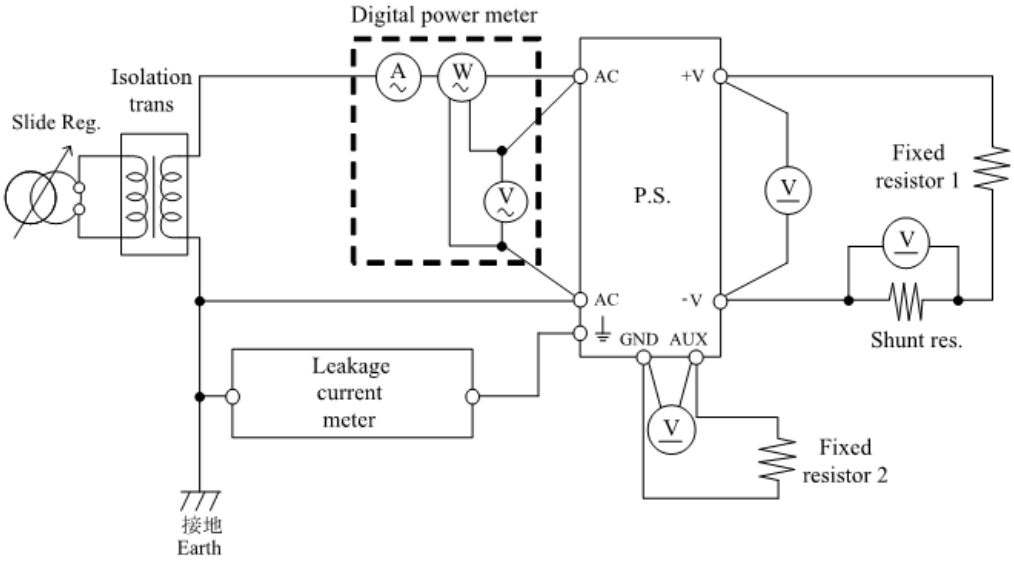
測定回路 1 Circuit 1 used for determination

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



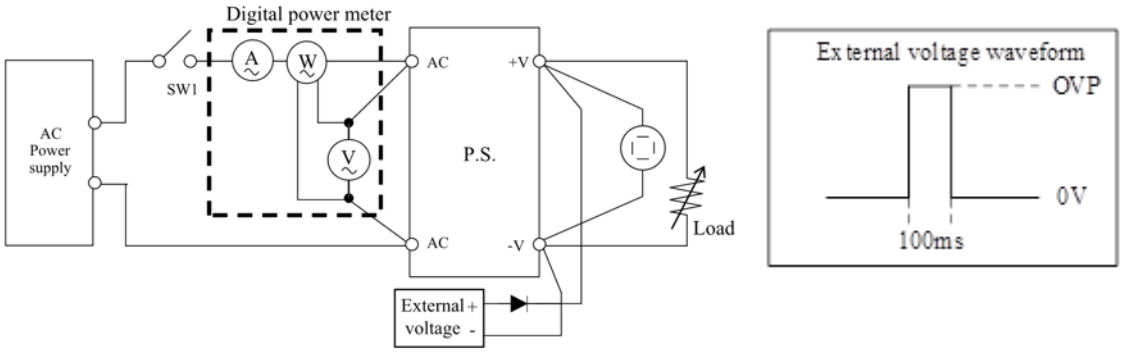
測定回路 2 Circuit 2 used for determination

リーク電流特性 Leakage current characteristics



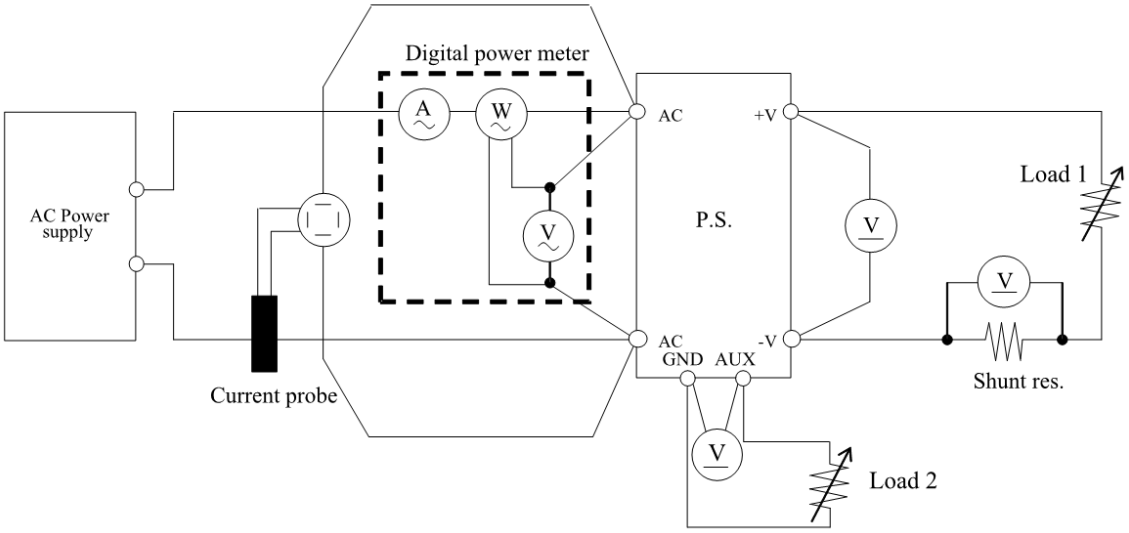
測定回路 3　Circuit 3 used for determination

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



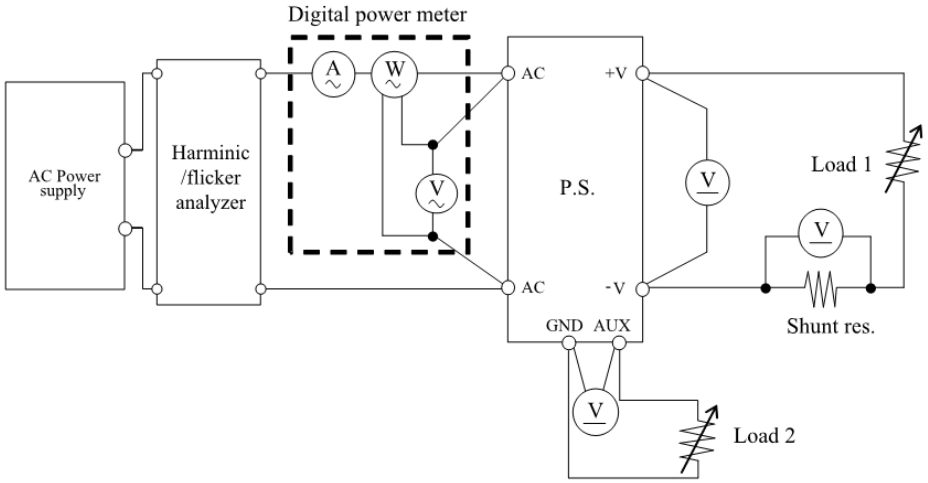
測定回路 4　Circuit 4 used for determination

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

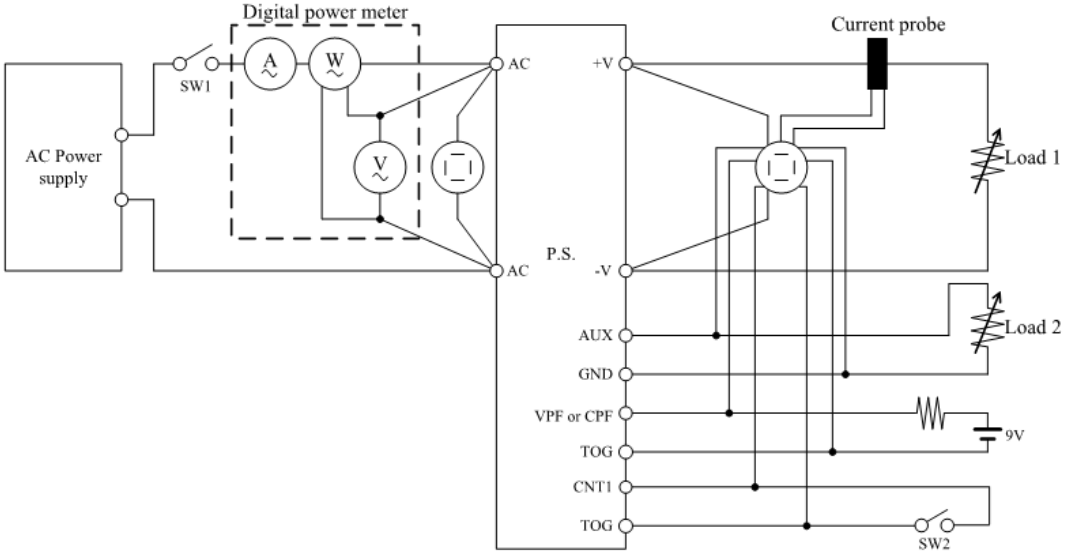
高調波成分 Input current harmonics



測定回路 6　Circuit 6 used for determination

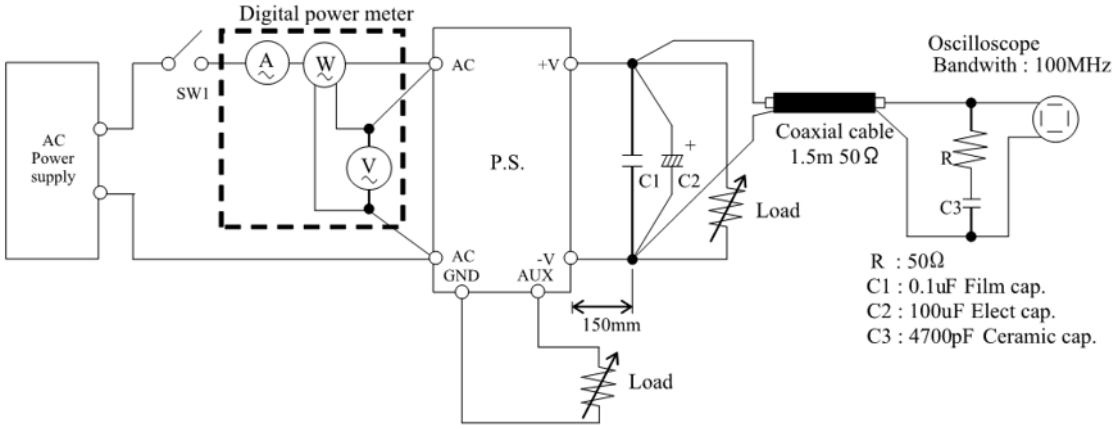
ON/OFF コントロール時出力立ち上がり、立ち下がり特性

Output rise, fall characteristics with ON/OFF Control



測定回路 7　Circuit 7 used for determination

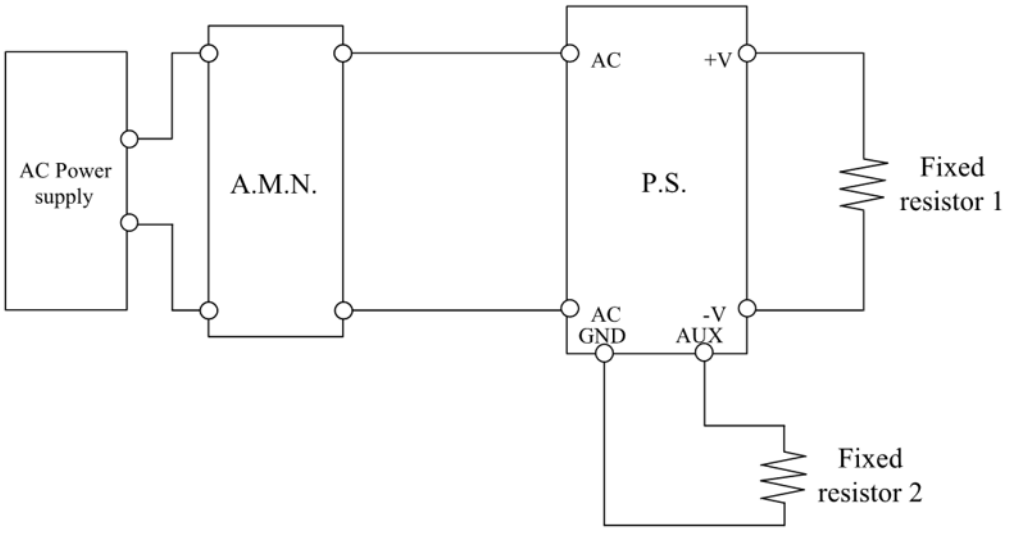
出力リップル、ノイズ電圧波形 Output ripple and noise voltage waveform



測定回路 8　Circuit 8 used for determination

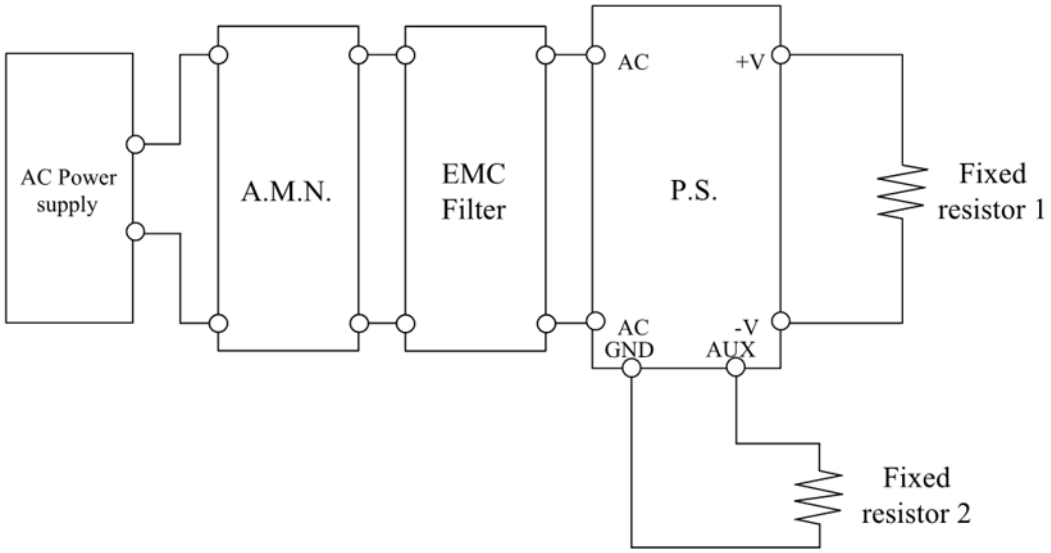
雑音端子電圧（帰還ノイズ） Conducted Emission

(a)　EMC フィルタ未使用　Non-Use of an EMC filter



(b)　EMC フィルタ使用　Use of an EMC filter

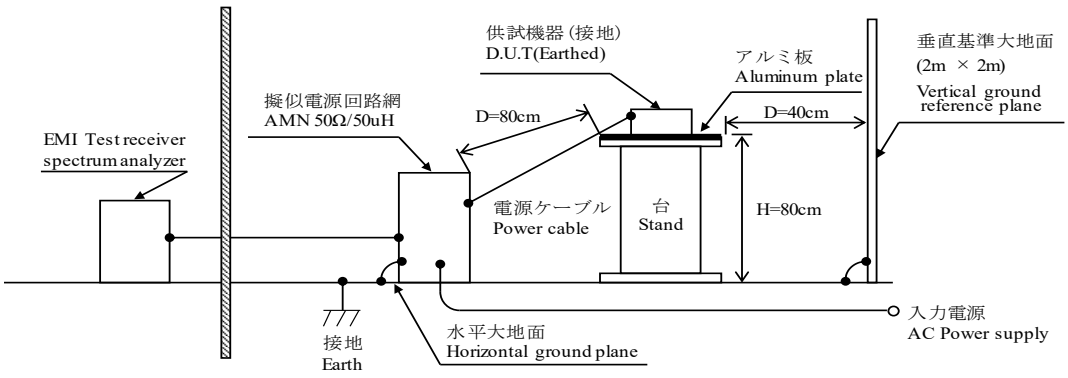
EMC filter ： RSEN-2010



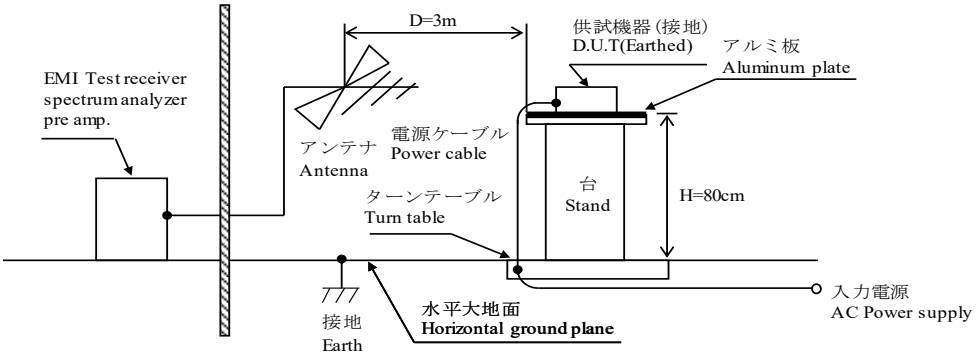
測定構成　Configuration used for determination

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.	DLM3054
2	DIGITAL MULTIMETER	Keysight	34970A
3	DIGITAL POWER METER	YOKOGAWA ELECT.	WT310
4	CURRENT PROBE	YOKOGAWA ELECT.	701931
5	DYNAMIC DUMMY LOAD	KIKUSUI	PLZ10005WSR
6	AC POWER SUPPLY	KIKUSUI	PCR18000WEA2R
7	CONTROLLED TEMP. CHAMBER	ESPEC	SU-641
8	DYNAMIC DUMMY LOAD	KIKUSUI	PLZ205W
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 ANALYER	YOKOGAWA ELECT.	KHA1000

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	200VAC	265VAC	Line regulation	
0A	5.017V	5.018V	5.017V	5.017V	1mV	0.020%
50.0A	5.014V	5.014V	5.014V	5.014V	0mV	0.000%
100.0A	5.011V	5.011V	5.011V	5.011V	0mV	0.000%
Load regulation	6mV	7mV	6mV	6mV		
	0.120%	0.140%	0.120%	0.120%		

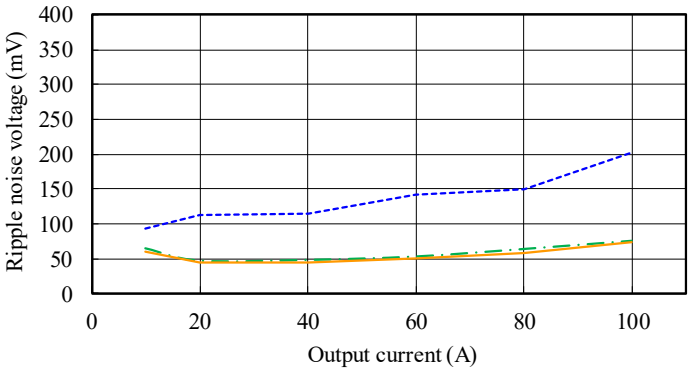
2. Temperature drift

Conditions Vin : 100 VAC
Iout : 100 A

Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	5.005V	5.011V	5.018V	13mV	0.260%

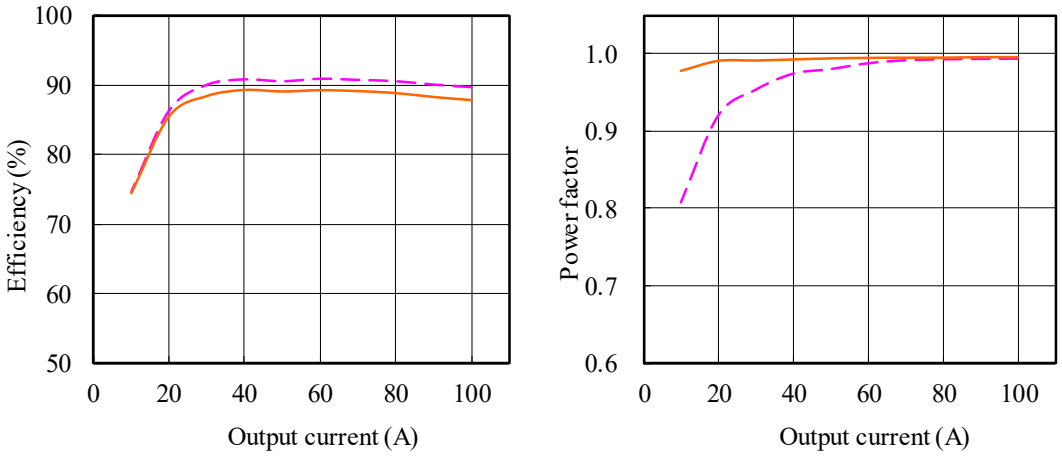
(2) リップルノイズ電圧対出力電流 Ripple noise voltage vs. Output current

Conditions Vin : 100 VAC
Vout : 5 V
Ta : -20 °C
25 °C
50 °C



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

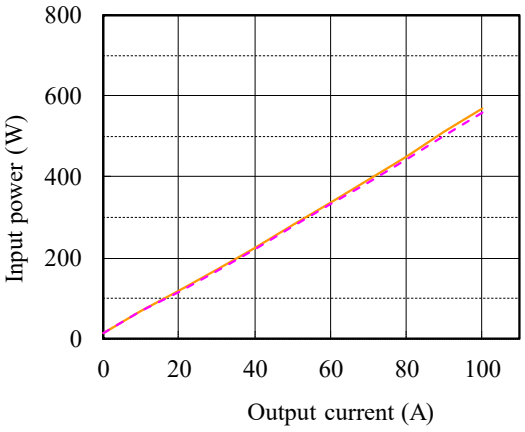
Conditions Vin : 100 VAC
200 VAC
Vout : 5 V
Iaux : 0 %
Ta : 25 ℃



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

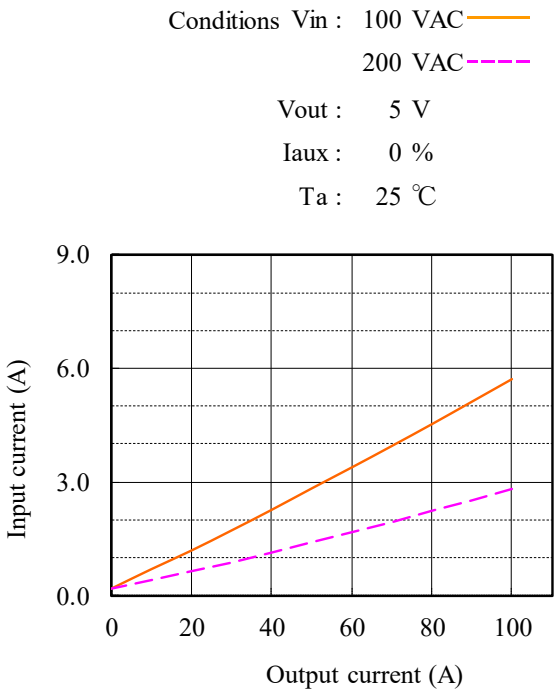
Conditions Vin : 100 VAC
200 VAC
Vout : 5 V
Iaux : 0 %
Ta : 25 ℃

Vin	Input power	
	Iout : 0%	Control OFF
100VAC	13.1W	4.9W
200VAC	13.6W	4.4W



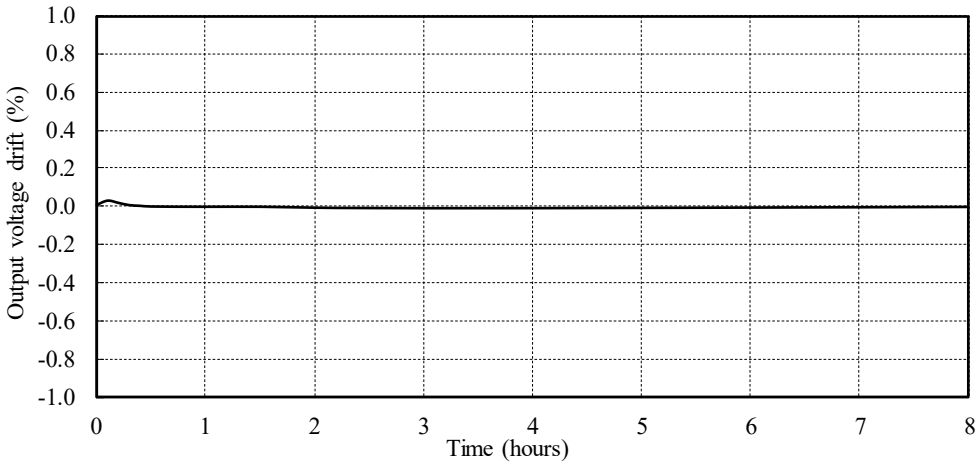
(5) 入力電流対出力電流 Input current vs. Output current

Vin	Input current	
	Iout : 0%	Control OFF
100VAC	0.17A	0.11A
200VAC	0.19A	0.14A



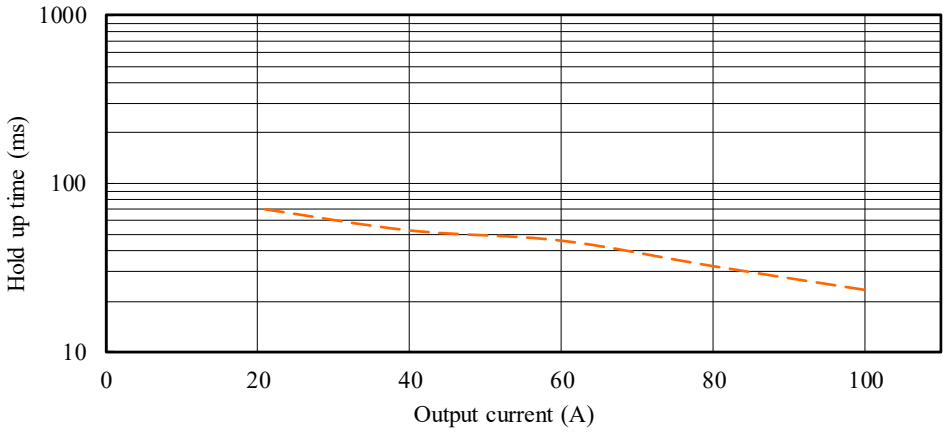
2.1.2 通電ドリフト特性 Warm up voltage drift characteristics

Conditions Vin : 100 VAC
Vout : 5 V
Iout : 100 A
Ta : 25 °C



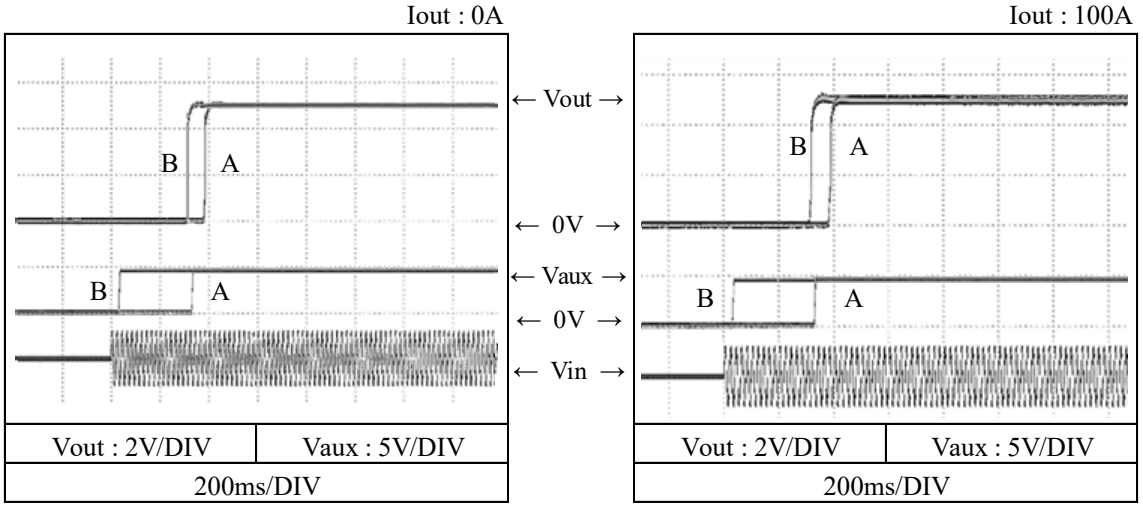
2.1.3 出力保持時間特性 Hold up time characteristics

Conditions Vin : 100 VAC
Vout : 5 V
Ta : 25 °C



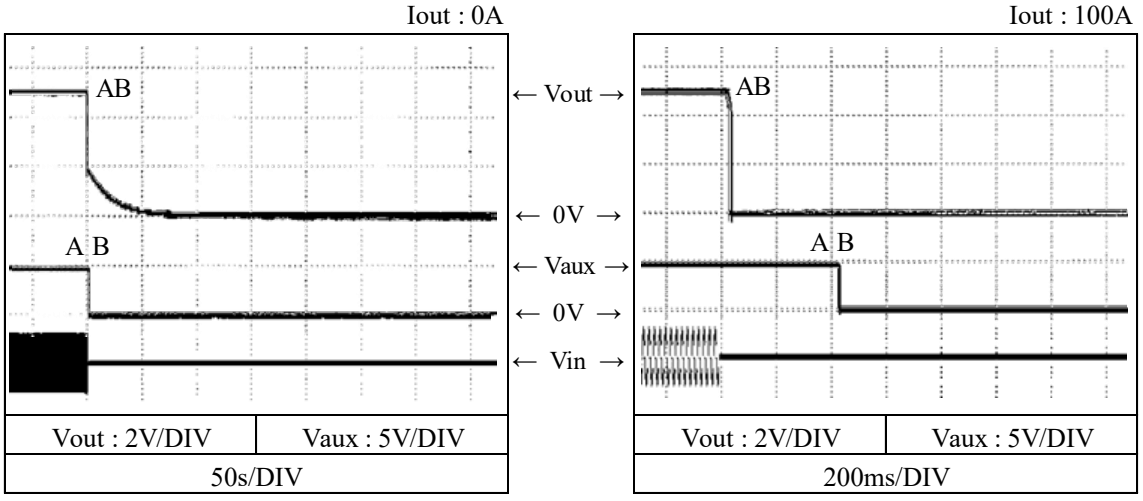
2.1.4　出力電圧立ち上がり特性 Output voltage rise characteristics

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



2.1.5　出力電圧立ち下がり特性 Output voltage fall characteristics

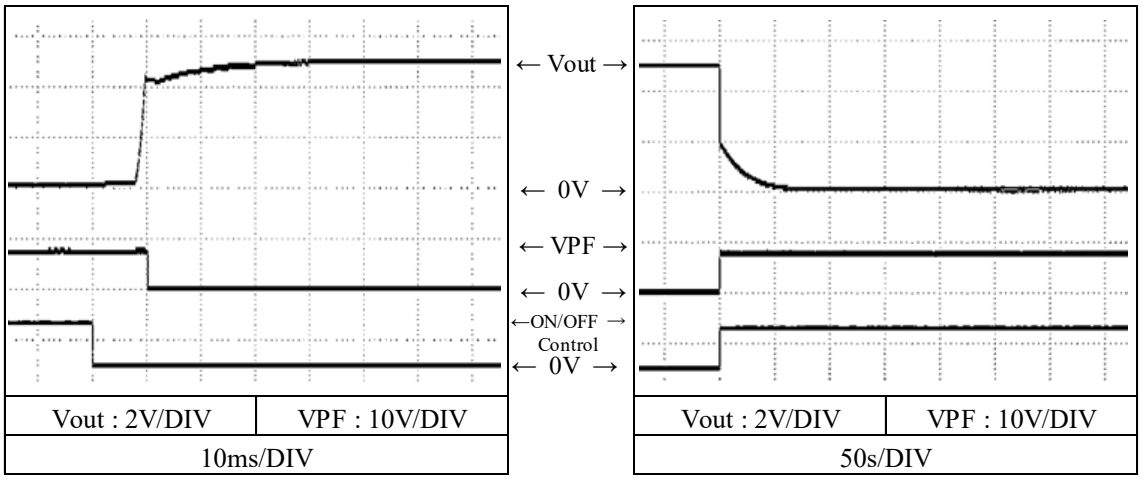
Conditions Vin : 100 VAC (A)
200 VAC (B)
Iaux : 100 %
Ta : 25 ℃



2.1.6 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
Ta : 25 ℃

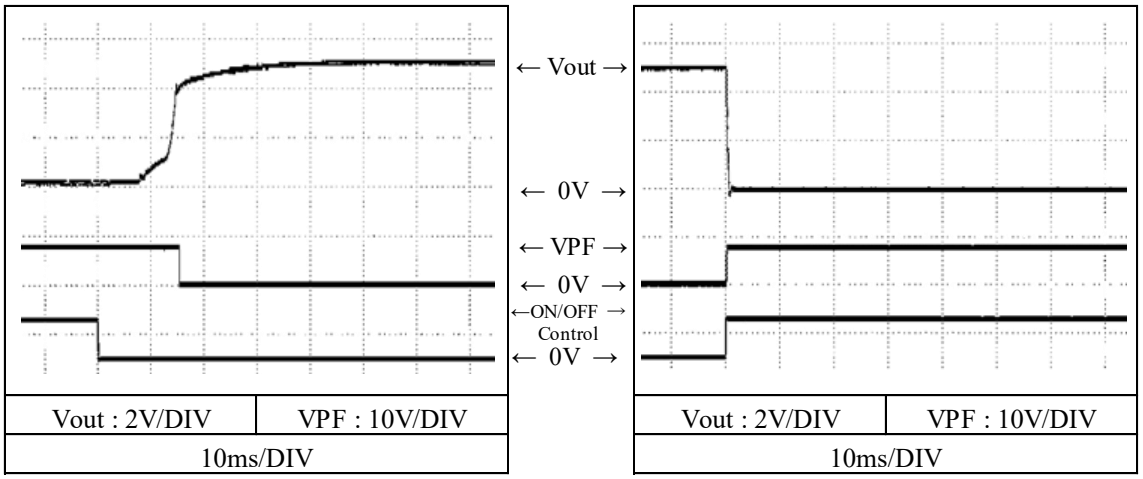
Iout : 0A



Vout : 2V/DIV	VPF : 10V/DIV
10ms/DIV	

Vout : 2V/DIV	VPF : 10V/DIV
50s/DIV	

Iout : 100.0A



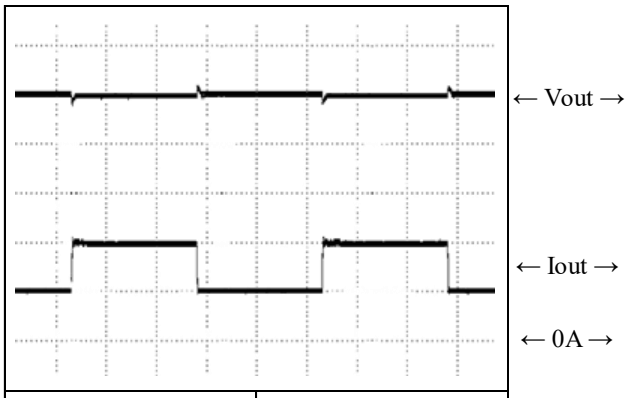
Vout : 2V/DIV	VPF : 10V/DIV
10ms/DIV	

Vout : 2V/DIV	VPF : 10V/DIV
10ms/DIV	

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

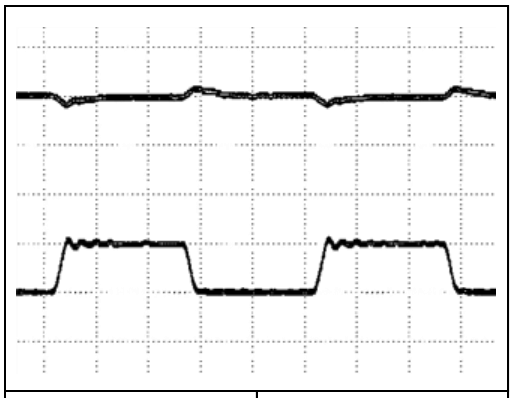
Conditions Vin : 100 VAC
Iout : 50.0A⟷100.0A
(tr = tf = 50us)
Ta : 25 ℃

f = 100Hz



Vout : 2V/DIV	2ms/DIV
+7.20%	-8.80%

f = 1kHz



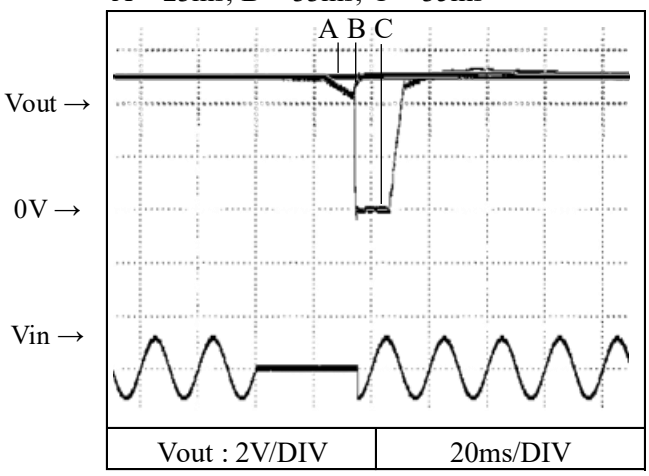
Vout : 2V/DIV	200μs/DIV
+8.20%	-9.60%

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 : 100 VAC
Iout : 100 A
Ta : 25 °C

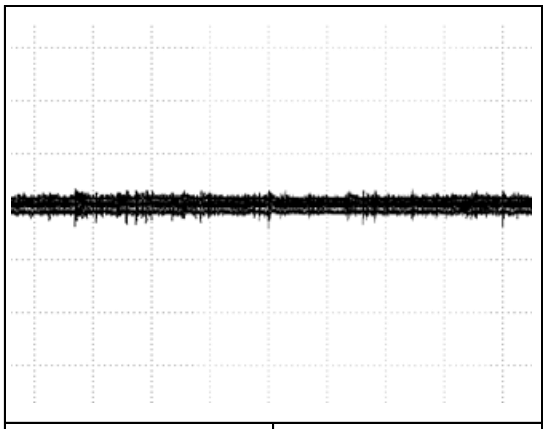
A = 23ms, B = 33ms, C = 35ms



Vout : 2V/DIV	20ms/DIV

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

Conditions Vin : 100 VAC
Vout : 5 V
Iout : 100 A
Ta : 25 ℃



Vout : 100mV/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 °C

Vout \ Vin	85VAC	100VAC	200VAC	265VAC	Line regulation	
0.5V	100.084A	100.084A	100.111A	100.089A	27mA	0.027%
2.5V	100.059A	100.060A	100.059A	100.064A	5mA	0.005%
5.0V	100.034A	100.034A	100.048A	100.046A	14mA	0.014%
Load regulation	50mA	50mA	63mA	43mA		
	0.050%	0.050%	0.063%	0.043%		

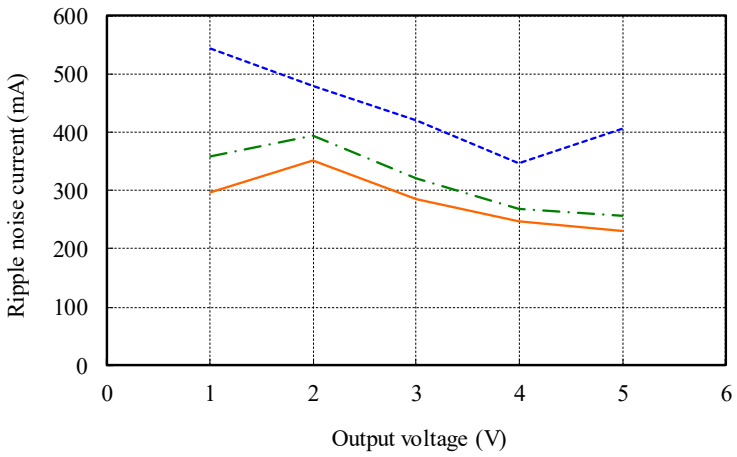
2. Temperature drift

Conditions Vin : 100 VAC
Vout : 5 V

Ta	-20°C	+25°C	+50°C	Temperature stability	
Iout	100.801A	100.034A	99.894A	907mA	0.907%

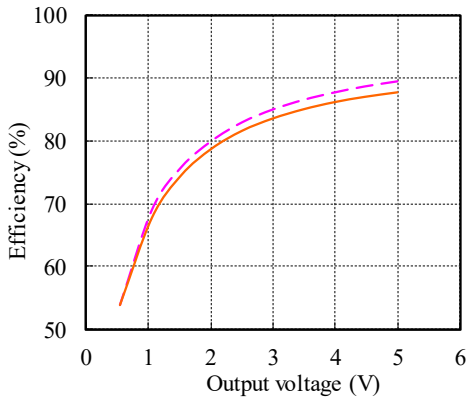
(2) リップルノイズ電流対出力電圧 Ripple noise current vs. Output voltage

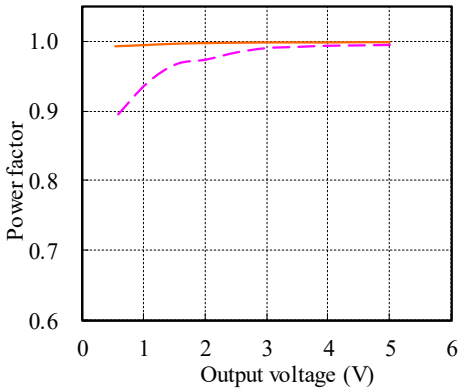
Conditions Vin : 100 VAC
Iout : 100 A
Ta : -20 °C
25 °C
50 °C



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

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

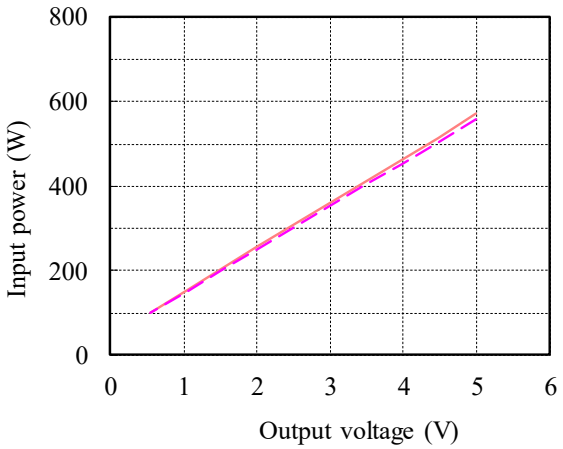




(4) 入力電力対出力電圧 Input power vs. Output voltage

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

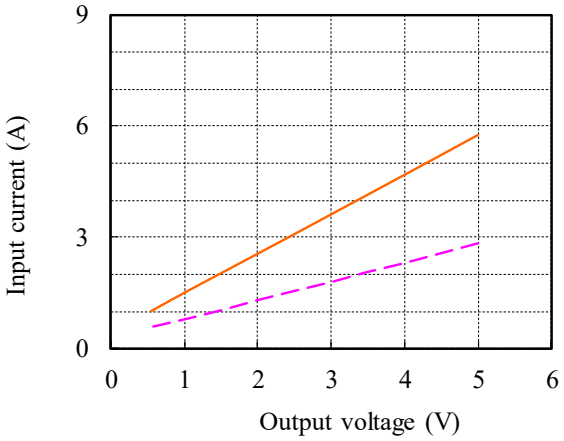
Vin	Input power
	Control OFF
100VAC	4.9W
200VAC	4.4W



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

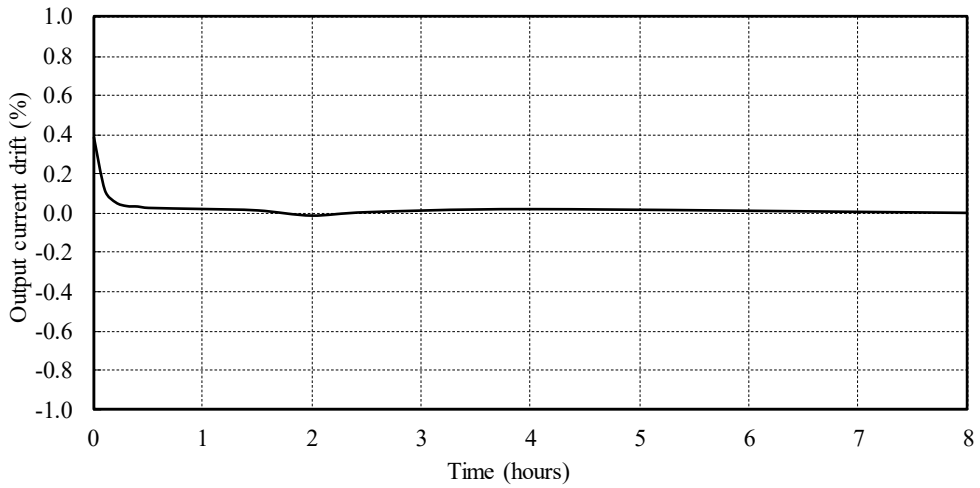
Conditions Vin : 100 VAC
200 VAC
Iout : 100 A
Iaux : 0 %
Ta : 25 ℃

Vin	Input current
	Control OFF
100VAC	0.11A
200VAC	0.14A



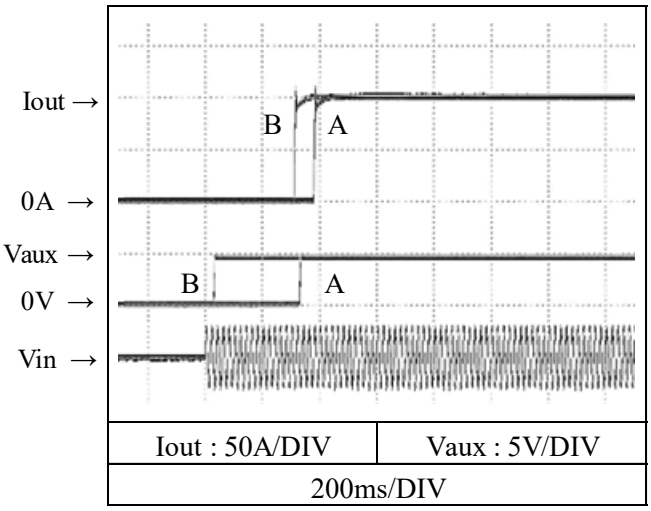
2.2.2 通電ドリフト特性 Warm up current drift characteristics

Conditions Vin : 100 VAC
Vout : 5 V
Iout : 100 A
Ta : 25 °C



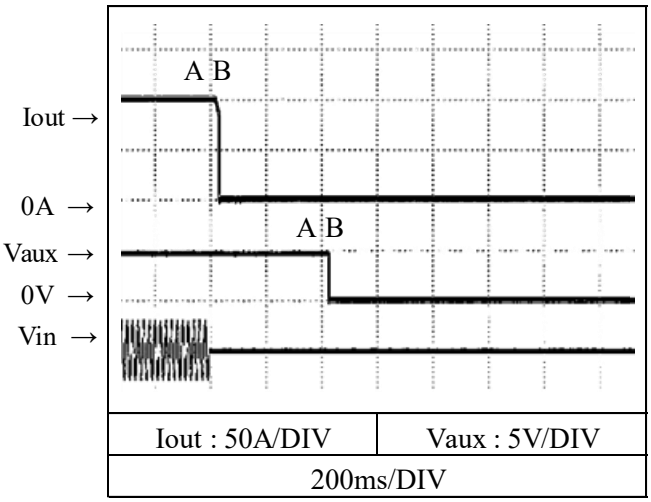
2.2.3 出力電流立ち上がり特性 Output current rise characteristics

Conditions Vin : 100 VAC (A)
200 VAC (B)
Vout : 5 V
Iaux : 100 %
Ta : 25 ℃



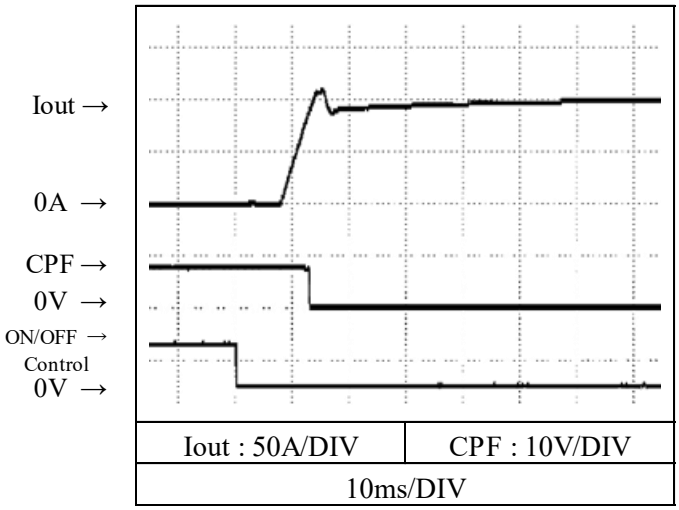
2.2.4 出力電流立ち下がり特性 Output current fall characteristics

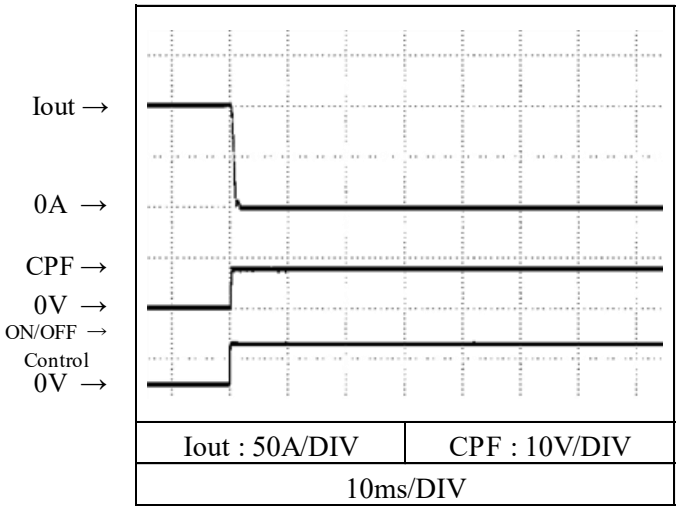
Conditions Vin : 100 VAC (A)
200 VAC (B)
Vout : 5 V
Iaux : 100 %
Ta : 25 ℃



2.2.5 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
Vout : 5 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

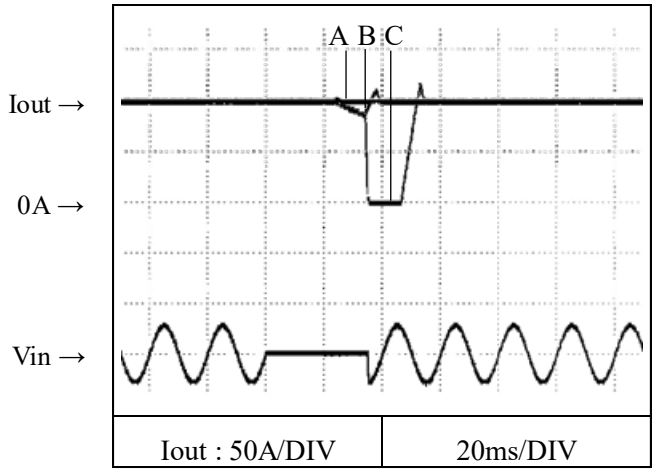
A : 出力電流の低下なし　Output current does not drop.

B : 出力電流の低下が0Aまでいかない　Output current drop down not reaching 0A.

C : 出力電流が0Aまで低下　Output current drops until 0A.

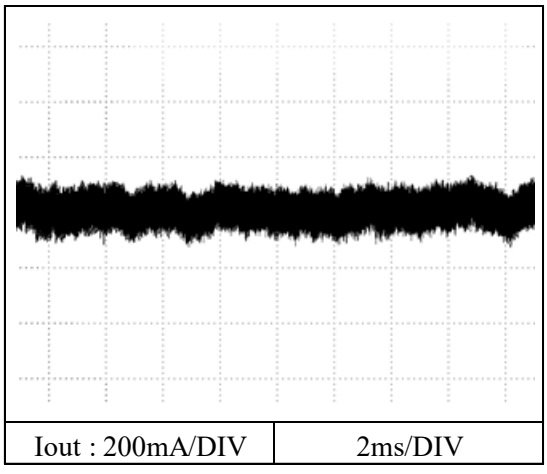
Conditions Vin : 100 VAC
Vout : 5 V
Ta : 25 °C

A = 23ms, B = 33ms, C = 35ms



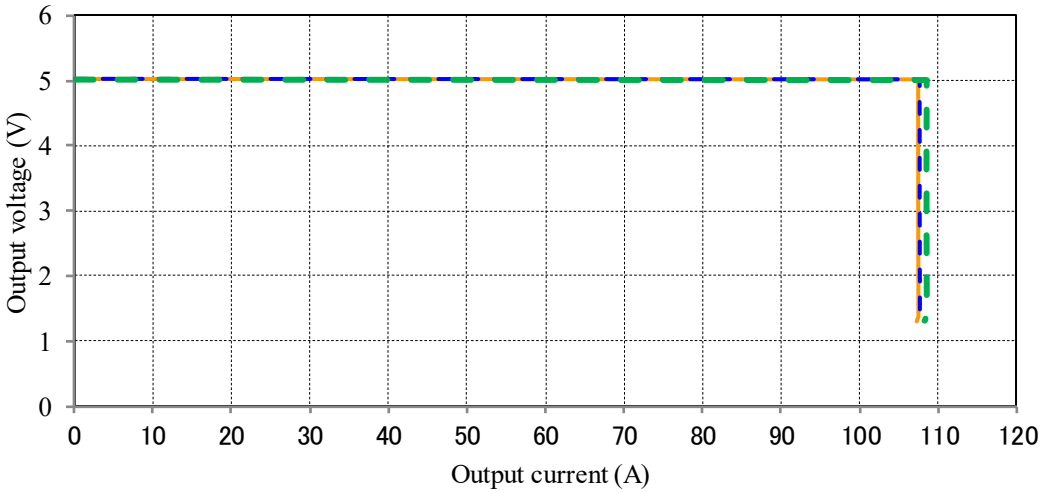
2.2.7　出力リップル、ノイズ波形 Output ripple and noise waveform

Conditions Vin : 100 VAC
Vout : 5 V
Iout : 100 A
Ta : 25 °C



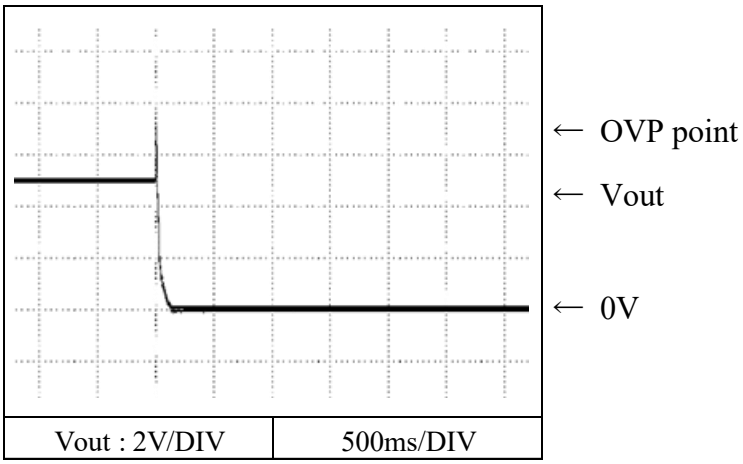
2.3 過電流保護特性 Over current protection (OCP) characteristics

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



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

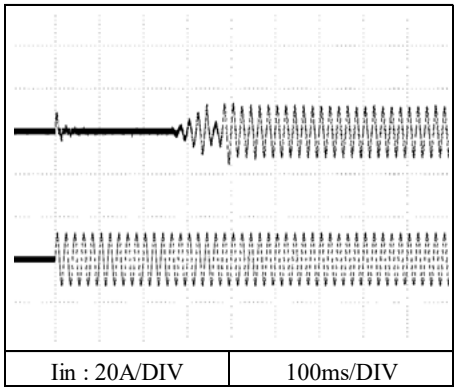
Conditions Vin : 100 VAC
Iout : 1 A
Ta : 25 °C



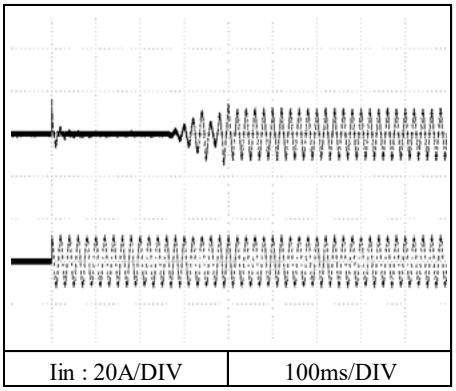
2.5 入力サージ電流(突入電流)波形 Inrush current waveform

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°

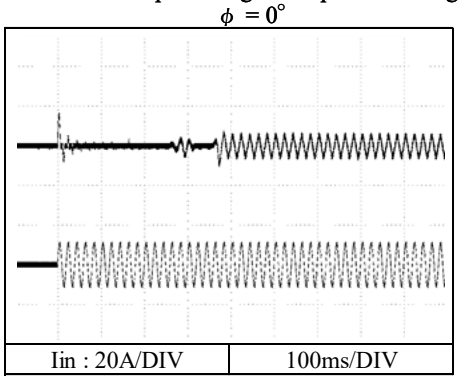


Switch on phase angle of input AC voltage
ϕ = 90°

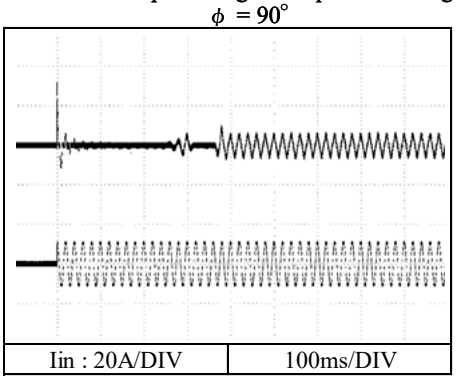


Conditions Vin : 200 VAC
Vout : Nominal output voltage
Iout : Maximum output current
Ta : 25 °C

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

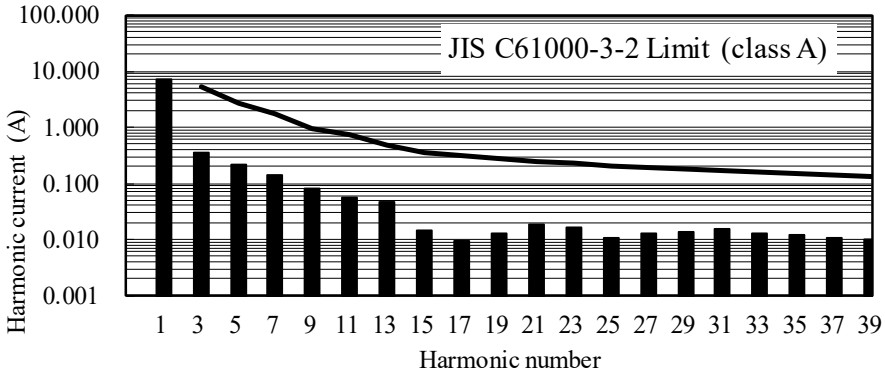


Switch on phase angle of input AC voltage
ϕ = 90°

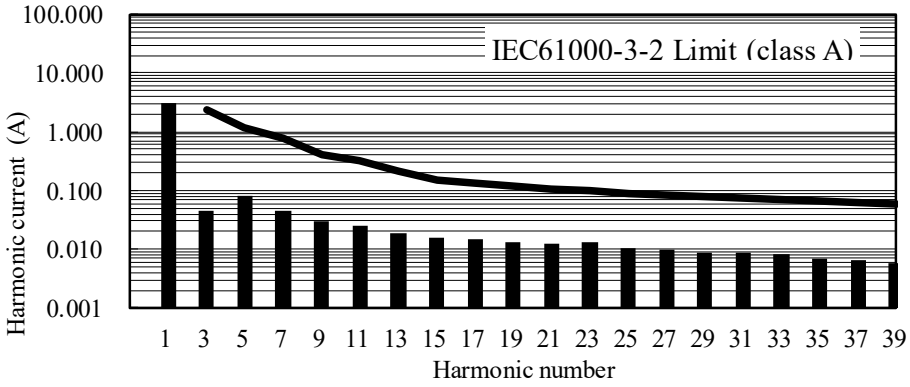


2.6 高調波成分 Input current harmonics

Conditions Vin : 100 VAC
Vout : Nominal output voltage
Iout : Maximum output current



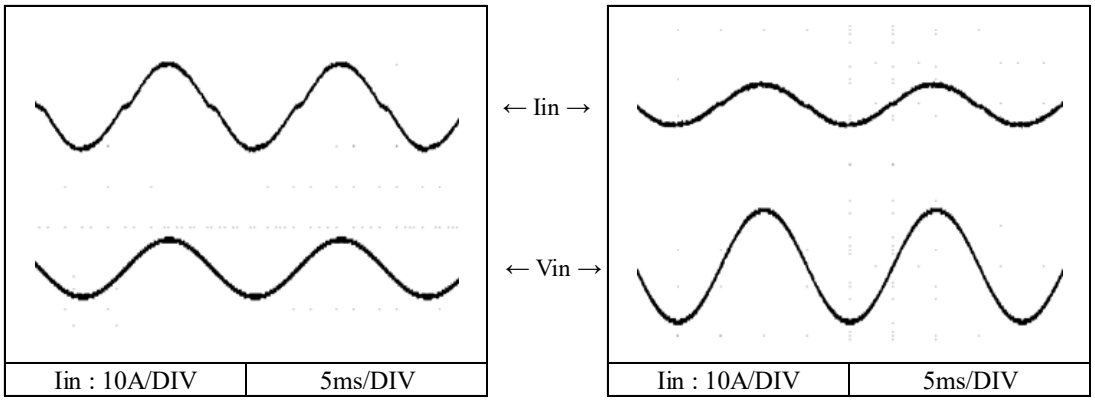
Conditions Vin : 230 VAC
Vout : Nominal output voltage
Iout : Maximum output current
Ta : 25 °C



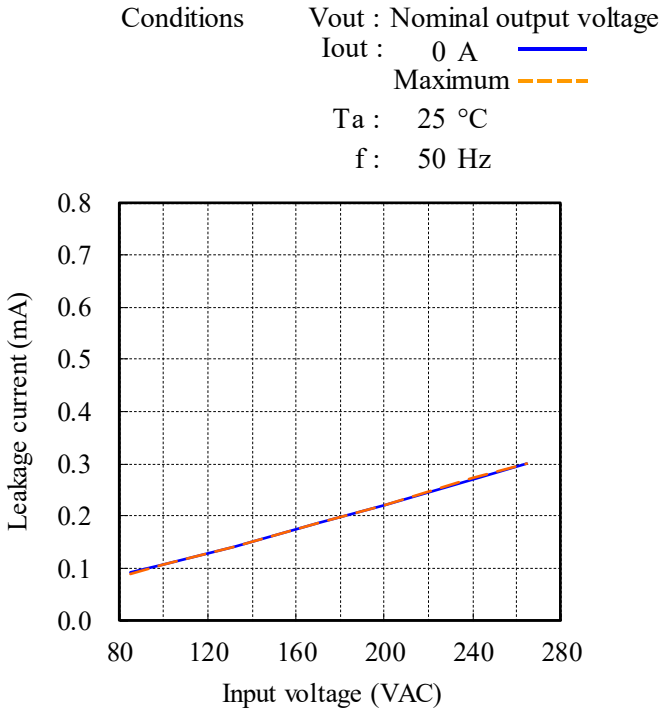
2.7 入力電流波形 Input current waveform

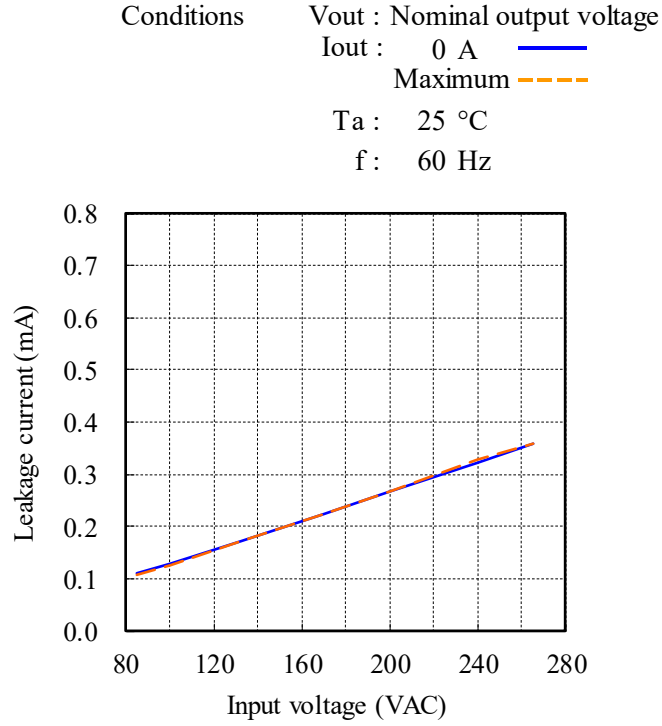
Conditions Vin : 100 VAC
Vout : Nominal output voltage
Iout : Maximum output current
Ta : 25 °C

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





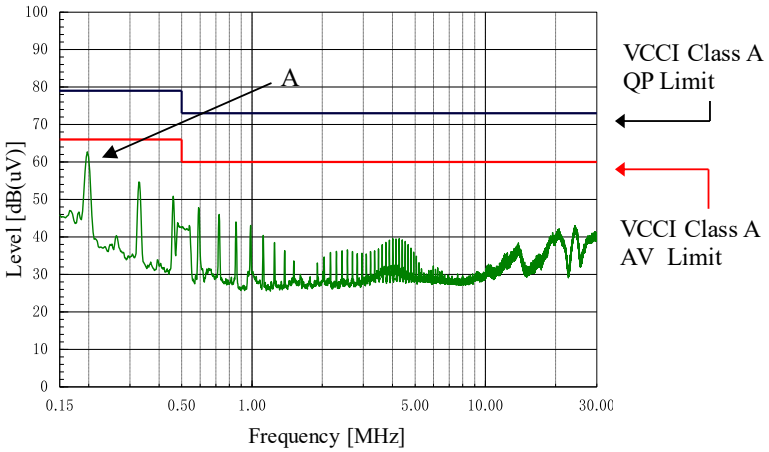
2.9 EMI 特性 Electro-Magnetic Interference characteristics

雑音端子電圧
Conducted Emission
EMCフィルタ未使用
Non-Use of an EMC filter

Conditions Vin : 100 VAC
Vout : 5 V
Iout : 100 A
Iaux : 100 %
Ta : 25 ℃

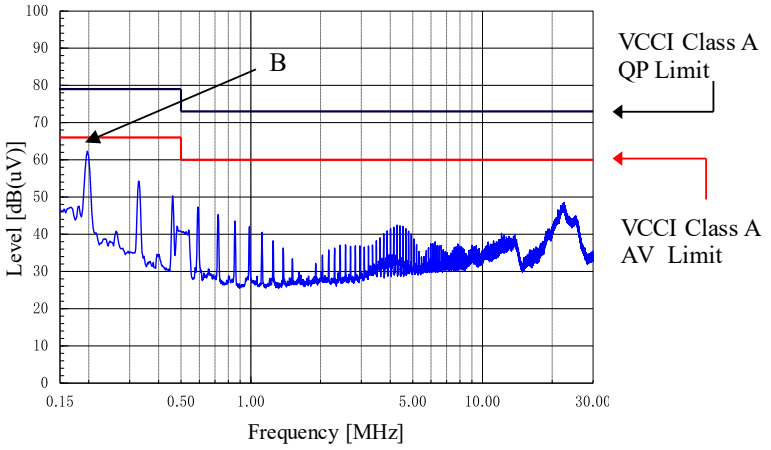
Phase : N

Ref. Data	Point A (0.20MHz) Limit (dB)	Measure (dB)
QP	79.0	62.2
AV	66.0	62.1



Phase : L

Ref. Data	Point B (0.20MHz) Limit (dB)	Measure (dB)
QP	79.0	61.7
AV	66.0	61.6



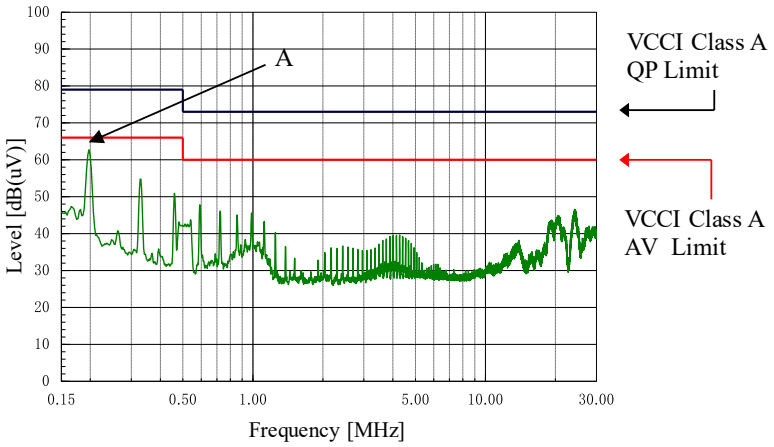
EN55011-A,EN55032-A,FCC-Aの限界値はVCCI class Aの限界値と同じ
Limit of EN55011-A,EN55032-A,FCC-A are same as its VCCI class A.
波形はピーク値
Waveform is peak values.

雑音端子電圧
Conducted Emission
EMCフィルタ未使用
Non-Use of an EMC filter

Conditions Vin : 230 VAC
Vout : 5 V
Iout : 100 A
Iaux : 100 %
Ta : 25 ℃

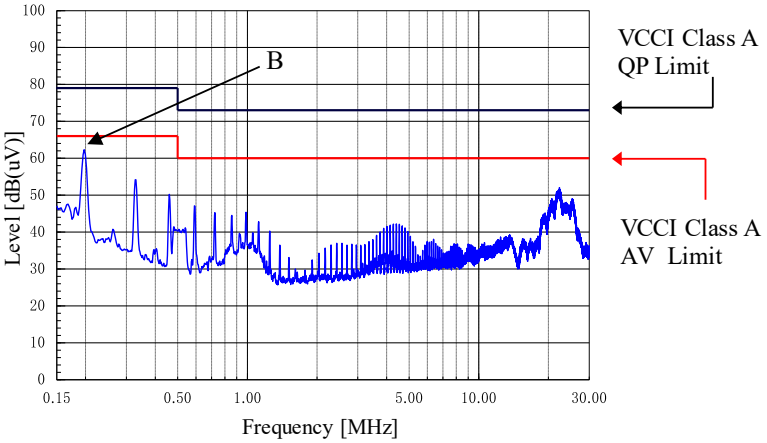
Phase : N

Ref. Data	Point A (0.20MHz) Limit (dB)	Measure (dB)
QP	79.0	62.2
AV	66.0	62.1



Phase : L

Ref. Data	Point B (0.20MHz) Limit (dB)	Measure (dB)
QP	79.0	61.7
AV	66.0	61.6



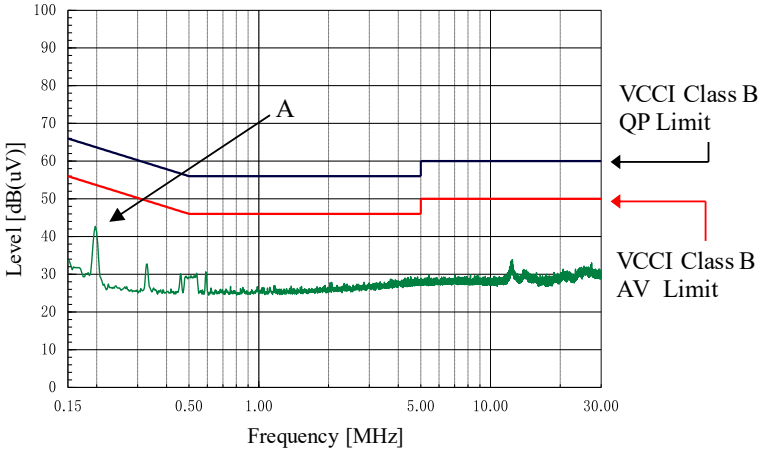
EN55011-A,EN55032-A,FCC-Aの限界値はVCCI class Aの限界値と同じ
Limit of EN55011-A,EN55032-A,FCC-A are same as its VCCI class A.
波形はピーク値
Waveform is peak values.

雑音端子電圧
Conducted Emission
EMCフィルタ使用
Use of an EMC filter

Conditions Vin : 100 VAC
Vout : 5 V
Iout : 100 A
Iaux : 100 %
Ta : 25 ℃

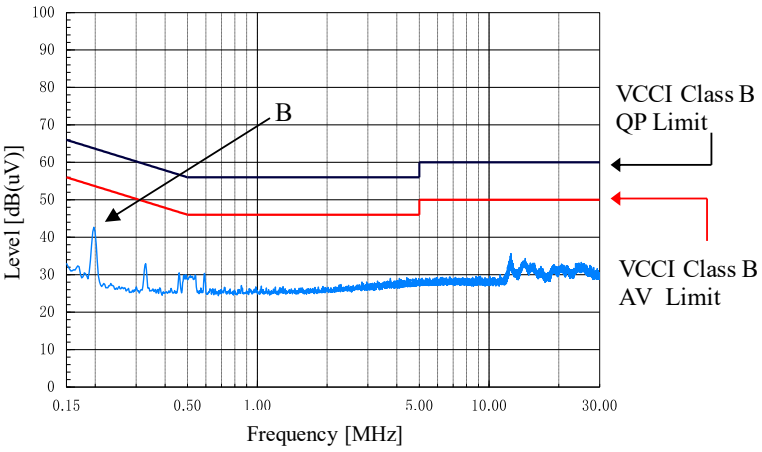
Phase : N

Ref. Data	Point A (0.20MHz) Limit (dB)	Measure (dB)
QP	63.6	41.1
AV	53.6	41.2



Phase : L

Ref. Data	Point B (0.20MHz) Limit (dB)	Measure (dB)
QP	63.6	41.2
AV	53.6	41.3



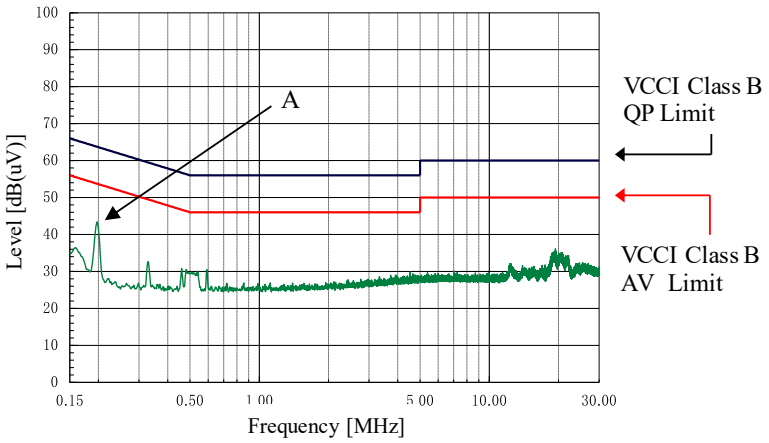
EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.
波形はピーク値
Waveform is peak values.

雑音端子電圧
Conducted Emission
EMCフィルタ使用
Use of an EMC filter

Conditions Vin : 230 VAC
Vout : 5 V
Iout : 100 A
Iaux : 100 %
Ta : 25 ℃

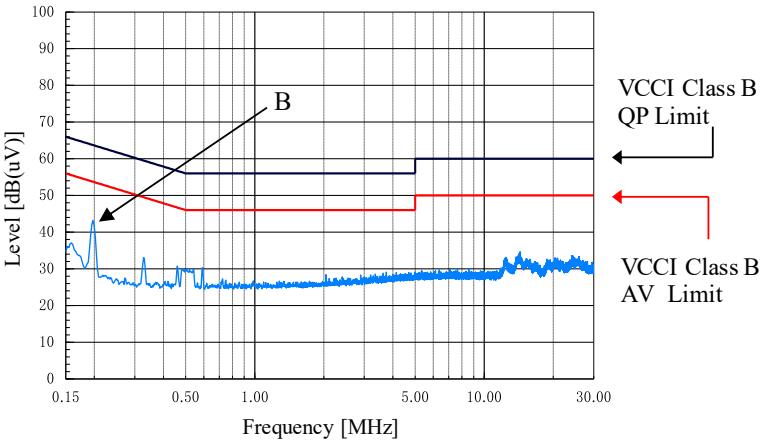
Phase : N

Ref. Data	Point A (0.20MHz) Limit (dB)	Measure (dB)
QP	63.6	41.2
AV	53.6	41.3



Phase : L

Ref. Data	Point B (0.20MHz) Limit (dB)	Measure (dB)
QP	63.6	41.2
AV	53.6	41.3



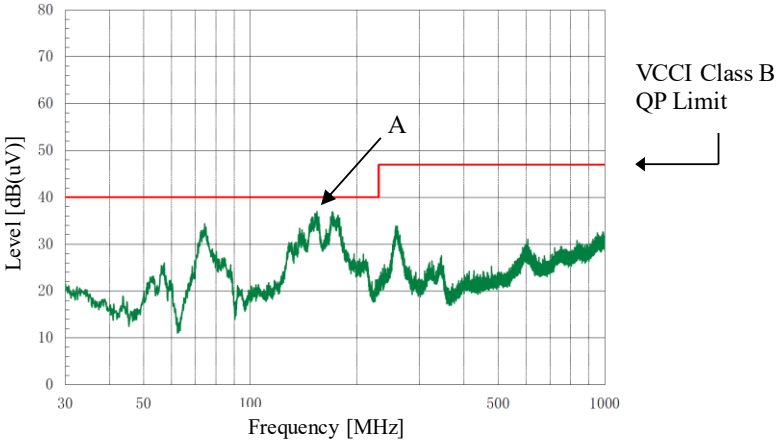
EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.
波形はピーク値
Waveform is peak values.

雑音電界強度
Radiated Emission

Conditions Vin : 100 VAC
Vout : 5 V
Iout : 100 A
Iaux : 100 %
Ta : 25 ℃

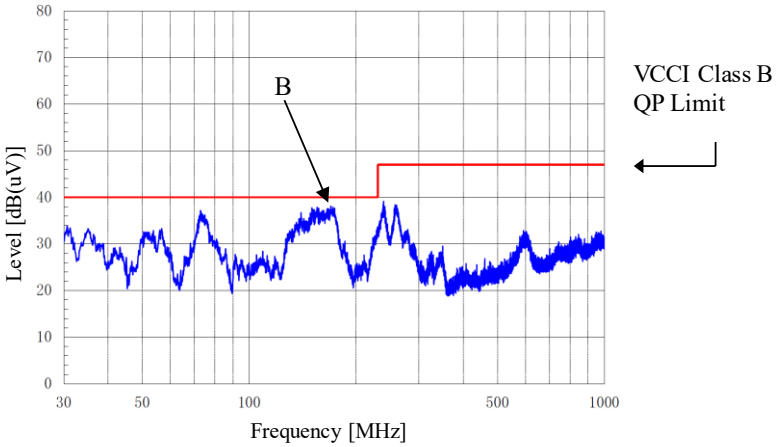
HORIZONTAL

Ref. Data	Point A (155.0MHz) Limit (dB)	Measure (dB)
QP	40.0	36.3



VERTICAL

Ref. Data	Point B (171.4MHz) Limit (dB)	Measure (dB)
QP	40.0	33.4



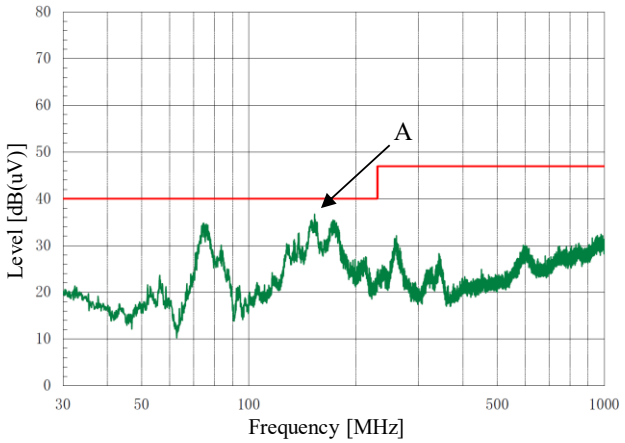
EN55011-B,EN55032-B,FCC-Bの限界値はVCCI class Bの限界値と同じ
Limit of EN55011-B,EN55032-B,FCC-B are same as its VCCI class B.
波形はピーク値
Waveform is peak values.

雑音電界強度
Radiated Emission

Conditions Vin : 230 VAC
Vout : 5 V
Iout : 100 A
Iaux : 100 %
Ta : 25 ℃

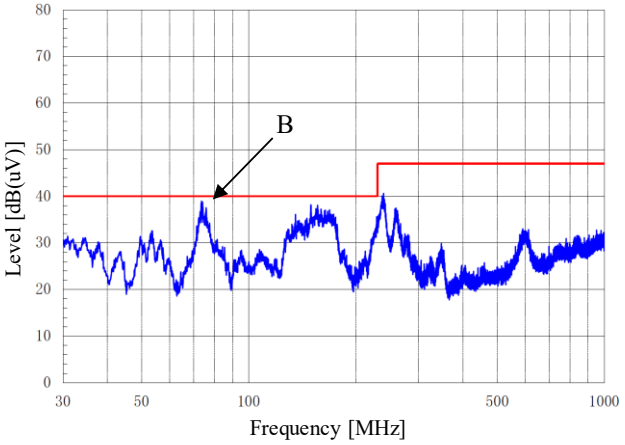
HORIZONTAL

Ref. Data	Point A (154.4MHz) Limit (dB)	Measure (dB)
QP	40.0	35.0



VERTICAL

Ref. Data	Point B (74.3MHz) Limit (dB)	Measure (dB)
QP	40.0	35.4



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