

HWS3000GT4-60

EVALUATION DATA

型式データ

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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

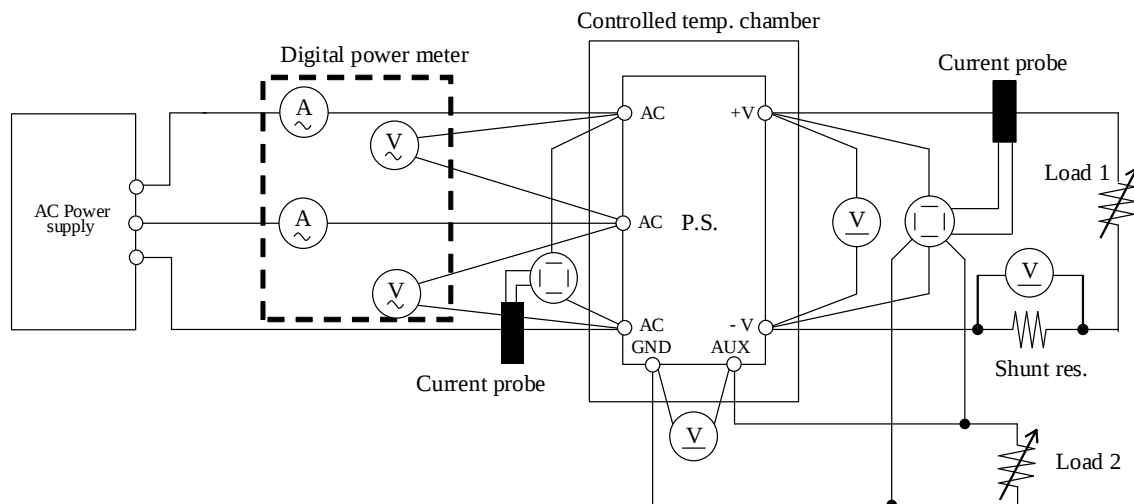
過電流保護特性 Over current protection (OCP) characteristics

入力電圧瞬停特性 Response to brown out characteristics

入力電流波形 Input current waveform

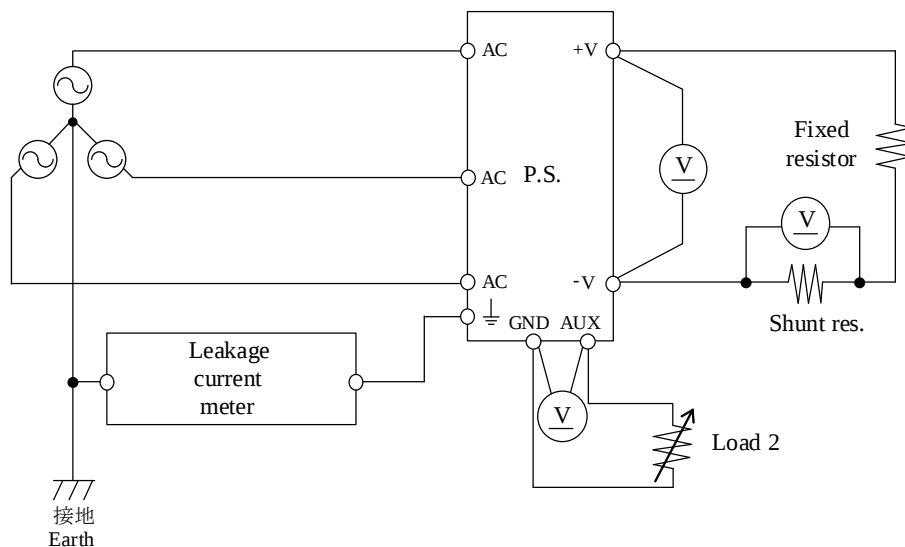
過渡応答(負荷急変)特性 Dynamic load response characteristics

出力リップル、ノイズ電流波形 Output ripple and noise current waveform



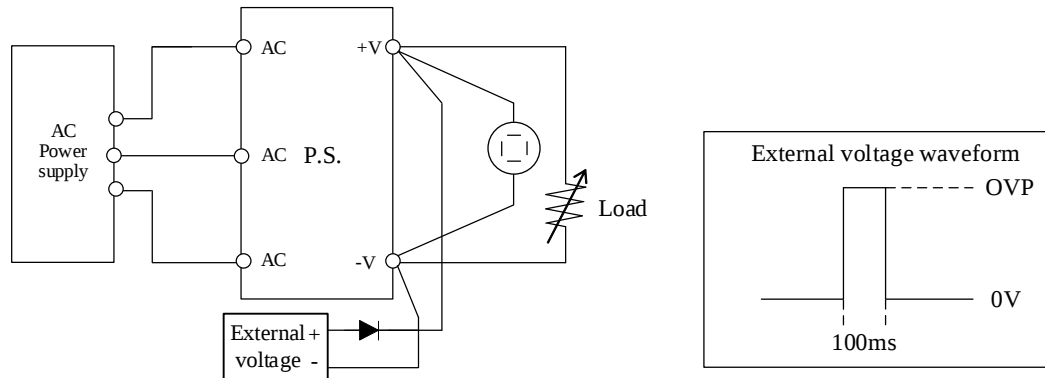
測定回路 2 Circuit 2 used for determination

リーク電流特性 Leakage current characteristics

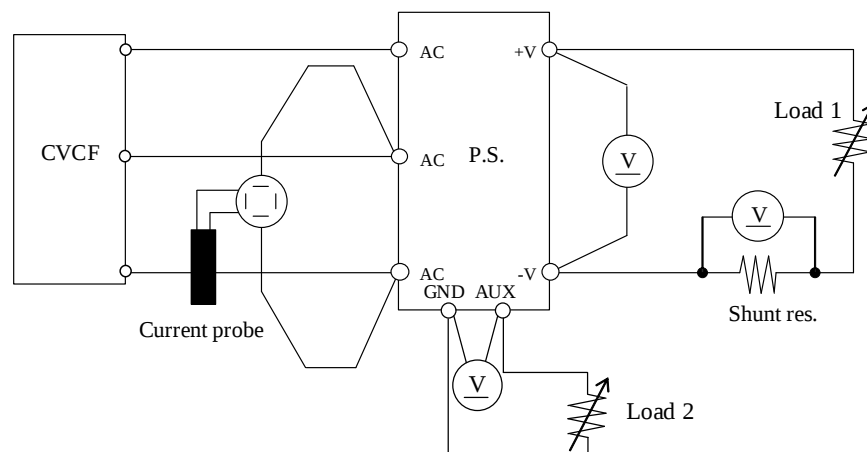


測定回路3 Circuit 3 used for determination

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



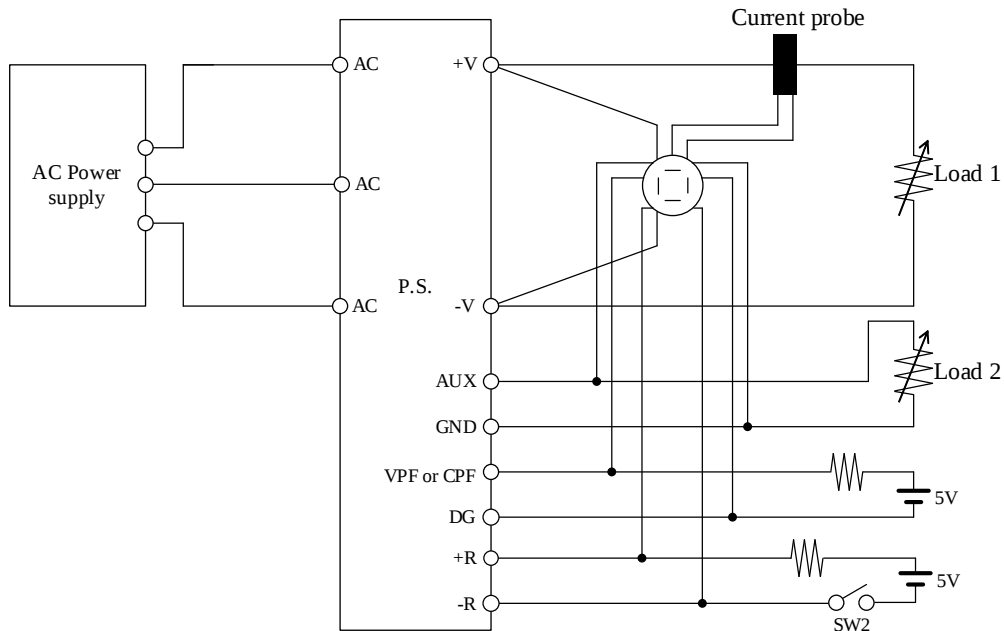
測定回路 5 Circuit 5 used for determination

ON/OFF コントロール時出力立ち上がり、立ち下がり特性

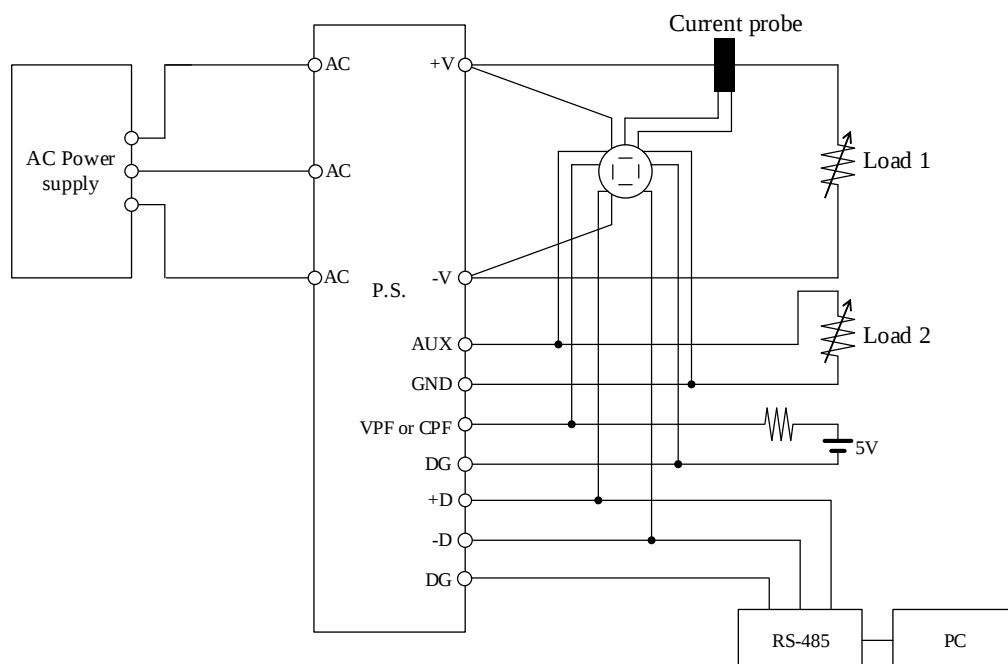
Output rise, fall characteristics with ON/OFF Control

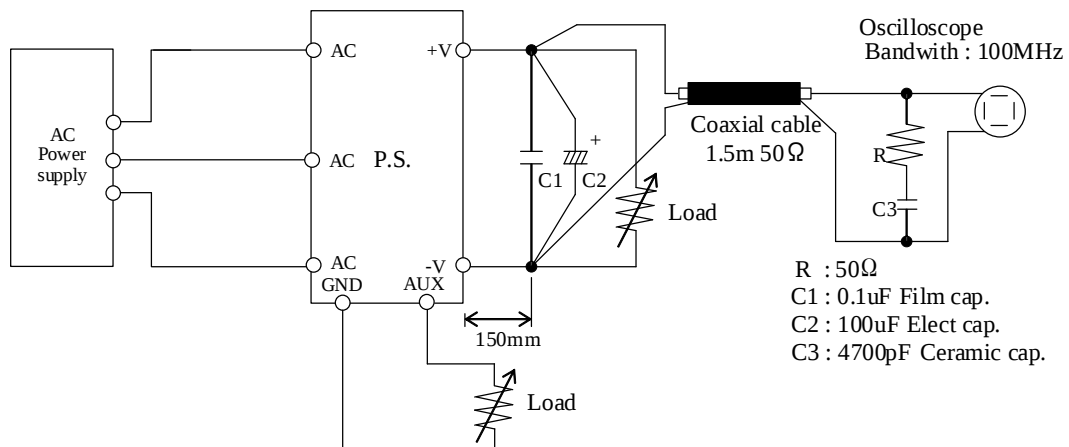
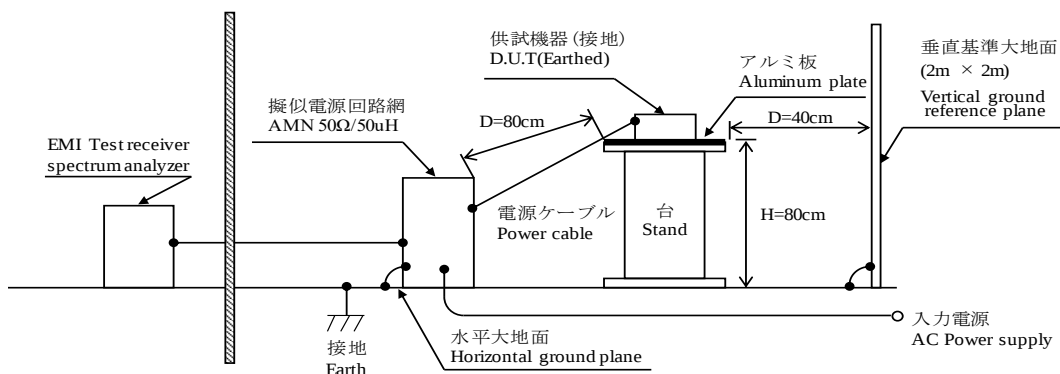
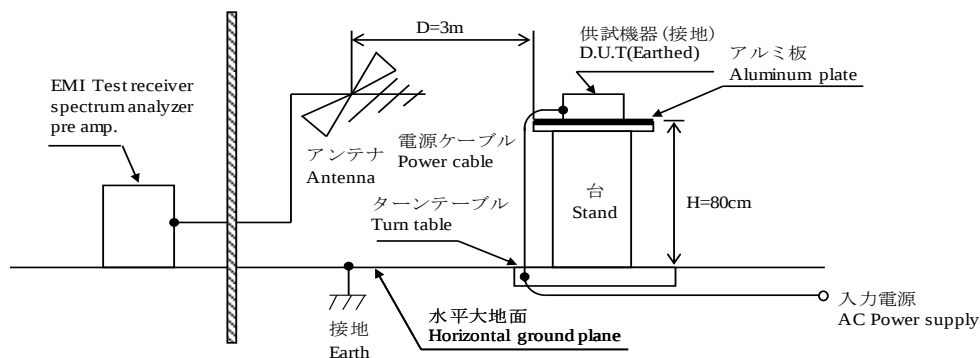
(a) リモート ON/OFF コントロール端子による ON/OFF

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 6 Circuit 6 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.	DLM5058
2	DIGITAL MULTIMETER	TEXIO	DAQ-9600
3	DIGITAL POWER METER	HIOKI	PW3337
4	CURRENT PROBE	YOKOGAWA ELECT.	701931
5	DYNAMIC DUMMY LOAD	KIKUSI	PLZ1205W
6	CVCF	KIKUSUI	PCR18000WEA2R
7	CONTROLLED TEMP. CHAMBER	ESPEC	PSL-4J
8	DYNAMIC DUMMY LOAD	TDK-Lambda	SFL 120-60-300
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

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	360VAC	400VAC	480VAC	528VAC	Line regulation	
0A	60.269V	60.288V	60.278V	60.279V	19mV	0.031%
25A	60.044V	60.044V	60.047V	60.037V	10mV	0.016%
50A	60.043V	60.063V	60.061V	60.047V	20mV	0.033%
Load regulation	226mV	243mV	231mV	242mV		
	0.377%	0.406%	0.386%	0.404%		

2. Temperature drift

Conditions Vin : 400 VAC

Iout : 50 A

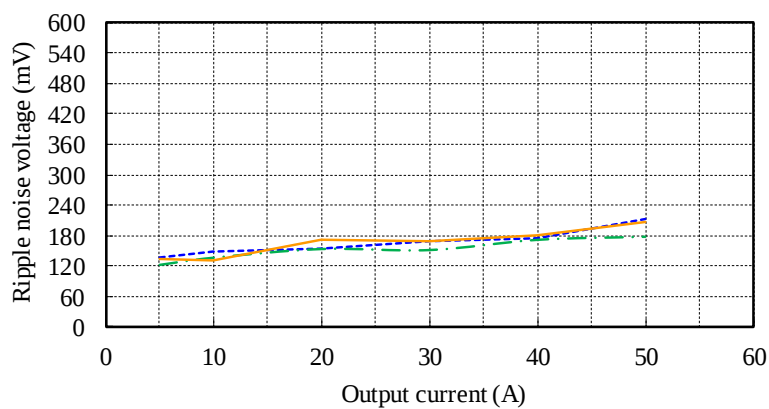
Ta	-20°C	+25°C	+50°C	Temperature stability	
Vout	60.085V	60.063V	59.987V	98mV	0.163%

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

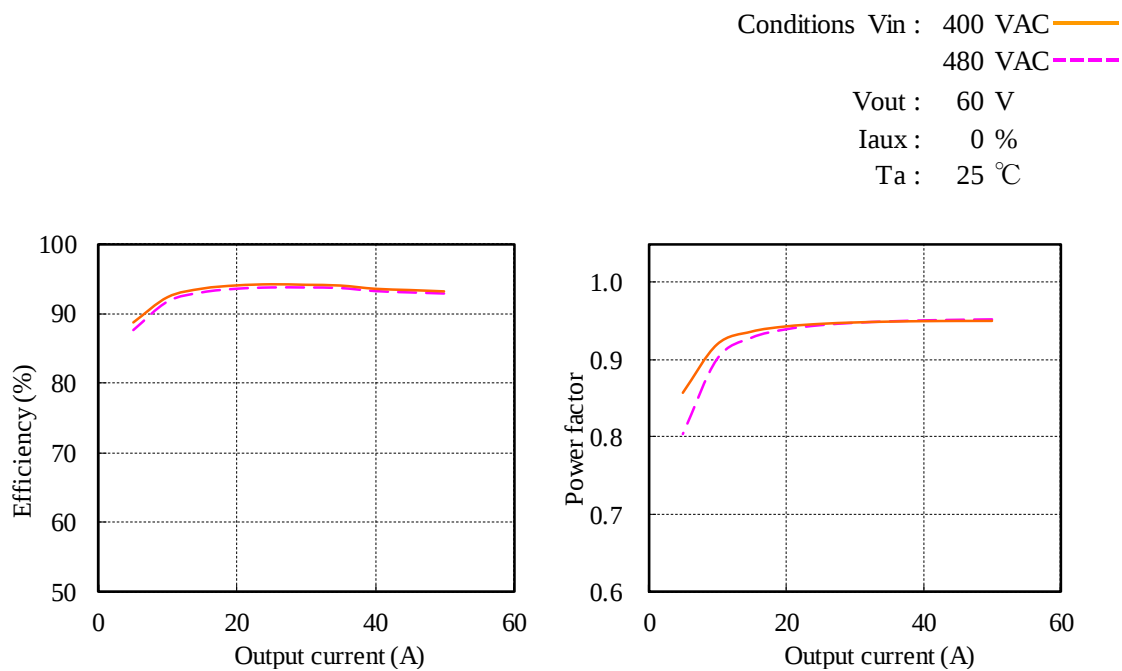
Conditions Vin : 400 VAC

Vout : 60 V

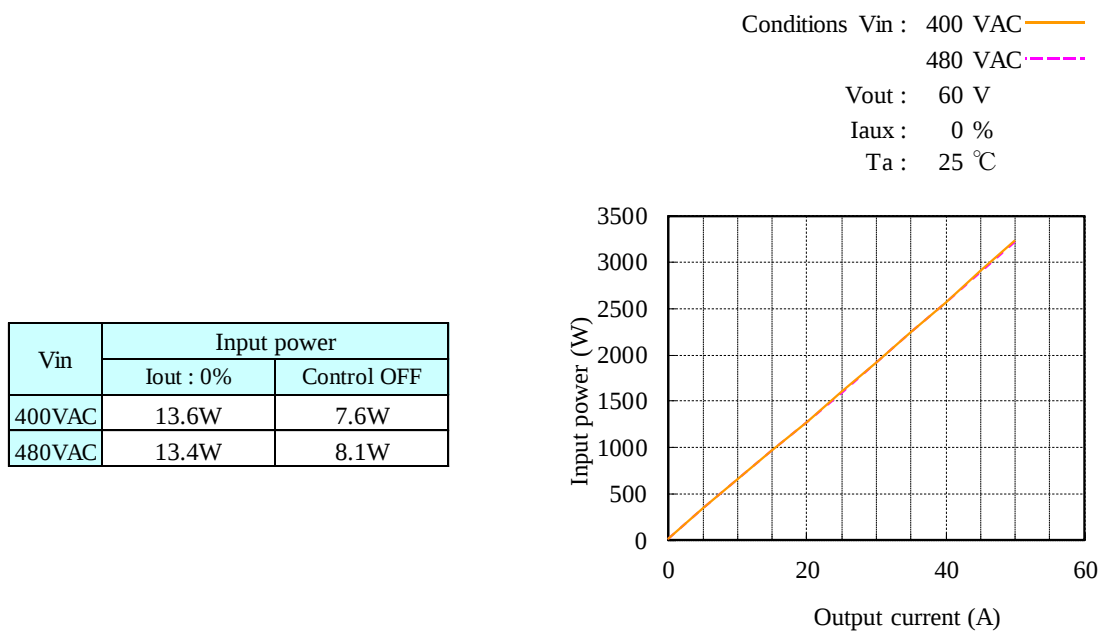
Ta : -20 °C ---
 25 °C ---
 50 °C ---



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



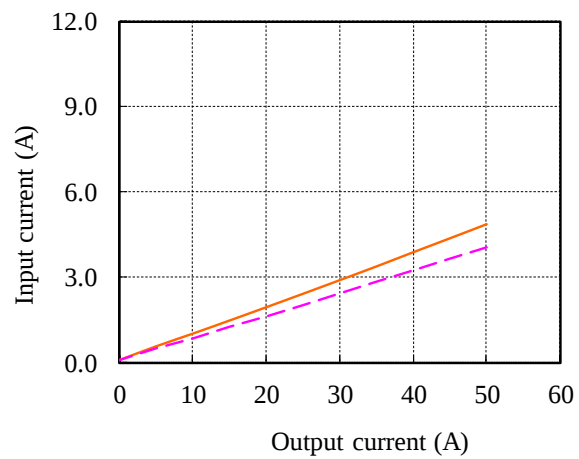
(4) 入力電力対出力電流 Input power vs. Output current



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

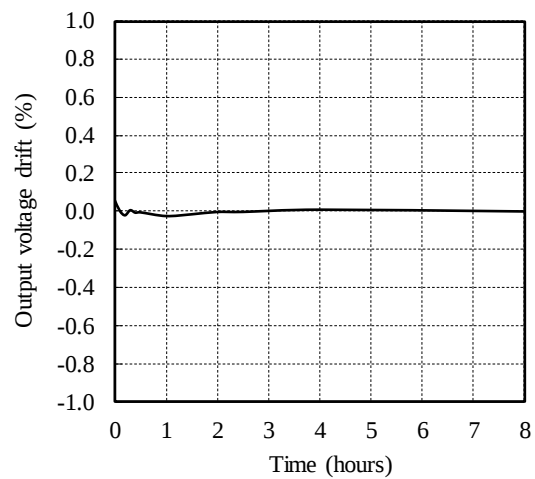
Conditions Vin : 400 VAC ———
 480 VAC - - - -
 Vout : 60 V
 Iaux : 0 %
 Ta : 25 °C

Vin	Input current	
	Iout : 0%	Control OFF
400VAC	0.09A	0.17A
480VAC	0.10A	0.19A



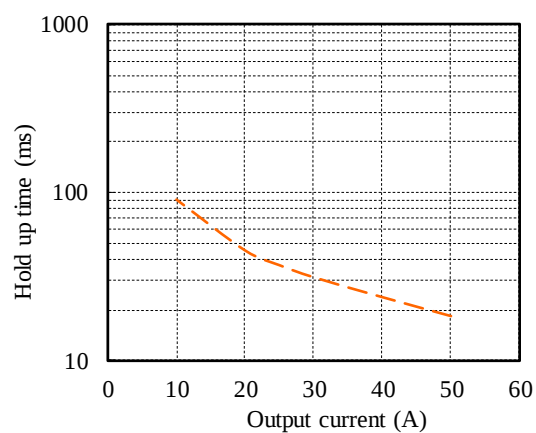
2.1.2 通電ドリフト特性 Warm up voltage drift characteristics

Conditions V_{in} : 400 VAC
 V_{out} : 60 V
 I_{out} : 50 A
 T_a : 25 °C



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

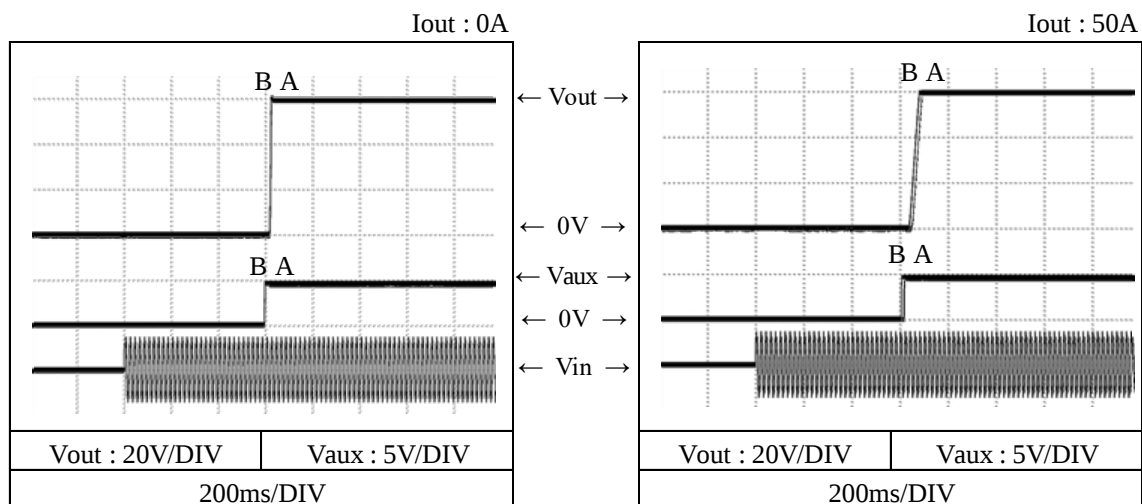
Conditions V_{in} : 400 VAC
 V_{out} : 60 V
 T_a : 25 °C



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

Conditions V_{in} : 400 VAC (A)

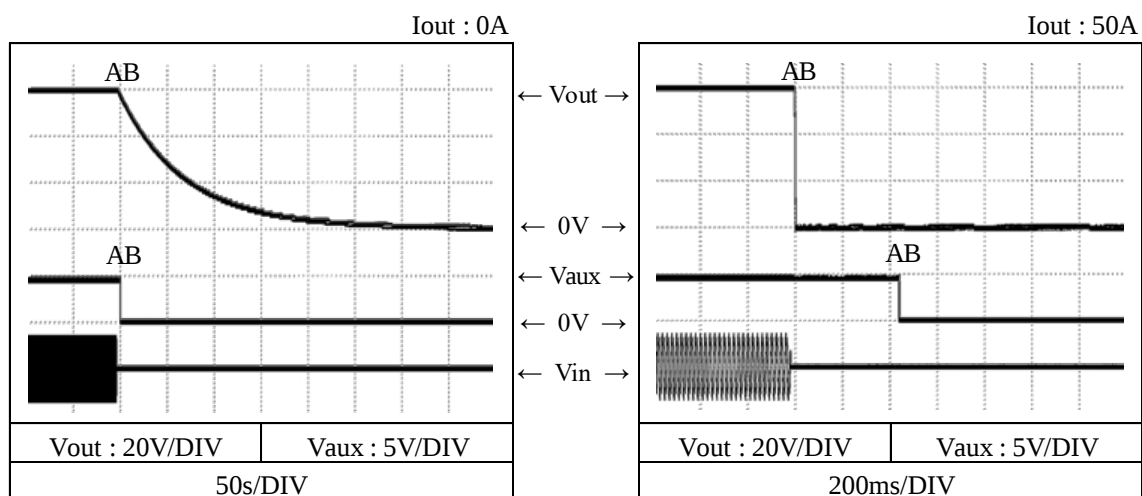
480 VAC (B)

 I_{aux} : 100 % T_a : 25 °C

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

Conditions V_{in} : 400 VAC (A)

480 VAC (B)

 I_{aux} : 100 % T_a : 25 °C

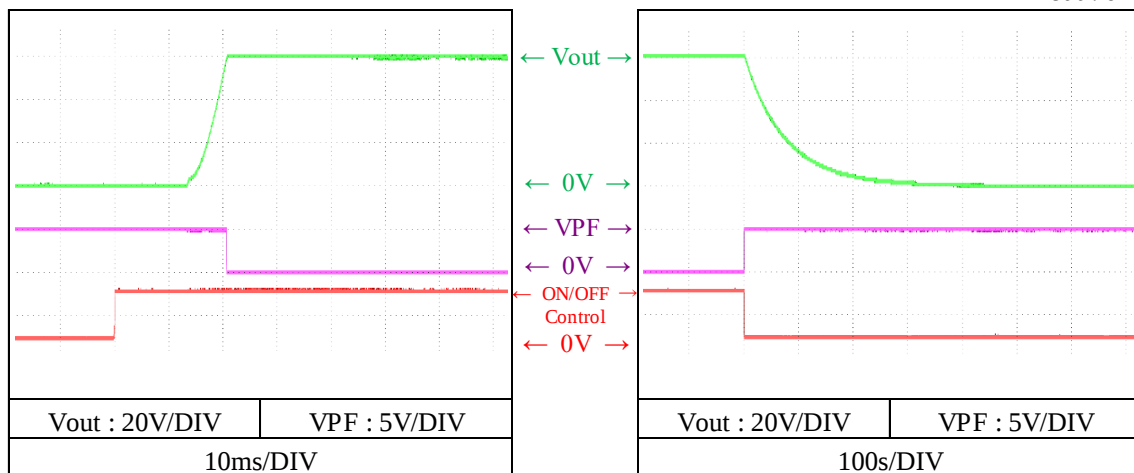
2.1.6 ON/OFF コントロール時出力立ち上がり、立下がり特性 Output rise, fall characteristics with ON/OFF Control

(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

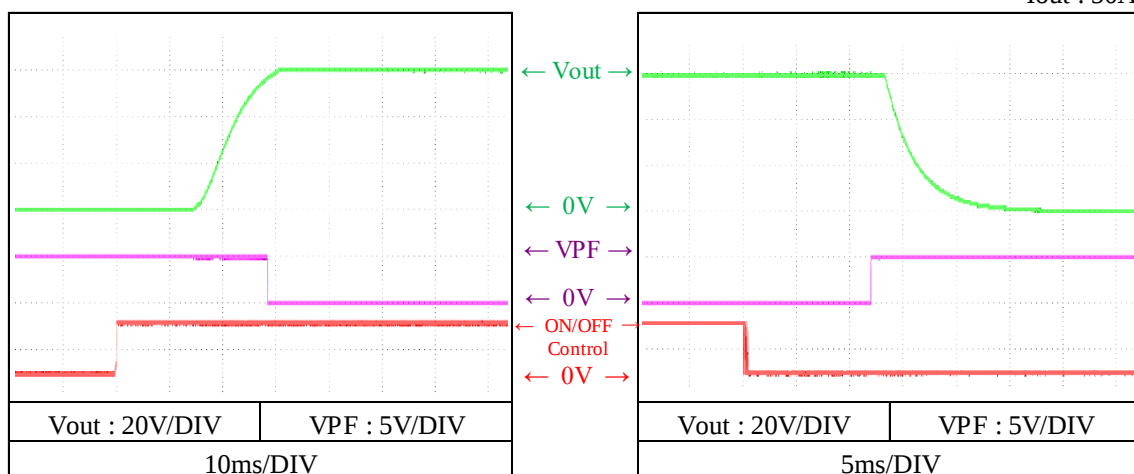
Conditions V_{in} : 400 VAC

T_a : 25 °C

I_{out} : 0A



I_{out} : 50A

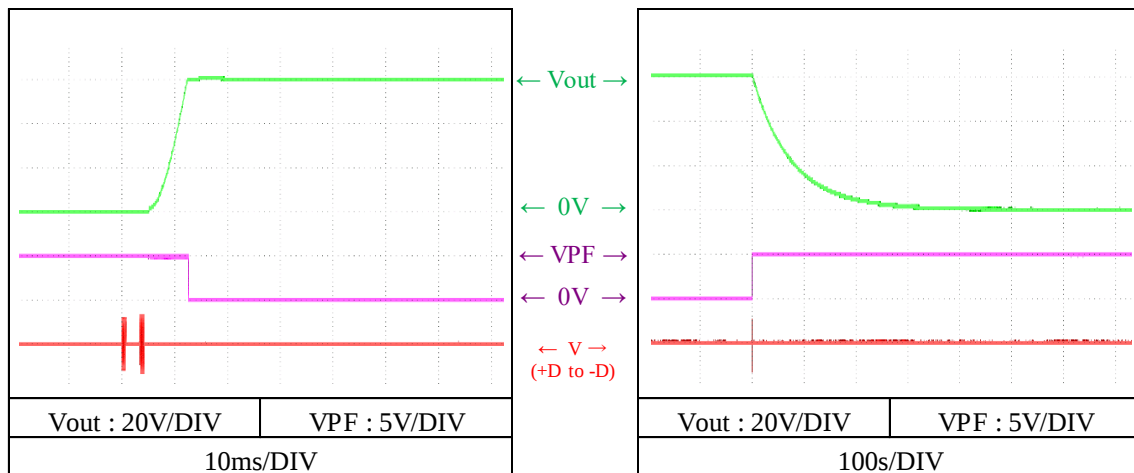


(b) RS-485 通信による ON/OFF ON/OFF control by RS-485

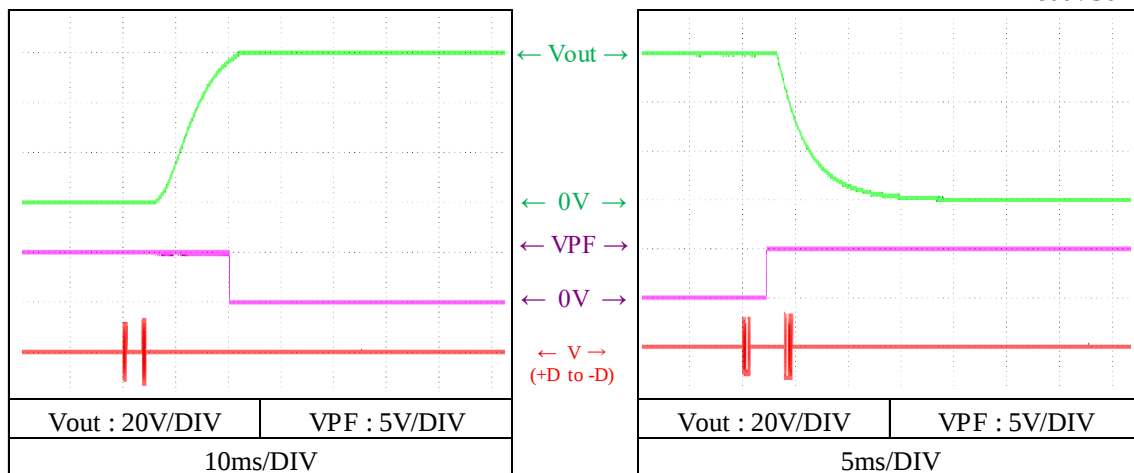
Conditions V_{in} : 400 VAC

T_a : 25 °C

I_{out} : 0A

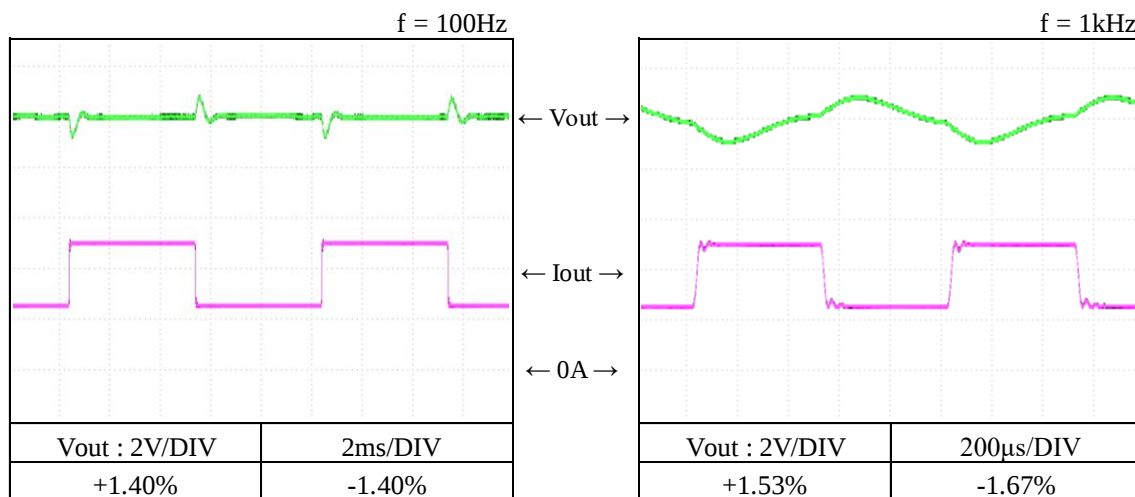


I_{out} : 50A



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

Conditions V_{in} : 400 VAC
 I_{out} : 25.0A $\longleftrightarrow$ 50A
 (tr = tf = 50 μ s)
 T_a : 25 °C

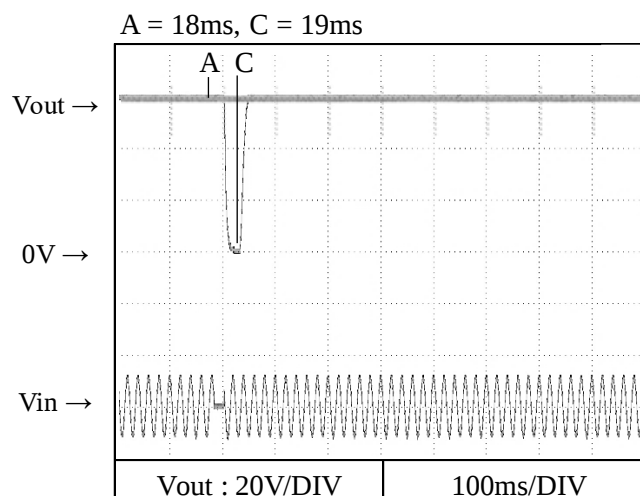


2.1.8 入力電圧瞬停特性 Response to brown out characteristics

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 V_{in} : 400 VAC
 I_{out} : 50 A
 T_a : 25 °C



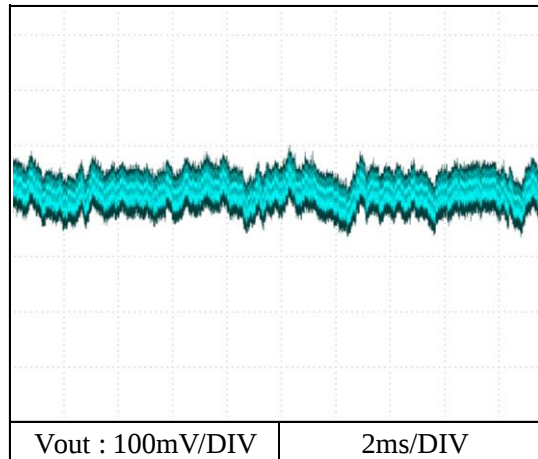
2.1.9 出力リップル、ノイズ波形 Output ripple and noise waveform

Conditions V_{in} : 400 VAC

V_{out} : 60 V

I_{out} : 50 A

T_a : 25 °C



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	360VAC	400VAC	480VAC	528VAC	Line regulation	
6V	50.097A	50.115A	50.097A	50.091A	24mA	0.048%
30V	50.108A	50.098A	50.103A	50.102A	10mA	0.020%
60V	50.076A	50.078A	50.082A	50.076A	6mA	0.012%
Load regulation	32mA	37mA	21mA	26mA		
	0.064%	0.074%	0.042%	0.052%		

2. Temperature drift

Conditions Vin : 400 VAC

Vout : 60 V

Ta	-20°C	+25°C	+50°C	Temperature stability	
Iout	50.039A	50.078A	50.106A	67mA	0.134%

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

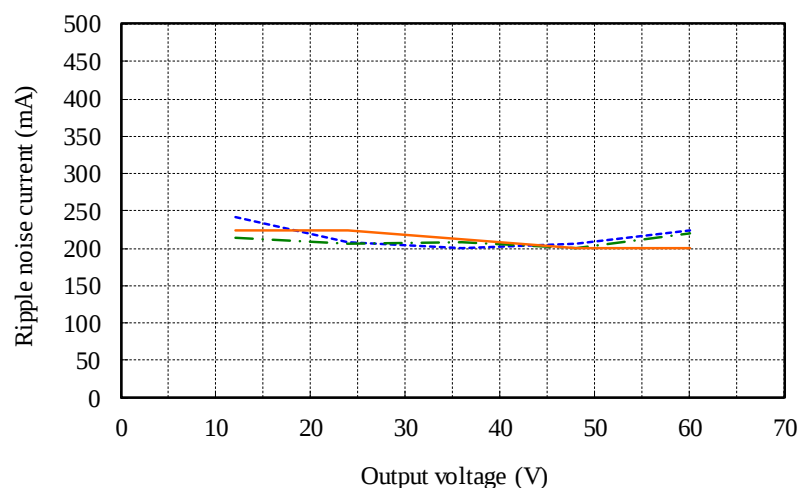
Conditions Vin : 400 VAC

Iout : 50 A

Ta : -20 °C

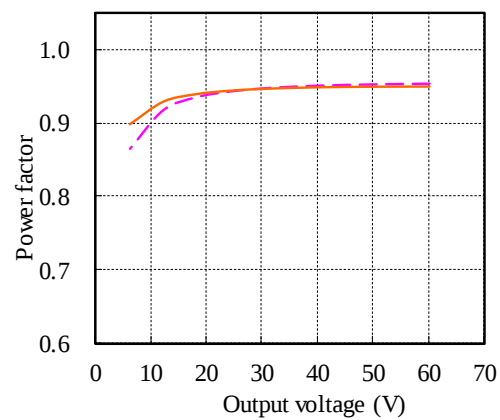
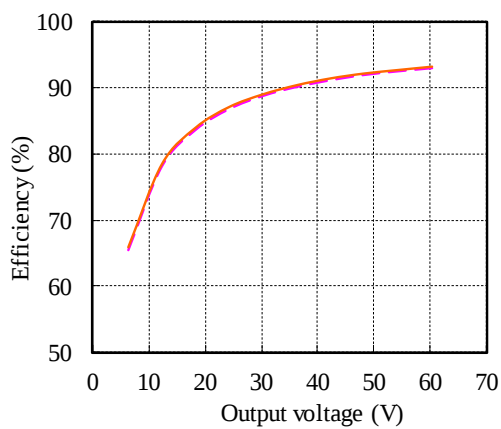
25 °C

50 °C



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

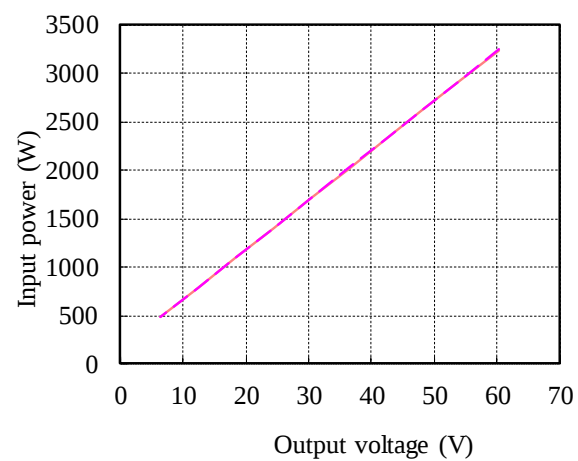
Conditions Vin : 400 VAC ———
 480 VAC ·····
 Iout : 50 A
 Iaux : 0 %
 Ta : 25 °C



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

Conditions Vin : 400 VAC ———
 480 VAC ·····
 Iout : 50 A
 Iaux : 0 %
 Ta : 25 °C

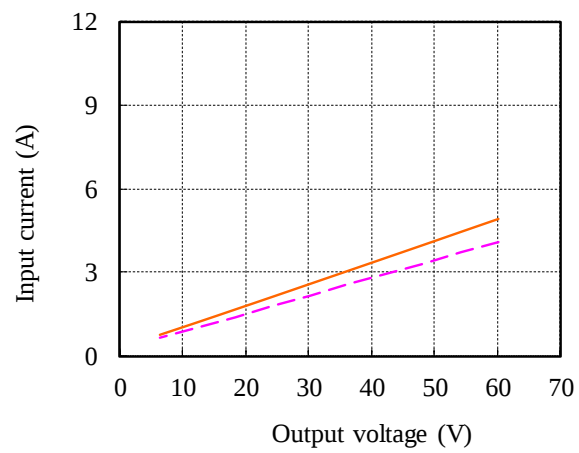
Vin	Input power
	Control OFF
400VAC	7.6W
480VAC	8.1W



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

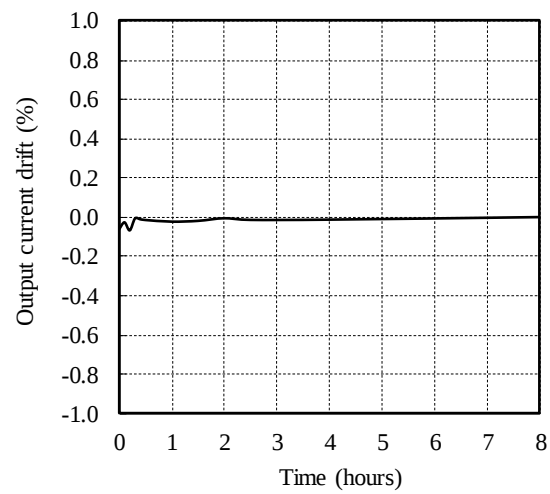
Conditions Vin : 400 VAC ———
480 VAC - - - - -
Iout : 50 A
Iaux : 0 %
Ta : 25 °C

Vin	Input current
	Control OFF
400VAC	0.17A
480VAC	0.19A



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

Conditions V_{in} : 400 VAC
 V_{out} : 60 V
 I_{out} : 50 A
 T_a : 25 °C



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

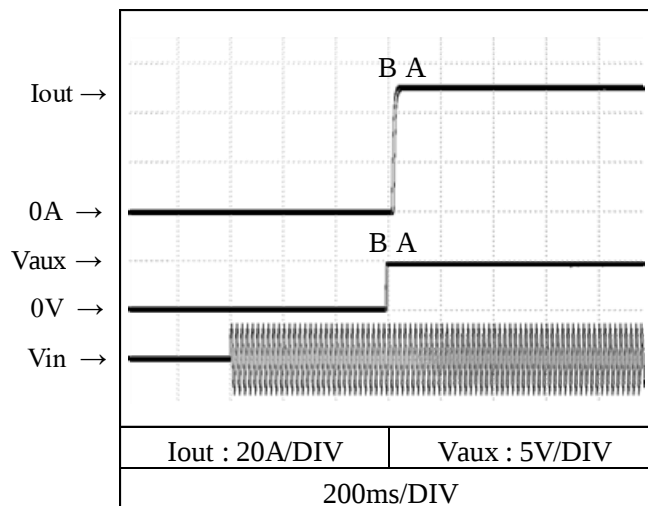
Conditions V_{in} : 400 VAC (A)

480 VAC (B)

V_{out} : 60 V

I_{aux} : 100 %

T_a : 25 °C



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

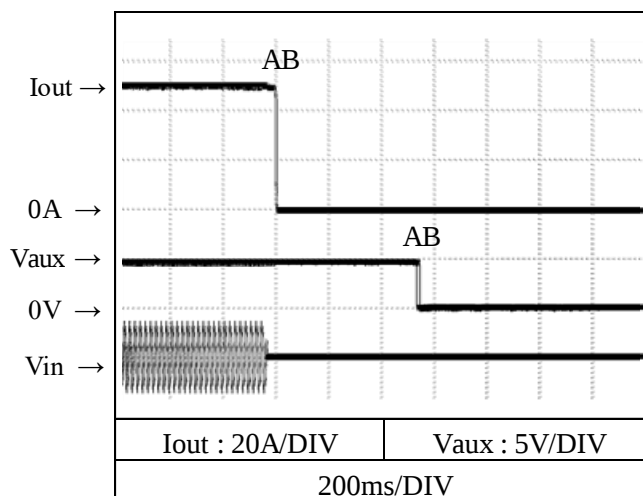
Conditions V_{in} : 400 VAC (A)

480 VAC (B)

V_{out} : 60 V

I_{aux} : 100 %

T_a : 25 °C



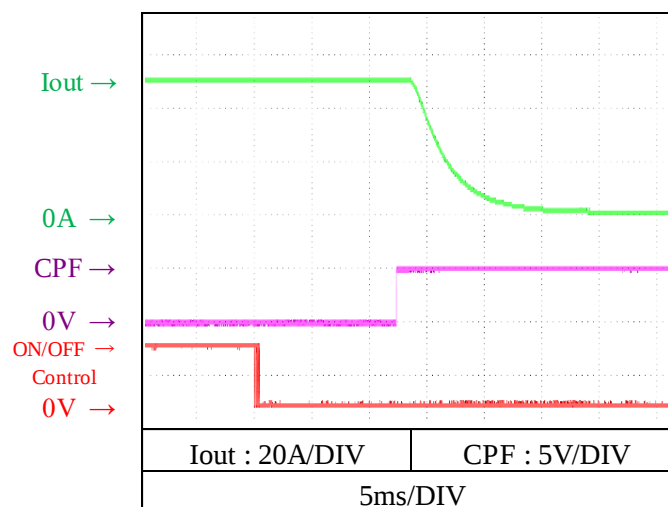
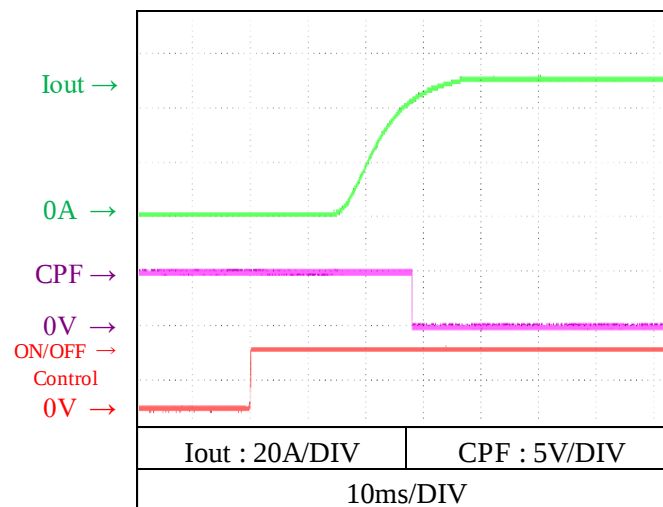
2.2.5 ON/OFF コントロール時出力立ち上がり、立下がり特性 Output rise, fall characteristics with ON/OFF Control

(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 V_{in} : 400 VAC

V_{out} : 60 V

T_a : 25 °C

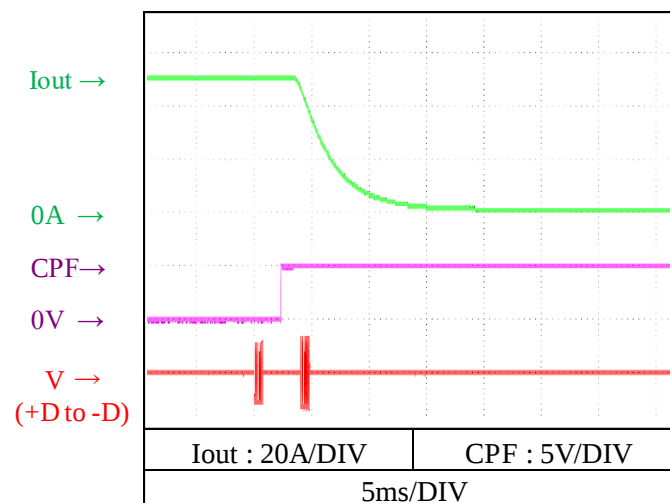
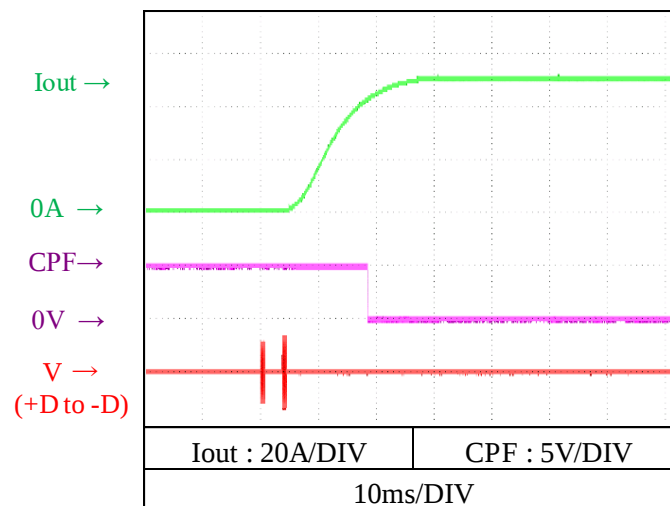


(b) RS-485 通信による ON/OFF ON/OFF control by RS-485

Conditions Vin : 400 VAC

Vout : 60 V

Ta : 25 °C



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.

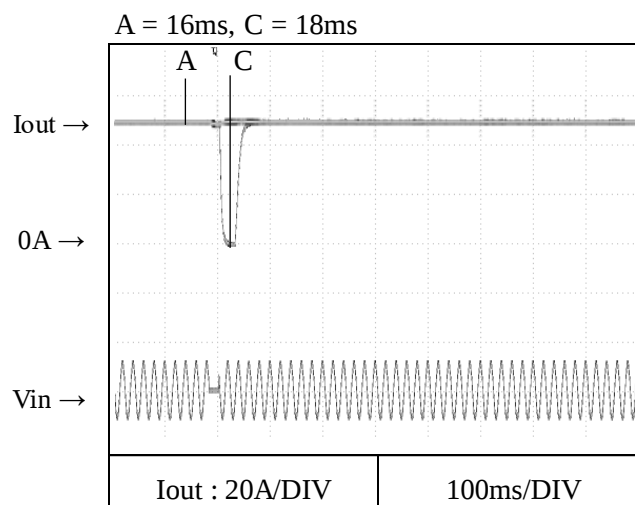
B : 出力電流の低下が0Aまでいかない Output current drop down not reaching 0A.

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

Conditions V_{in} : 400 VAC

V_{out} : 60 V

T_a : 25 °C



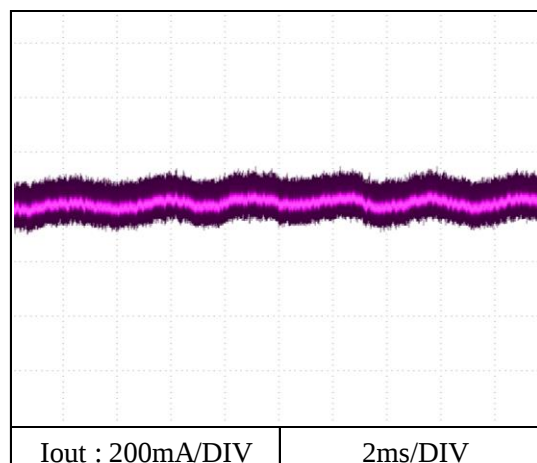
2.2.7 出力リップル、ノイズ波形 Output ripple and noise waveform

Conditions V_{in} : 400 VAC

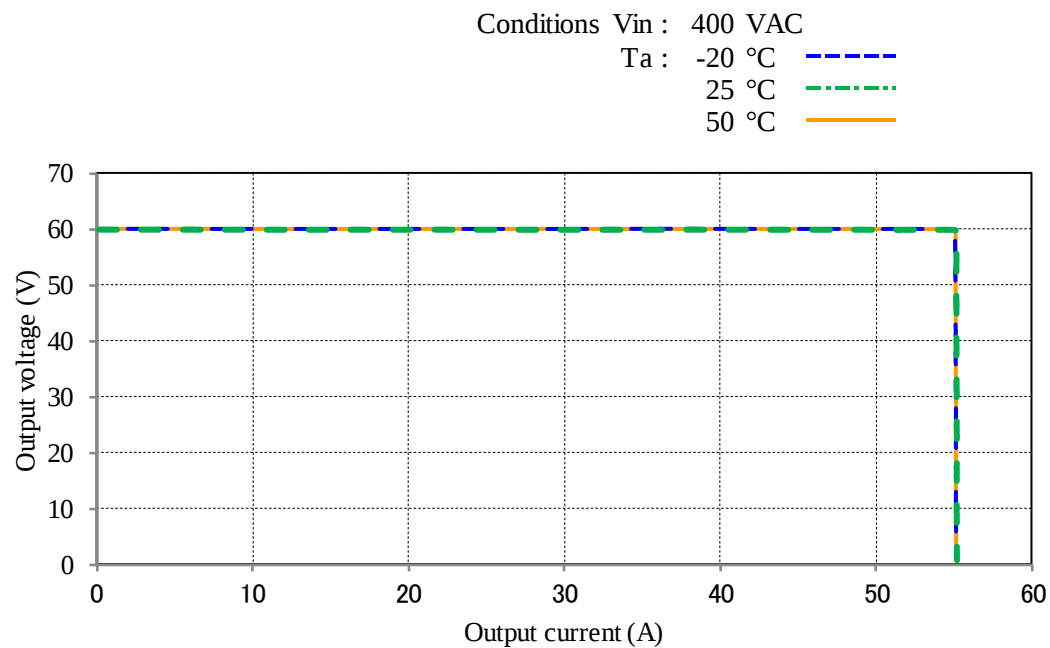
V_{out} : 60 V

I_{out} : 50.0 A

T_a : 25 °C

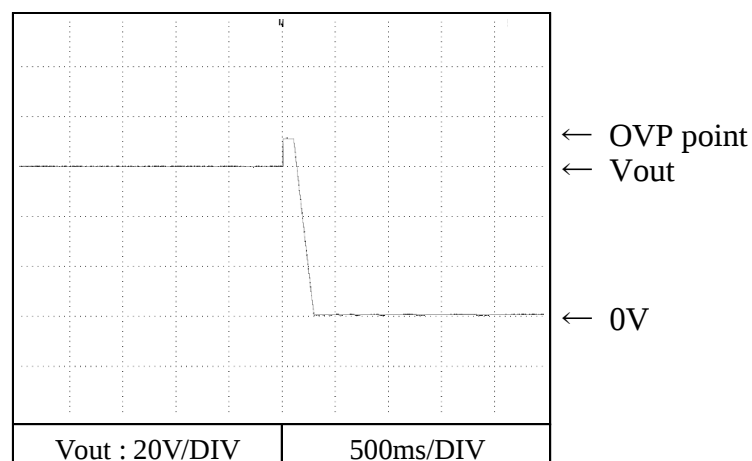


2.3 過電流保護特性 Over current protection (OCP) characteristics



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

Conditions V_{in} : 400 VAC
 I_{out} : 0.1 A
 T_a : 25 °C



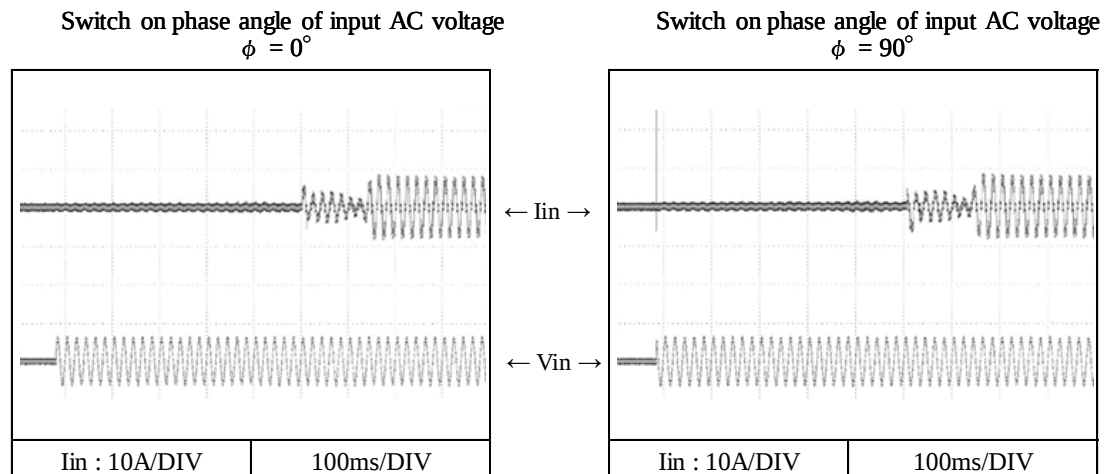
2.5 入力サージ電流(突入電流)波形 Inrush current waveform

Conditions V_{in} : 400 VAC

V_{out} : Nominal output voltage

I_{out} : Maximum output current

T_a : 25 °C



2.6 入力電流波形 Input current waveform

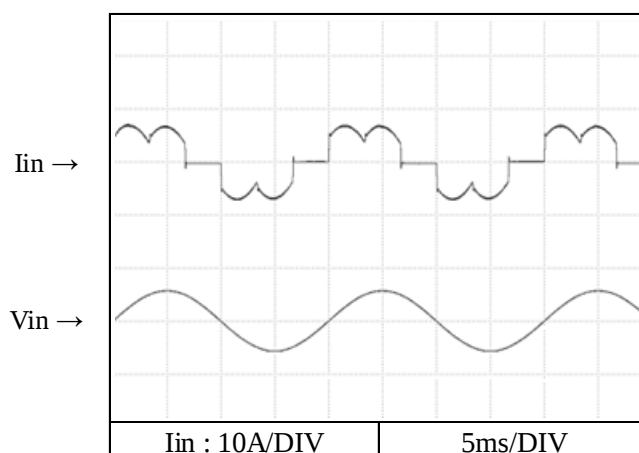
Conditions

V_{in} : 400 VAC

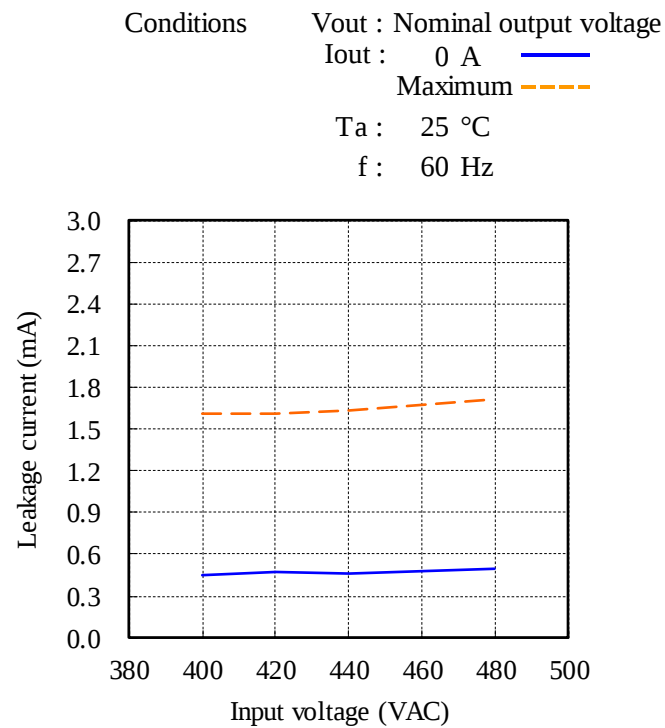
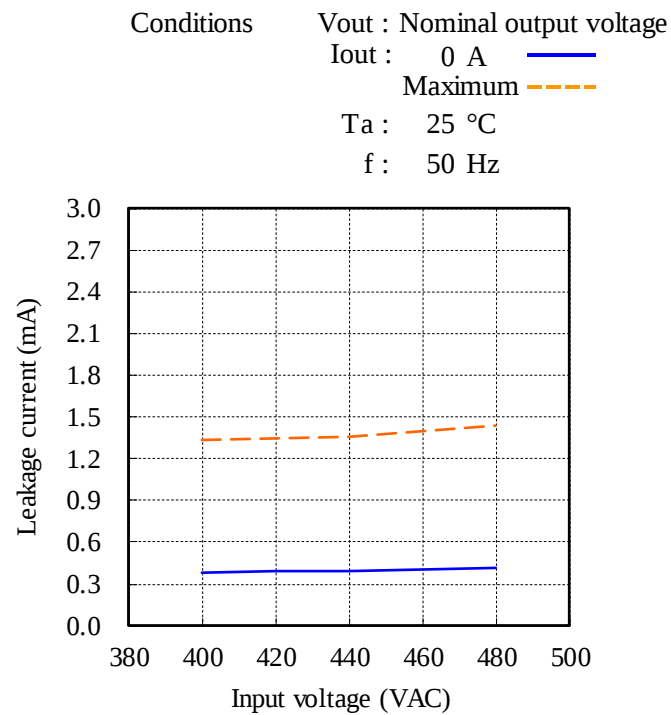
V_{out} : Nominal output voltage

I_{out} : Maximum output current

T_a : 25 °C



2.7 リーク電流特性 Leakage current characteristics



2.8 EMI 特性 Electro-Magnetic Interference characteristics

雑音端子電圧

Conducted Emission

Conditions Vin : 400 VAC

Vout : 60 V

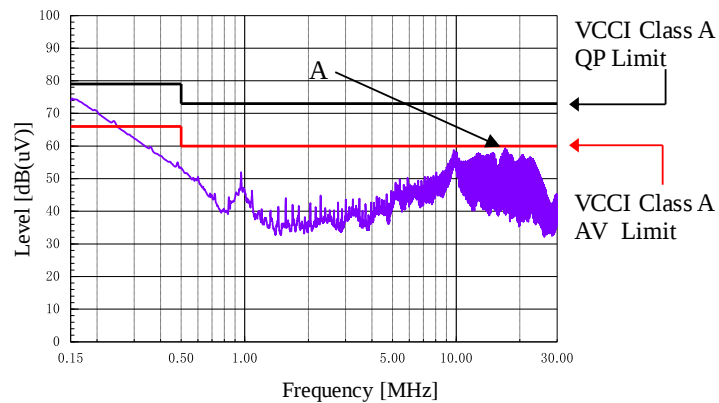
Iout : 50 A

Iaux : 100 %

Ta : 25 °C

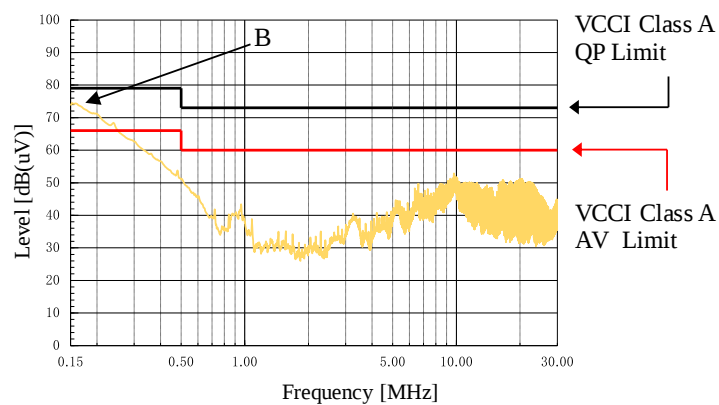
Phase : L1

Point A (17MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	73.0	57.2
AV	60.0	55.7



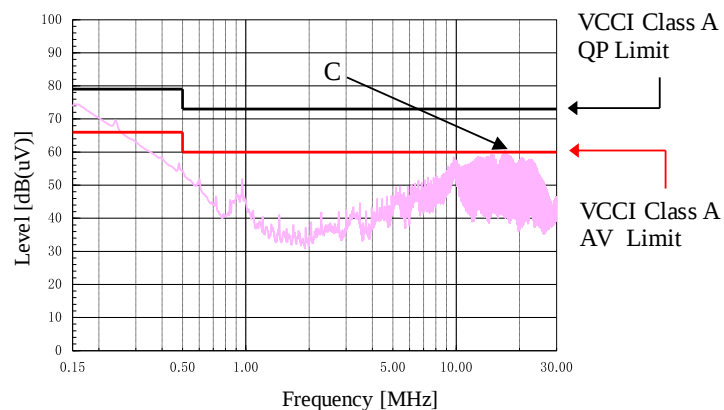
Phase : L2

Point B (0.17MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	79.0	69.2
AV	66.0	58.0



Phase : L3

Point C (17MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	73.0	58.3
AV	60.0	56.6



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.

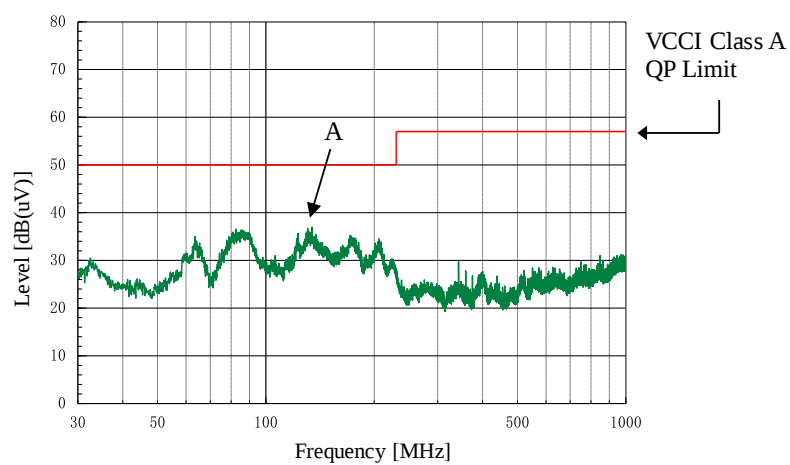
2-8. EMI特性 Electro-Magnetic Interference characteristics

雑音電界強度
Radiated Emission

Conditions Vin : 400 VAC
Vout : 60 V
Iout : 50 A
Iaux : 100 %
Ta : 25 °C

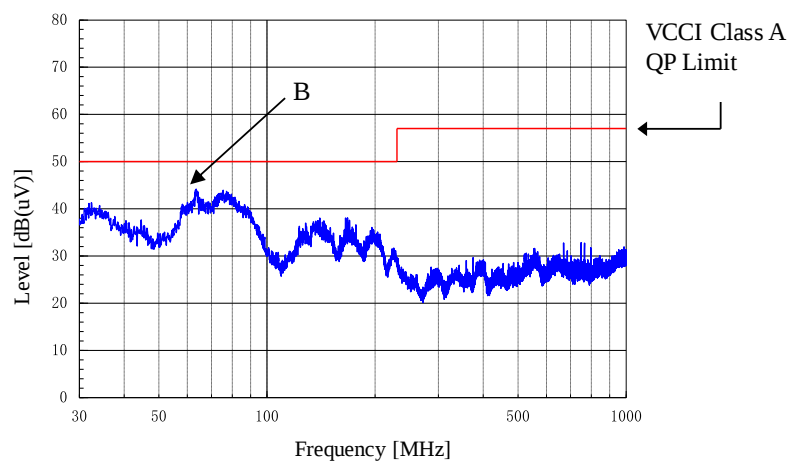
HORIZONTAL

Point A (135MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	50.0	32.0



VERTICAL

Point B (63MHz)		
Ref. Data	Limit (dB)	Measure (dB)
QP	50.0	42.9



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.