# HWS30A

# EVALUATION DATA

# 型式データ

# INDEX

## 2. 特性データ　Characteristics



使用記号　Terminology used

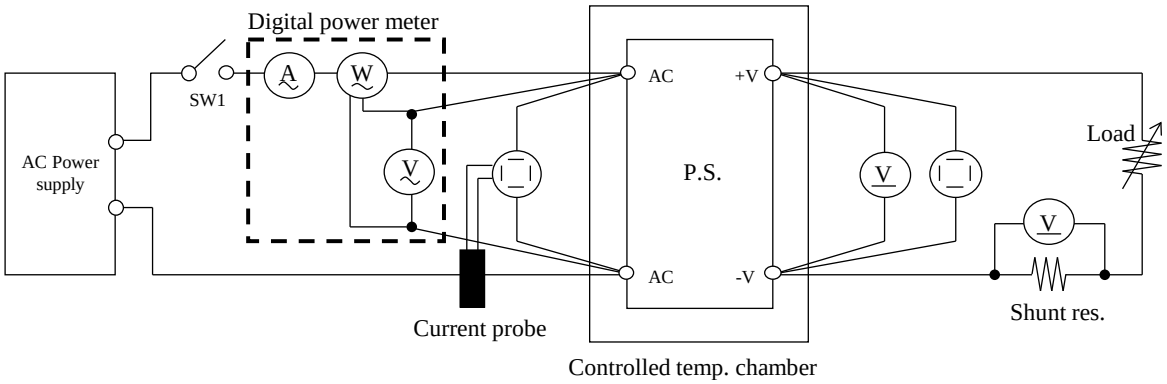
| | 定義 Definition | | |
|---|---|---|---|
| Vin | ..... | 入力電圧 | Input voltage |
| Vout | ..... | 出力電圧 | Output voltage |
| Iin | ..... | 入力電流 | Input current |
| Iout | ..... | 出力電流 | Output current |
| Ta | ..... | 周囲温度 | Ambient temperature |
| f | ..... | 周波数 | Frequency |

## 1. 測定方法　Evaluation Method

1.1　測定回路　Circuit used for determination

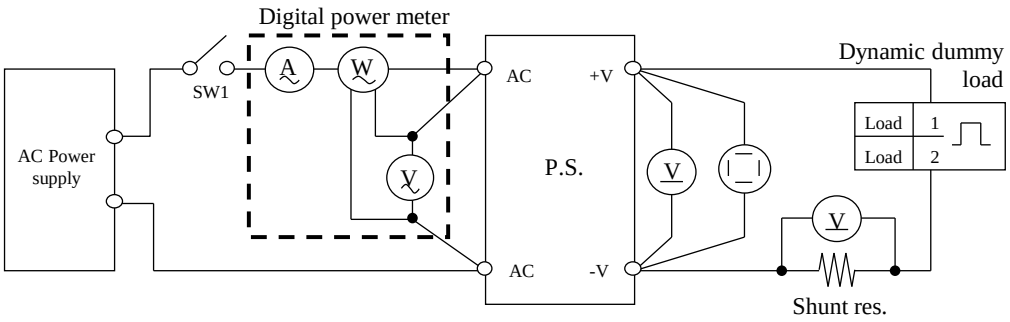
測定回路1 Circuit 1 used for determination

- ・静特性　Steady state data
- ・通電ドリフト特性　Warm up voltage drift characteristics
- ・出力保持時間特性　Hold up time characteristics
- ・出力立ち上がり特性　Output rise characteristics
- ・出力立ち下がり特性　Output fall characteristics
- ・過電流保護特性　Over current protection (OCP) characteristics
- ・過電圧保護特性　Over voltage protection (OVP) characteristics
- ・過渡応答（入力急変）特性　Dynamic line response characteristics
- ・入力電圧瞬停特性　Response to brown out characteristics
- ・入力電流波形　Input current waveform

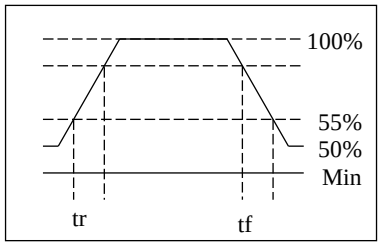



測定回路2 Circuit 2 used for determination

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

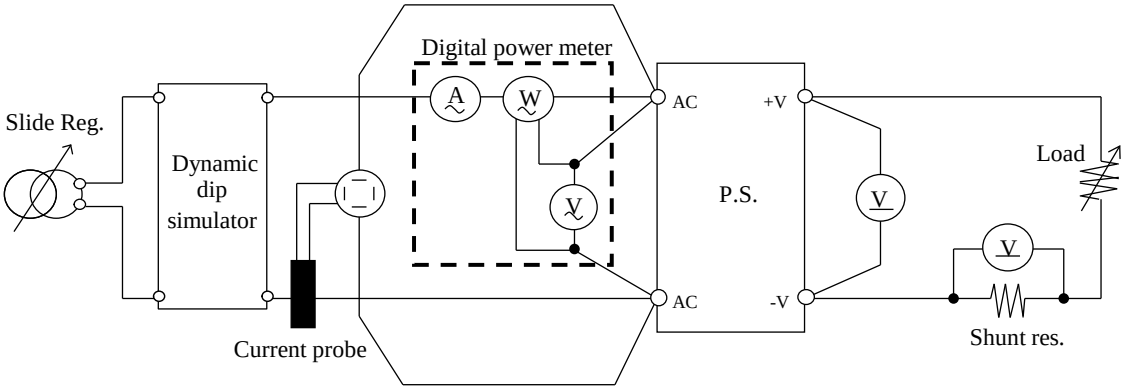



Output current waveform



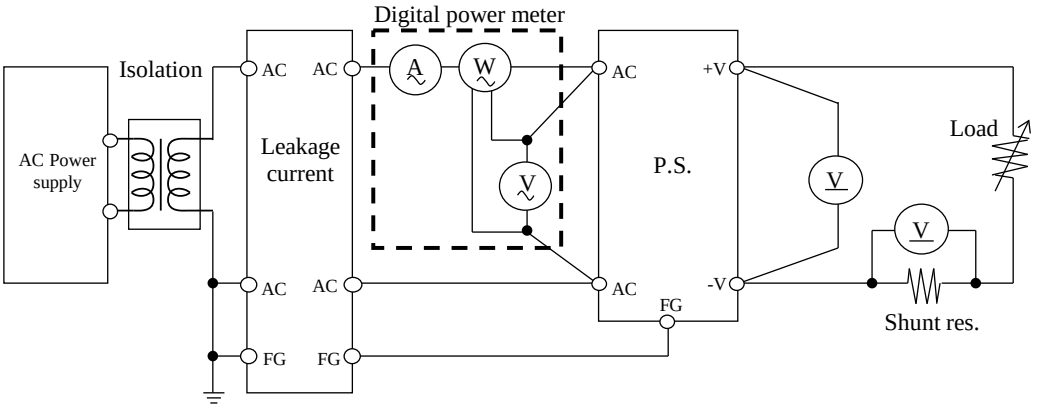
測定回路3 Circuit 3 used for determination

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



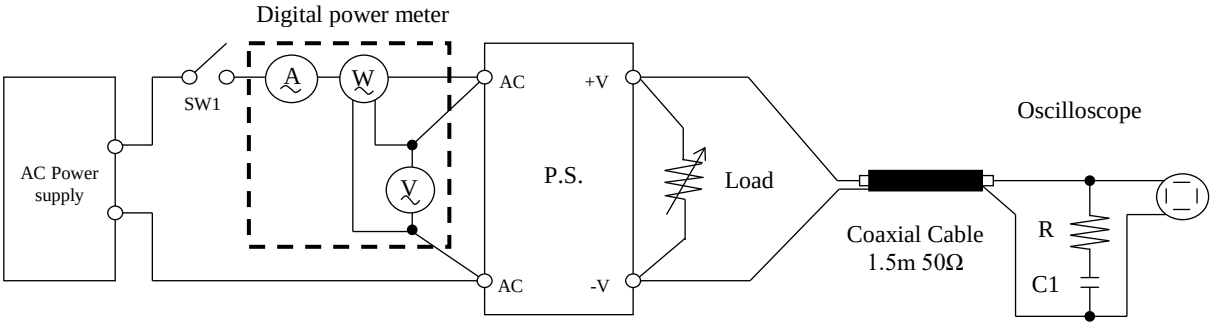

測定回路4 Circuit 4 used for determination

・リーク電流特性　Leakage current characteristics



測定回路5 Circuit 5 used for determination

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

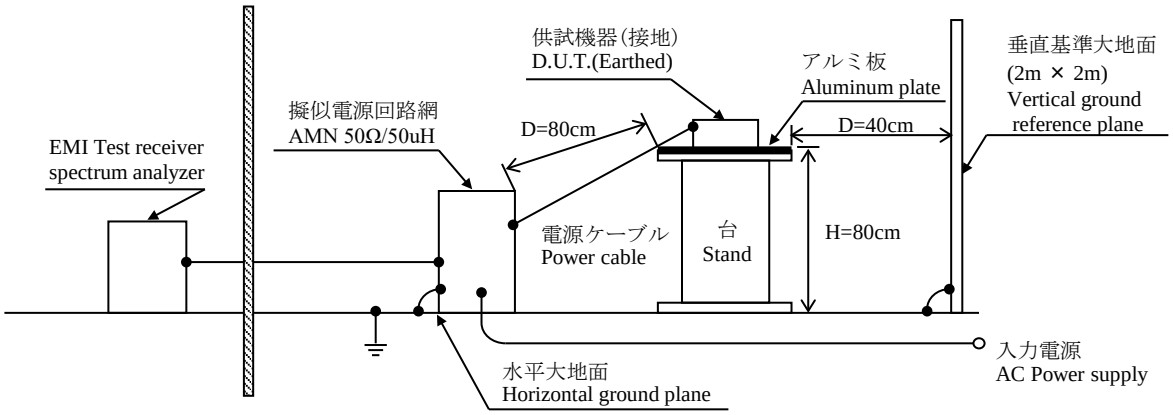



R ：50Ω
C1 : 4700pF Ceramic cap.

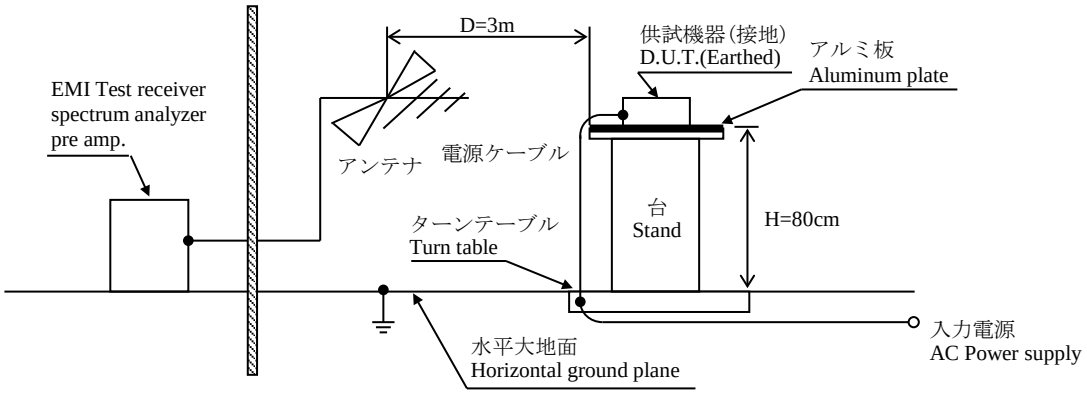
測定構成 Configuration used for determination

・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. | DL9040L / DLM2054 |
| 2 | DIGITAL MULTIMETER | AGILENT | 34970A |
| 3 | DIGITAL POWER METER | HIOKI | 3334 |
| 4 | DIGITAL POWER METER | YOKOGAWA ELECT. | WT110 / WT210 |
| 5 | CURRENT PROBE | YOKOGAWA ELECT. | 701928 / 701930 |
| 6 | DYNAMIC DUMMY LOAD | TAKASAGO | FK-400L / FK-600L |
| 7 | DYNAMIC DUMMY LOAD | KIKUSUI | PLZ1004W / PLZ150U |
| 8 | DUMMY LOAD | PCN | PHF250 SERIES |
| 9 | ISOLATION TRANS | MATSUNAGA | 3WTC-50K |
| 10 | CVCF | TAKASAGO | AA2000XG |
| 11 | CVCF | KIKUSUI | PCR4000L |
| 12 | CVCF | NF | ES10000S |
| 13 | LEAKAGE CURRENT METER | HIOKI | 3156 |
| 14 | DYNAMIC DIP SIMULATOR | TAKAMISAWA | PSA-210 |
| 15 | CONTROLLED TEMP. CHAMBER | ESPEC | SU-261 / SH-240 |
| 16 | EMI TEST RECEIVER / SPECTRUM ANALYZER | ROHDE & SCHWARZ | ESCI |
| 17 | PRE AMP. | SONOMA | 310N |
| 18 | AMN | SCHWARZBECK | NNLK8121 |
| 19 | ANTENNA | SCHWARZBECK | CBL6111D |
| 20 | HARMONIC / FLICKER ANALYZER | KIKUSUI | KHA1000 |
| 21 | SINGLE-PHASE MASTER | NF | 4420 |
| 22 | REFERENCE IMPEDANCE NETWORK 20A | NF | 4150 |
| 23 | MULTI OUTLET UNIT | KIKUSUI | OT01-KHA |

## 2. 特性データ　Characteristics

2.1 静特性　Steady state data

(1) 入力・負荷・温度変動／出力起動・遮断電圧

Regulation - line and load, Temperature drift / Start up voltage and Drop out voltage

### 5V

1. Regulation - line and load　Condition　Ta：　25 ℃

| Iout \ Vin | 85VAC | 100VAC | 200VAC | 265VAC | line regulation | |
|---|---|---|---|---|---|---|
| 0% | 5.022V | 5.022V | 5.022V | 5.022V | 0mV | 0.000% |
| 50% | 5.019V | 5.019V | 5.019V | 5.019V | 0mV | 0.000% |
| 100% | 5.017V | 5.017V | 5.017V | 5.017V | 0mV | 0.000% |
| load | 5mV | 5mV | 5mV | 5mV | | |
| regulation | 0.100% | 0.100% | 0.100% | 0.100% | | |

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

| Ta | -10℃ | +25℃ | +50℃ | temperature stability | |
|---|---|---|---|---|---|
| Vout | 5.017V | 5.017V | 5.018V | 1mV | 0.020% |

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

| | |
|---|---|
| Start up voltage (Vin) | 76VAC |
| Drop out voltage (Vin) | 55VAC |

### 12V

1. Regulation - line and load　Condition　Ta：　25 ℃

| Iout \ Vin | 85VAC | 100VAC | 200VAC | 265VAC | line regulation | |
|---|---|---|---|---|---|---|
| 0% | 12.018V | 12.018V | 12.018V | 12.018V | 0mV | 0.000% |
| 50% | 12.016V | 12.016V | 12.016V | 12.016V | 0mV | 0.000% |
| 100% | 12.014V | 12.014V | 12.014V | 12.014V | 0mV | 0.000% |
| load | 4mV | 4mV | 4mV | 4mV | | |
| regulation | 0.033% | 0.033% | 0.033% | 0.033% | | |

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

| Ta | -10℃ | +25℃ | +50℃ | temperature stability | |
|---|---|---|---|---|---|
| Vout | 12.016V | 12.014V | 12.005V | 11mV | 0.092% |

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

| | |
|---|---|
| Start up voltage (Vin) | 77VAC |
| Drop out voltage (Vin) | 55VAC |

### 24V

1. Regulation - line and load　Condition　Ta：　25 ℃

| Iout \ Vin | 85VAC | 100VAC | 200VAC | 265VAC | line regulation | |
|---|---|---|---|---|---|---|
| 0% | 24.038V | 24.038V | 24.038V | 24.039V | 1mV | 0.004% |
| 50% | 24.034V | 24.034V | 24.035V | 24.036V | 2mV | 0.008% |
| 100% | 24.031V | 24.032V | 24.031V | 24.031V | 1mV | 0.004% |
| load | 7mV | 6mV | 7mV | 8mV | | |
| regulation | 0.029% | 0.025% | 0.029% | 0.033% | | |

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

| Ta | -10℃ | +25℃ | +50℃ | temperature stability | |
|---|---|---|---|---|---|
| Vout | 24.053V | 24.032V | 24.019V | 34mV | 0.142% |

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

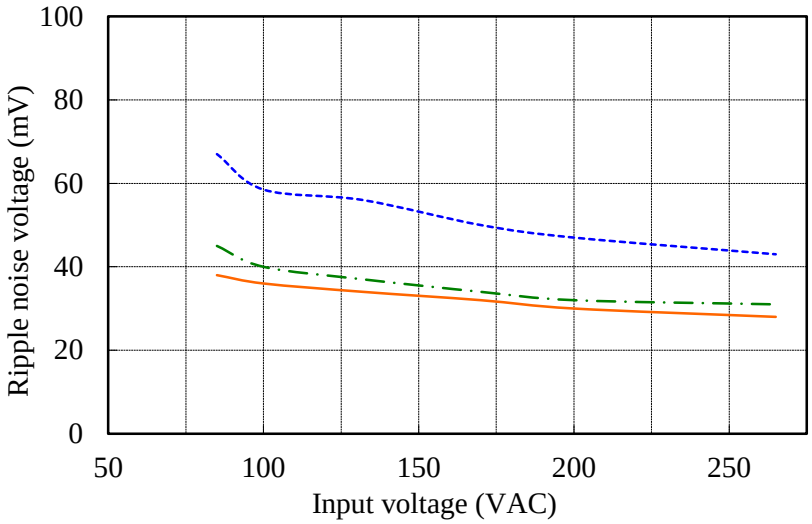
| | |
|---|---|
| Start up voltage (Vin) | 76VAC |
| Drop out voltage (Vin) | 56VAC |

(2) リップルノイズ電圧対入力電圧

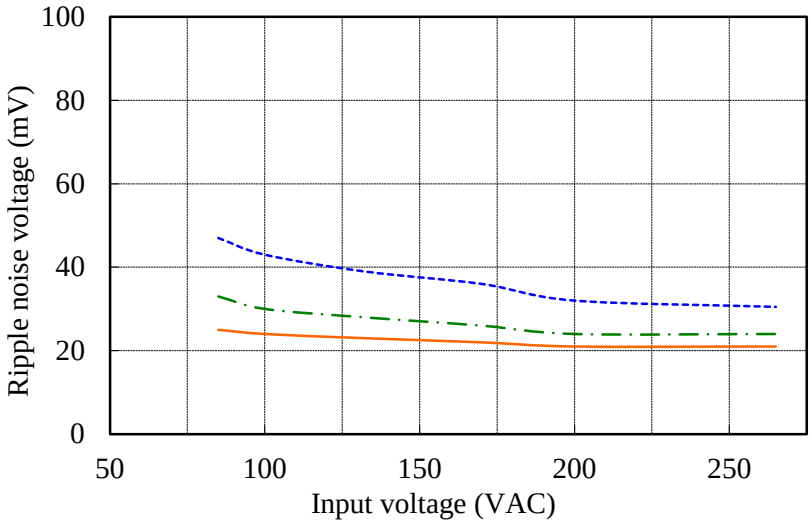
Ripple noise voltage vs. Input voltage

Conditions Iout: 100 %
Ta : -10 ℃
25 ℃
50 ℃

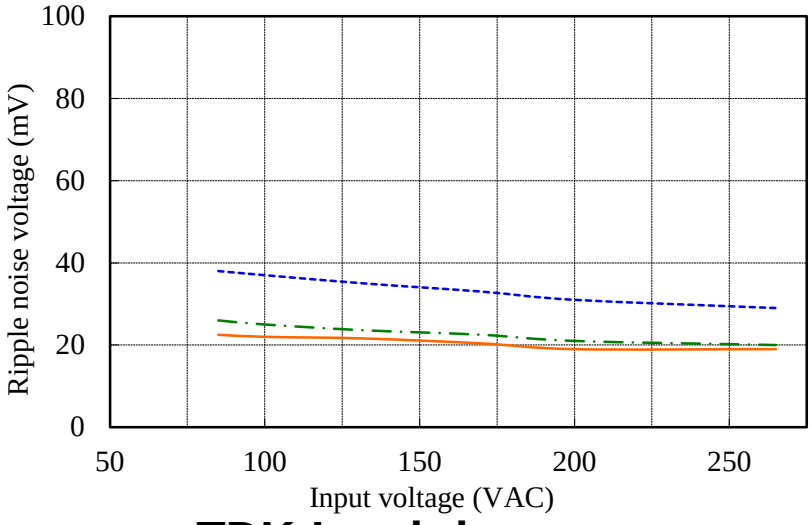
5V




12V




24V

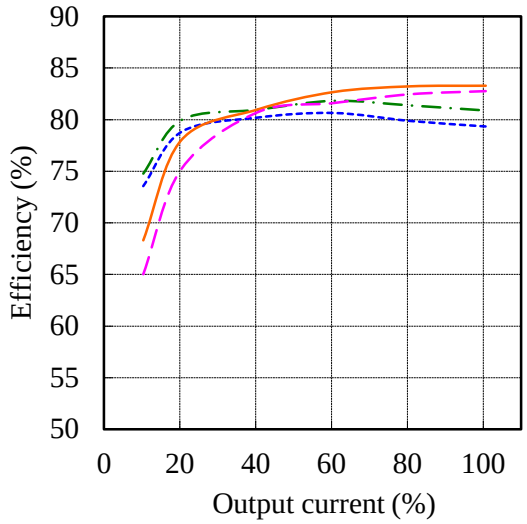


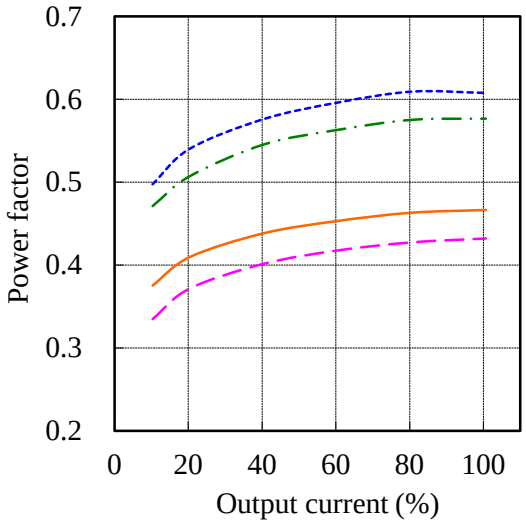
(3) 効率・力率対出力電流

Efficiency and Power factor vs. Output current

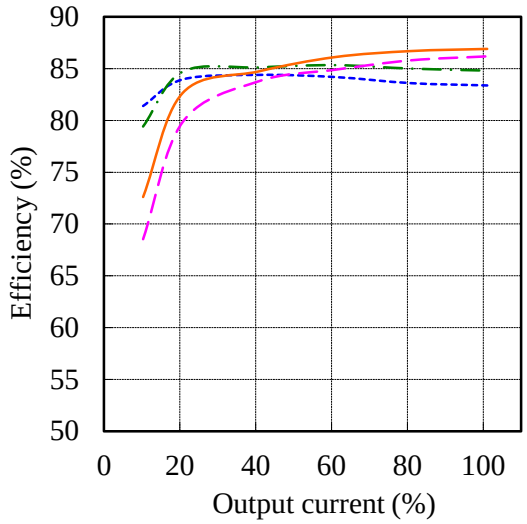
Conditions Vin : 85 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

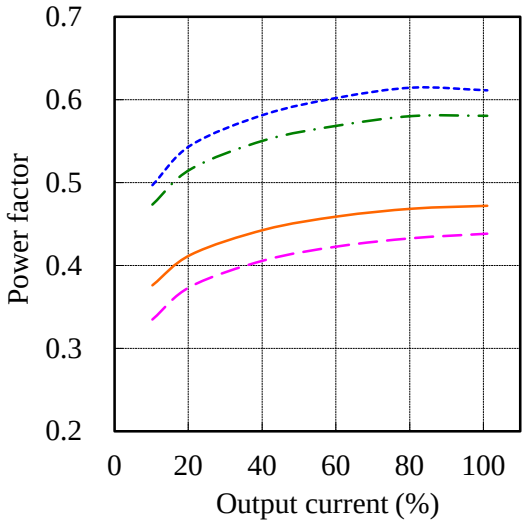
5V



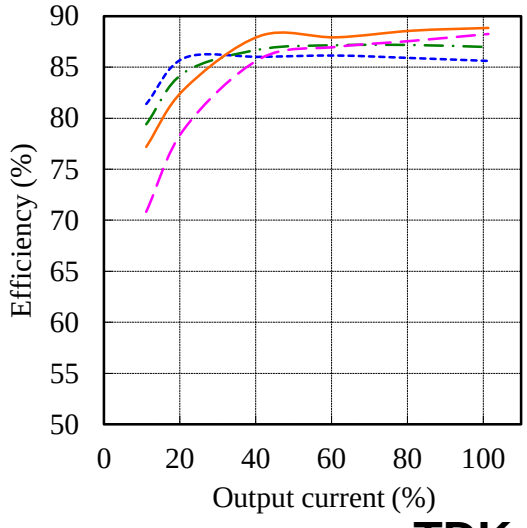



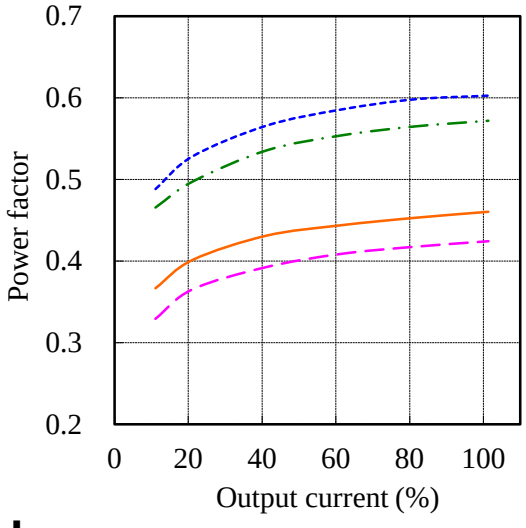

12V




24V



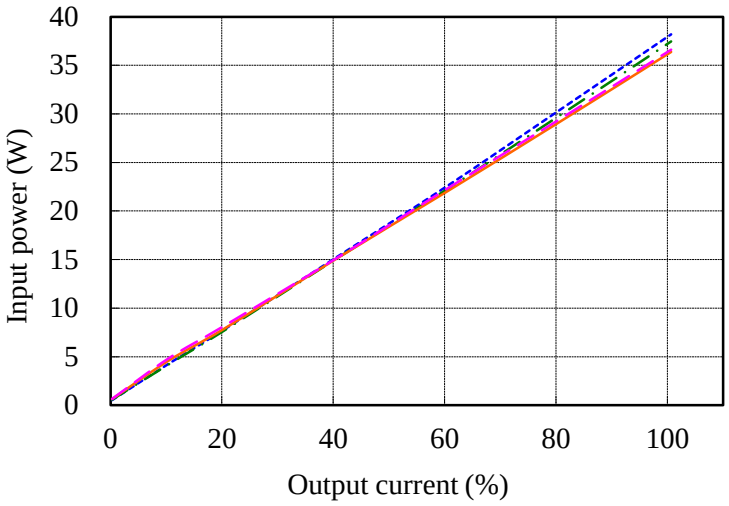



(4) 入力電力対出力電流
Input power vs. Output current

Conditions Vin : 85 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

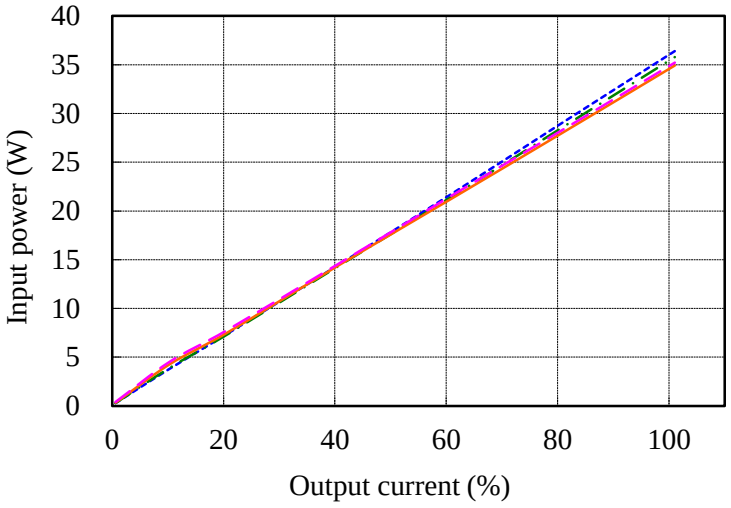
## 5V

| Vin | Input power |
|---|---|
| | Iout : 0% |
| 85VAC | 0.5W |
| 100VAC | 0.6W |
| 200VAC | 0.6W |
| 265VAC | 0.7W |



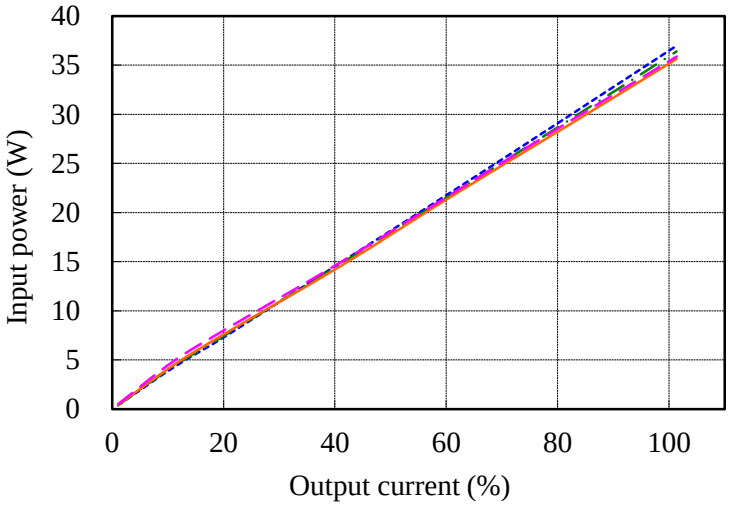

## 12V

| Vin | Input power |
|---|---|
| | Iout : 0% |
| 85VAC | 0.3W |
| 100VAC | 0.3W |
| 200VAC | 0.3W |
| 265VAC | 0.4W |




## 24V

| Vin | Input power |
|---|---|
| | Iout : 0% |
| 85VAC | 0.4W |
| 100VAC | 0.4W |
| 200VAC | 0.4W |
| 265VAC | 0.5W |

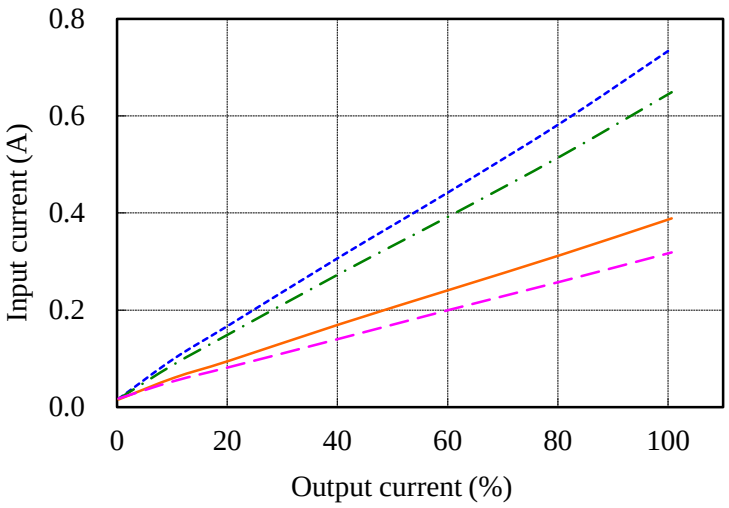


(5) 入力電流対出力電流
Input current vs. Output current

Conditions Vin : 85 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

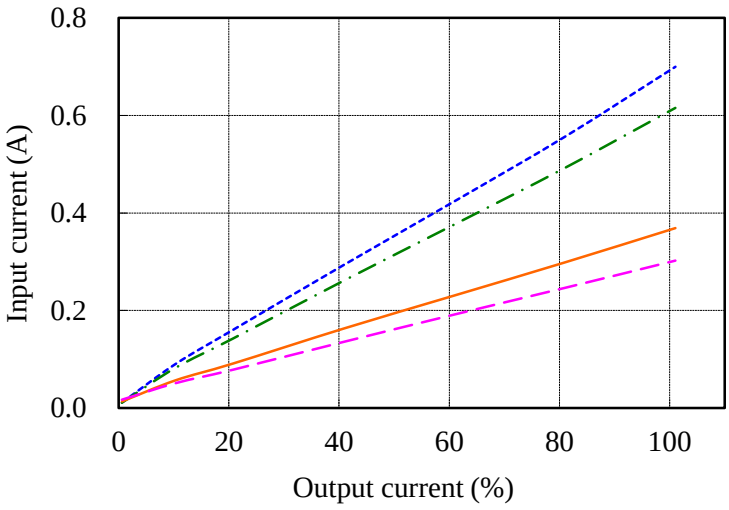
## 5V

| Vin | Input current |
|---|---|
| | Iout : 0% |
| 85VAC | 0.02A |
| 100VAC | 0.02A |
| 200VAC | 0.02A |
| 265VAC | 0.02A |



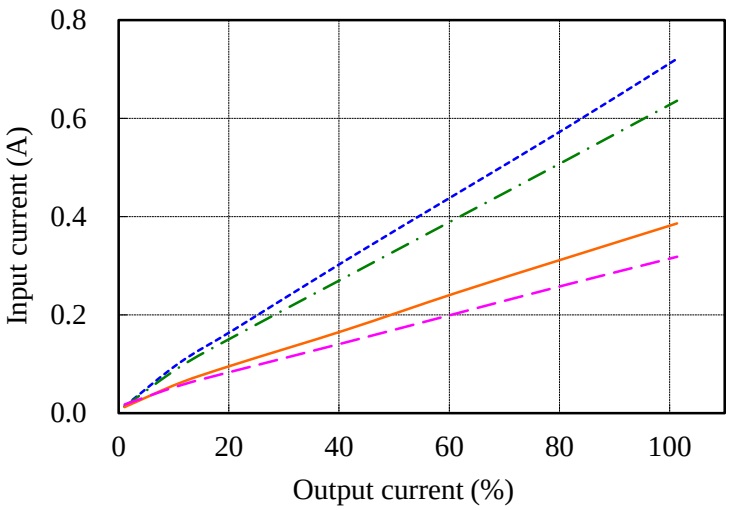

## 12V

| Vin | Input current |
|---|---|
| | Iout : 0% |
| 85VAC | 0.01A |
| 100VAC | 0.01A |
| 200VAC | 0.01A |
| 265VAC | 0.02A |




## 24V

| Vin | Input current |
|---|---|
| | Iout : 0% |
| 85VAC | 0.01A |
| 100VAC | 0.01A |
| 200VAC | 0.01A |
| 265VAC | 0.02A |

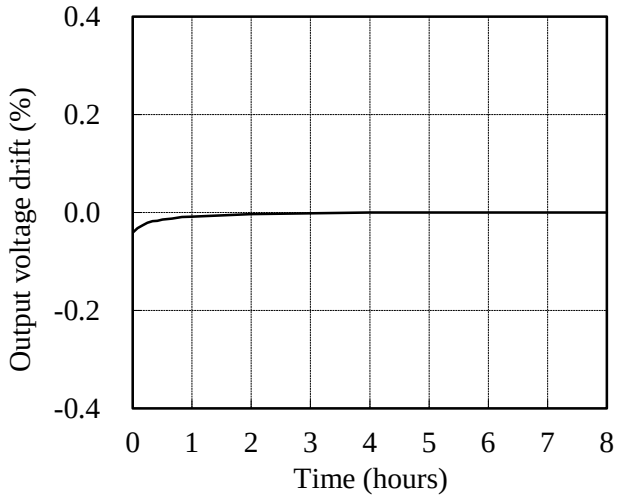


2.2 通電ドリフト特性

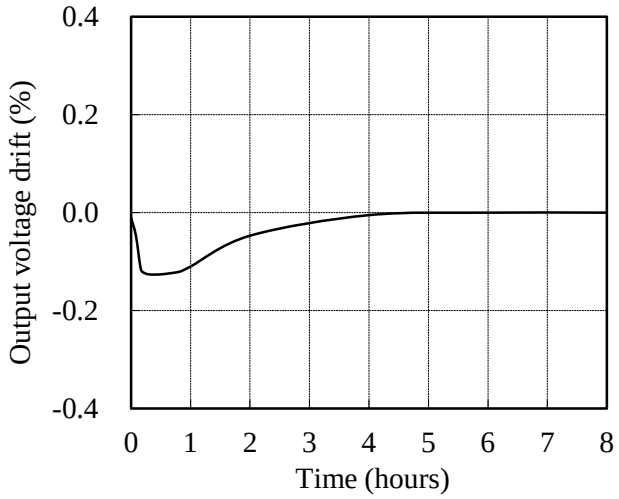
Warm up voltage drift characteristics

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

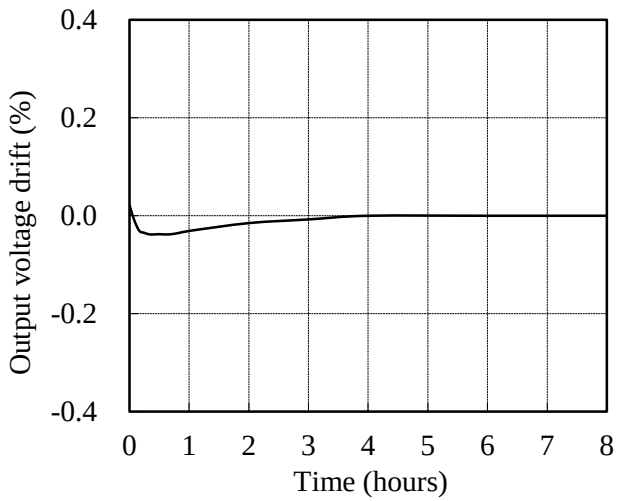
5V




12V



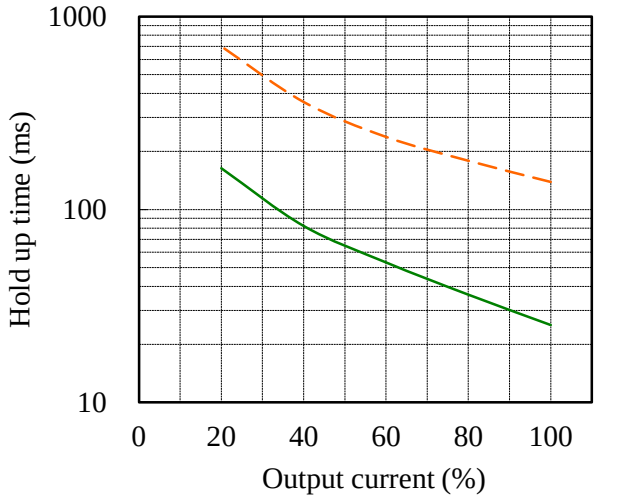

24V

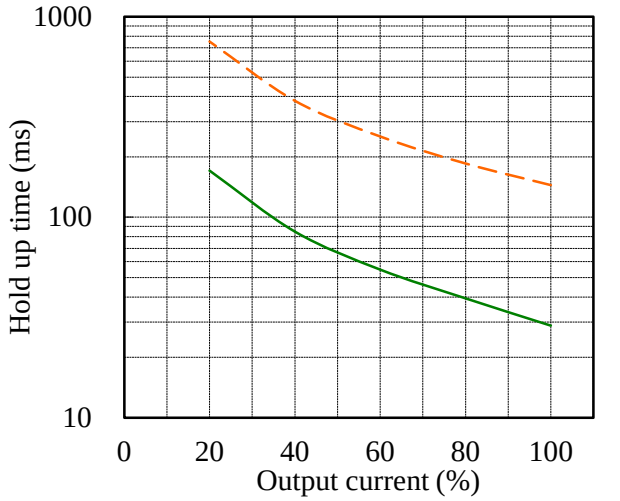


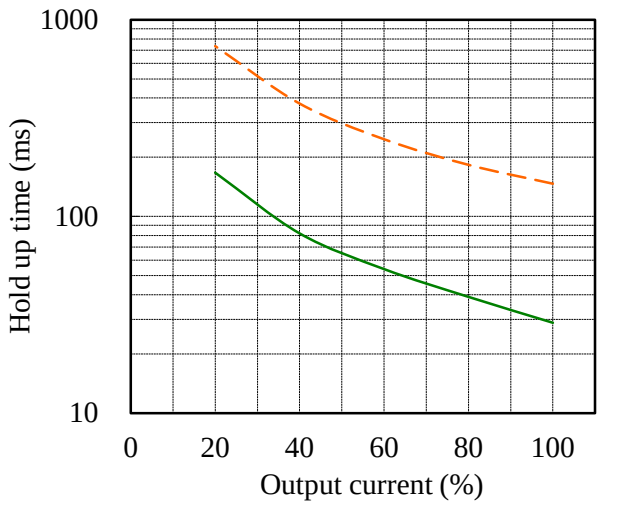

2.3 出力保持時間特性

Hold up time characteristics

Conditions Vin : 100 VAC
200 VAC
Ta : 25 ℃



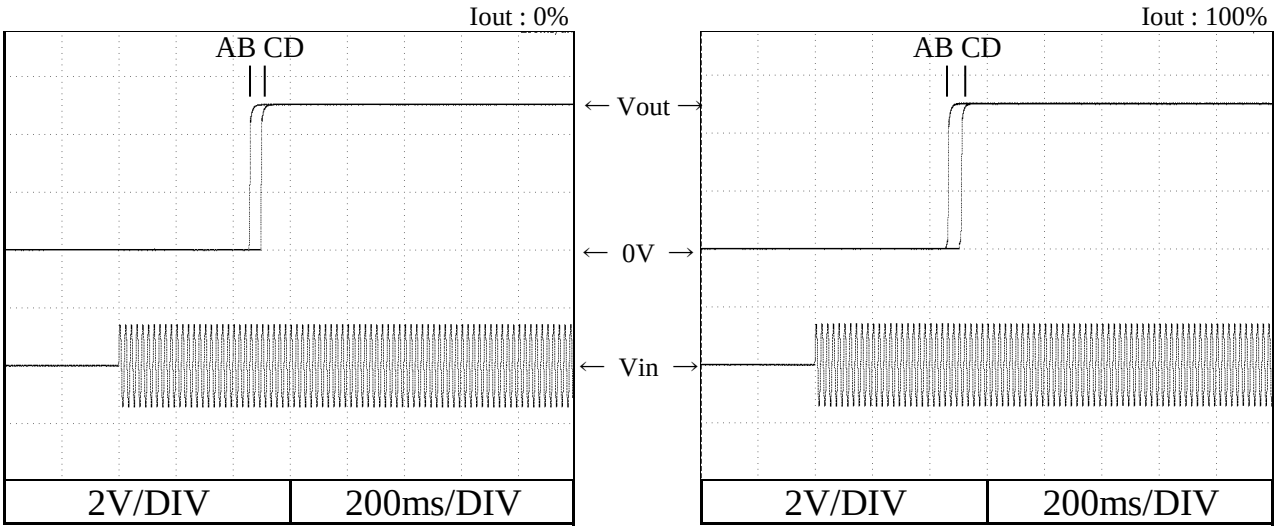



2.4 出力立ち上がり特性

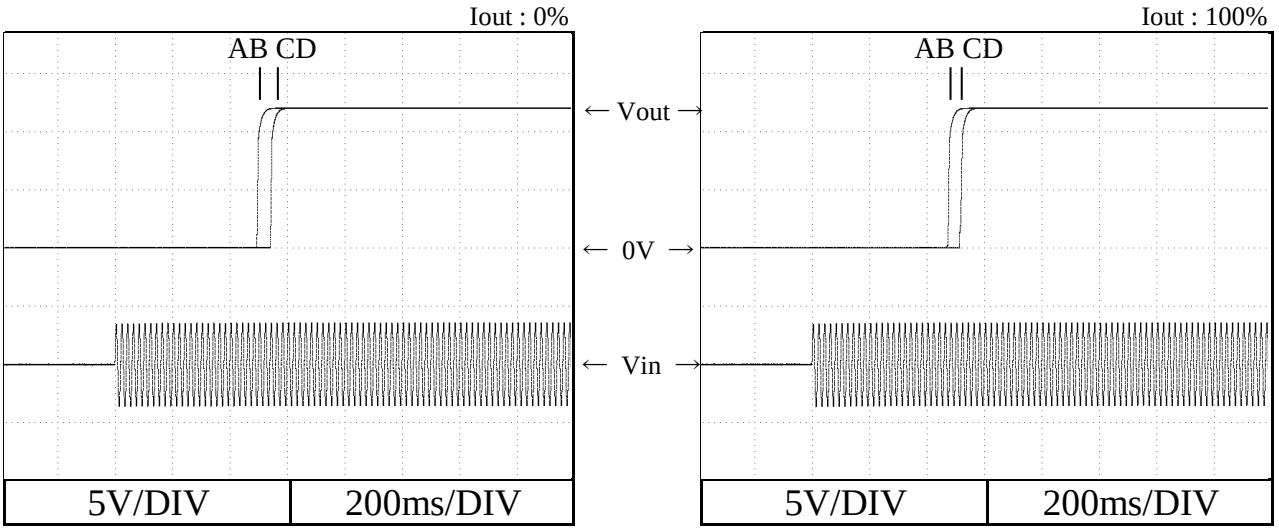
Output rise characteristics

Conditions Vin : 85 VAC (A)
100 VAC (B)
200 VAC (C)
265 VAC (D)
Ta : 25 ℃

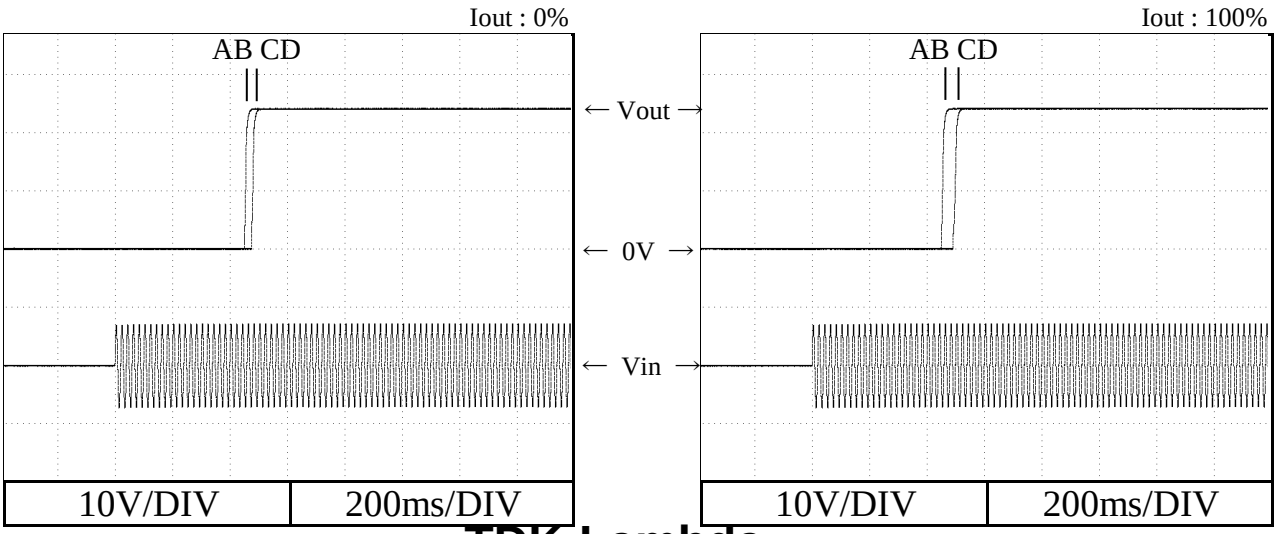
5V




12V




24V

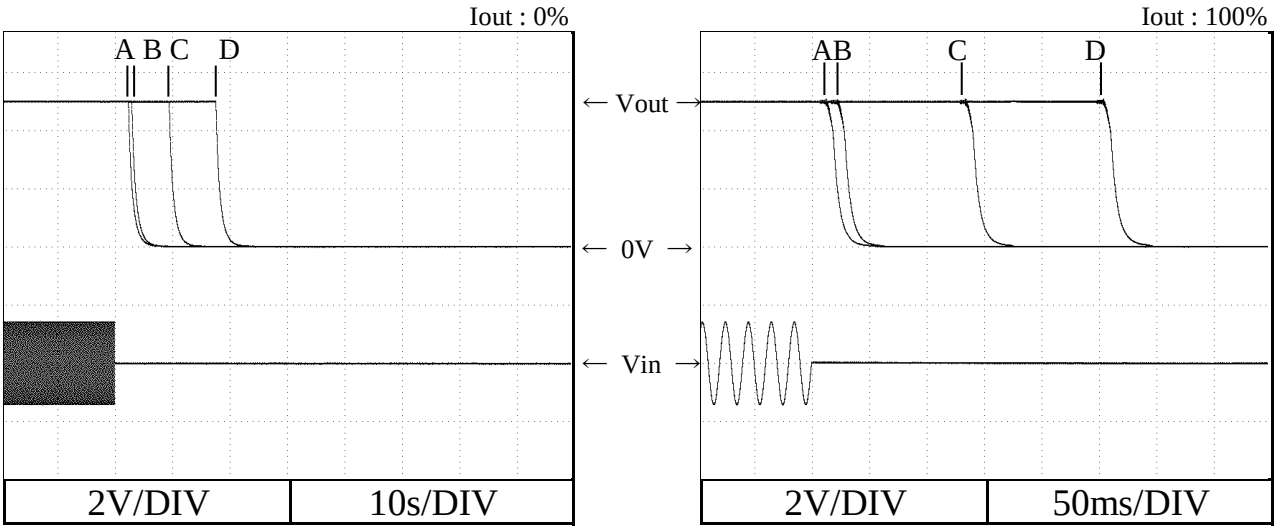


2.5 出力立ち下がり特性

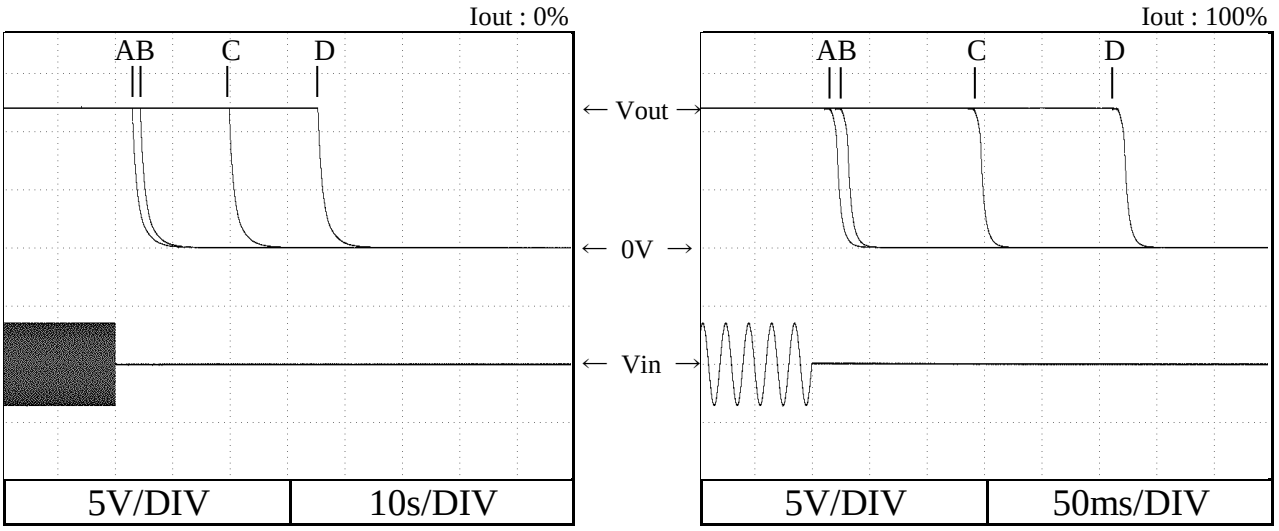
Output fall characteristics

Conditions Vin : 85 VAC (A)
100 VAC (B)
200 VAC (C)
265 VAC (D)
Ta : 25 ℃

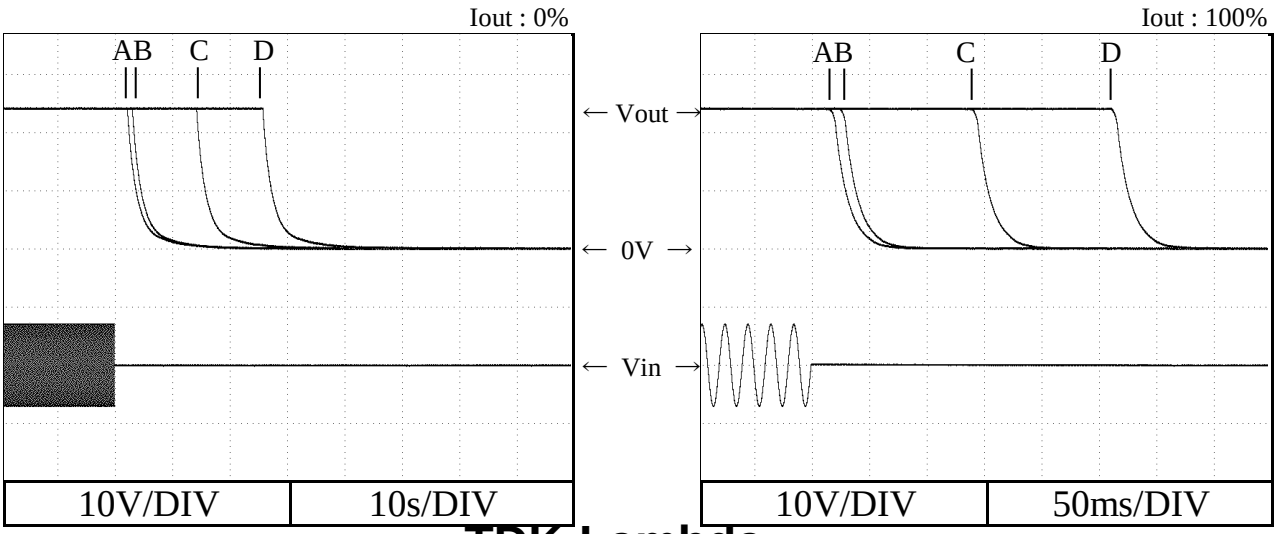
5V




12V




24V



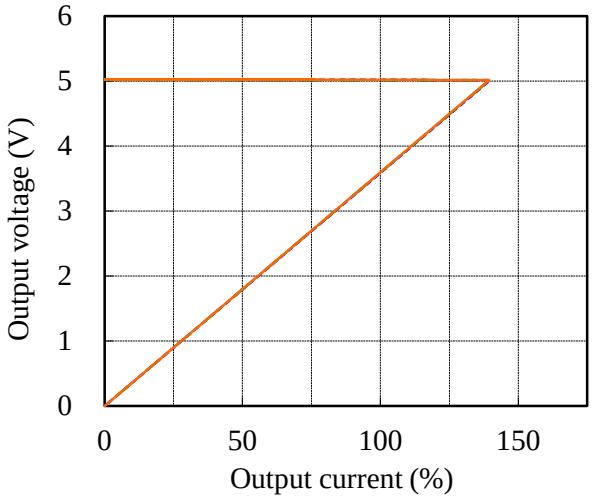
2.6 過電流保護特性

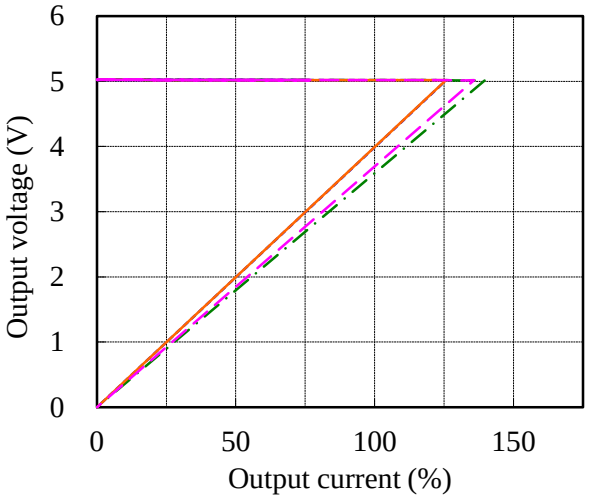
Over current protection (OCP) characteristics

Conditions Vin : 100 VAC
Ta : -10 ℃
25 ℃
50 ℃

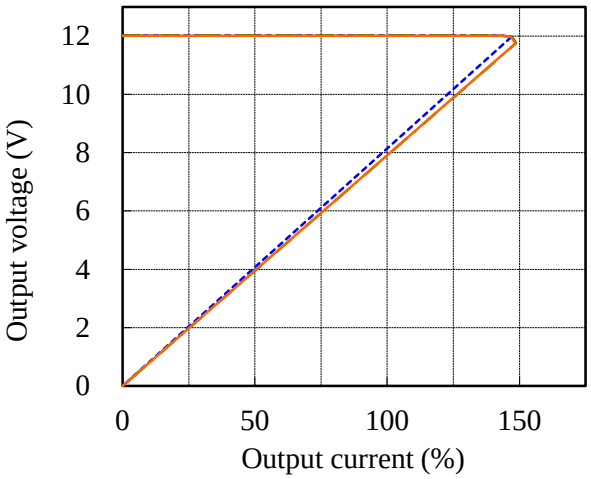
Conditions Vin : 85 VAC
100 VAC
200 VAC
265 VAC
Ta : 25 ℃

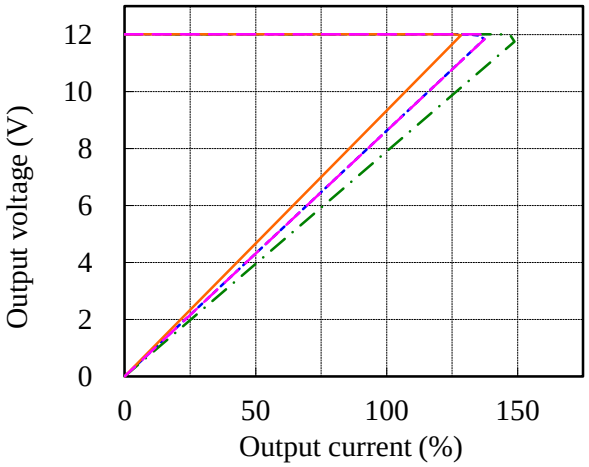
5V



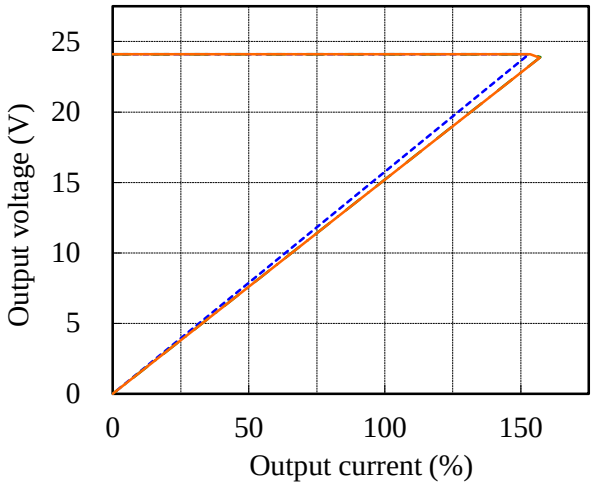



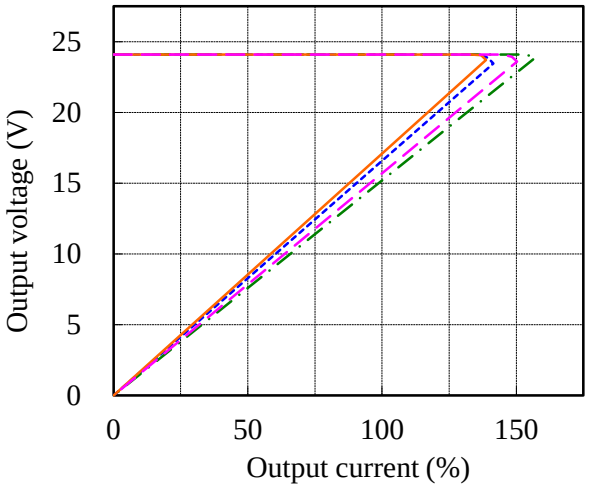

12V




24V



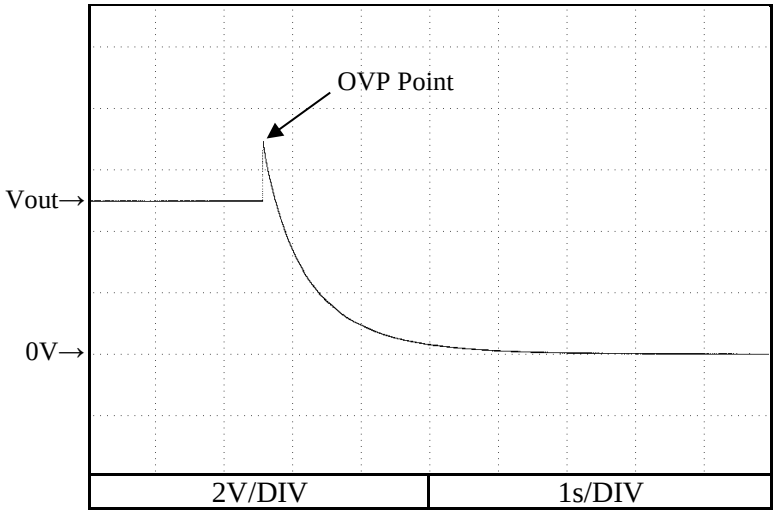



2.7 過電圧保護特性

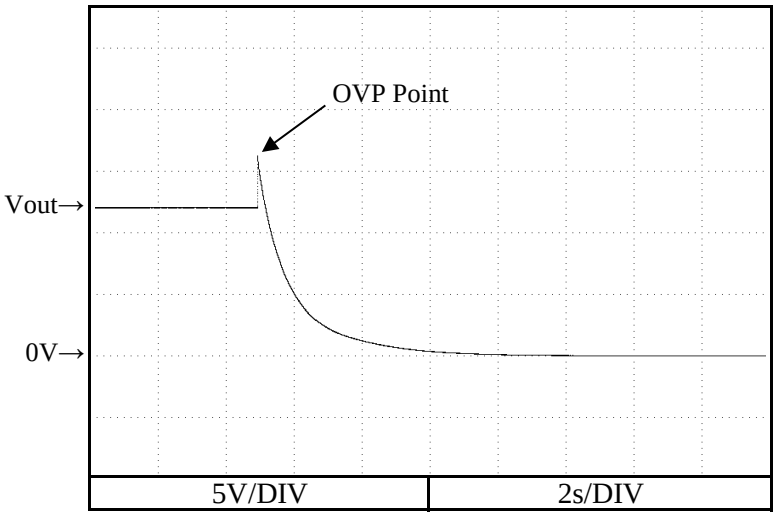
Over voltage protection (OVP) characteristics

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

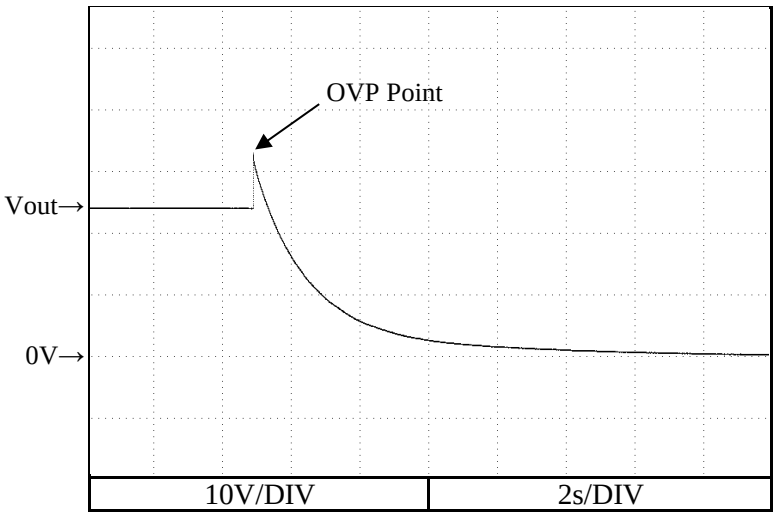
5V




12V




24V

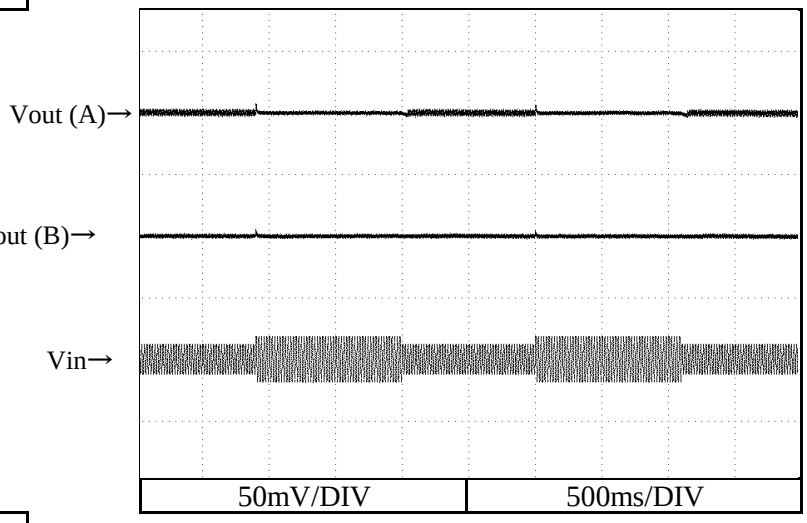


2.8 過渡応答（入力急変）特性

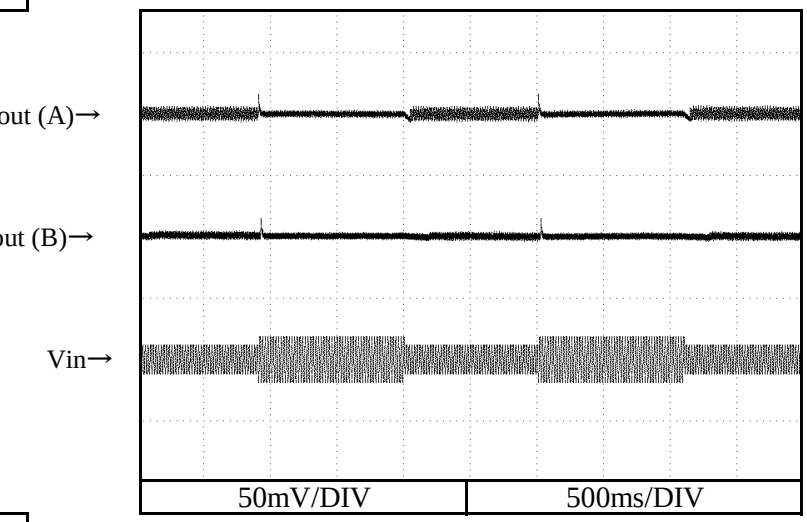
Dynamic line response characteristics

Conditions　Vin : 85 VAC←→132VAC (A)
170 VAC←→265VAC (B)
Iout : 100 %
Ta : 25 ℃

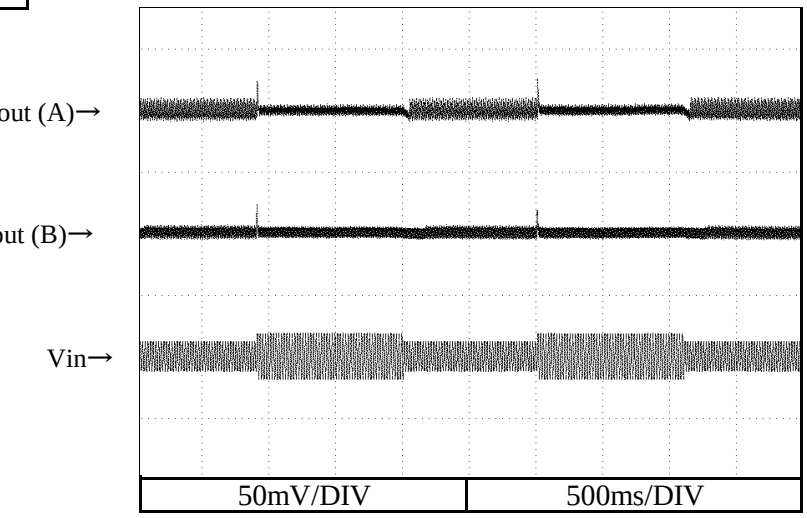
5V




12V




24V

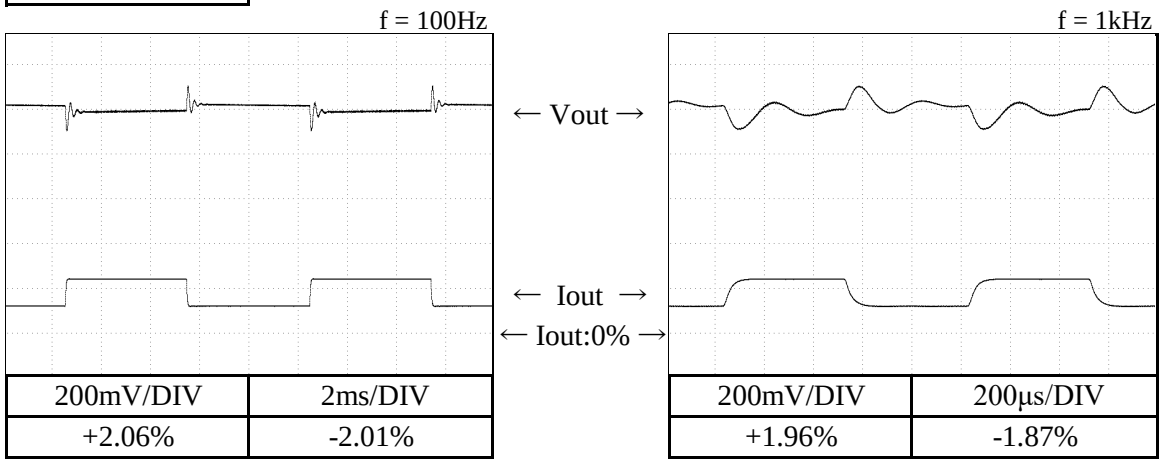


2.9 過渡応答（負荷急変）特性

Dynamic load response characteristics

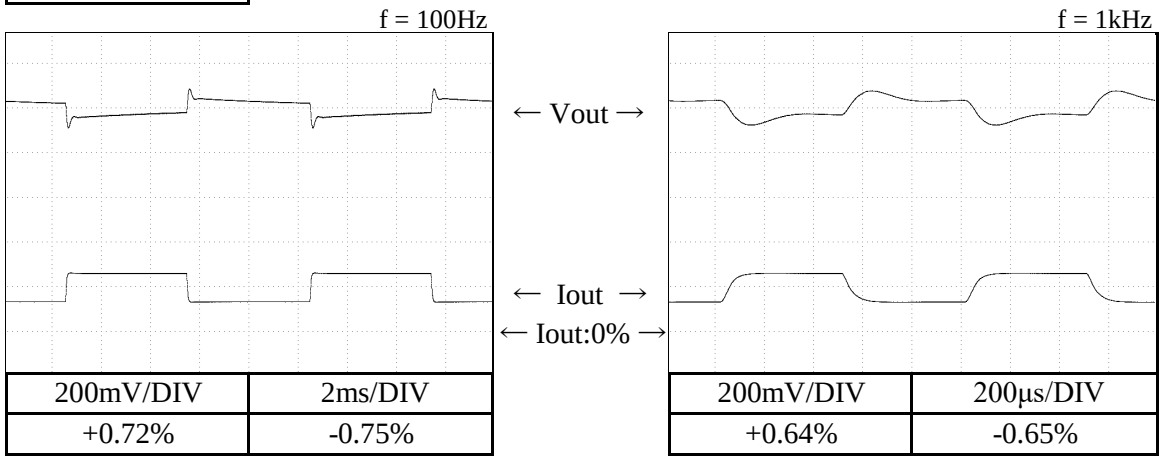
Conditions Vin : 100 VAC
Iout : 50 % ⟷ 100 %
(tr = tf = 50us)
Ta : 25 ℃

## 5V



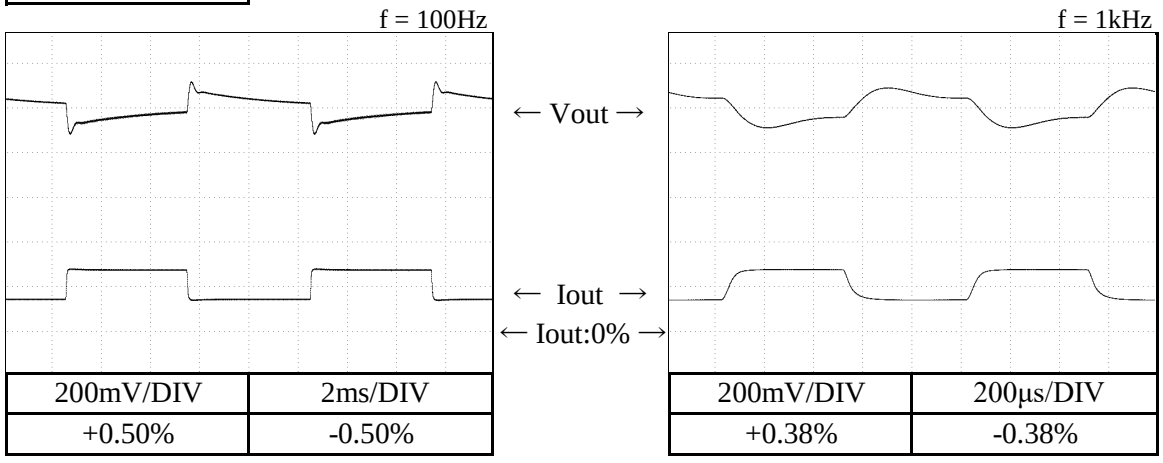

| 200mV/DIV | 2ms/DIV | 200mV/DIV | 200μs/DIV |
|---|---|---|---|
| +2.06% | -2.01% | +1.96% | -1.87% |

## 12V




| 200mV/DIV | 2ms/DIV | 200mV/DIV | 200μs/DIV |
|---|---|---|---|
| +0.72% | -0.75% | +0.64% | -0.65% |

## 24V




| 200mV/DIV | 2ms/DIV | 200mV/DIV | 200μs/DIV |
|---|---|---|---|
| +0.50% | -0.50% | +0.38% | -0.38% |

2.10 入力電圧瞬停特性

Response to brown out characteristics

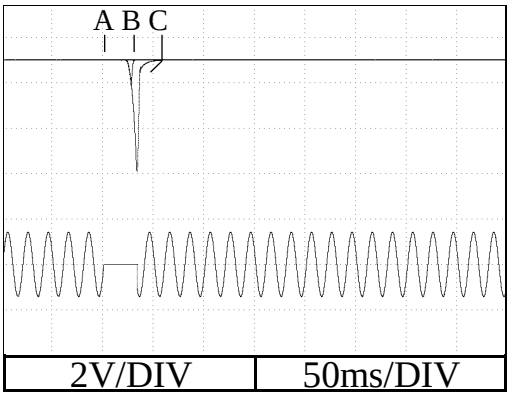
Conditions Iout : 100 %
Ta : 25 ℃

瞬停時間 Interruption time

A : 出力電圧が低下なし Output voltage does not drop.
B : 出力電圧の低下が0Vまでいかない Output voltage drop down not reaching 0V.
C : 出力電圧が0Vまで低下 Output voltage drops until 0V.

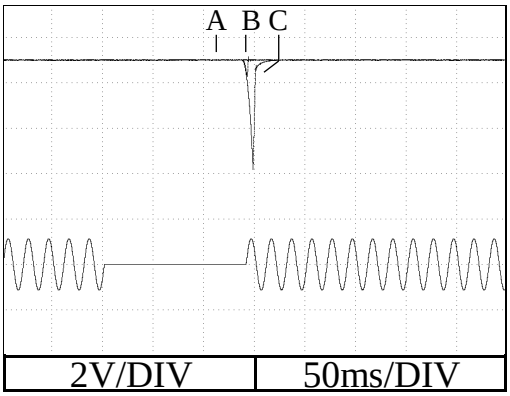
5V

Vin : 100VAC
A = 23ms、B = 27ms、C = 33ms



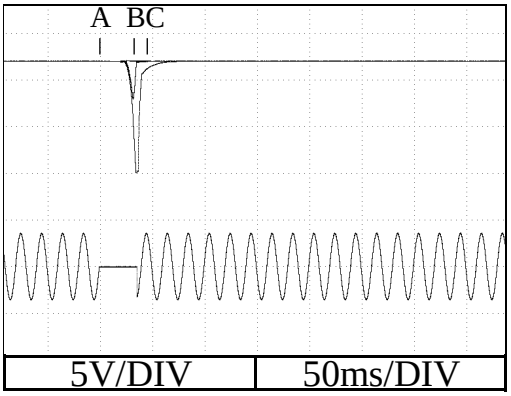

← Vout →
← 0V →
← Vin →

Vin : 200VAC
A = 132ms、B = 137ms、C = 143ms



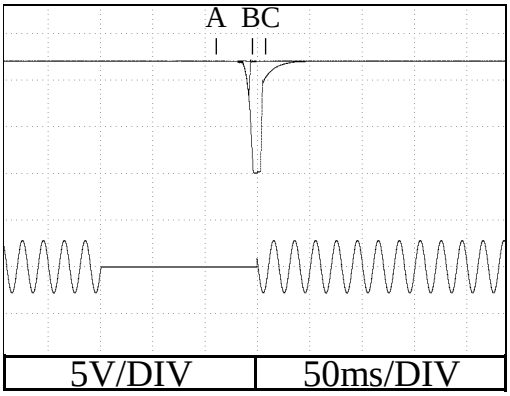

12V

Vin : 100VAC
A = 23ms、B = 29ms、C = 36ms



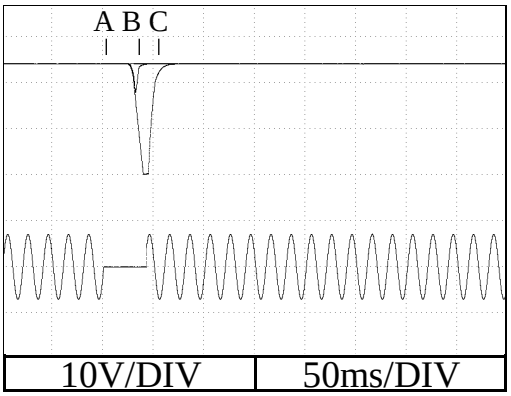

← Vout →
← 0V →
← Vin →

Vin : 200VAC
A = 136ms、B = 142ms、C = 149ms



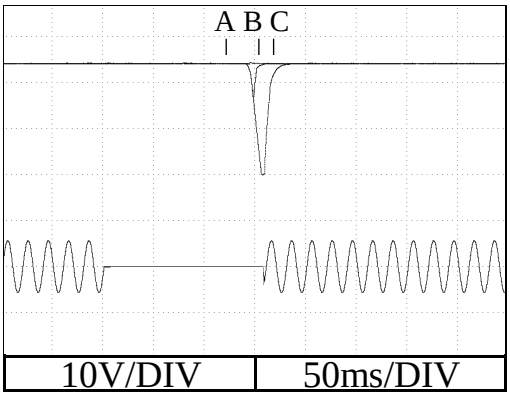

24V

Vin : 100VAC
A = 26ms、B = 32ms、C = 42ms




← Vout →
← 0V →
← Vin →

Vin : 200VAC
A = 141ms、B = 147ms、C = 157ms

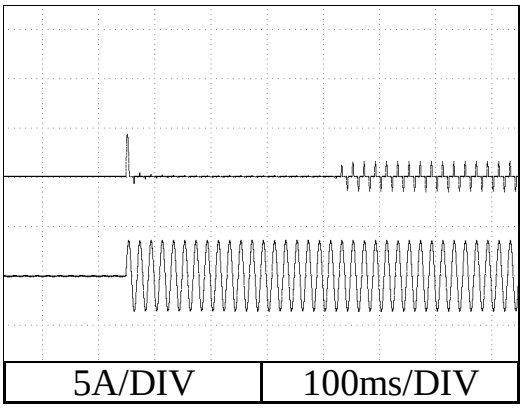


2.11 入力サージ電流（突入電流）波形
Inrush current waveform

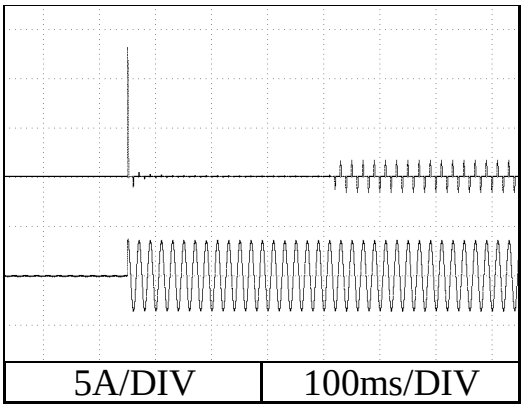
5V

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

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

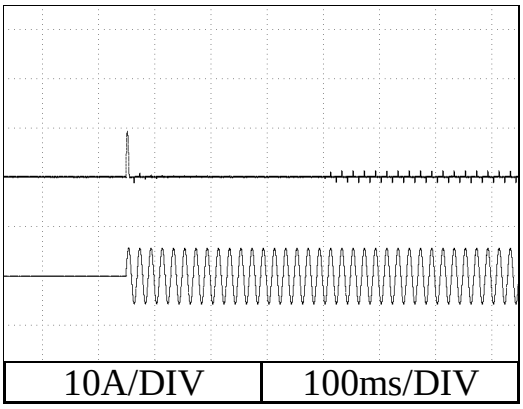



Switch on phase angle of input AC voltage
$\phi$ = 90°

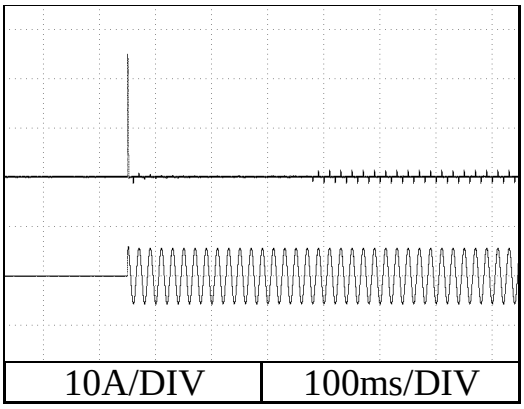



Conditions Vin : 200 VAC
Iout : 100 %
Ta : 25 ℃

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




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



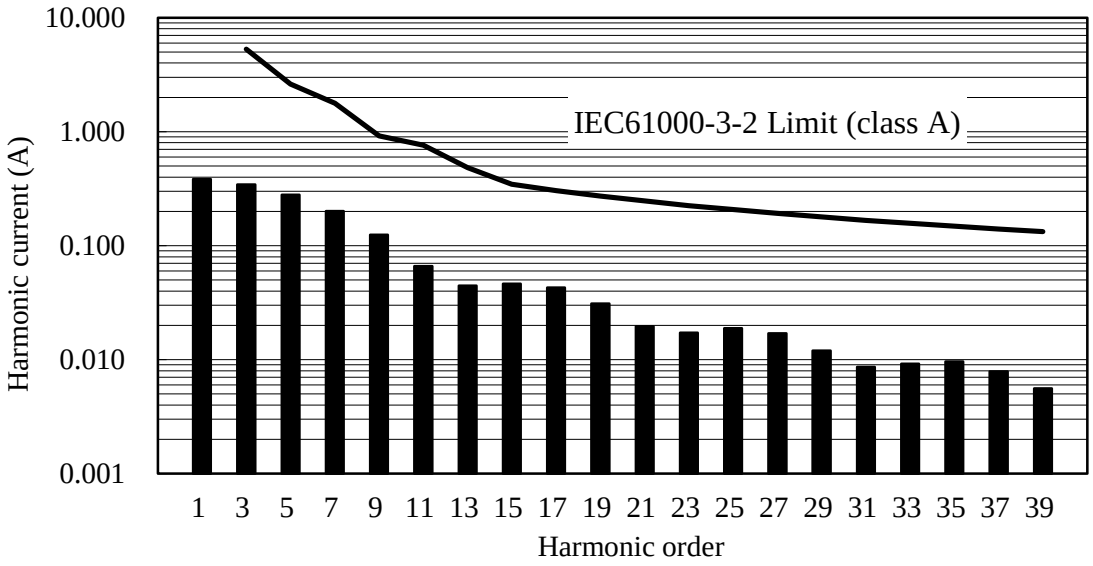
2.12 高調波成分

Input current harmonics

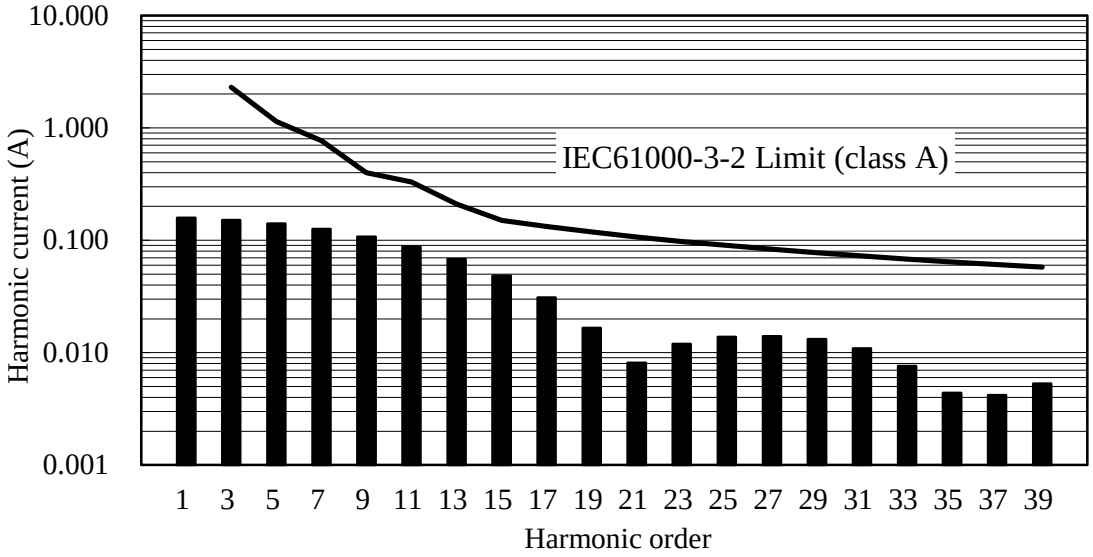
Conditions Iout : 100 %
Ta : 25 ℃

5V

Vin : 100 VAC



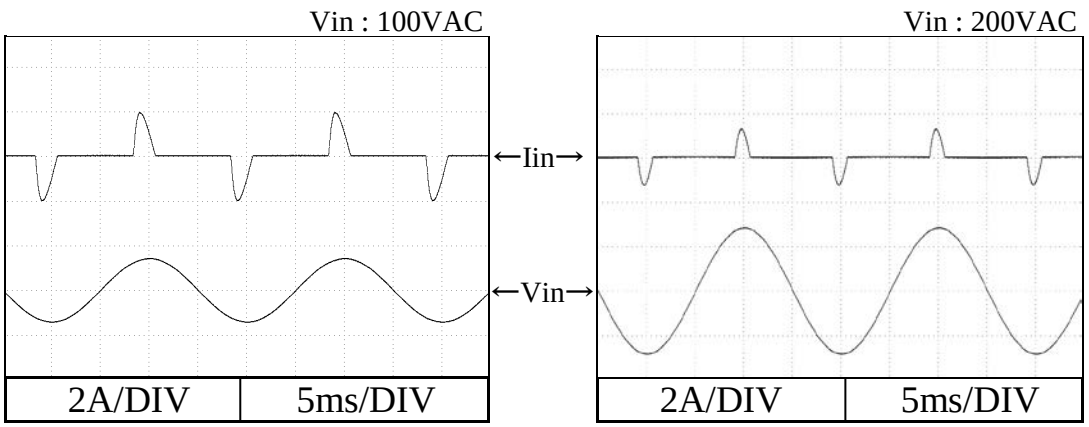

Vin : 230 VAC




2.13 入力電流波形

Input current waveform

Conditions Iout : 100 %
Ta : 25 ℃



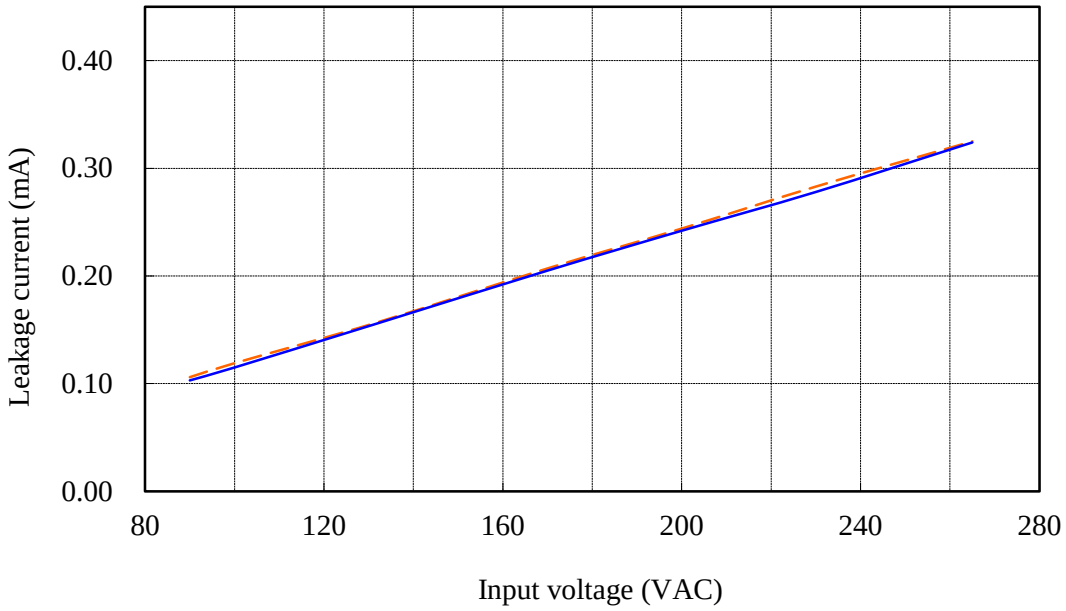
2.14 リーク電流特性

Leakage current characteristics

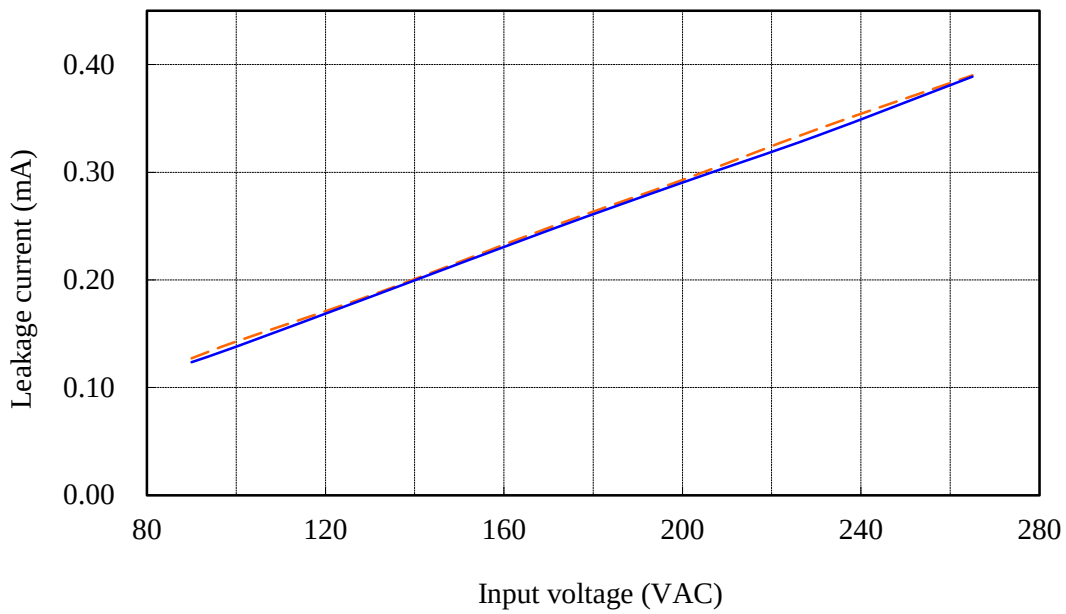
Conditions Iout : 0 % ——
100 % - - - - -
Ta : 25 ℃
Equipment used : 3156 (HIOKI)

5V

f : 50 Hz




f : 60 Hz

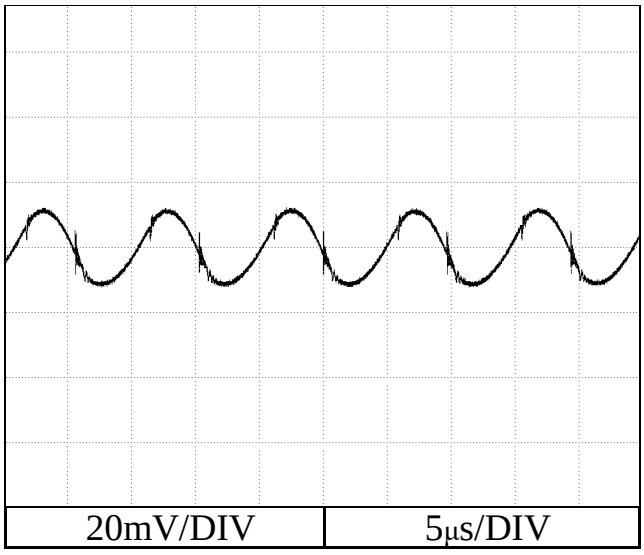


2.15 出力リップル、ノイズ波形

Output ripple and noise waveform

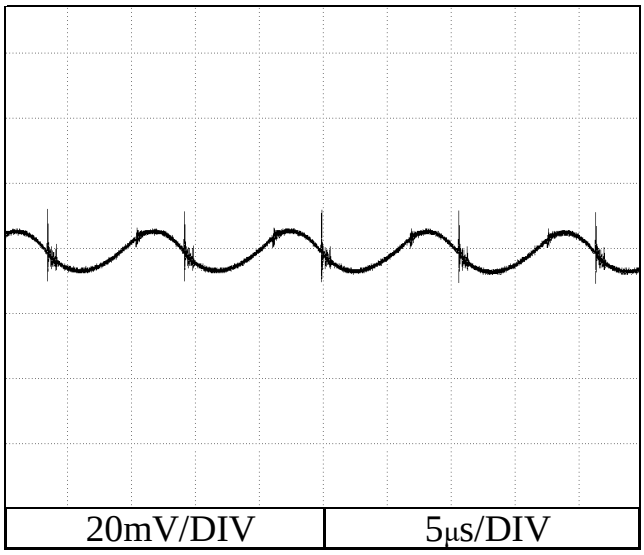
Conditions Vin : 100 VAC
Iout : 100 %
Ta : 25 ℃

5V



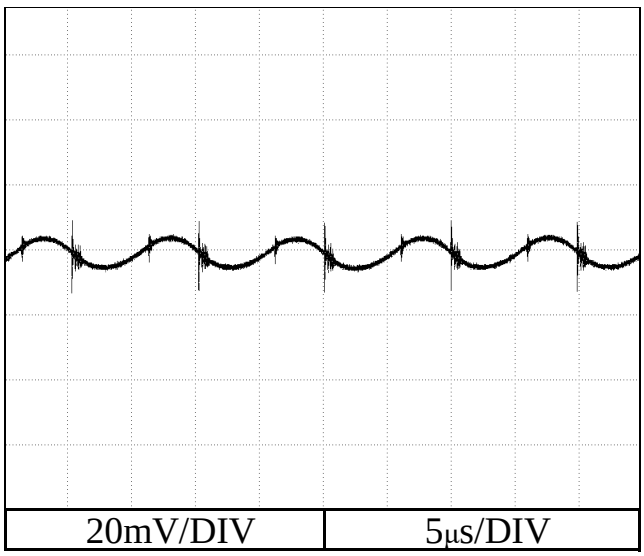
20mV/DIV | 5μs/DIV

12V



20mV/DIV | 5μs/DIV

24V



20mV/DIV | 5μs/DIV

2.16 ＥＭＩ特性

Electro-Magnetic Interference characteristics

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

雑音端子電圧

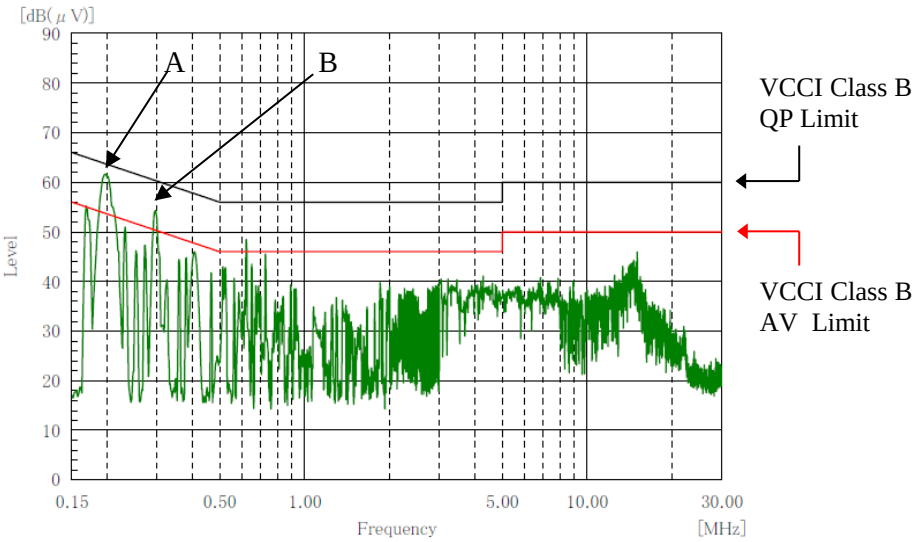
Conducted Emission

5V

| Ref. Data | Point A (201kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 63.6 | 57.3 |
| AV | 53.6 | 38.8 |

| Ref. Data | Point B (302kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 60.2 | 50.5 |
| AV | 50.2 | 30.3 |

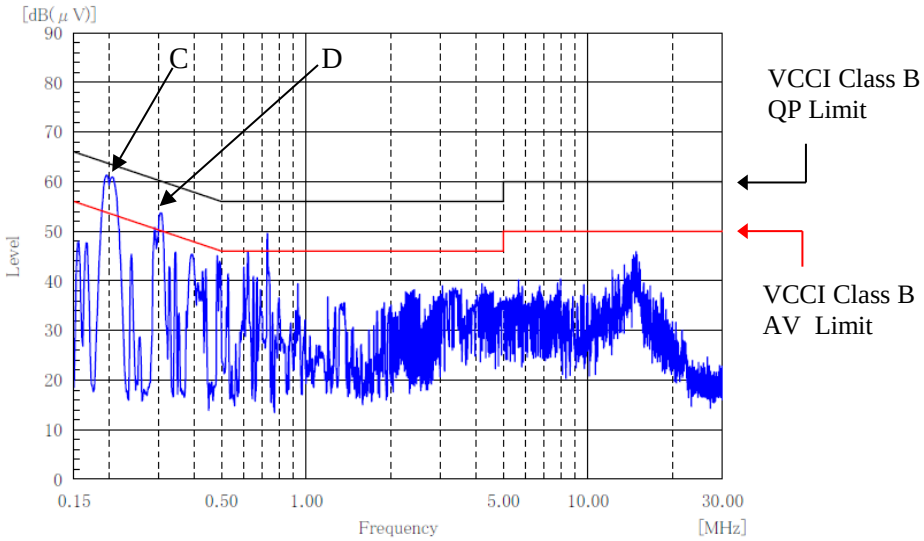
Phase : N




| Ref. Data | Point C (207kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 63.3 | 57.3 |
| AV | 53.3 | 38.8 |

| Ref. Data | Point D (310kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 60.0 | 50.7 |
| AV | 50.0 | 31.2 |

Phase : L




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

2.16 ＥＭＩ特性

Electro-Magnetic Interference characteristics

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

雑音端子電圧

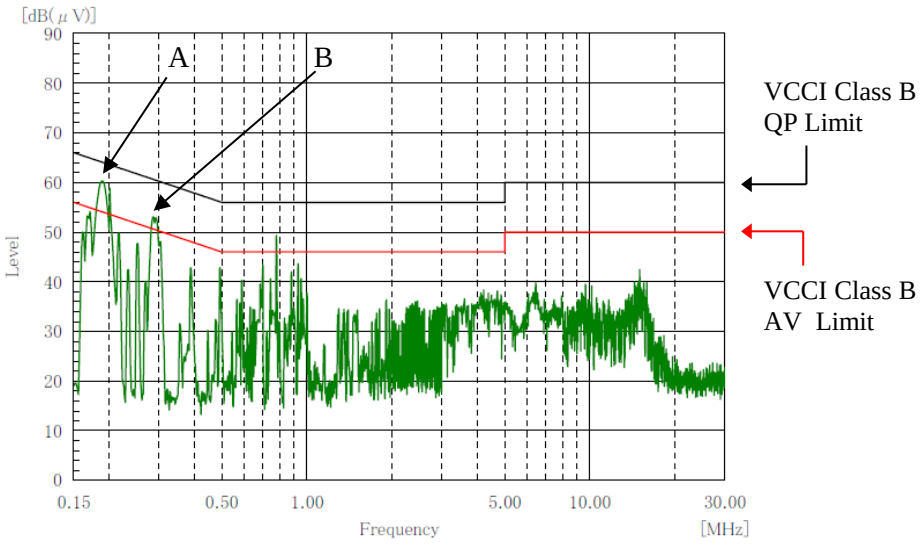
Conducted Emission

12V

| Ref. Data | Point A (194kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 63.8 | 57.0 |
| AV | 53.8 | 37.8 |

| Ref. Data | Point B (287kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 60.6 | 49.8 |
| AV | 50.6 | 29.7 |

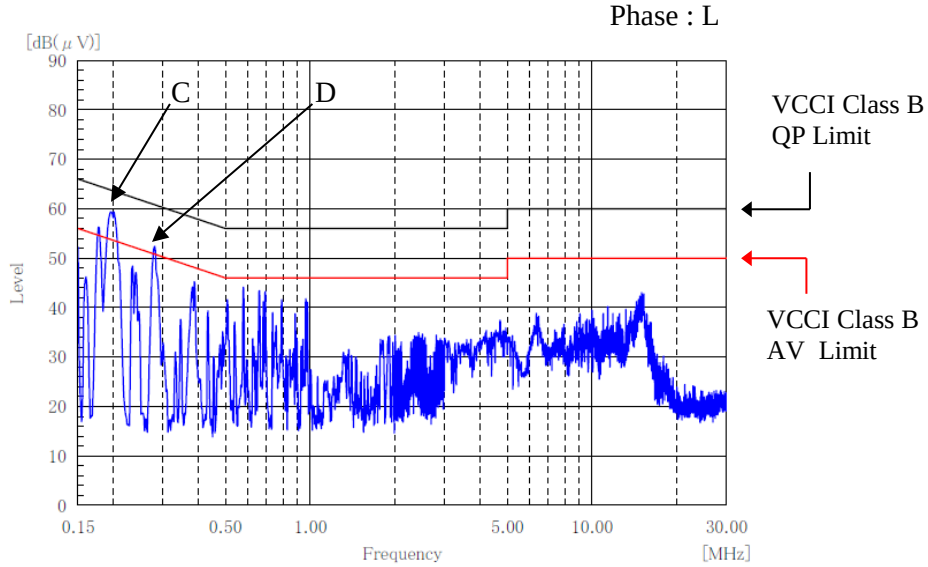
Phase : N




| Ref. Data | Point C (193kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 63.9 | 56.9 |
| AV | 53.9 | 38.2 |

| Ref. Data | Point D (281kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 60.8 | 49.7 |
| AV | 50.8 | 28.9 |

Phase : L




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

2.16 ＥＭＩ特性

Electro-Magnetic Interference characteristics

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

雑音端子電圧

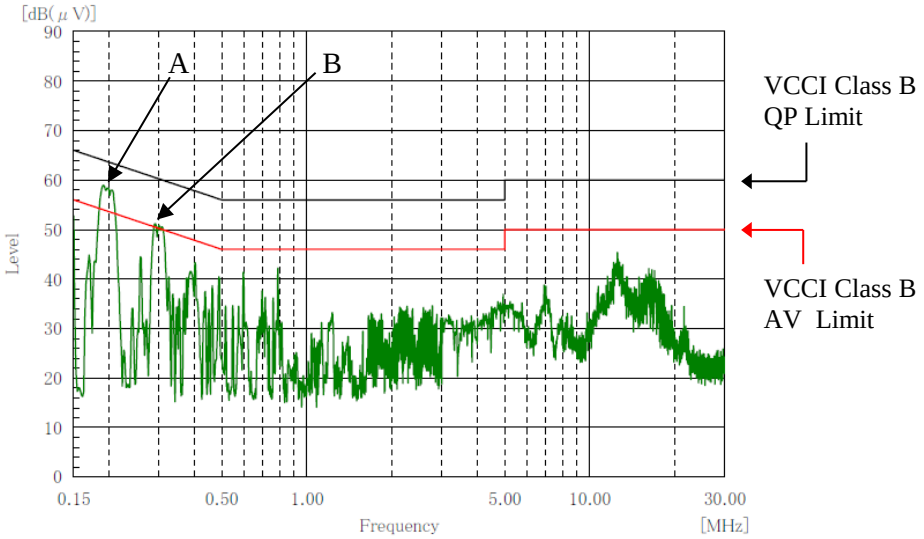
Conducted Emission

24V

| Ref. Data | Point A (201kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 63.6 | 55.4 |
| AV | 53.6 | 35.8 |

| Ref. Data | Point B (296kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 60.4 | 47.6 |
| AV | 50.4 | 27.1 |

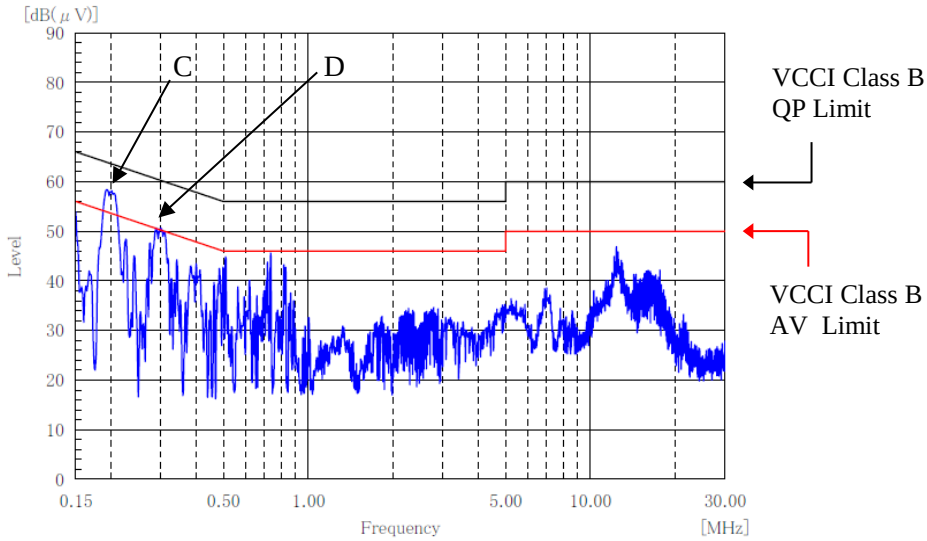
Phase : N




| Ref. Data | Point C (203kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 63.5 | 54.9 |
| AV | 53.5 | 34.9 |

| Ref. Data | Point D (302kHz) Limit (dB) | Measure (dB) |
|---|---|---|
| QP | 60.2 | 46.7 |
| AV | 50.2 | 26.9 |

Phase : L




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

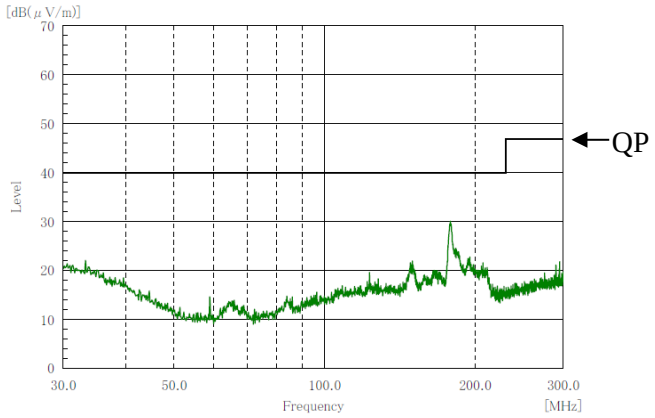
2.16 ＥＭＩ特性
Electro-Magnetic Interference characteristics

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

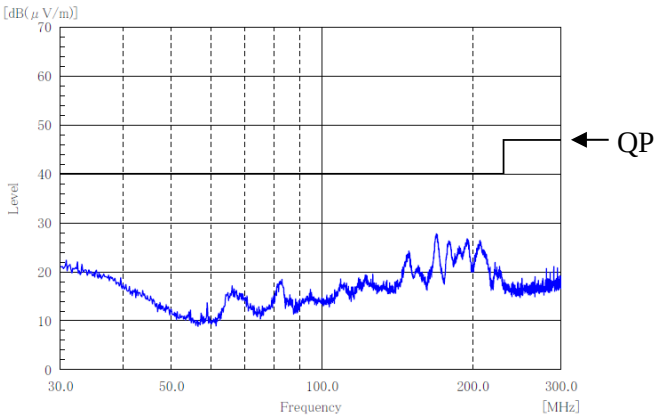
雑音電界強度
Radiated Emission

5V

HORIZONTAL

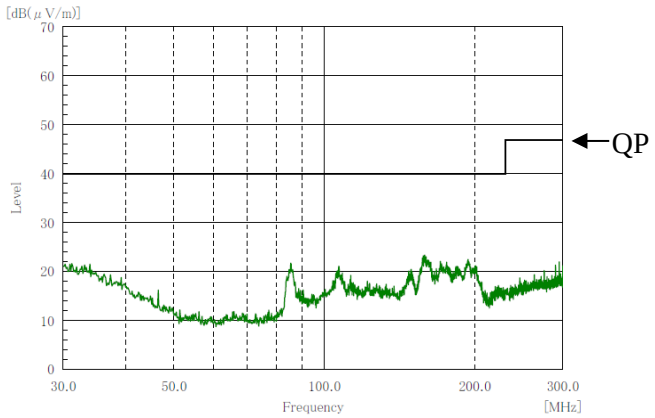



VERTICAL

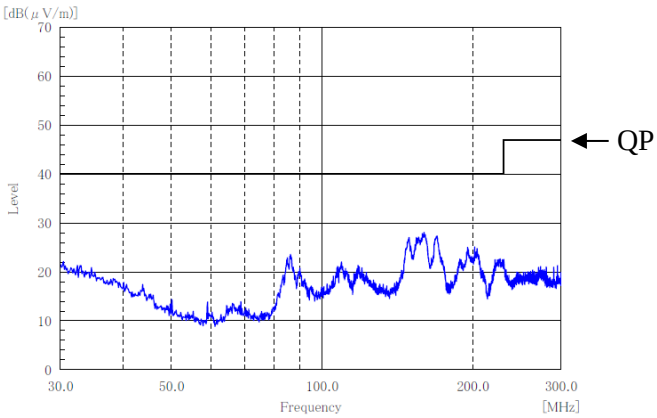



12V

HORIZONTAL

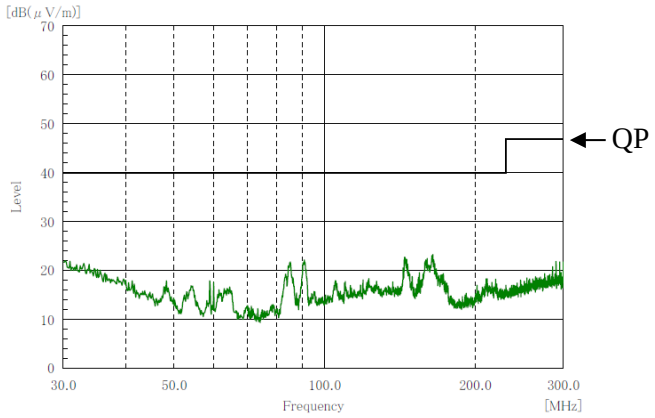



VERTICAL

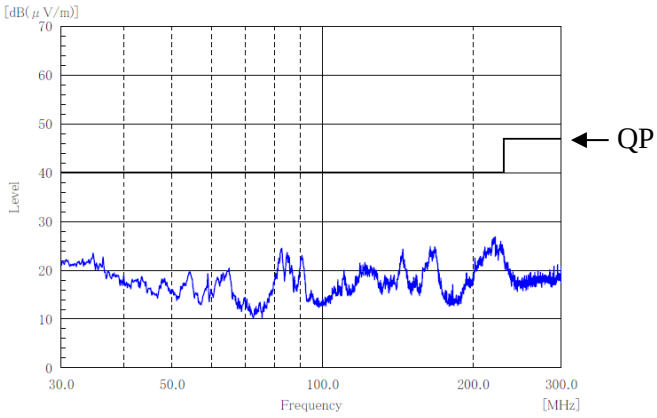



24V

HORIZONTAL




VERTICAL




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

表示はピーク値
Indication is peak values.