

# **PFE500F**

# **EVALUATION DATA**

# 型式データ

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## 使用記号 Terminology used

	定義	Definition	
V <sub>in</sub>	.....	入力電圧	Input voltage
V <sub>o</sub>	.....	出力電圧	Output voltage
V <sub>onoff</sub>	.....	+ON/OFF電圧	+ON/OFF voltage
I <sub>in</sub>	.....	入力電流	Input current
I <sub>o</sub>	.....	出力電流	Output current
T <sub>bp</sub>	.....	ベースプレート温度	Base plate temperature
T <sub>a</sub>	.....	周囲温度	Ambient temperature
f	.....	周波数	Frequency

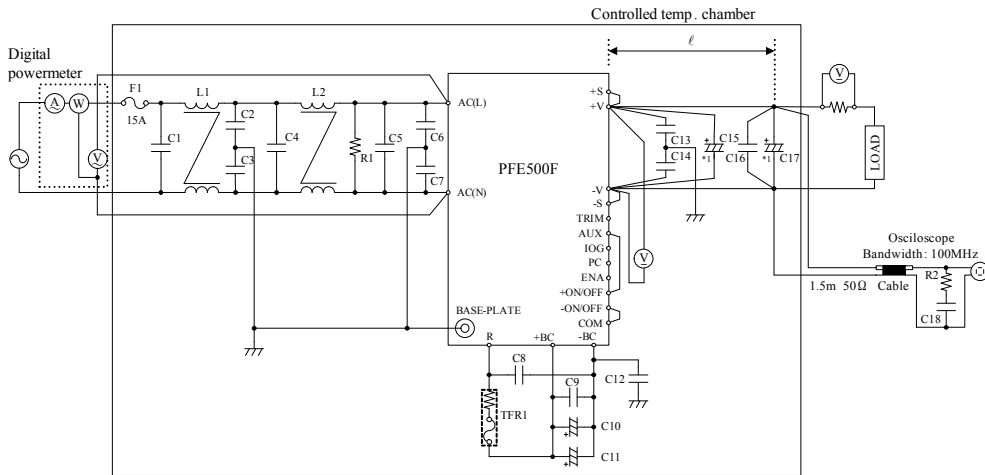
※ 当社測定条件における結果であり、参考値としてお考え願います。  
Test results are reference data based on our measurement condition.

1. 測定方法 Evaluation Method

1-1. 測定回路 Measurement Circuits

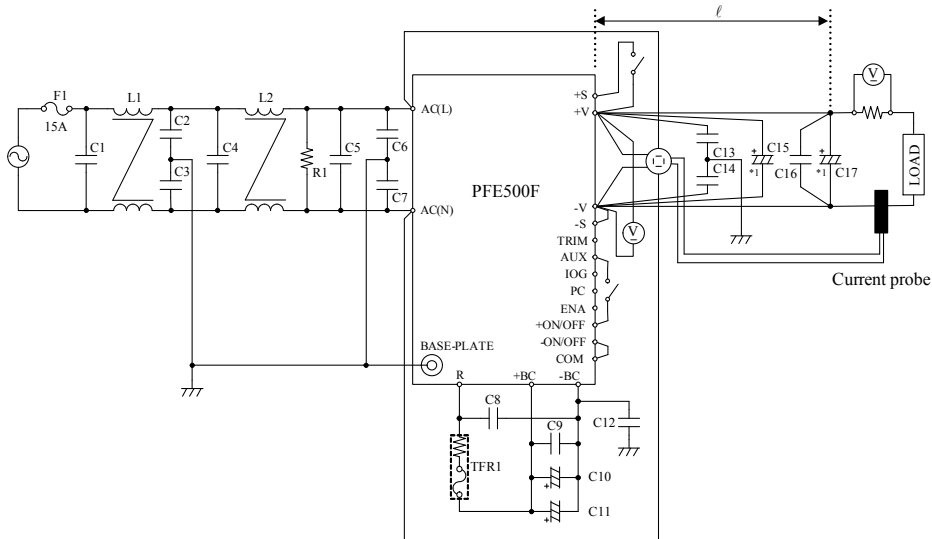
(1) 静特性、出力リップル、ノイズ波形

Steady state characteristics and output ripple noise waveform

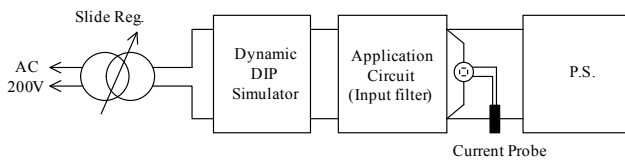


(2) 過渡応答、過電圧保護機能、その他

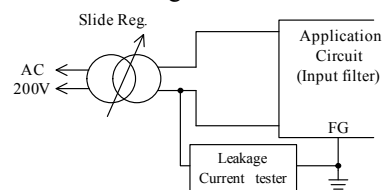
Dynamic characteristics, over voltage protection and other characteristics



Inrush current characteristics



Leakage current characteristics



- C1, C4, C5: 1uF Film Capacitor
- C2, C3, C6, C7, C12: 2200pF Ceramic Capacitor
- C8, C9: 1uF Film Capacitor
- C10, C11: 390uF Electrolytic Capacitor
- C13, C14: 0.033uF Film Capacitor
- C16: 2.2uF Ceramic Capacitor
- C18: 4700pF Ceramic Capacitor

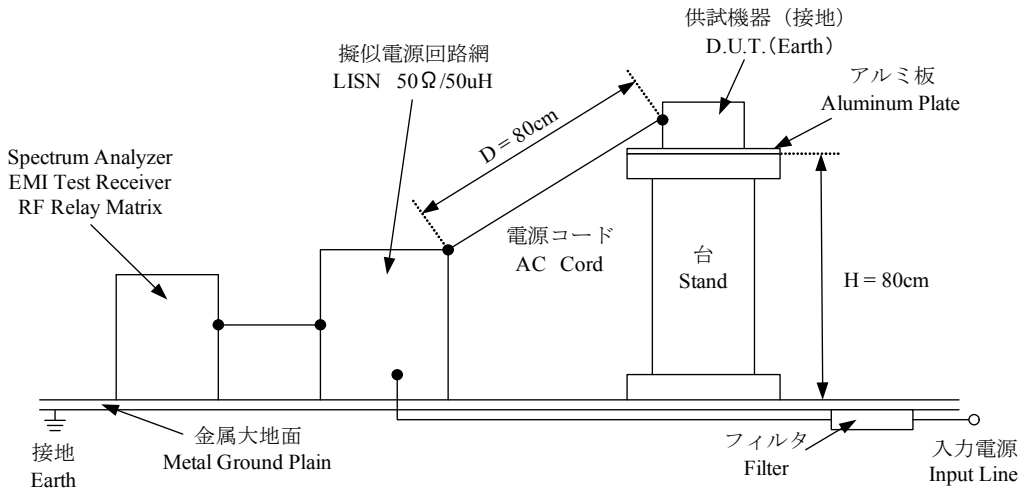
- C15, C17: 12V-1000uF Electrolytic Capacitor  
28V- 470uF Electrolytic Capacitor  
48V- 220uF Electrolytic Capacitor
- R1: 0.5W 470kΩ
- R2: 50Ω
- L1, L2: 6mH
- ℓ : 50mm
- TFR1: 10Ω more 139°C

==== Note =====

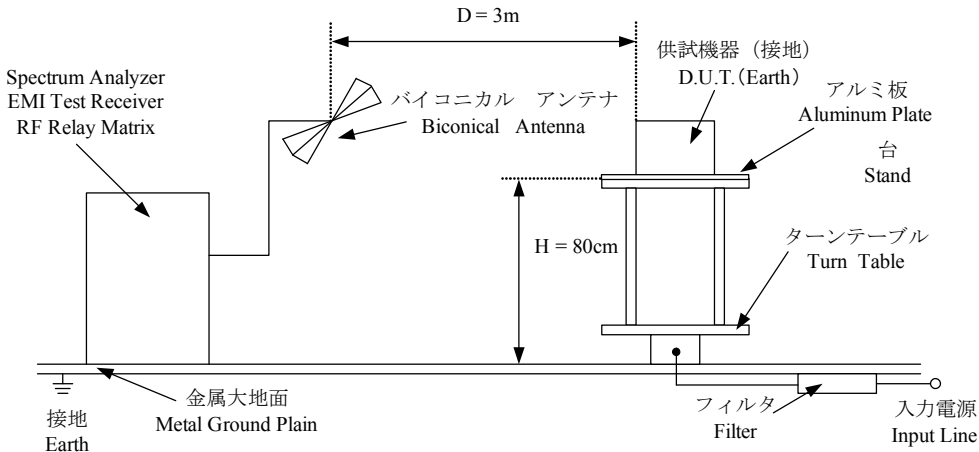
\*1. If the ambient temperature is less than -20°C, use twice of the recommended capacitor above.

(3) EMI特性 Electro-Magnetic Interference characteristics

(a) 雑音端子電圧(帰還ノイズ) Conducted Emission Noise

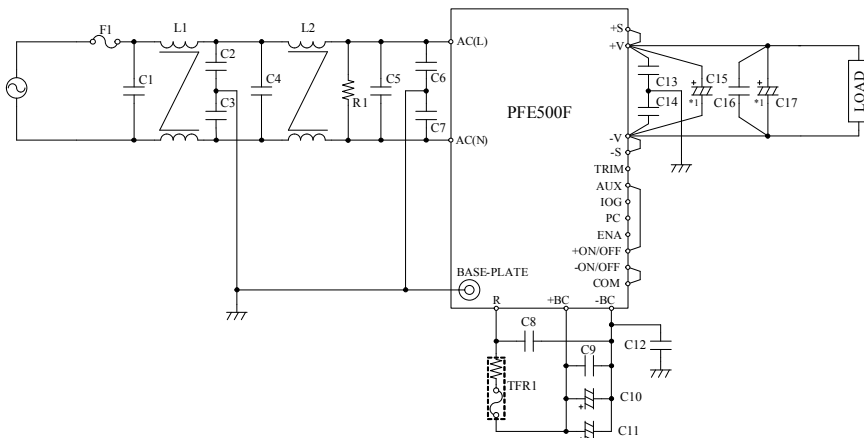


(b) 雑音電界強度(輻射ノイズ) Radiated Emission Noise



\* Shielded cable used to input and output cable.

VCCI class A 対応アプリケーションシステム VCCI class A application system



- |                      |                              |           |                                   |
|----------------------|------------------------------|-----------|-----------------------------------|
| C1, C4, C5:          | 1uF Film Capacitor           | C15, C17: | 12V-1000uF Electrolytic Capacitor |
| C2, C3, C6, C7, C12: | 2200pF Ceramic Capacitor     |           | 28V- 470uF Electrolytic Capacitor |
| C8, C9:              | 1uF Film Capacitor           |           | 48V- 220uF Electrolytic Capacitor |
| C10, C11:            | 390uF Electrolytic Capacitor | R1:       | 0.5W 470kΩ                        |
| C13, C14:            | 0.033uF Film Capacitor       | L1, L2:   | 6mH                               |
| C16:                 | 2.2uF Ceramic Capacitor      | TFR1:     | 10Ω more 139°C                    |

## 1-2. 使用測定機器 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL PHOSPHOR OSCILLOSCOPE	TEKTRONIX	TDS3012
2	DIGITAL STORAGE OSCILLOSCOPE	IWATSU-LECROY	LT364L
3	DIGITAL POWER METER	YOKOGAWA ELECT.	WT110
4	DATA ACQUISITION / SWITCH UNIT	AGILENT	34970A
5	CURRENT PROBE AMPLIFIER	TEKTRONIX	TM502A
6	CURRENT PROBE	TEKTRONIX	A6303
7	SHUNT RESISTER	YOKOGAWA ELECT.	2215
8	CONTROLLED TEMP. CHAMBER	ESPEC CORP.	SU-261
9	SPECTRUM ANALYZER	ROHDE & SCHWARZ	FSA
10	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESHS10
11	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESVS10
12	RF RELAY MATRIX	ROHDE & SCHWARZ	PSU
13	AMN	KYORITU DENSHI	KNW-242
14	ANTENNA(BICONICAL ANTENNA)	SCHWARZBECK	BBA9106
15	DYNAMIC DUMMY LOAD	TAKASAGO	FK-1000L
16	AC POWER SUPPLY	TAKASAGO	AA-2000XG

2. 特性データ Characteristics

2-1. 静特性 Steady state characteristics

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

12V

1. Regulation - line and load

condition Tbp : 25°C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	11.996V	11.996V	11.996V	11.996V	0mV	0.000%
50%	11.994V	11.994V	11.994V	11.994V	0mV	0.000%
100%	11.992V	11.992V	11.992V	11.992V	0mV	0.000%
load regulation	4mV	4mV	4mV	4mV		
	0.033%	0.033%	0.033%	0.033%		

2. Temperature drift

conditions Vin : 100VAC

Iout : 100%

Ta	-40°C	25°C	85°C	temperature stability	
Vout	11.919V	11.992V	12.085V	166mV	1.382%

28V

1. Regulation - line and load

condition Tbp : 25°C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	28.044V	28.043V	28.044V	28.045V	2mV	0.007%
50%	28.044V	28.042V	28.043V	28.044V	2mV	0.007%
100%	28.045V	28.042V	28.042V	28.043V	3mV	0.011%
load regulation	1mV	1mV	2mV	2mV		
	0.004%	0.004%	0.007%	0.007%		

2. Temperature drift

conditions Vin : 100VAC

Iout : 100%

Ta	-40°C	25°C	85°C	temperature stability	
Vout	27.866V	28.042V	28.099V	233mV	0.832%

48V

1. Regulation - line and load

condition Tbp : 25°C

Iout \ Vin	85VAC	100VAC	200VAC	265VAC	line regulation	
0%	47.996V	47.997V	47.997V	47.995V	2mV	0.004%
50%	47.996V	47.997V	47.996V	47.995V	2mV	0.004%
100%	47.997V	47.998V	47.997V	47.996V	2mV	0.004%
load regulation	1mV	1mV	1mV	1mV		
	0.002%	0.002%	0.002%	0.002%		

2. Temperature drift

conditions Vin : 100VAC

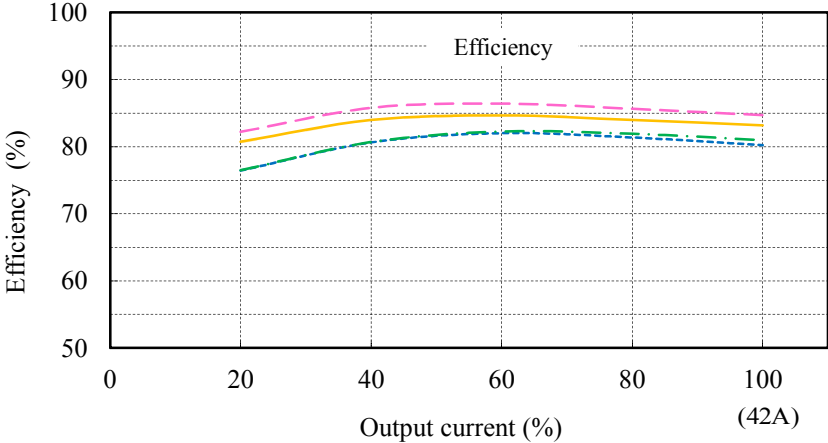
Iout : 100%

Ta	-40°C	25°C	85°C	temperature stability	
Vout	47.580V	47.998V	48.102V	522mV	1.087%

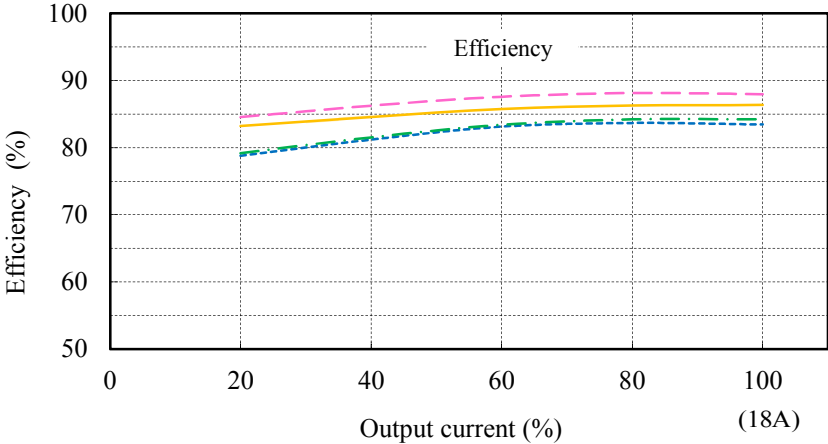
(2) 効率対出力電流 Efficiency vs. Output current

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

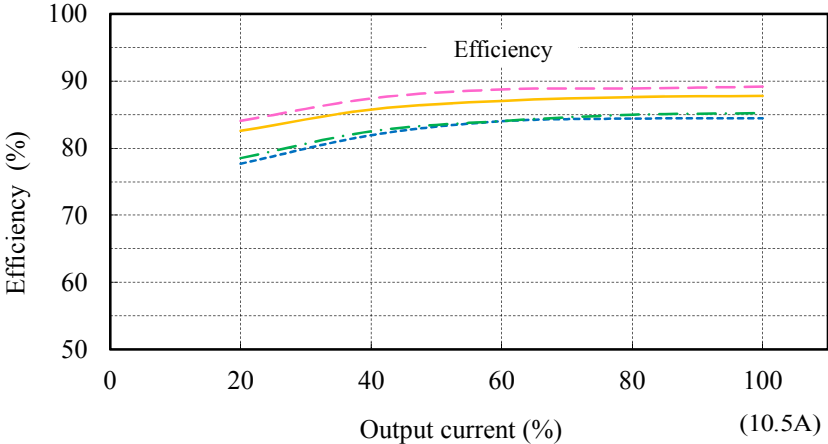
12V



28V



48V

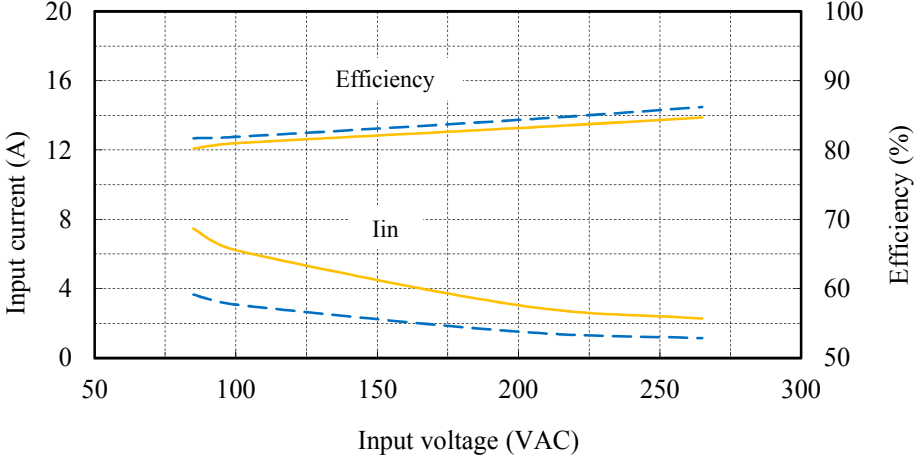




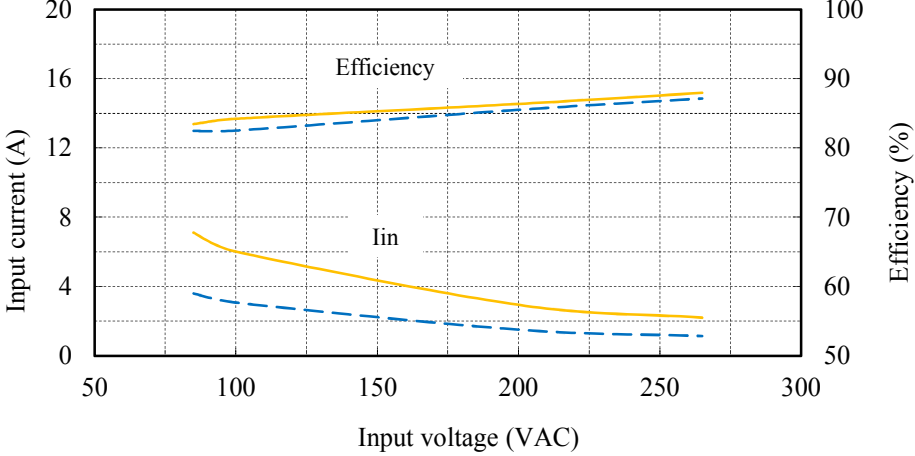
(3) 入力電流・効率 対 入力電圧 Input current and Efficiency vs. Input voltage

Conditions Io : 50%  
          : 100%  
Tbp : 25 °C

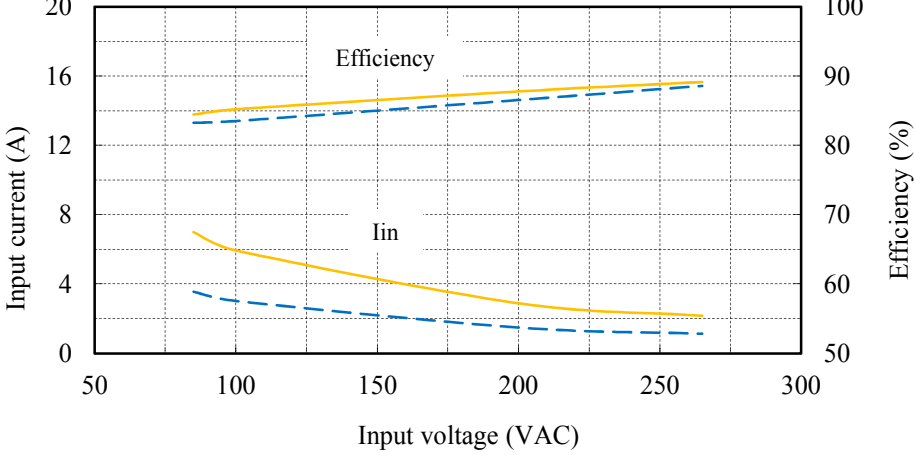
12V



28V



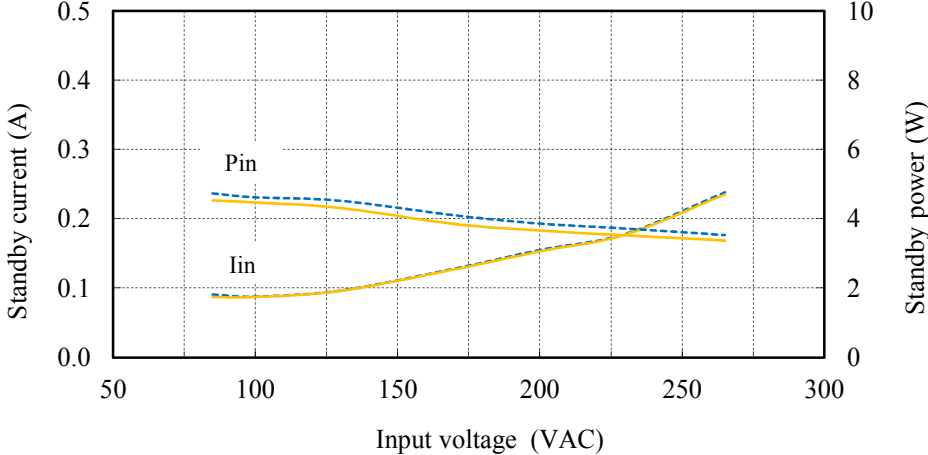
48V



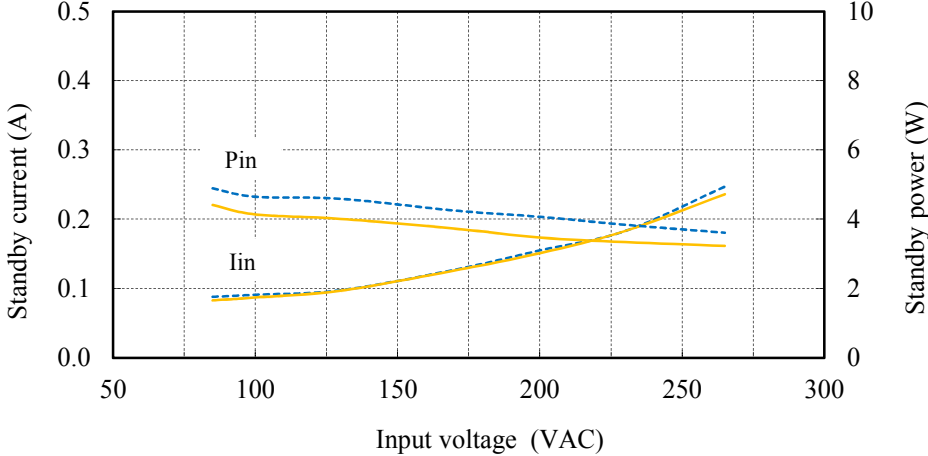
(4) 待機電流・電力特性 Standby current and power characteristics

Conditions No load -----  
Control OFF -----  
Tbp : 25 °C

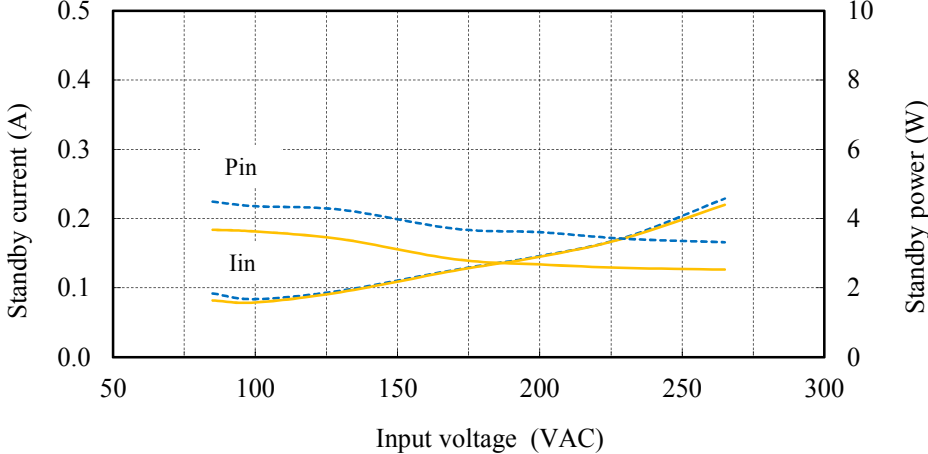
12V



28V



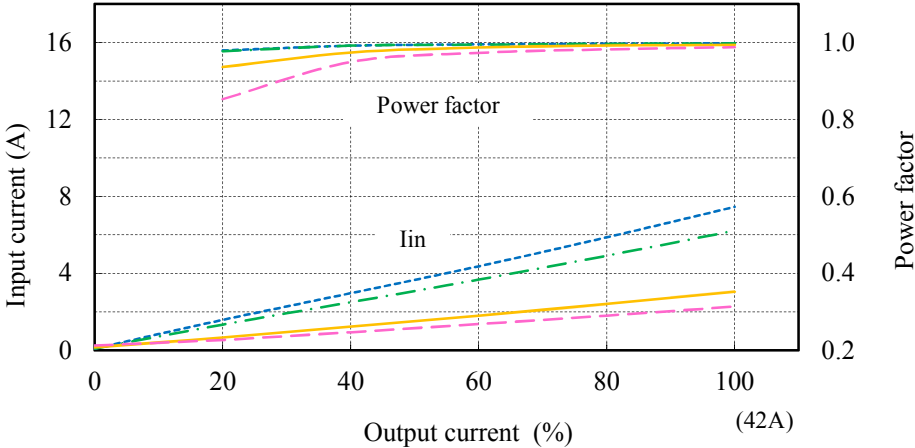
48V



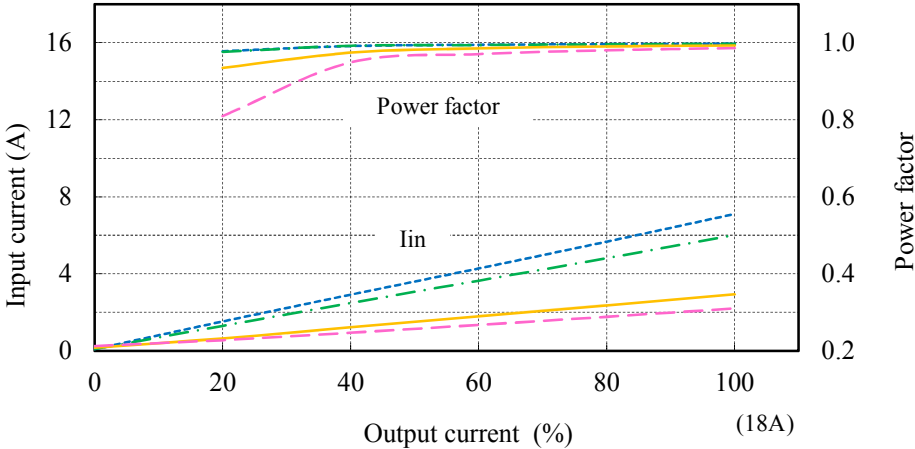
(5) 入力電流・力率 対 出力電流 Input current and Power factor vs. Output current

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

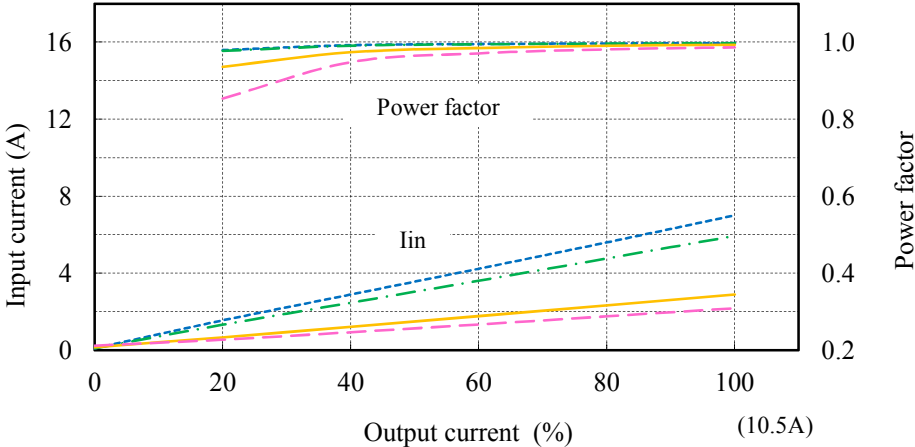
12V



28V



48V

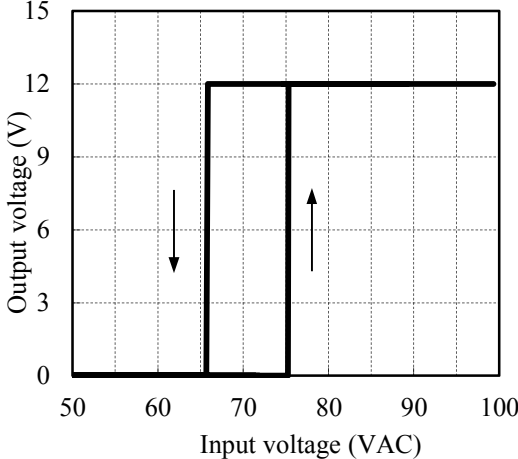
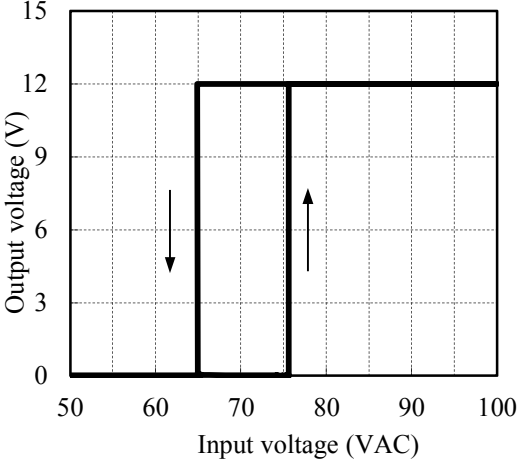


(6) 起動・停止電圧特性 Start and Stop voltage characteristics

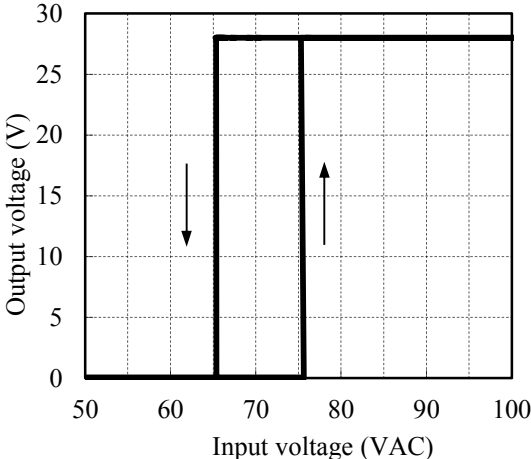
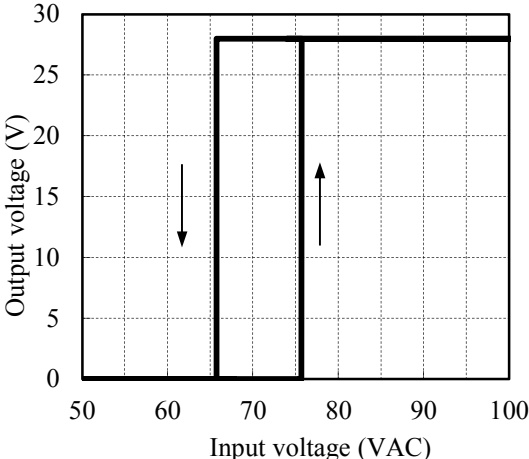
Conditions  $I_o$  : 0%  
 $T_{bp}$  : 25 °C

Conditions  $I_o$  : 100%  
 $T_{bp}$  : 25 °C

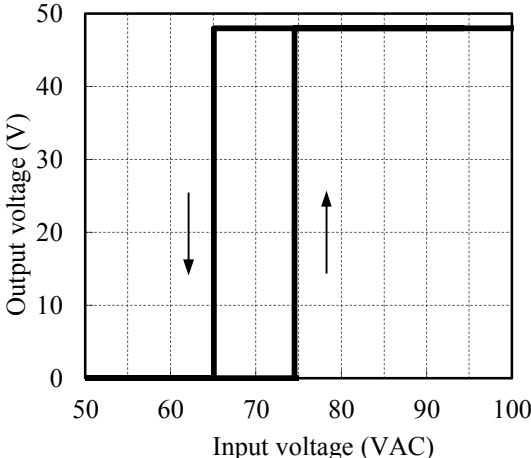
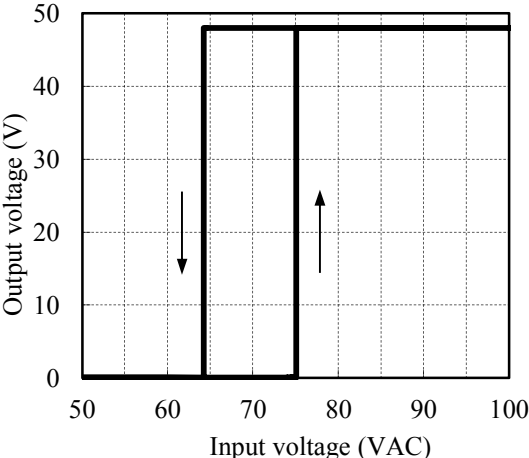
12V



28V



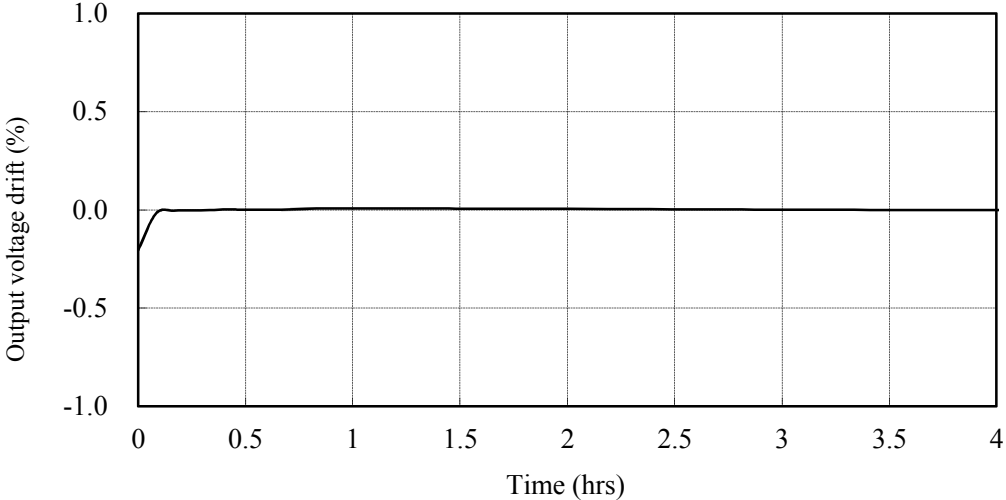
48V



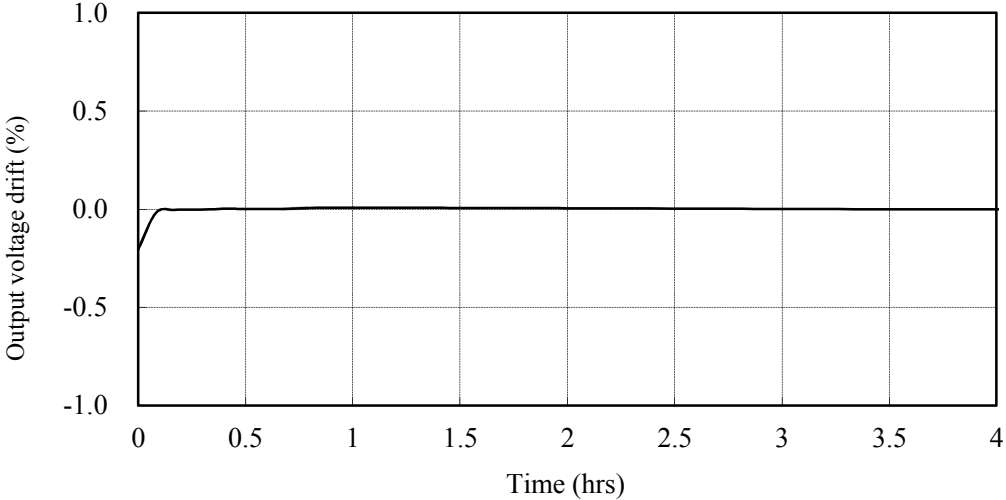
2-2. 通電ドリフト特性 Warm up voltage drift characteristics

Conditions Vin : 100VAC  
Io : 100%  
Tbp : 25 °C

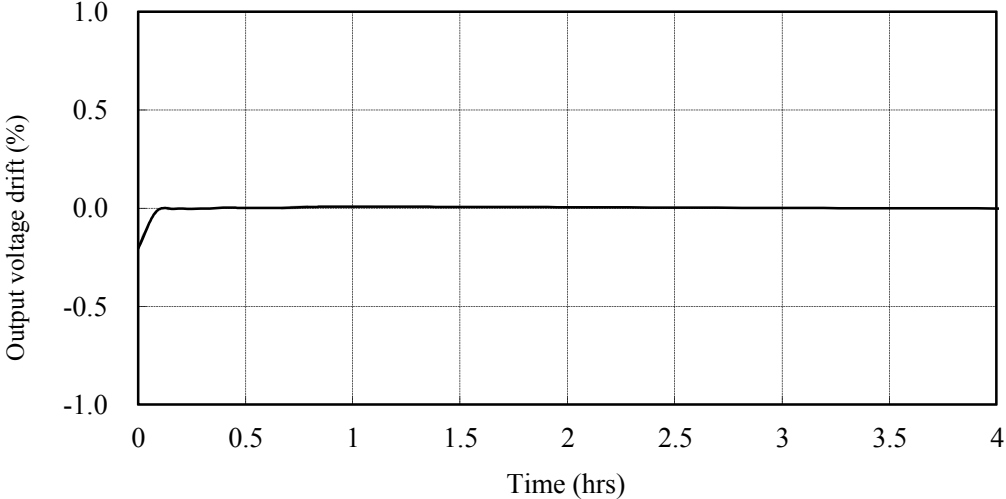
12V



28V



48V

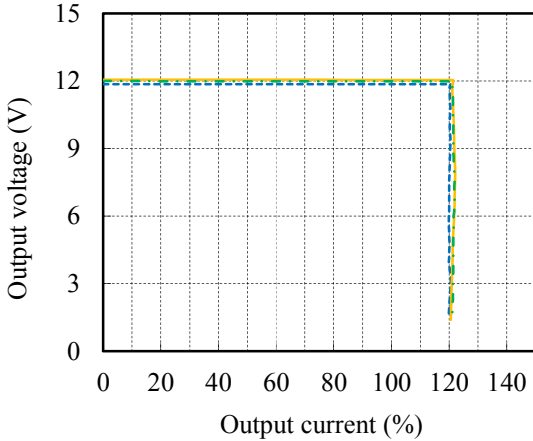
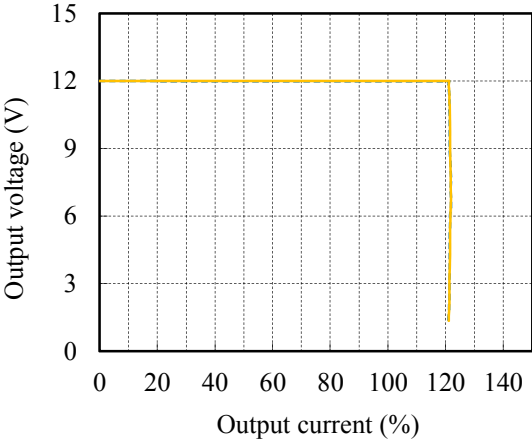


2-3. 過電流保護特性 Over current protection (OCP) characteristics

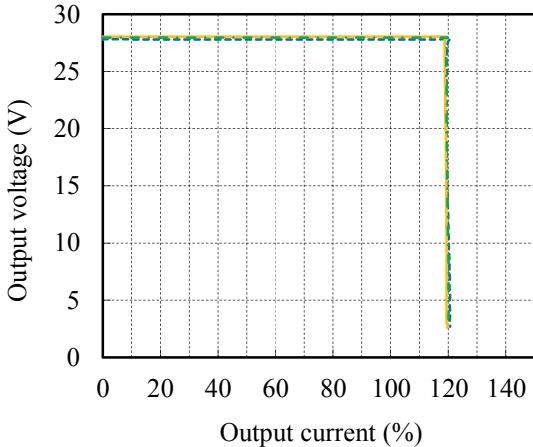
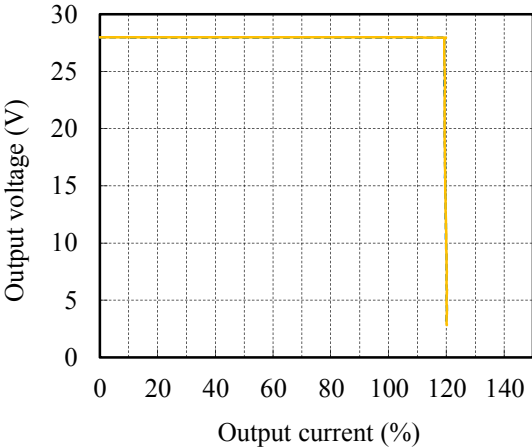
Conditions Vin : 100VAC  
200VAC  
Tbp : 25 °C

Conditions Vin : 100VAC  
Tbp : -40°C  
25 °C  
85°C(12V)  
100°C(28V,48V)

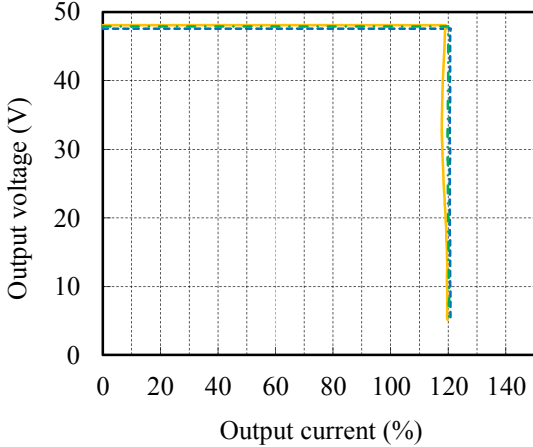
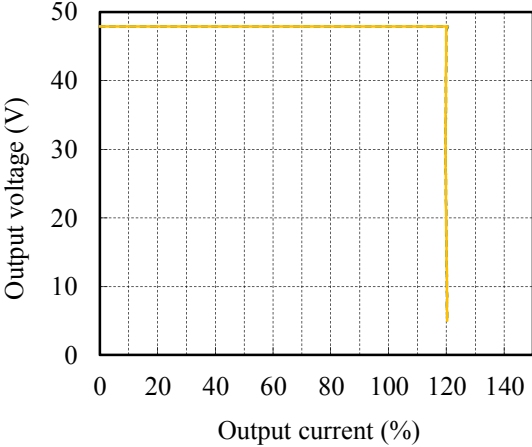
12V



28V

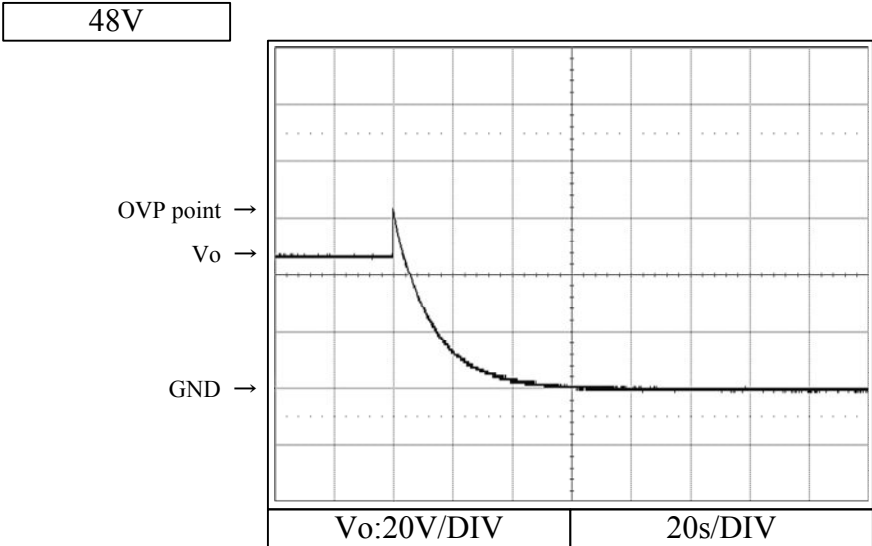
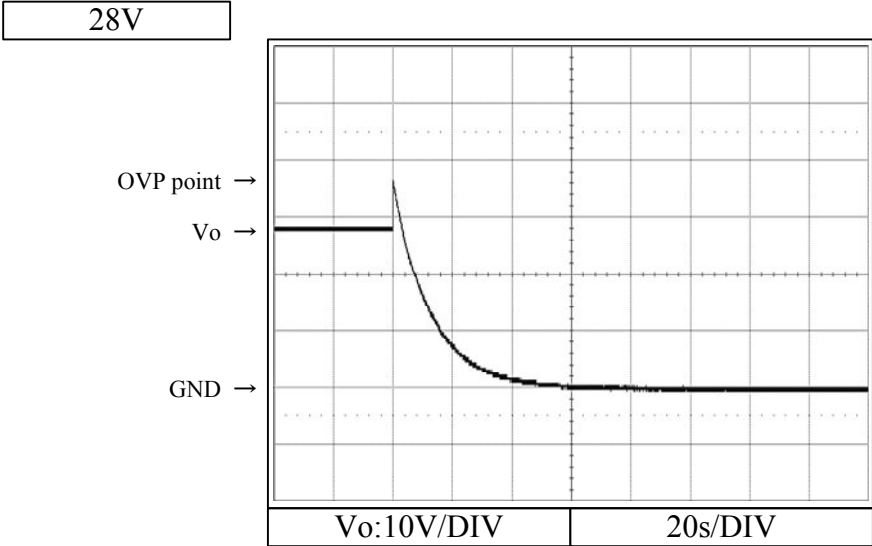
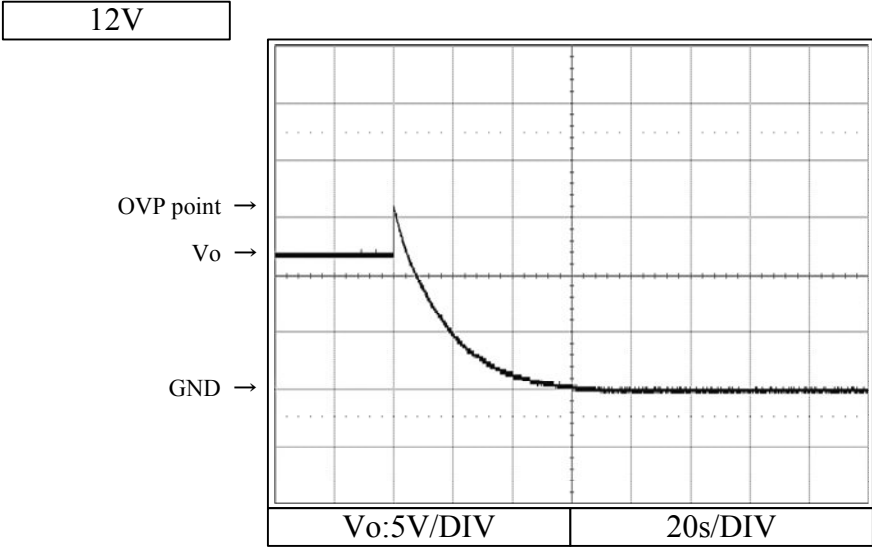


48V



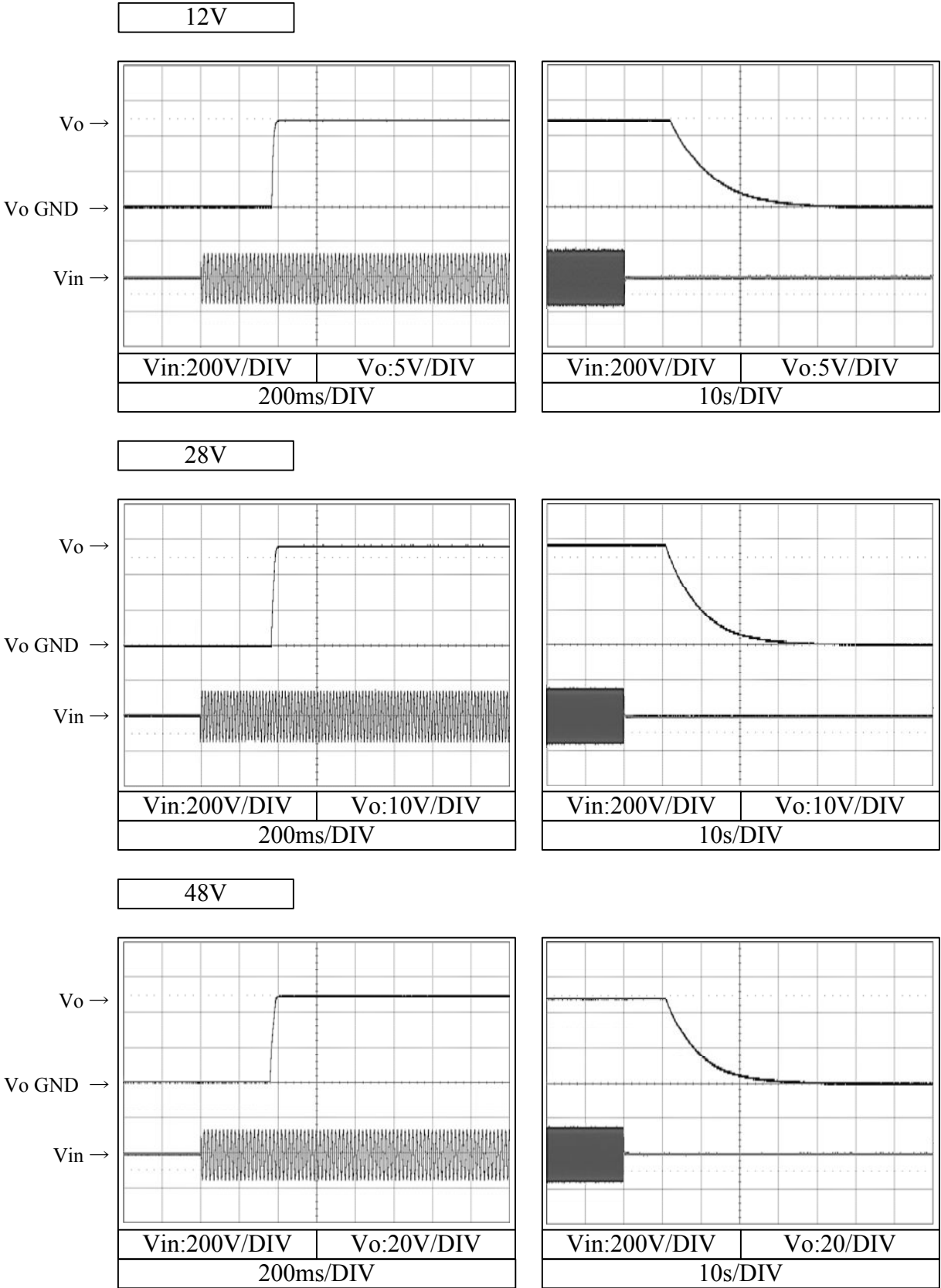
2-4. 過電圧保護特性 Over voltage protection (OVP) characteristics

Conditions Vin : 100VAC  
Io : 0%  
Tbp : 25 °C



2-5. 出力立ち上がり、立ち下がり特性 Output rise and fall characteristics

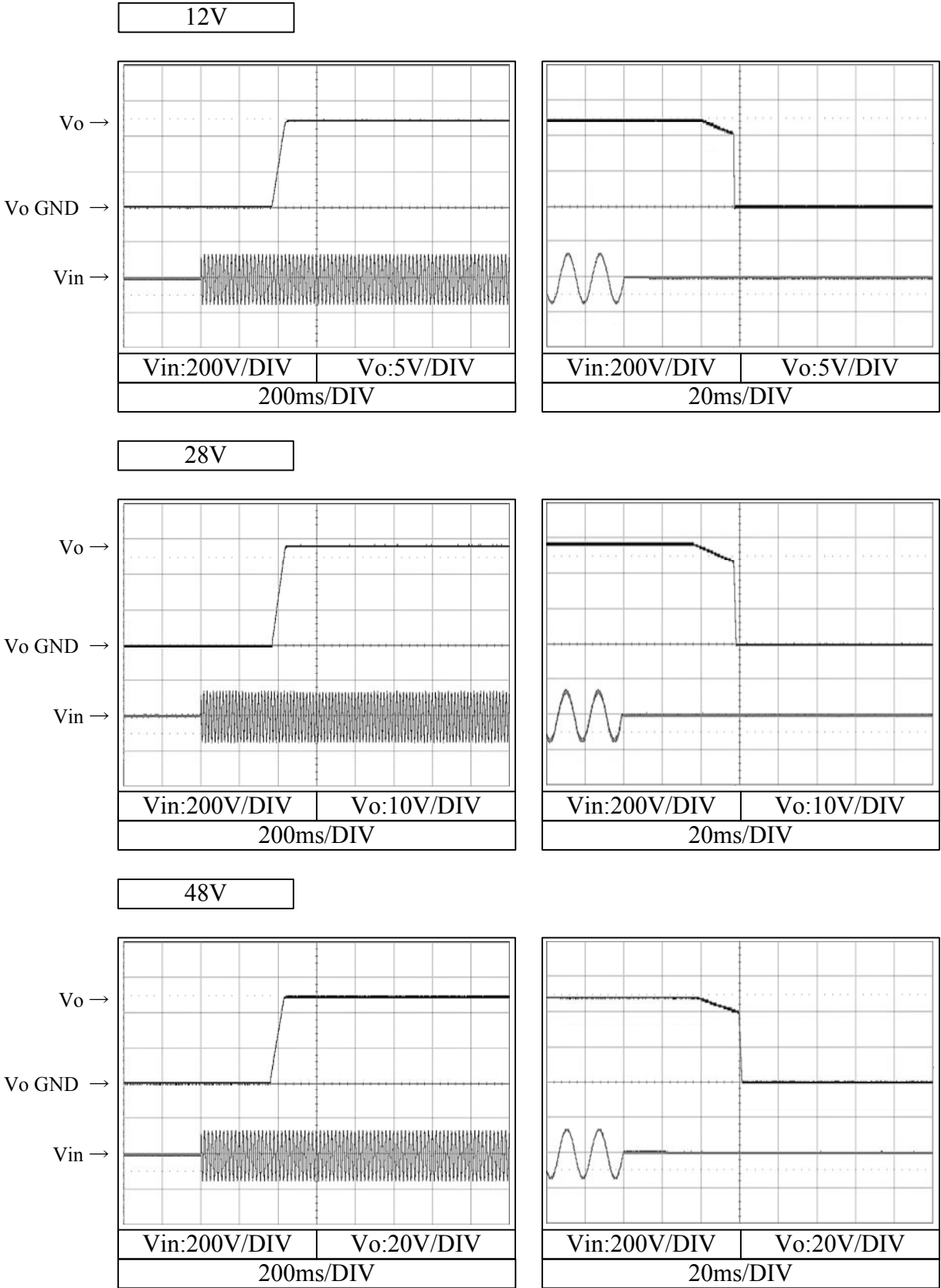
Conditions Vin : 100VAC  
Io : 0%  
Tbp : 25 °C





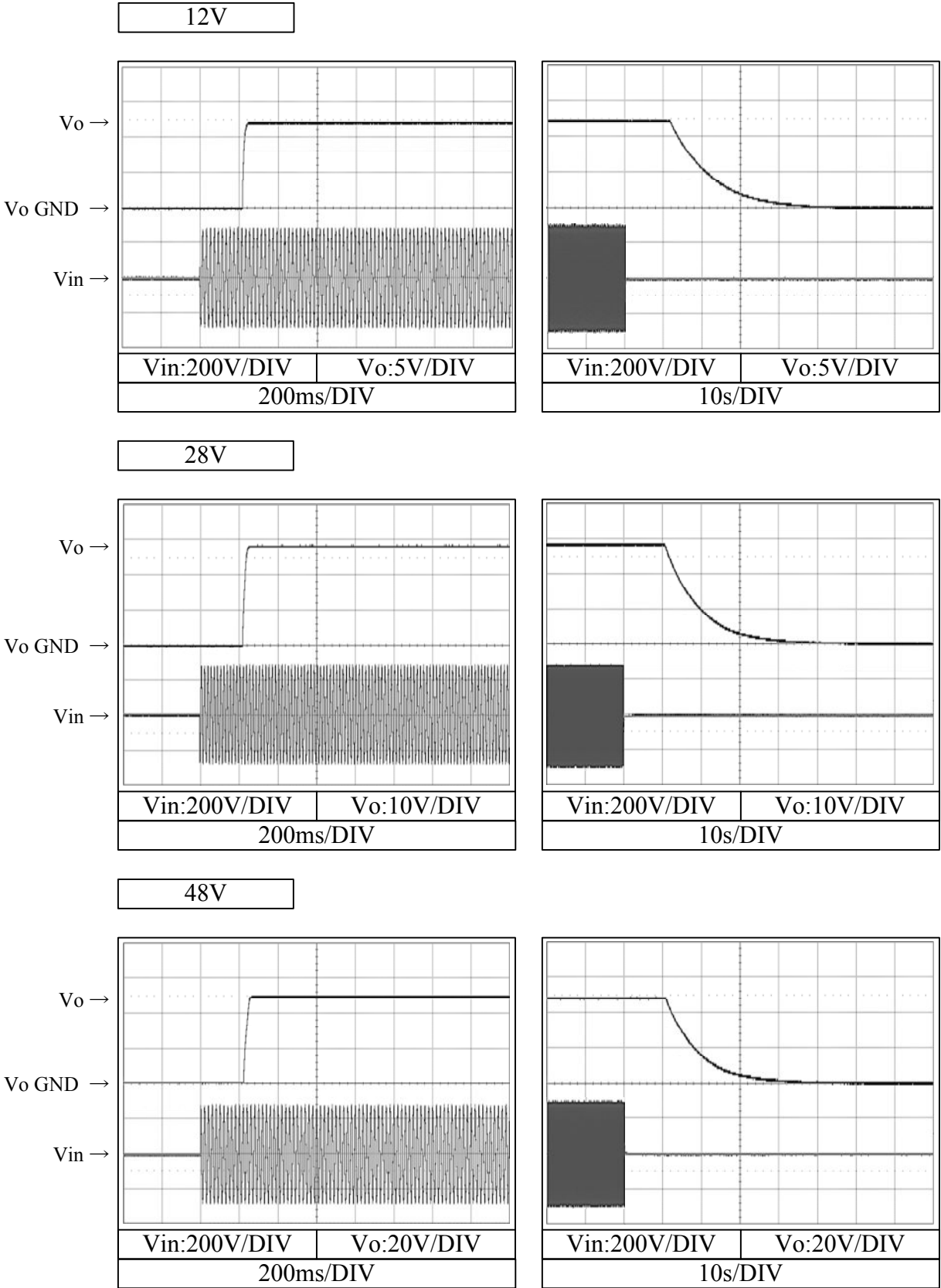
2-5. 出力立ち上がり、立ち下がり特性 Output rise and fall characteristics

Conditions Vin : 100VAC  
Io : 100%  
Tbp : 25 °C



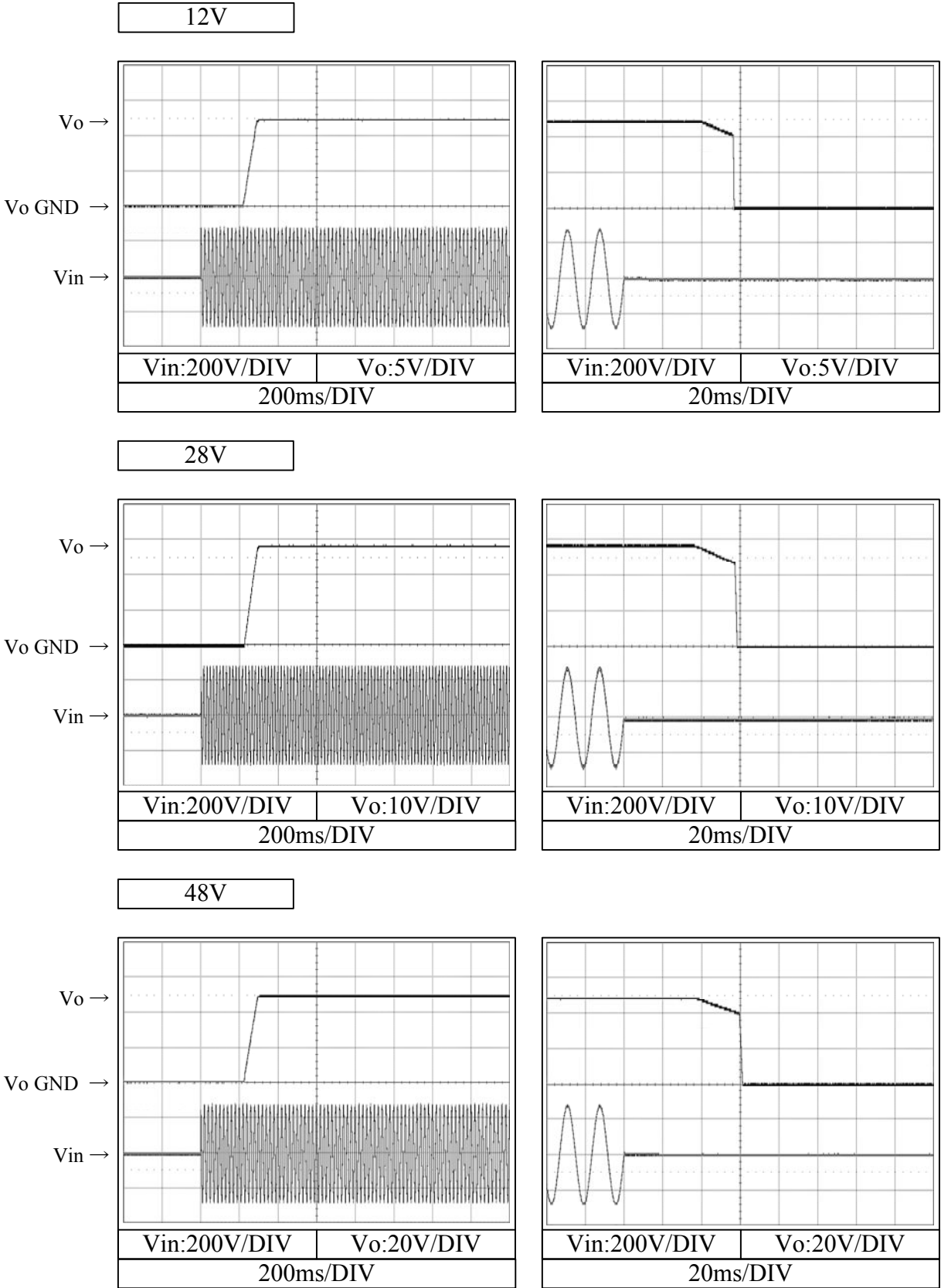
2-5. 出力立ち上がり、立ち下がり特性 Output rise and fall characteristics

Conditions Vin : 200VAC  
Io : 0%  
Tbp : 25 °C



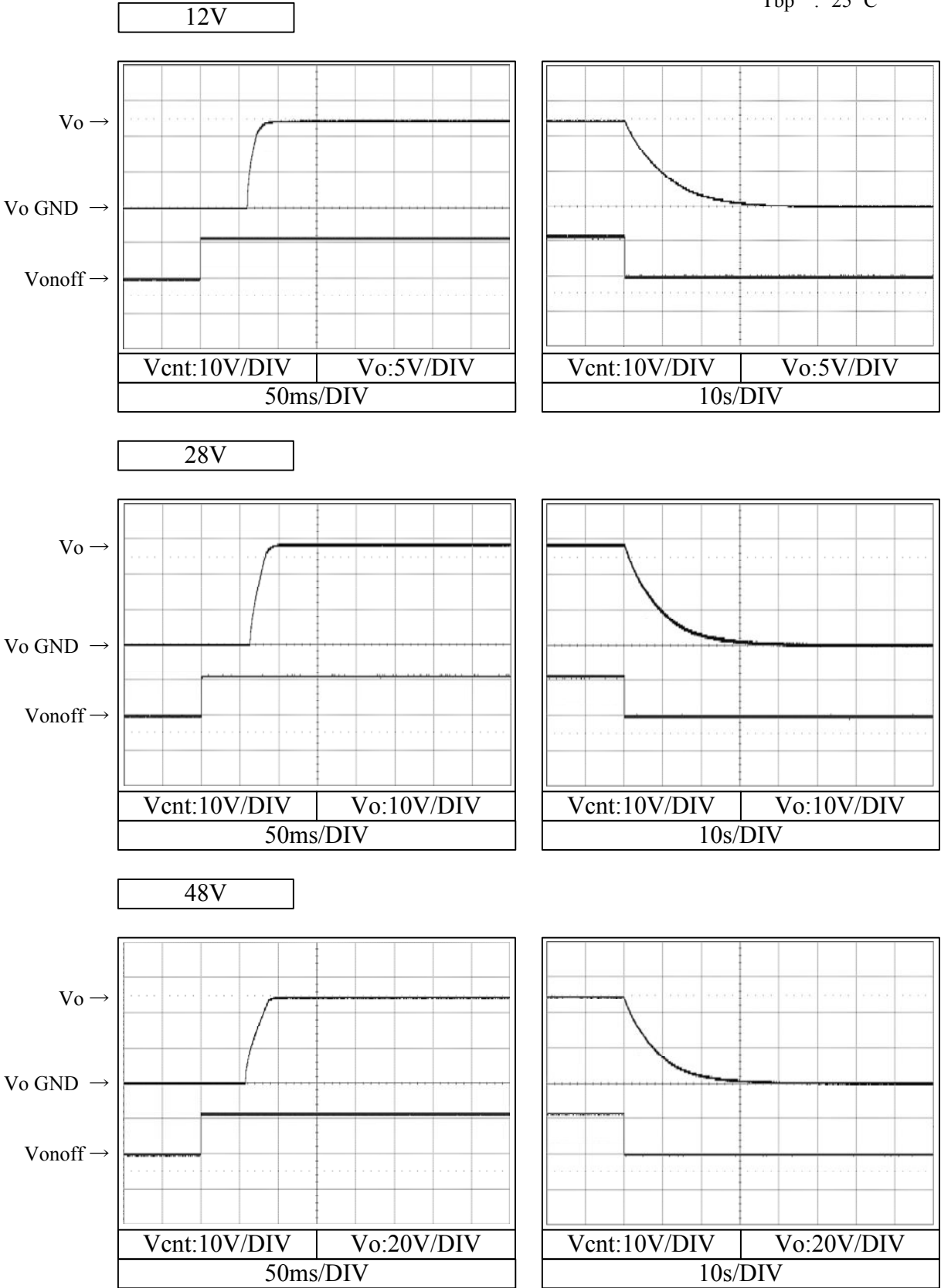
2-5. 出力立ち上がり、立ち下がり特性 Output rise and fall characteristics

Conditions Vin : 200VAC  
Io : 100%  
Tbp : 25 °C



2-6. 出力立ち上がり、立ち下り特性 (ON/OFFコントロール時)  
Output rise and fall characteristics with ON/OFF CONTROL

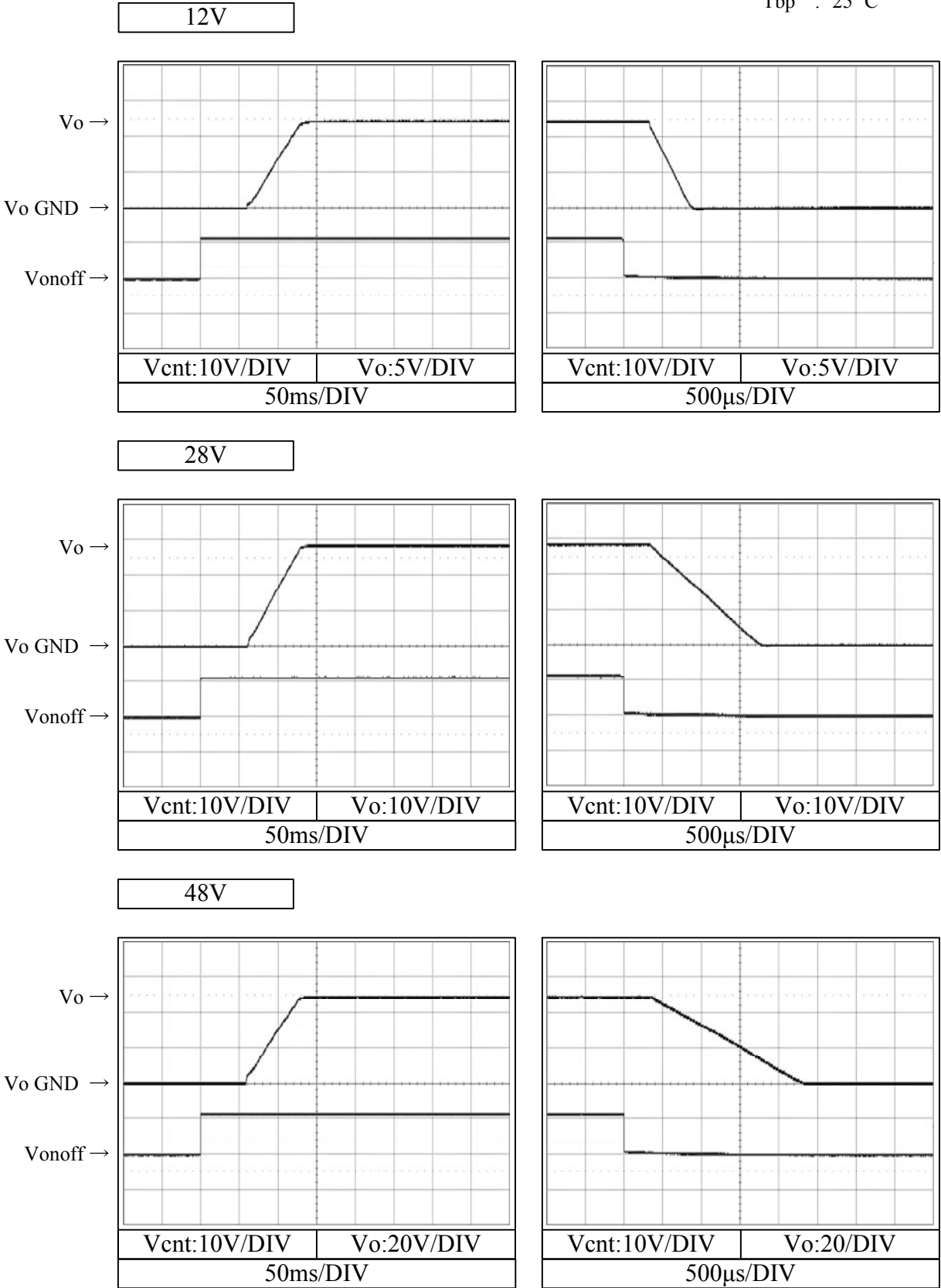
Conditions Vin : 100VAC  
Io : 0%  
Tbp : 25 °C



Note : 200VAC is same as characteristics of 100VAC

2-6. 出力立ち上がり、立ち下り特性 (ON/OFFコントロール時)  
Output rise and fall characteristics with ON/OFF CONTROL

Conditions Vin : 100VAC  
Io : 100%  
Tbp : 25 °C

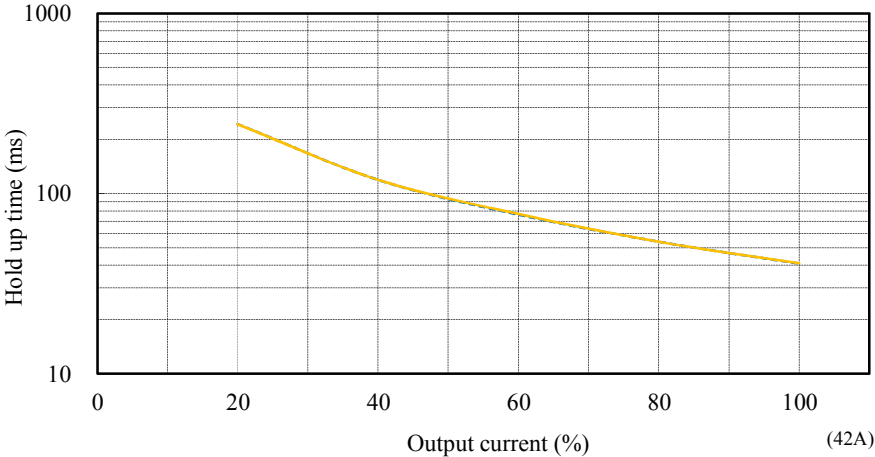


Note : 200VAC is same as characteristics of 100VAC

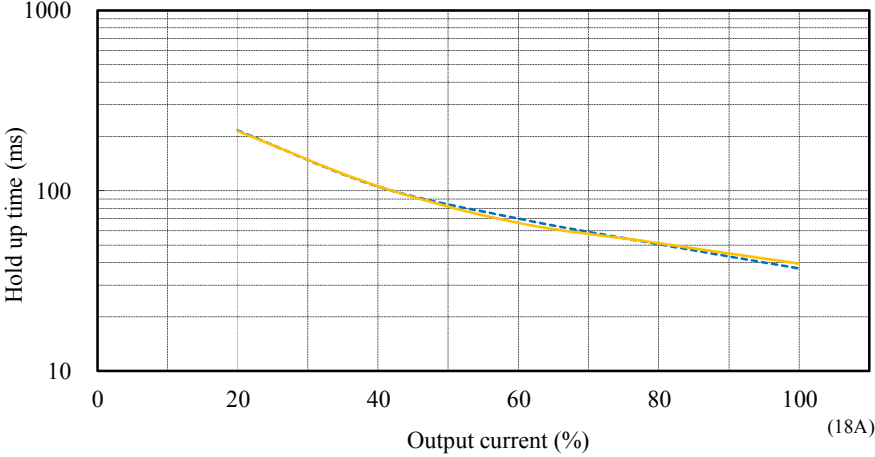
2-7. 出力電圧保持時間特性 Hold up time characteristics

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

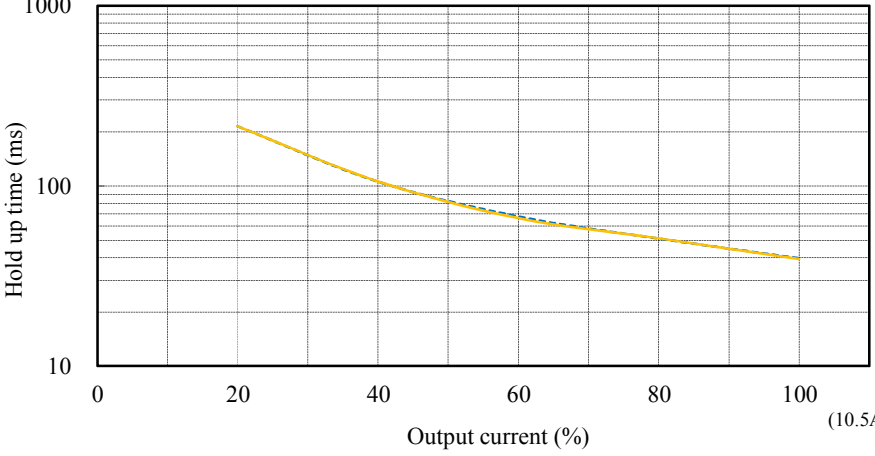
12V



28V



48V



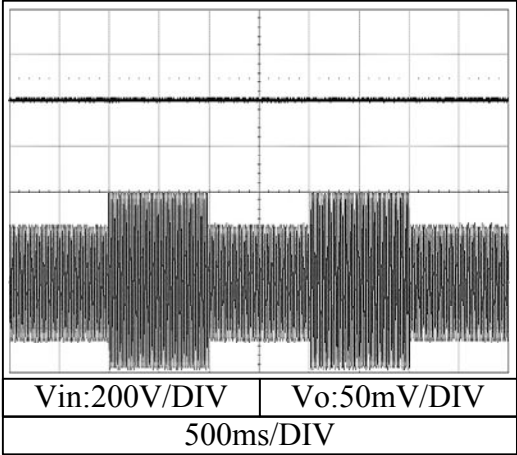
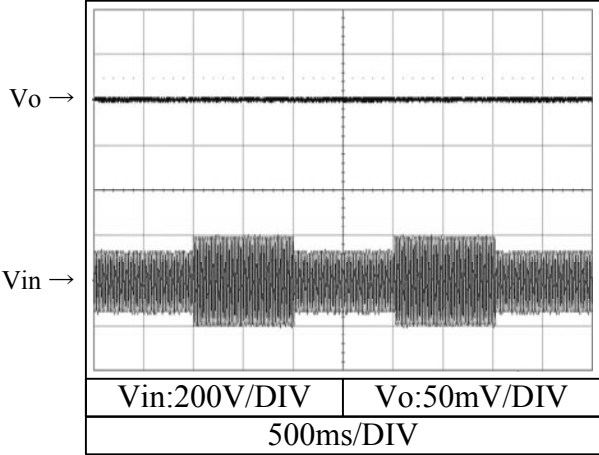
2-8. 過渡応答(入力急変)特性 Dynamic line response characteristics

Conditions I<sub>o</sub> : 100%  
T<sub>bp</sub> : 25 °C

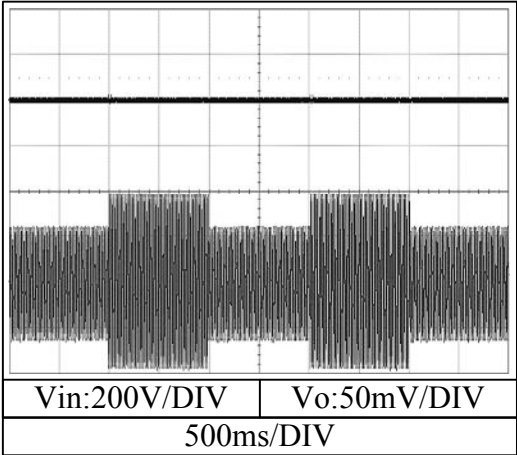
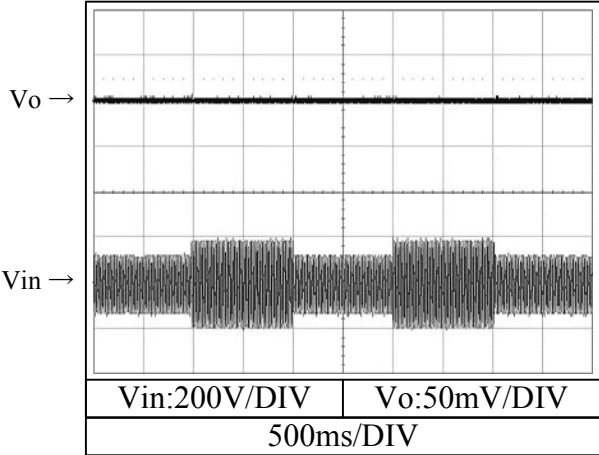
Vin:85VAC ⇔ 130VAC

Vin:170VAC ⇔ 265VAC

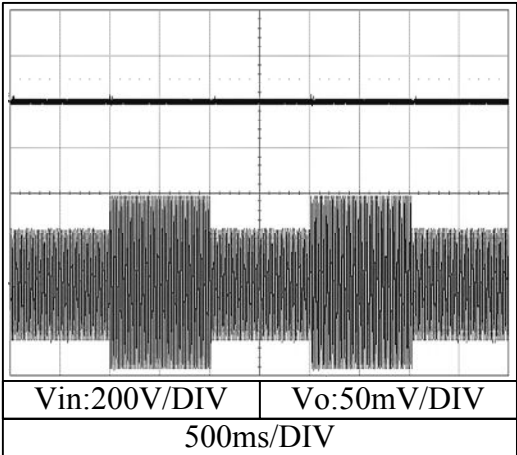
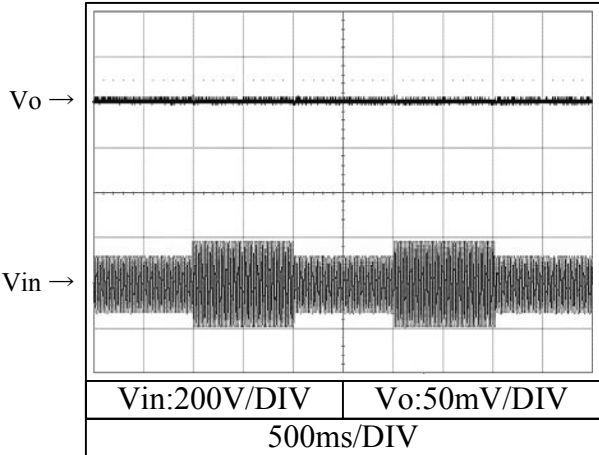
12V



28V



48V

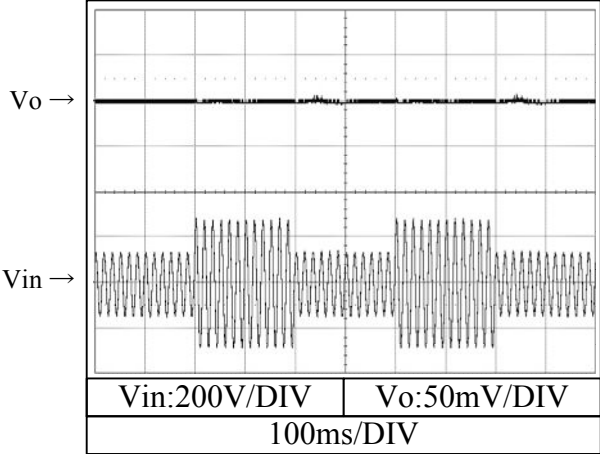


2-8. 過渡応答(入力急変)特性 Dynamic line response characteristics

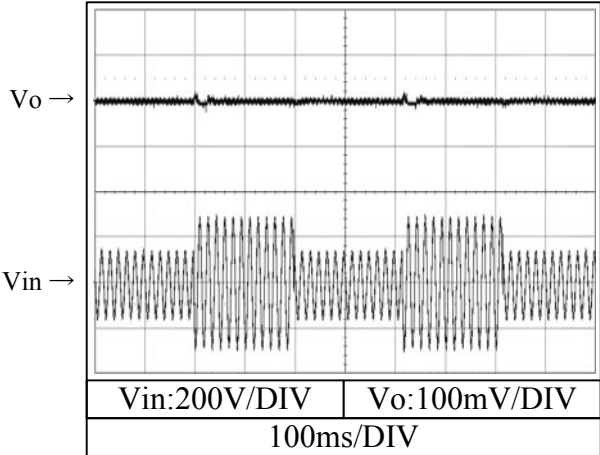
Conditions I<sub>o</sub> : 100%  
T<sub>bp</sub> : 25 °C

Vin:100VAC ⇔ 200VAC

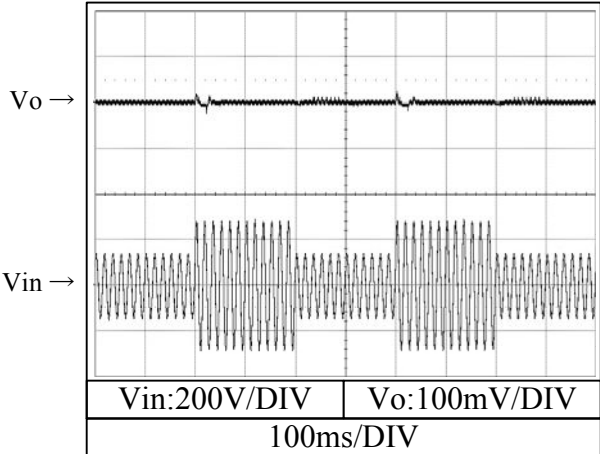
12V



28V



48V

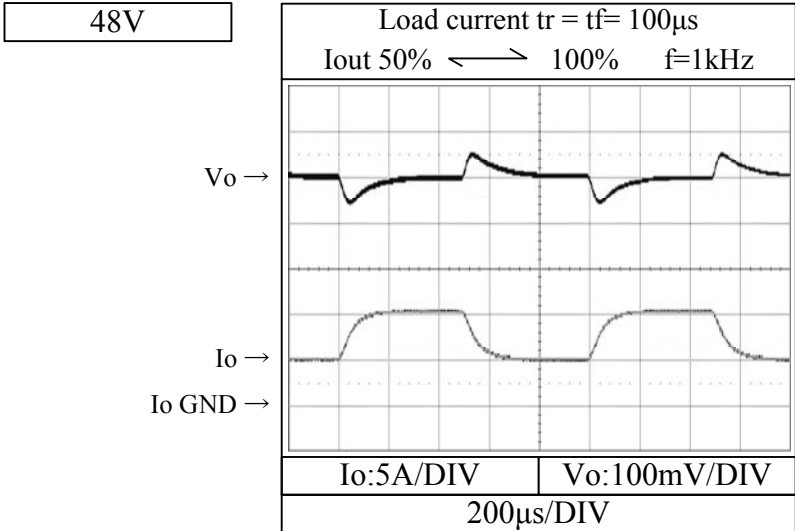
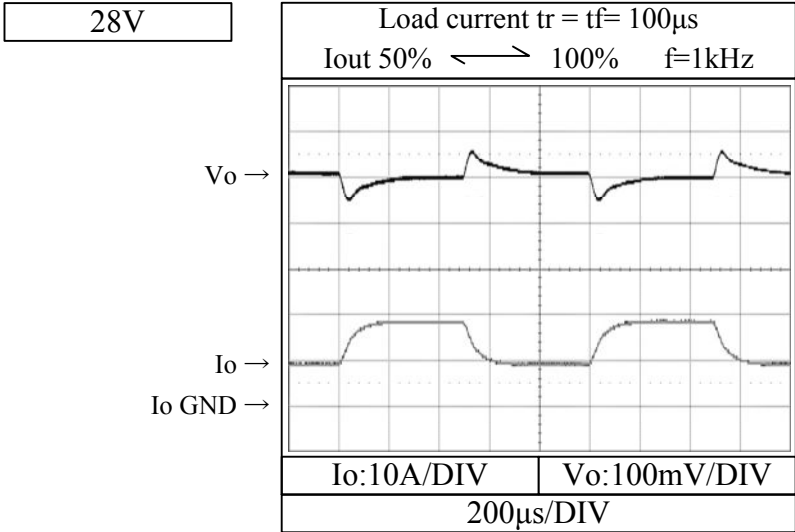
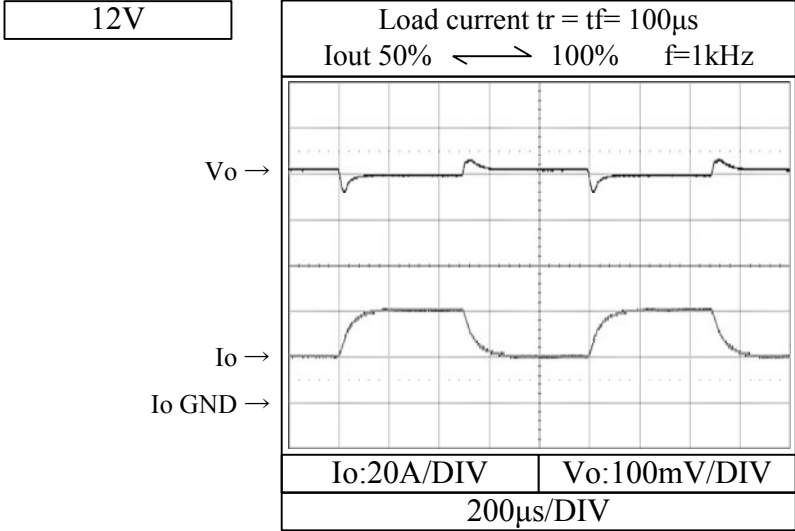


Note : This test follows SEMI F47-0200



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

Conditions Vin : 100VAC  
Tbp : 25 °C



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

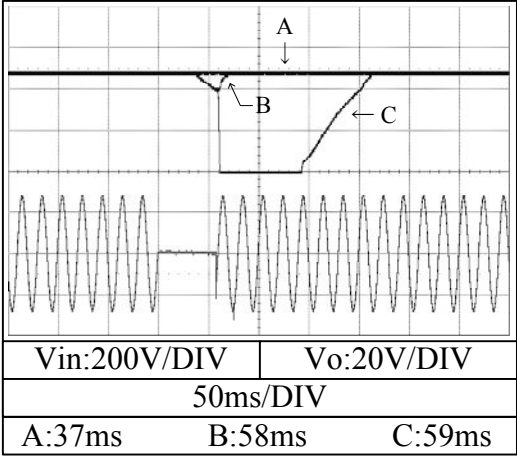
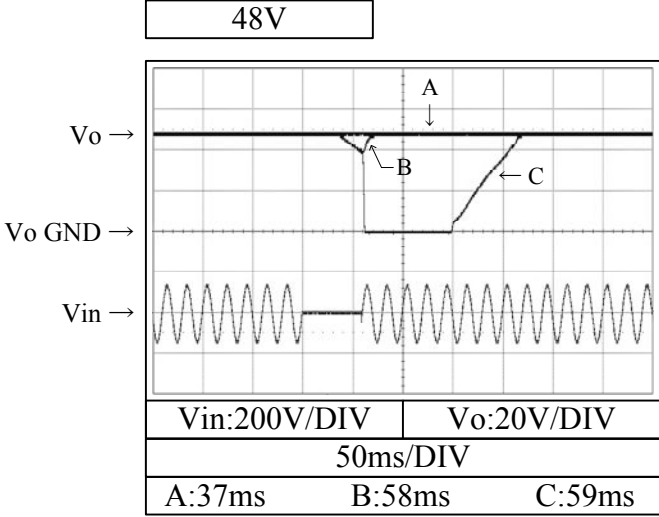
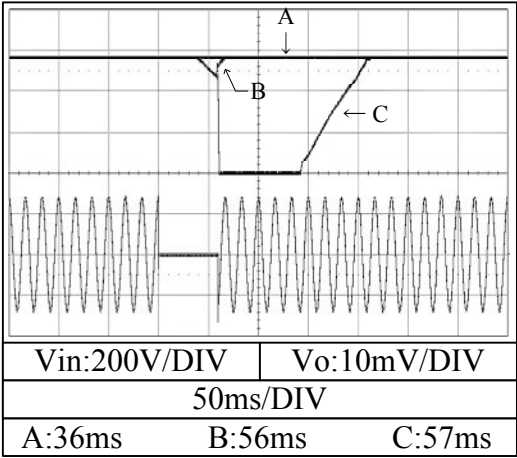
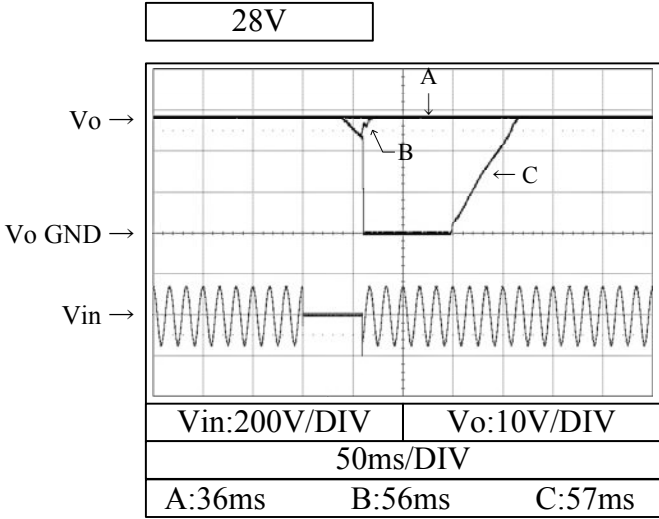
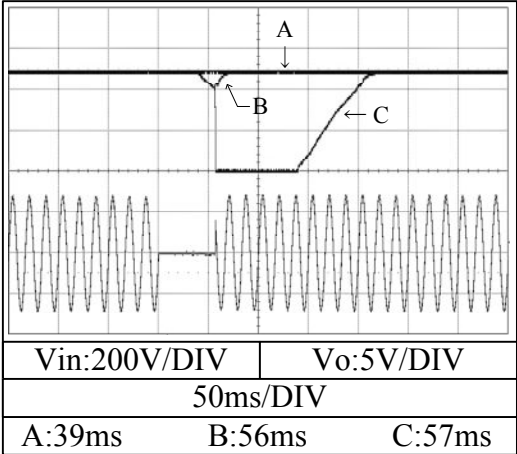
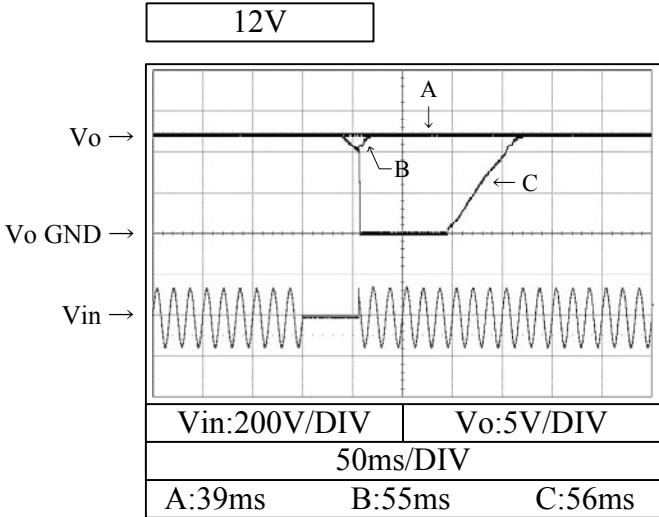
Conditions I<sub>o</sub> : 100%  
T<sub>bp</sub> : 25 °C

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.

V<sub>in</sub>:100VAC

V<sub>in</sub>:200VAC

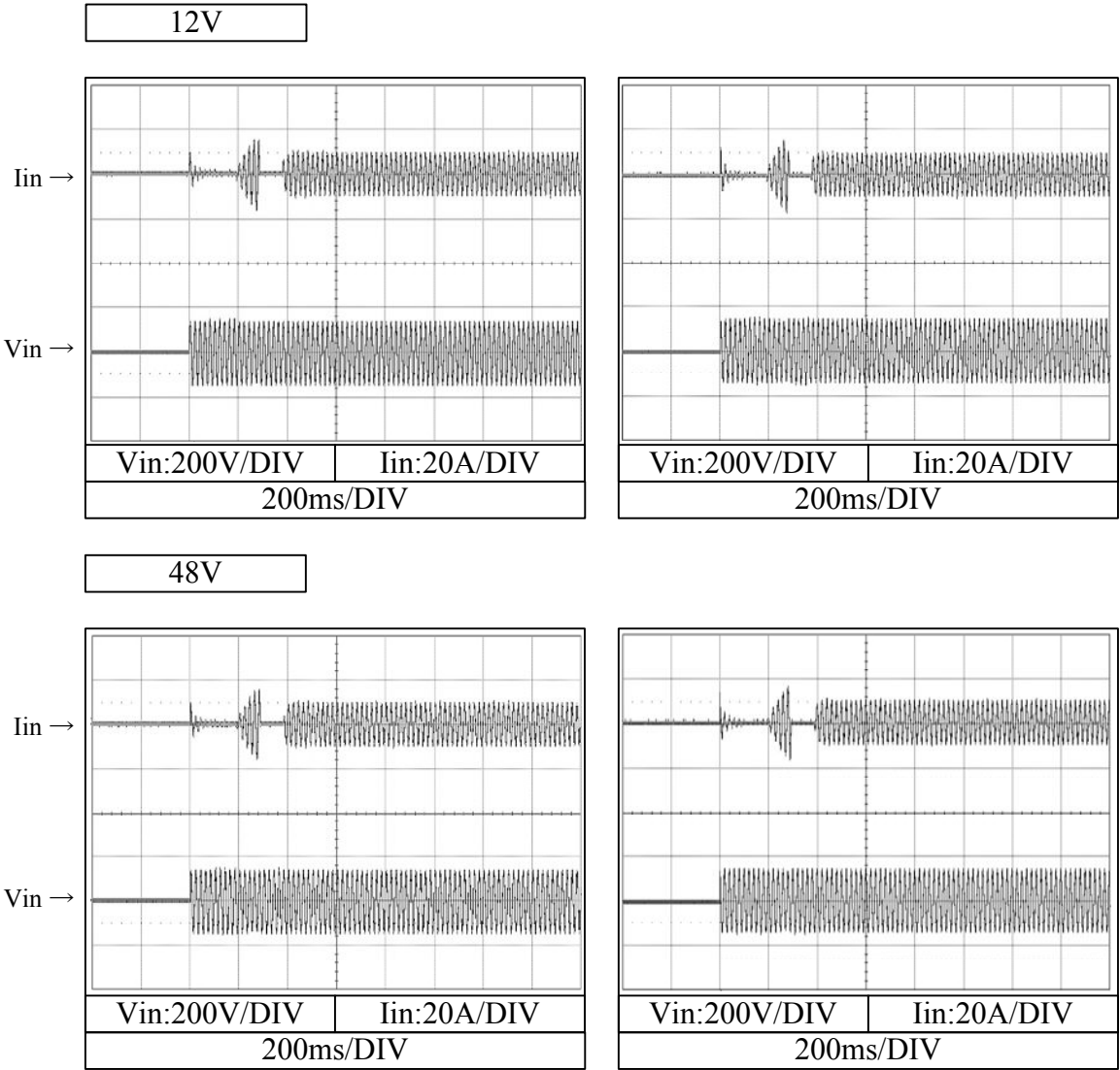


2-11. 入力サージ電流(突入電流)特性 Inrush current characteristics

Conditions Vin : 100VAC  
Io : 100%  
Tbp : 25 °C

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

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



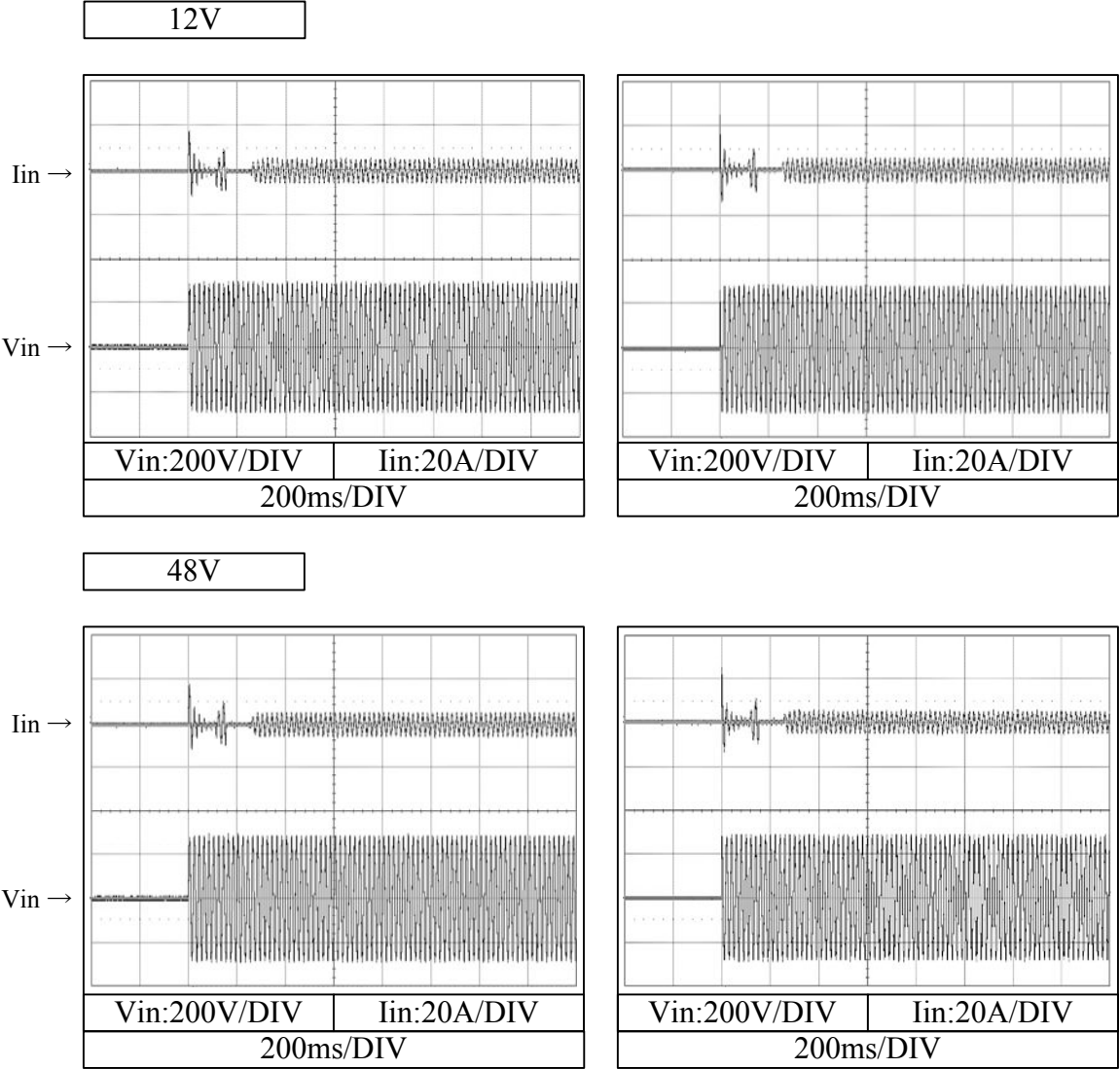
Note : 28V is same as characteristics of 48V

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

Conditions Vin : 200VAC  
Io : 100%  
Tbp : 25 °C

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

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



Note : 28V is same as characteristics of 48V

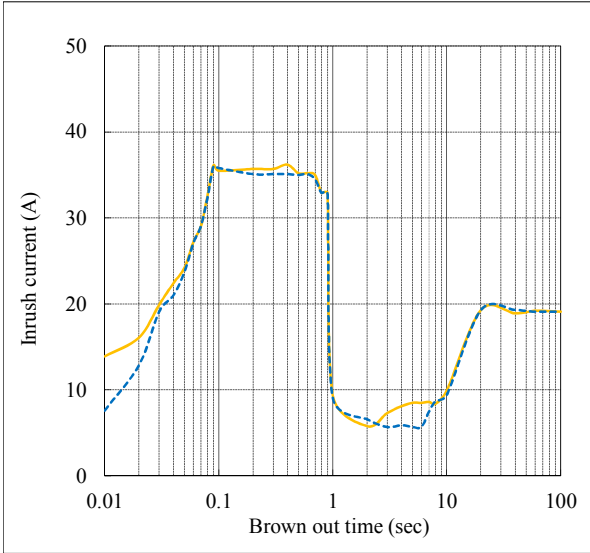
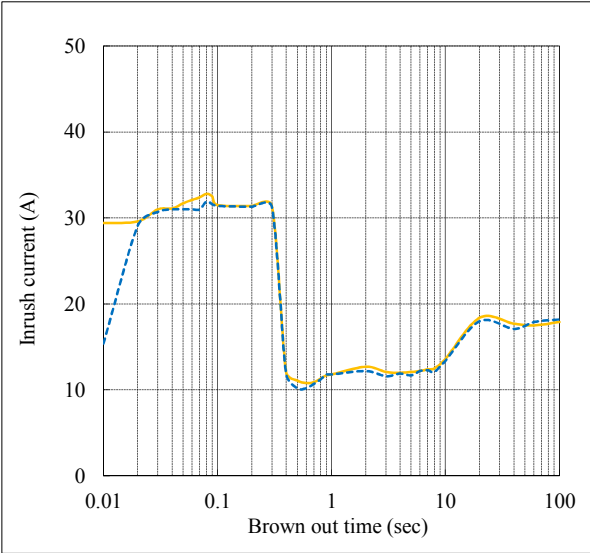
2-12. 瞬停突入電流特性 Inrush current characteristics

Conditions Io : 50% ---  
100% —  
Tbp : 25 °C

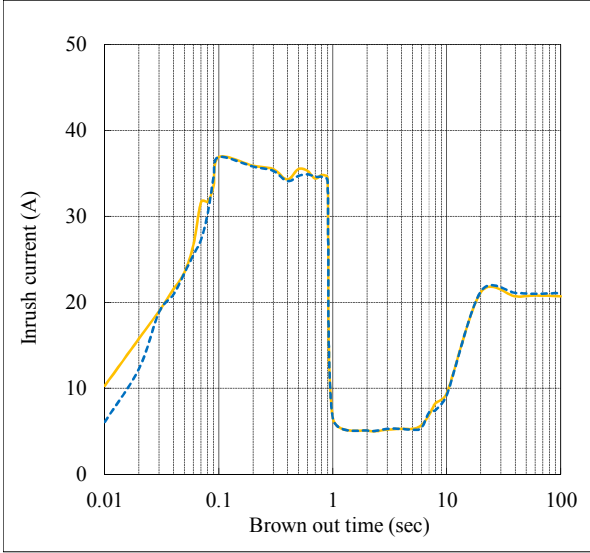
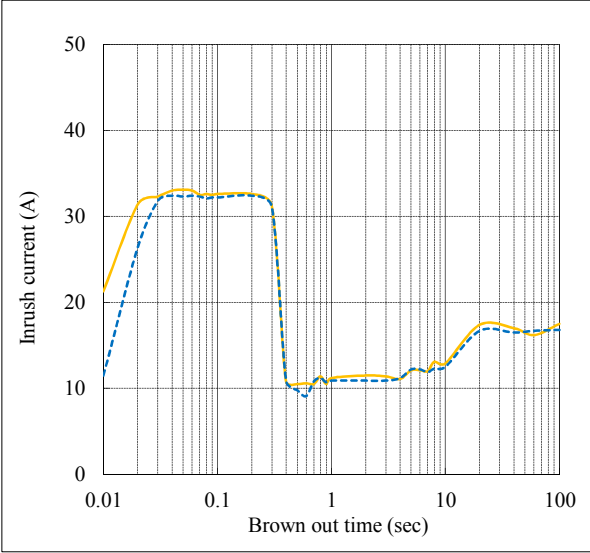
Vin:100VAC

Vin:200VAC

12V



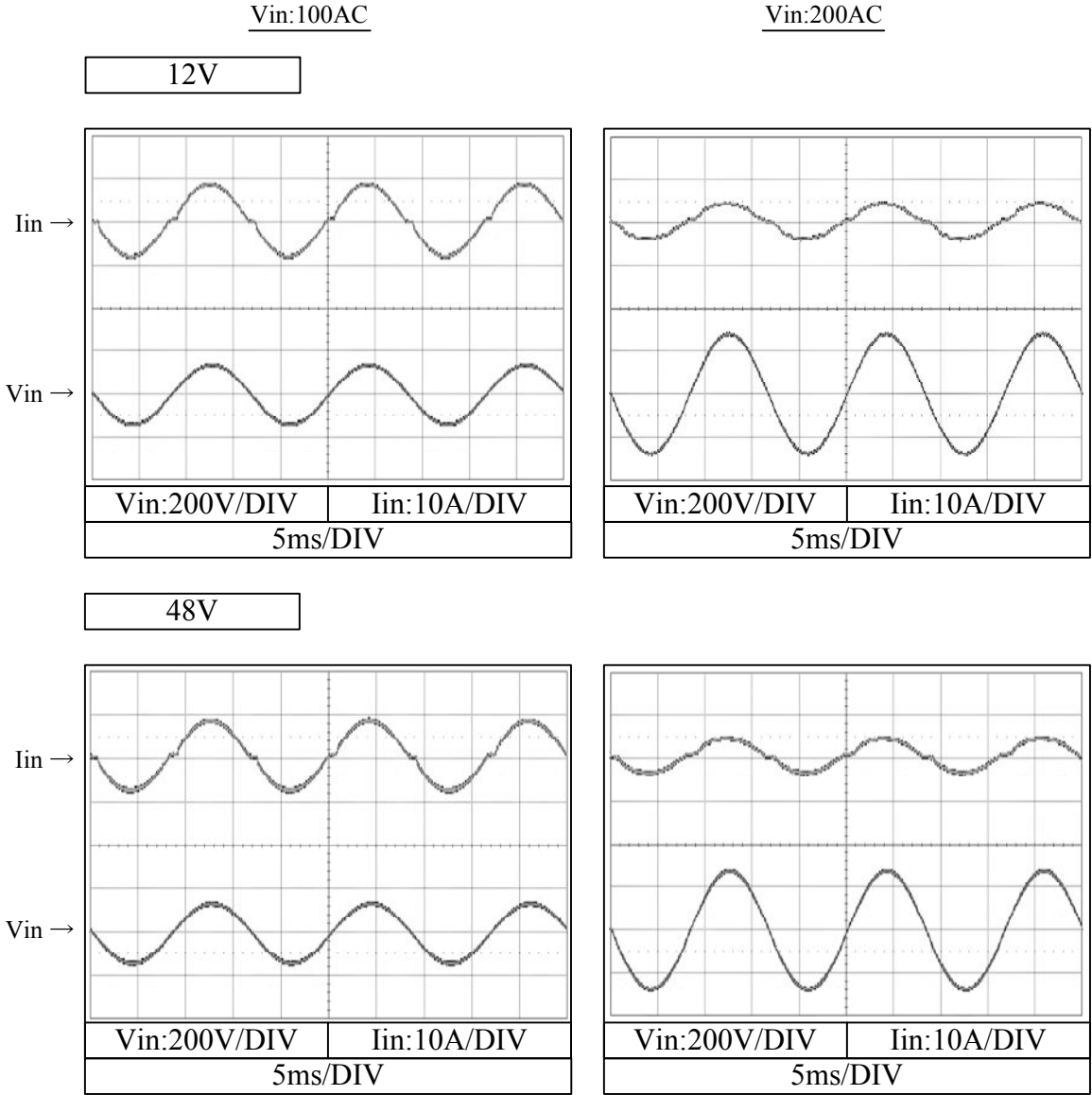
48V



Note : Above data includes secondary inrush current.  
: 28V is same as characteristics of 48V

2-13. 入力電流波形 Input current waveform

Conditions  $I_o$  : 100%  
 $T_{bp}$  : 25 °C

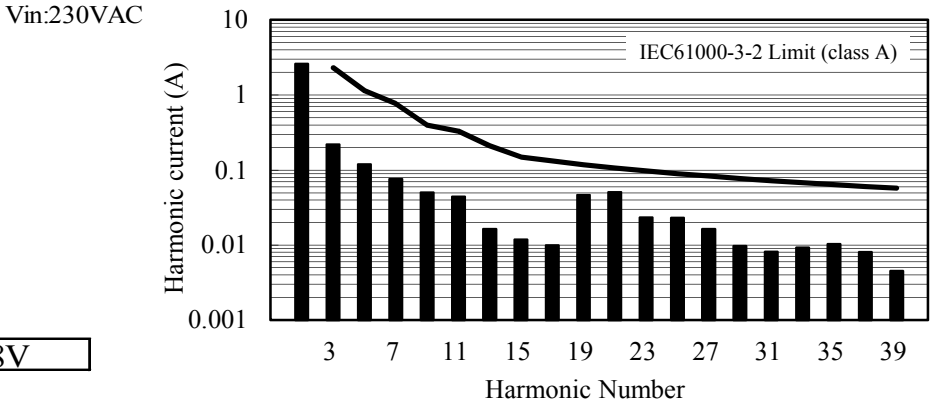
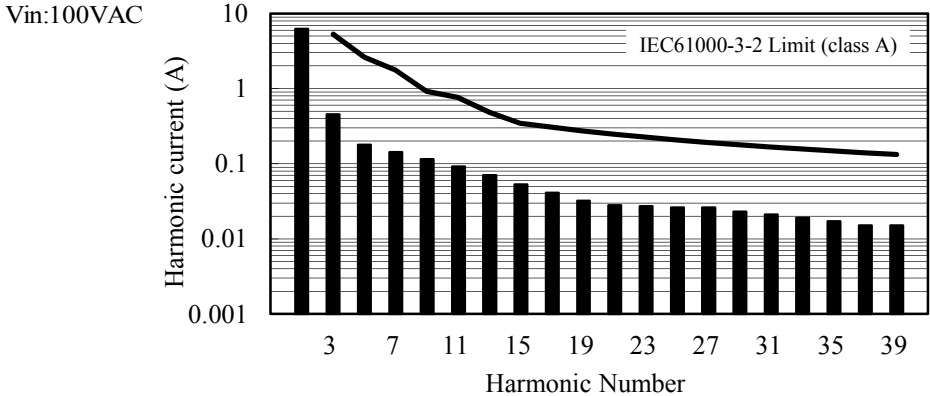


Note : 28V is same as characteristics of 48V

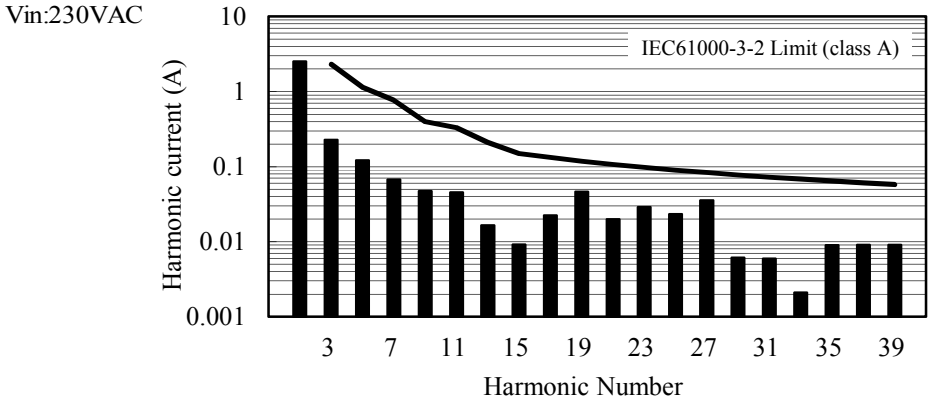
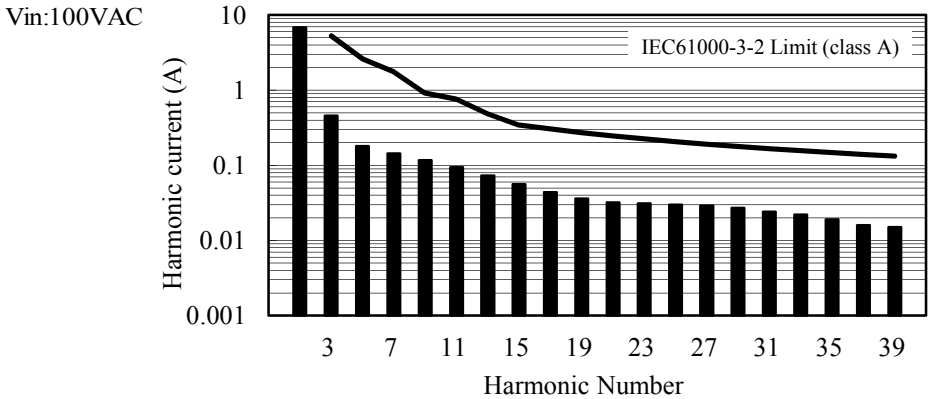
2-14. 高調波成分 Input current harmonics

Conditions Io : 100%  
Tbp : 25 °C

12V



48V

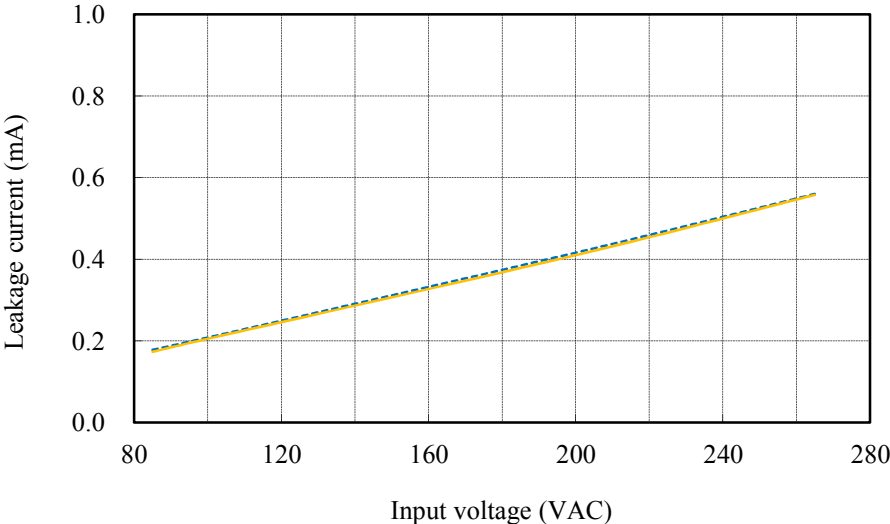


Note : 28V is same as characteristics of 48V

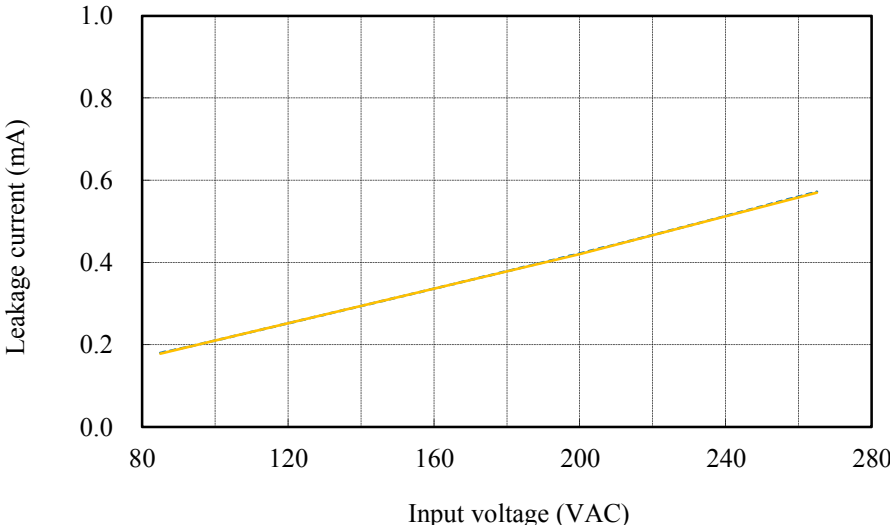
2-15. リーク電流特性 Leakage current characteristics

Conditions Io : 0% ---  
                  100% —  
Tbp : 25 °C  
f : 50Hz

12V



48V



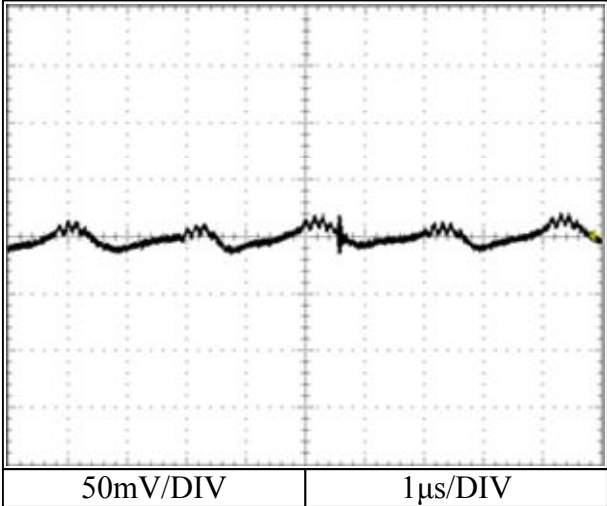
Note : 28V is same as characteristics of 48V



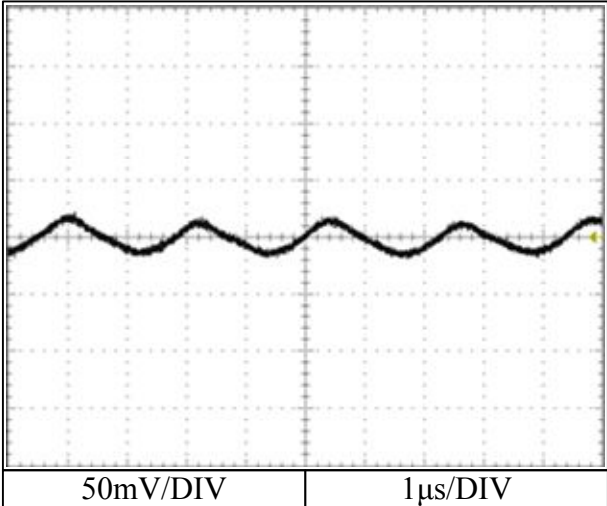
2-16. 出力リップル、ノイズ波形 Output ripple and noise waveform

Conditions Vin : 100VAC  
Io : 100%  
Tbp : 25 °C

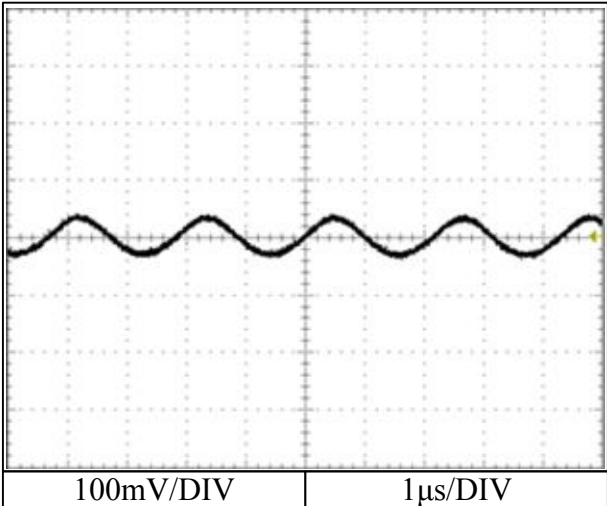
12V



28V



48V



2-17. EMI特性 Electro-Magnetic Interference characteristics

(a) 雑音端子電圧 (帰還ノイズ) Conducted Emission Noise

Conditions Vin : 100VAC

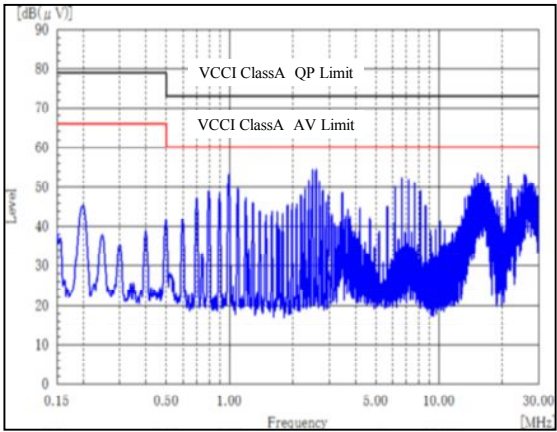
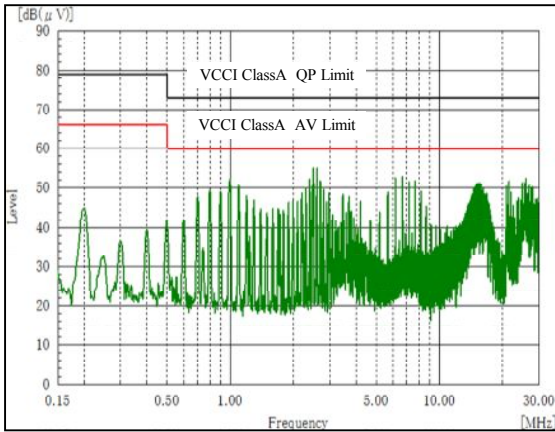
Io : 100%

Tbp : 25 °C

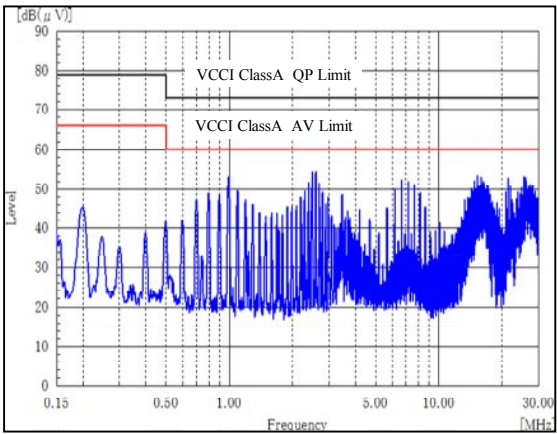
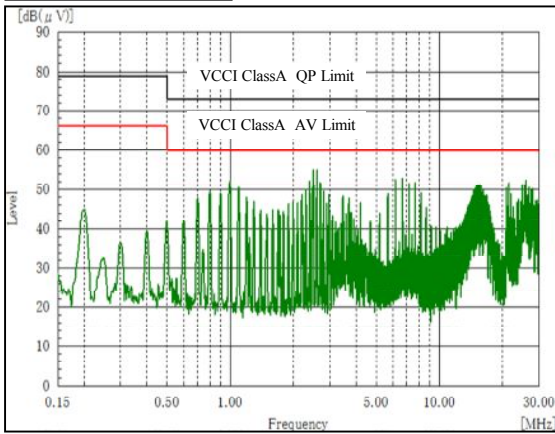
Phase:N

Phase:L

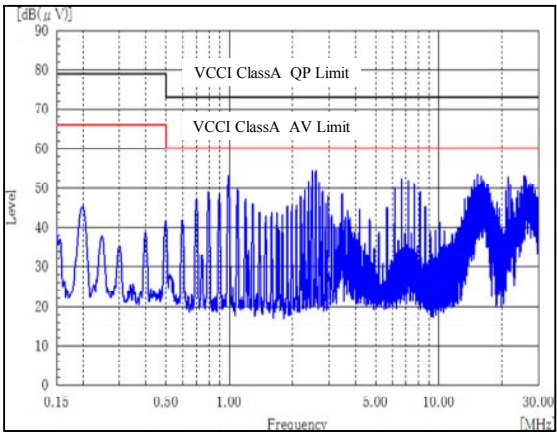
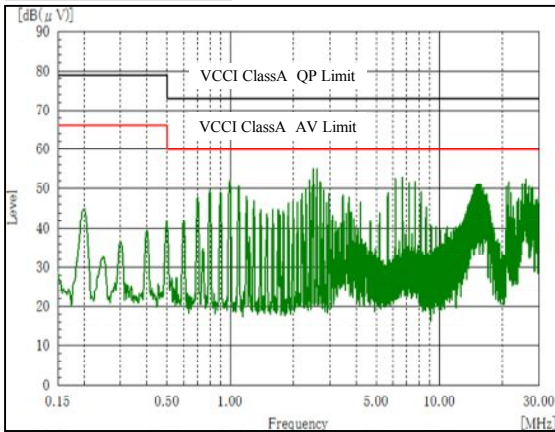
12V



28V



48V



2-17. EMI特性 Electro-Magnetic Interference characteristics

(b) 雑音電界強度(輻射ノイズ) Radiated Emission Noise

Conditions Vin : 100VAC  
Io : 100%  
Tbp : 25 °C

HORIZONTAL

VERTICAL

