

DRF240-24-1

EVALUATION DATA

INDEX

1. Evaluation Method	PAGE
1.1 Circuit used for determination	
Circuit 1 used for determination	T-1
Steady state data	
Over current protection (OCP) characteristics	
Over voltage protection (OVP) characteristics	
Output rise characteristics	
Output fall characteristics	
Hold up time characteristics	
Response to brown out characteristics	
Input current harmonics	
Input current waveform	
Circuit 2 used for determination	T-1
Output rise, fall characteristics with ON/OFF Control	
Circuit 3 used for determination	T-2
Dynamic load response characteristics	
Circuit 4 used for determination.....	T-2
Inrush current waveform	
Circuit 5 used for determination	T-2
Leakage current characteristics	
Circuit 6 used for determination	T-3
Output ripple and noise waveform	
Configuration used for determination	T-3
Electro-Magnetic Interference characteristics	
(a) Conducted Emission	
(b) Radiated Emission	
1.2 List of equipment used	T-4

2. Characteristics

2.1	Steady state data	
	(1) Regulation - line and load, Temperature drift	
	/ Start up voltage and Drop out voltage	T-5
	(2) Efficiency vs. Output current	T-6
	(3) Input current vs. Output current	T-7
	(4) Input power vs. Output current	T-8
2.2	Over current protection (OCP) characteristics	T-9
2.3	Over voltage protection (OVP) characteristics	T-9
2.4	Output rise characteristics	T-10
2.5	Output fall characteristics	T-11
2.6	Output rise, fall characteristics with ON/OFF Control	T-12
2.7	Hold up time characteristics	T-13
2.8	Dynamic load response characteristics	T-14
2.9	Response to brown out characteristics	T-15~16
2.10	Inrush current waveform	T-17
2.11	Input current harmonics	T-18
2.12	Input current waveform	T-18
2.13	Leakage current characteristics	T-19
2.14	Output ripple and noise waveform	T-20
2.15	Electro-Magnetic Interference characteristics	T-21~22

Terminology used

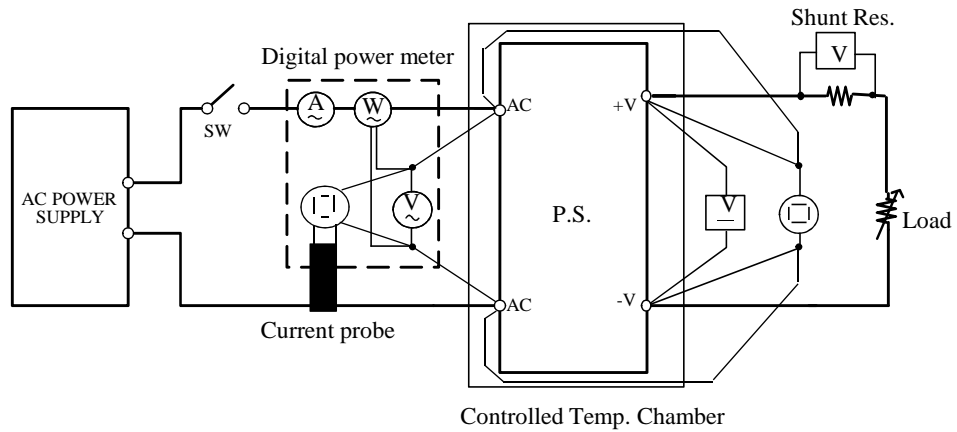
	Definition
V_{in} Input voltage
V_{out} Output voltage
I_{in} Input current
I_{out} Output current
T_a Ambient temperature
f Frequency

1. Evaluation Method

1.1 Circuit used for determination

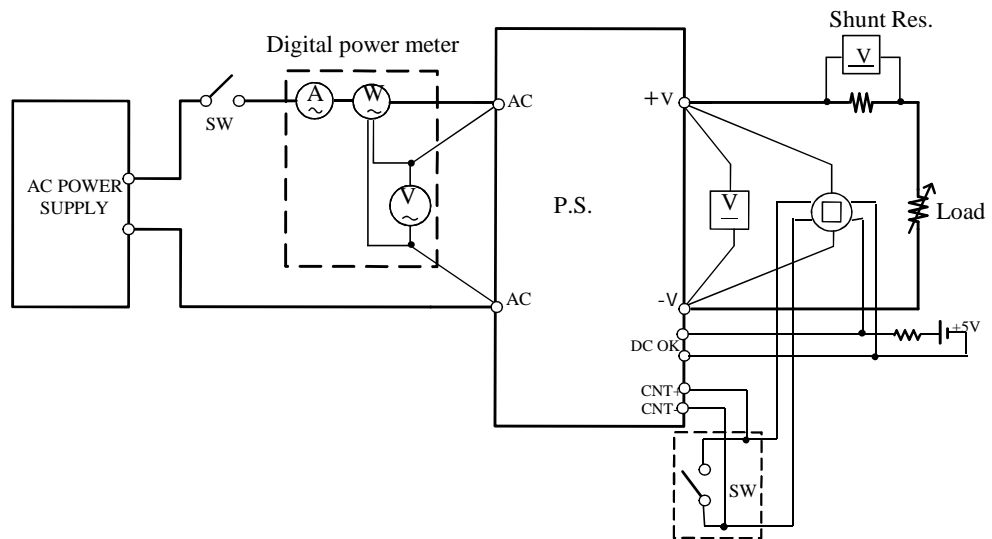
Circuit 1 used for determination

- Steady state data
- Over current protection (OCP) characteristics
- Over voltage protection (OVP) characteristics
- Output rise characteristics
- Output fall characteristics
- Hold up time characteristics
- Response to brown out characteristics
- Input Current Harmonics
- Input current



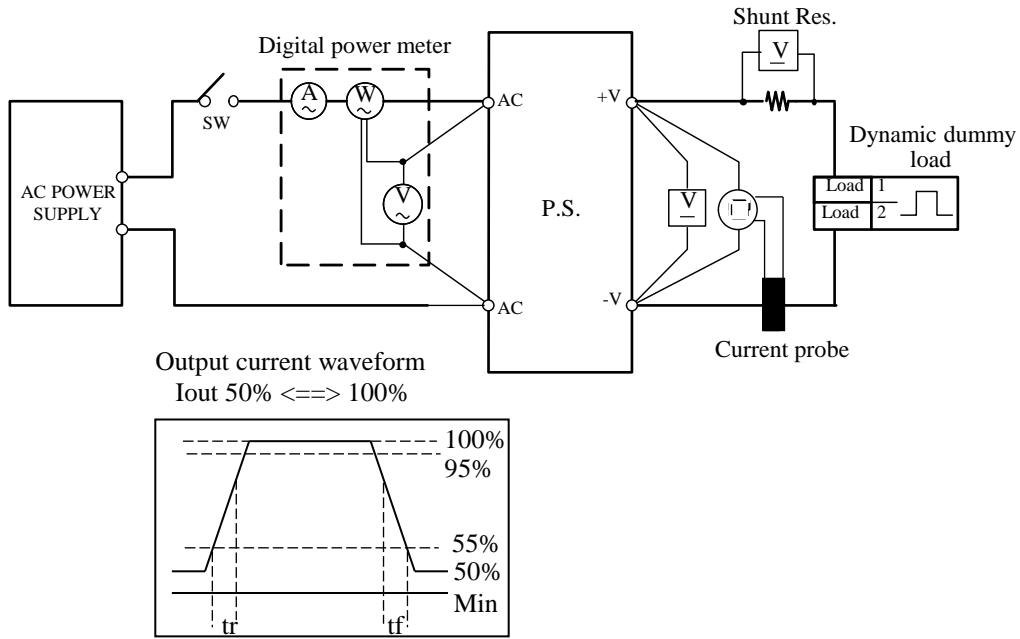
Circuit 2 used for determination

- Output rise, fall characteristics with ON/OFF Control



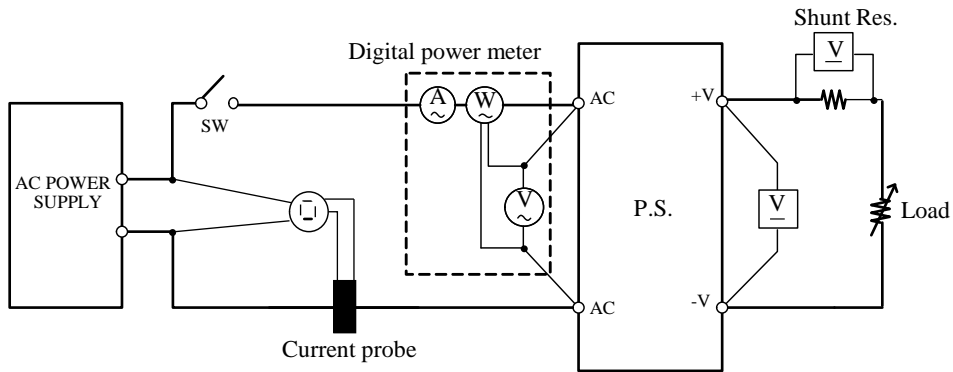
Circuit 3 used for determination

- Dynamic load response characteristics



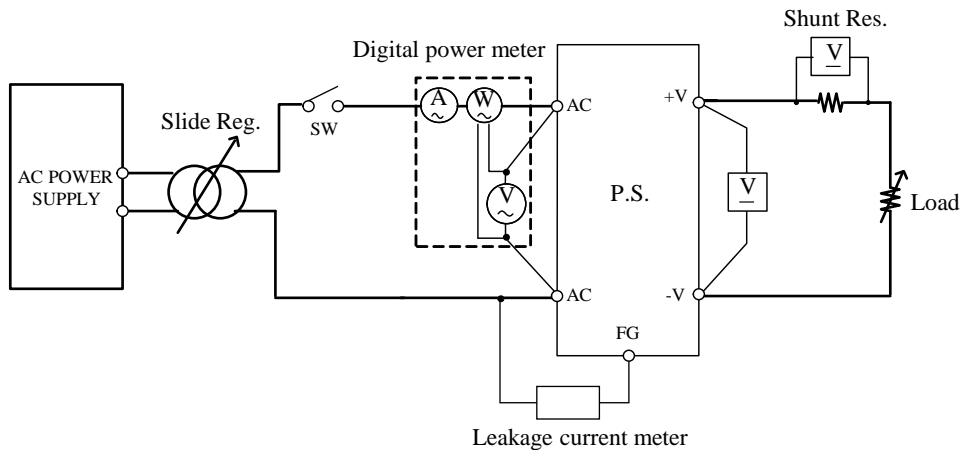
Circuit 4 used for determination

- Inrush current waveform



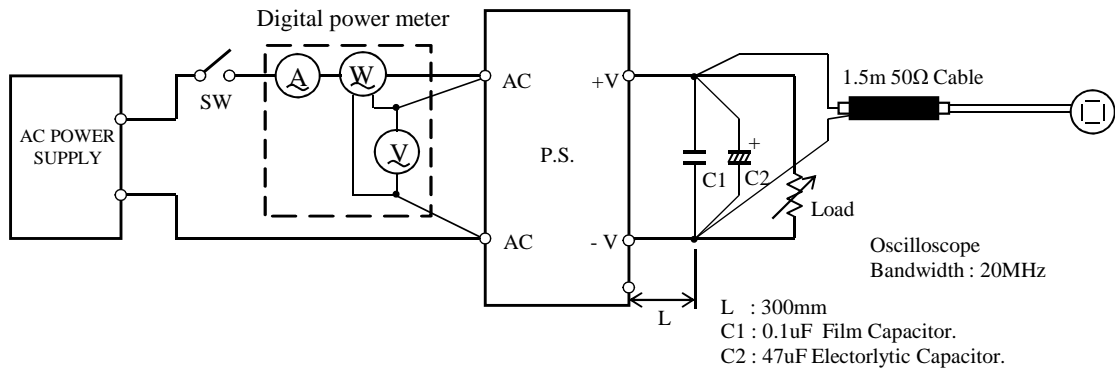
Circuit 5 used for determination

- Leakage current characteristics



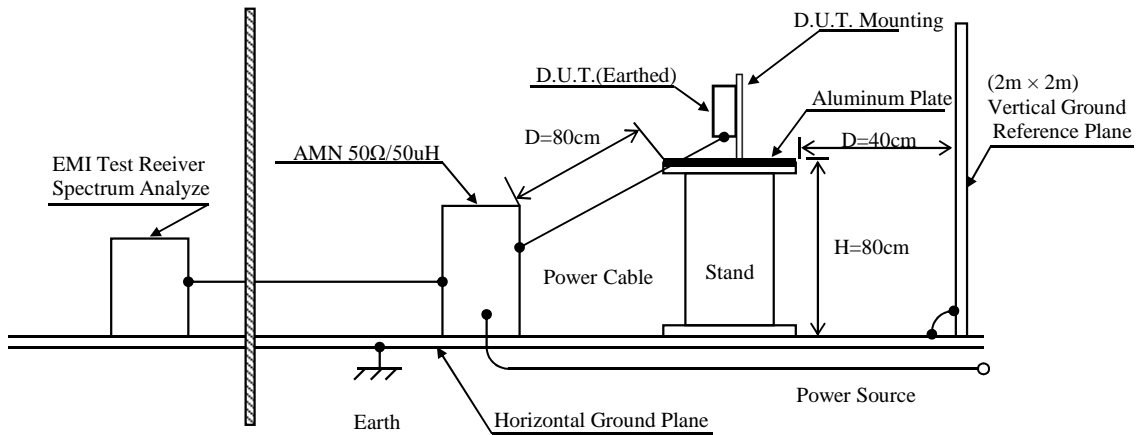
Circuit 6 used for determination

- Output ripple and noise waveform



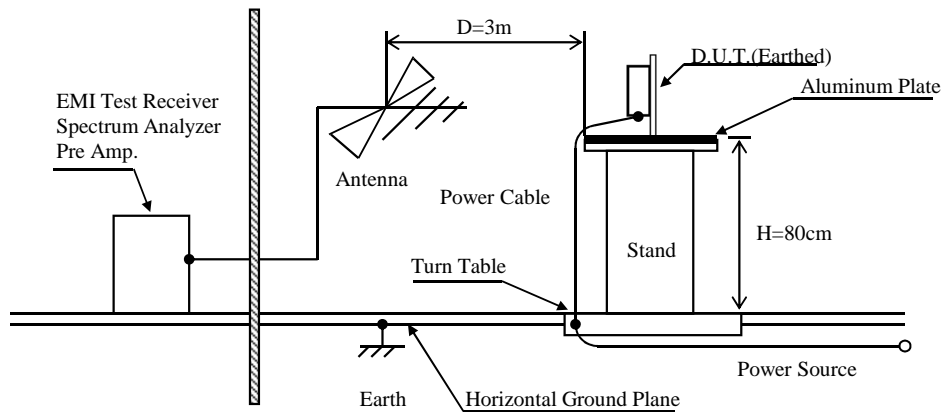
Configuration used for determination

- Electro-Magnetic Interference characteristics
- (a) Conducted Emission



(b) Radiated Emission

Radiated Emission



1.2 List of equipment used

	EQUIPMENT USED	MANUFACTURER	MODEL NO.
1	DIGITAL STORAGE OSCILLOSCOPE	YOKOGAWA	DL1740/DL1740E
2	DIGITAL MULTIMETER	AGILENT	34970A
3	DIGITAL POWER METER	HIOKI	3333
4	CURRENT PROBE/AMPLIFIER	YOKOGAWA	701931
5	DATA ACQUISITION UNIT	AGILENT	34970A
6	DYNAMIC DUMMY LOAD	CHROMA	63112A
7	CONTROLLED TEMP. CHAMBER	ESPEC	SH-641
8	LEAKAGE CURRENT METER	SIMPSON	228
9	AC SOURCE	CHROMA	61505
10	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESPI
11	LISN	TDK	NNLK8121
12	LISN	COM-POWER CORPORATION	LI-215A
13	SPECTRUM ANALYZER	AGILENT	E7402A

2 Characteristics

2.1 Steady state data

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

24V

1. Regulation - line and load

Condition Ta : 25°C

Iout \ Vin	85VAC	115VAC	230VAC	264VAC	line regulation	
0%	24.094	24.088	24.088	24.089	6mV	0.025%
50%	24.089	24.084	24.084	24.086	5mV	0.021%
100%	24.083	24.080	24.081	24.081	3mV	0.013%
load regulation	11mV	8mV	7mV	8mV		
	0.046%	0.033%	0.029%	0.033%		

2. Temperature drift

Condition Vin : 115VAC
Iout : 100%

Ta	-25°C	25°C	60°C	temperature stability	
Vout	23.999V	24.080V	24.086V	87mV	0.362%

3. Start up voltage and Drop out voltage

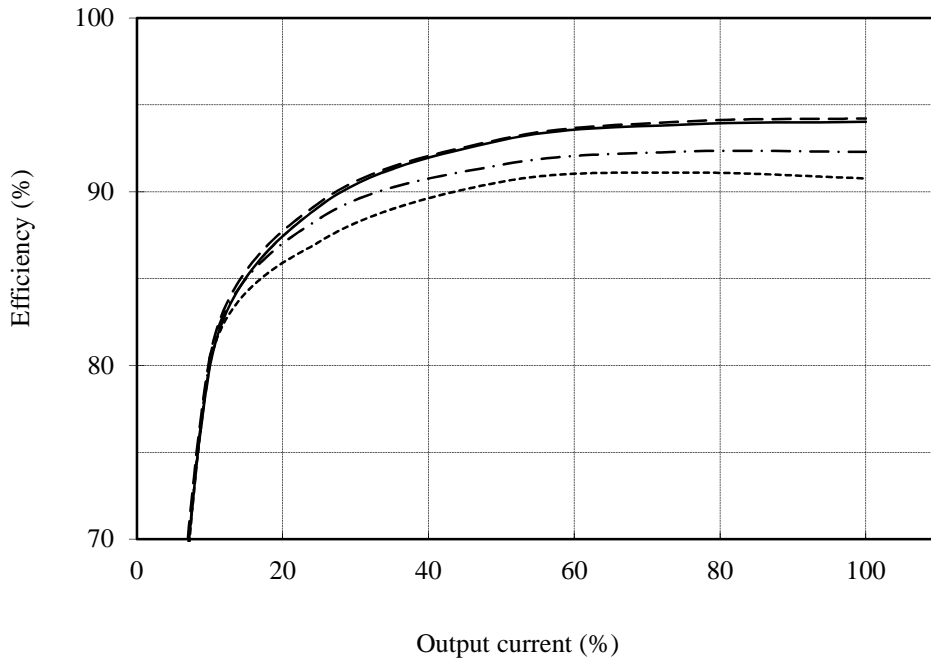
Condition Ta : 25°C
Iout : 100%

Start up voltage (Vin)	76VAC
Drop out voltage (Vin)	62VAC

(2) Efficiency vs. Output current

Conditions Vin : 85VAC -----
: 115VAC -.-.-.-
: 230VAC ————
: 264VAC - - - -
Ta : 25°C

24V

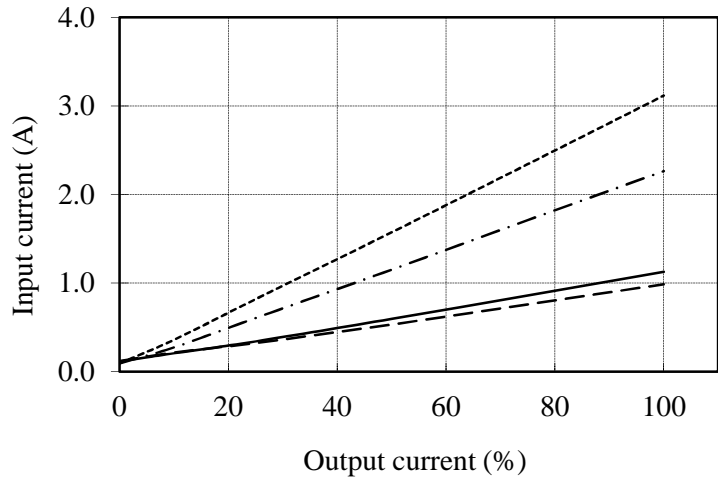


(3) Input current vs. Output current

Conditions Vin : 85VAC -----
 : 115VAC -.-.-.-
 : 230VAC ————
 : 264VAC - - - -
 Ta : 25°C

24V

Vin	Input current
	Iout : 0%
85VAC	0.10A
115VAC	0.10A
230VAC	0.11A
264VAC	0.12A



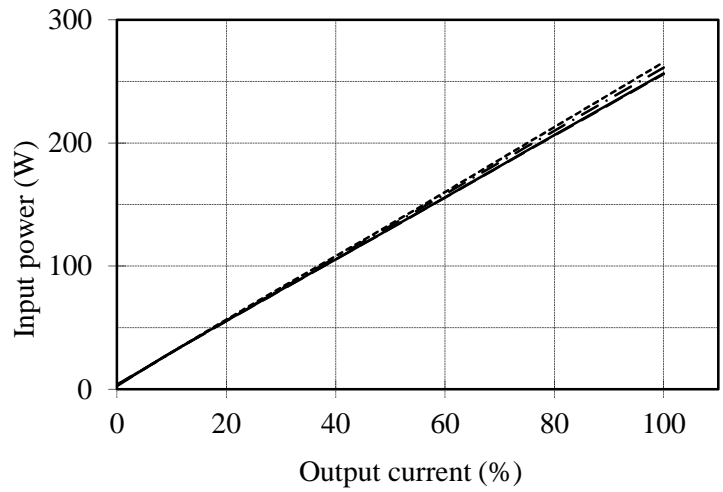
DRF240-24-1

(4) Input power vs. Output current

Conditions Vin: 85VAC -----
 : 115VAC -.-.-.-
 : 230VAC ————
 : 264VAC -.-.-.-
 Ta: 25°C

24V

Vin	Input power	
	Iout : 0%	Control
85VAC	3.5W	0.22W
115VAC	3.6W	0.24W
230VAC	2.8W	0.38W
264VAC	2.8W	0.44W

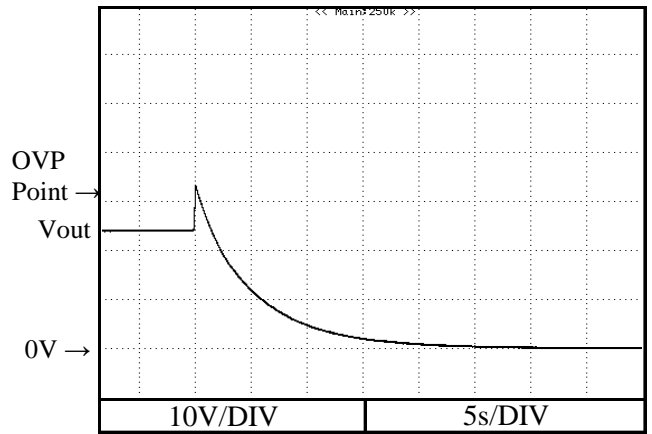
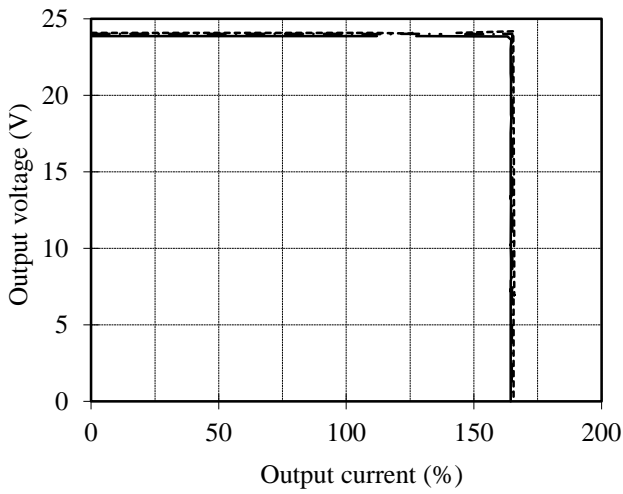


2.2 Over current protection (OCP) characteristics 2.3 Over voltage protection (OVP) characteristics

Conditions Vin : 115VAC
 Ta : -25°C -----
 25°C -.-.-.-
 60°C _____

Conditions Vin : 115VAC
 Iout : 0%
 Ta : 25°C

24V



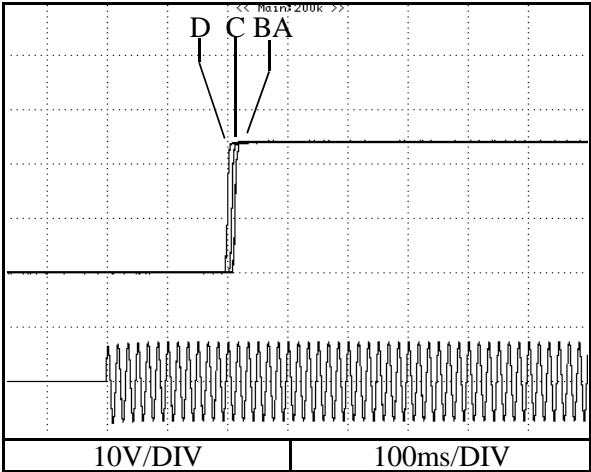
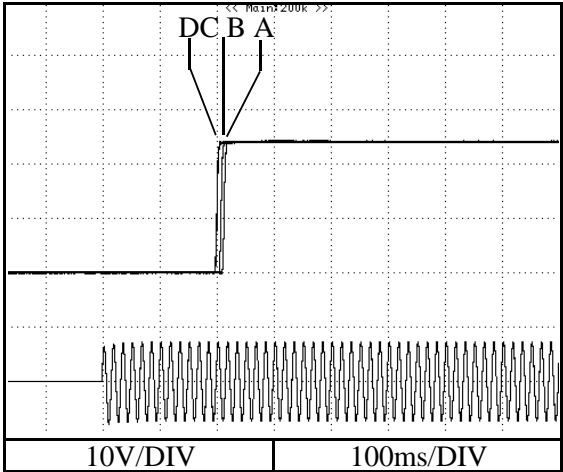
2.4 Output rise characteristics

Conditions Vin: 85VAC (A)
: 115VAC (B)
: 230VAC (C)
: 264VAC (D)
Ta: 25°C

24V

Iout : 0%

Iout : 100%



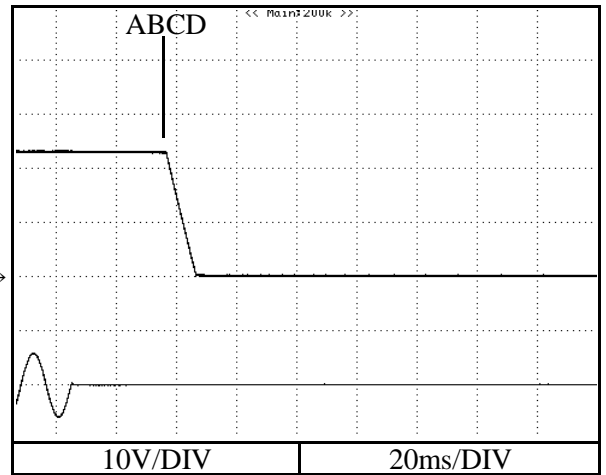
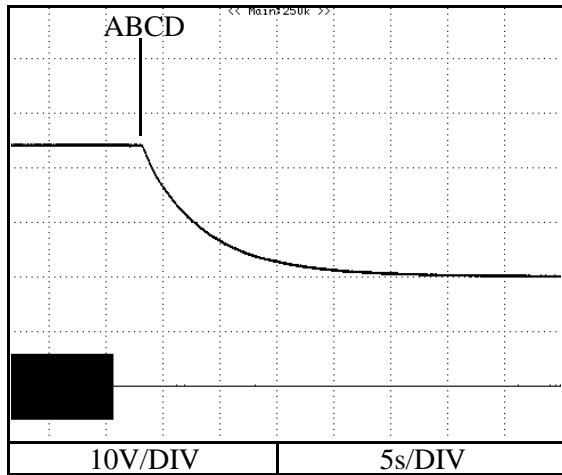
2.5 Output fall characteristics

Conditions Vin: 85VAC (A)
: 115VAC (B)
: 230VAC (C)
: 264VAC (D)
Ta: 25°C

24V

Iout : 0%

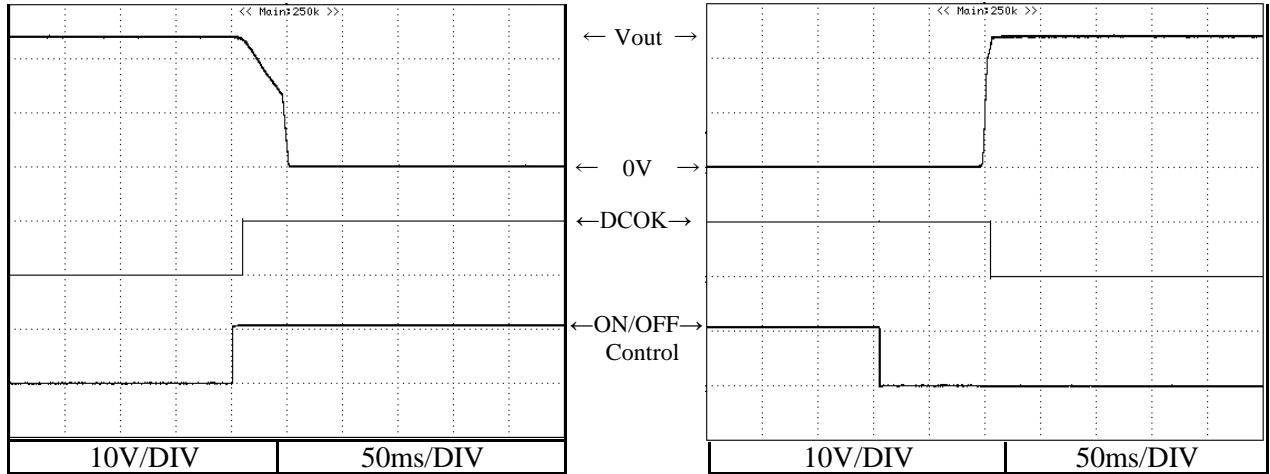
Iout : 100%



2.6 Output rise, fall characteristics with ON/OFF Control

Conditions Vin : 115VAC
Iout : 100%
Ta : 25°C

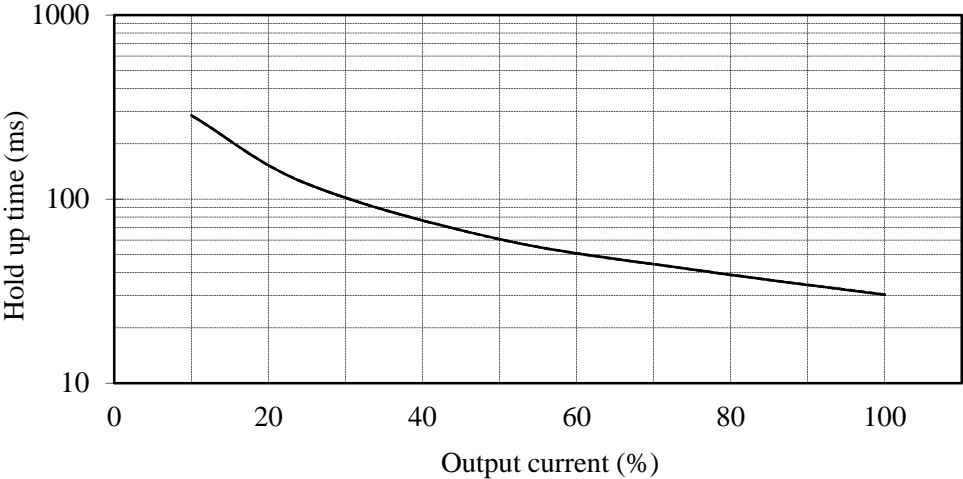
24V



2.7 Hold up time characteristics

Conditions Vin : 115VAC -----
 230VAC —
 Ta : 25°C

24V



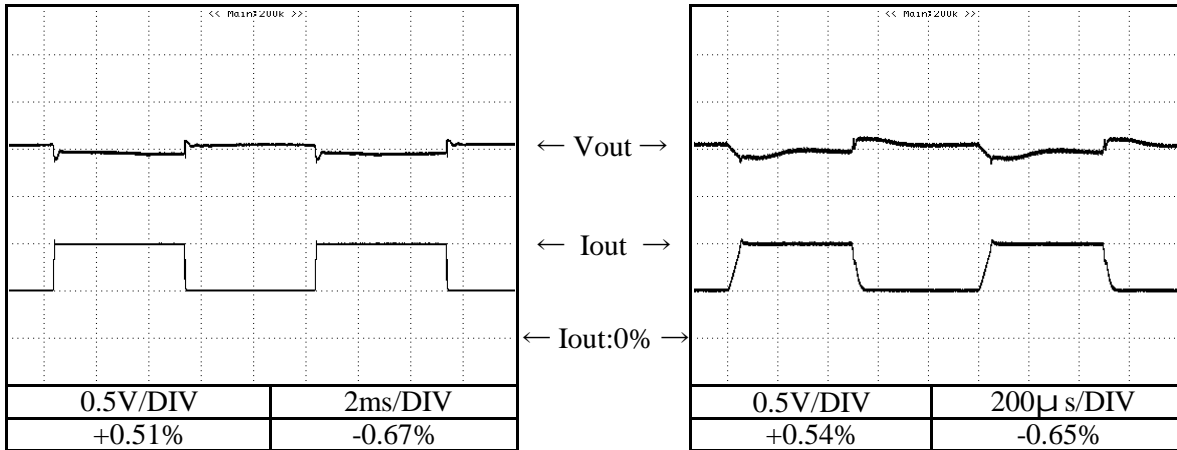
2.8 Dynamic load response characteristics

Conditions Vin : 115VAC
 Iout : 50% ↔ 100%
 (tr = tf = 50us)
 Ta : 25°C

24V

f = 100Hz

f = 1kHz

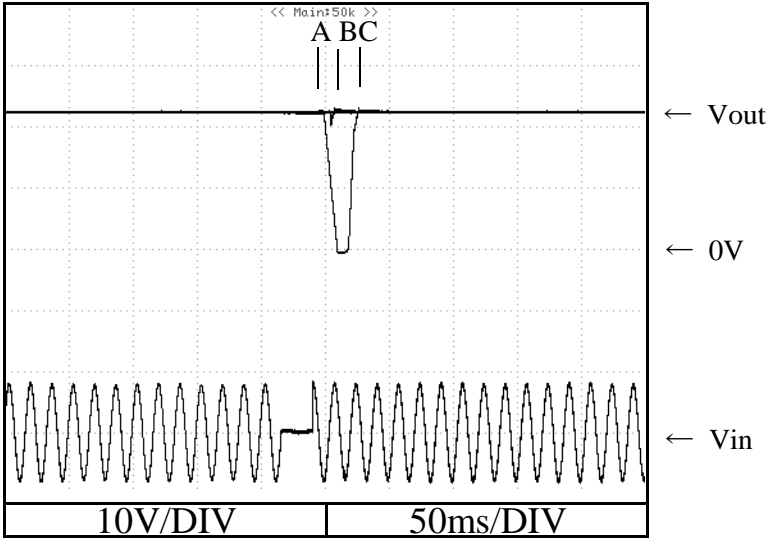


2.9 Response to brown out characteristics

Conditions Vin : 115VAC
Iout : 100%
Ta : 25°C

24V

A = 20ms
B = 23.8ms
C = 24ms



2.9 Response to brown out characteristics

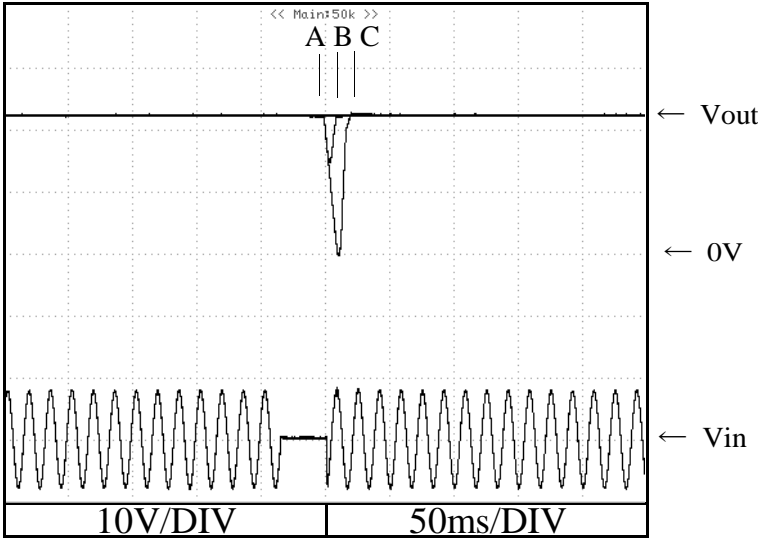
Conditions Vin : 230VAC
Iout : 100%
Ta : 25°C

24V

A = 33.5ms

B = 34ms

C = 35.7ms

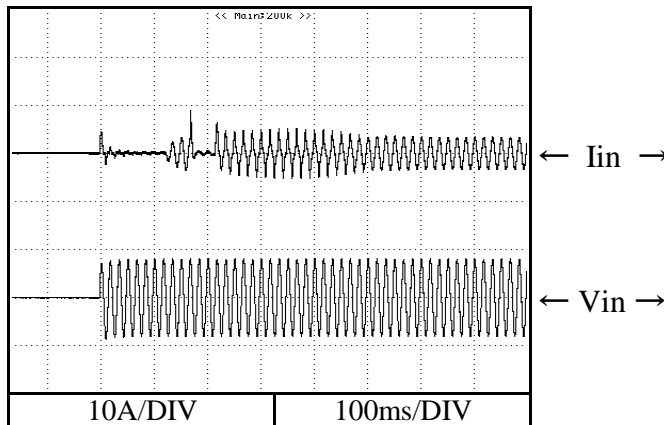


2.10 Inrush current waveform

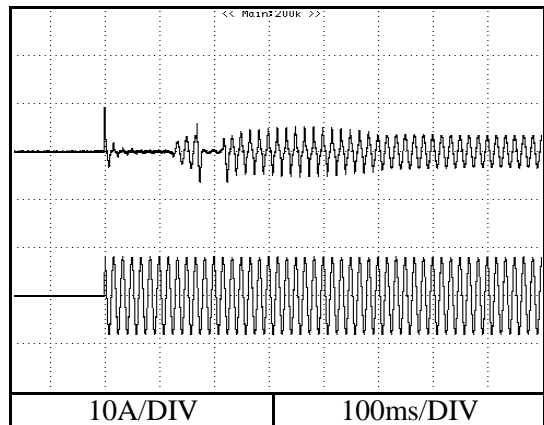
24V

Conditions Vin : 115VAC
Iout : 100%
Ta : 25°C

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

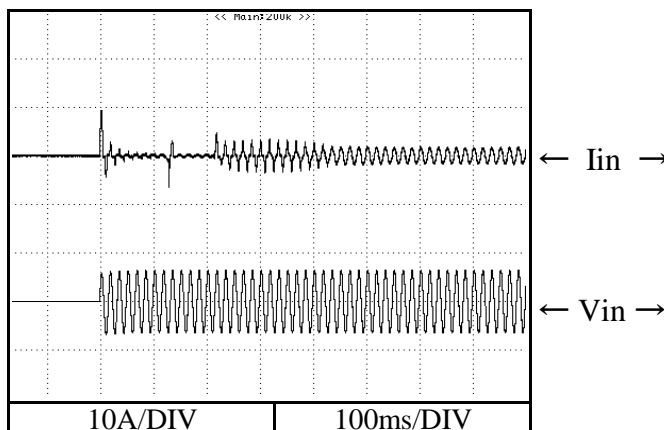


Switch on phase angle of input AC voltage
 $\phi = 90^\circ$

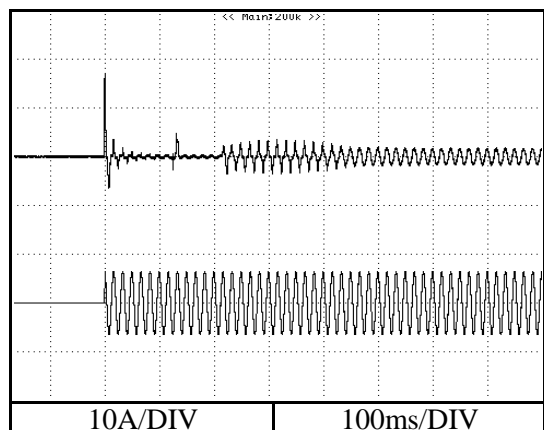


Conditions Vin : 230VAC
Iout : 100%
Ta : 25°C

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



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

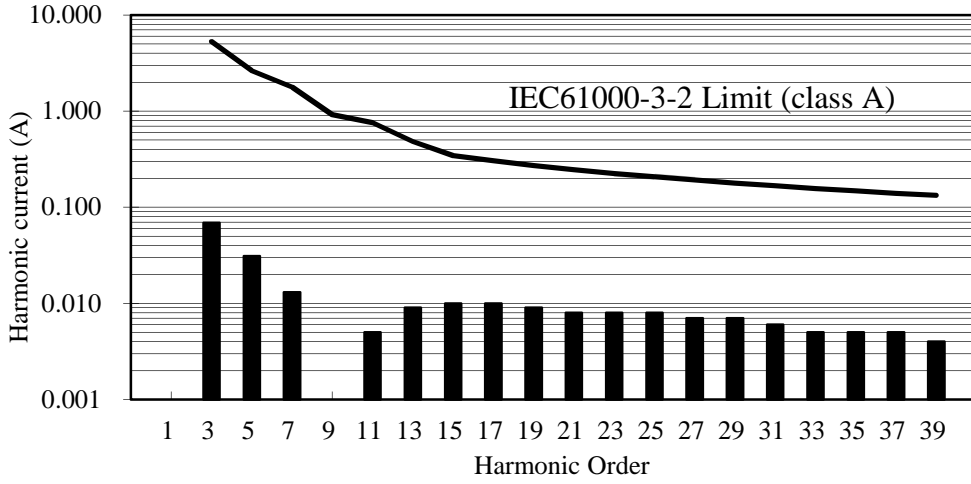


2.11 Input current harmonics

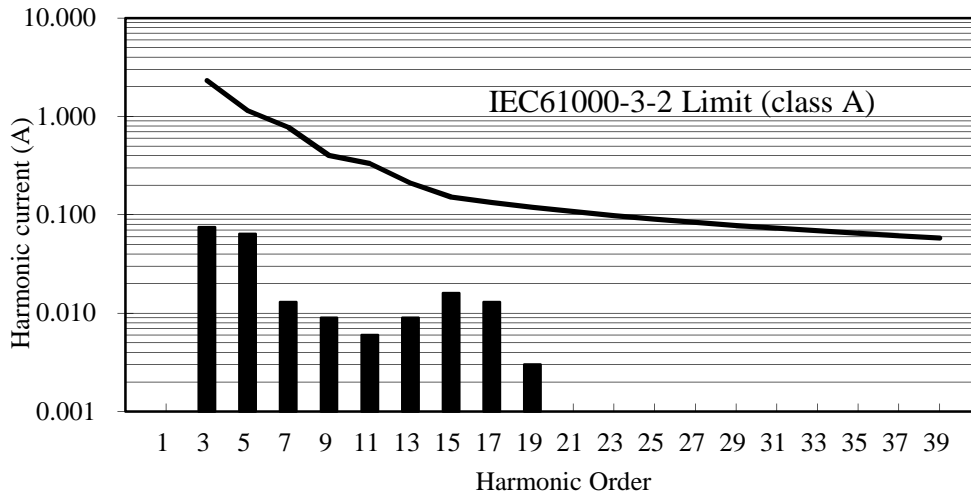
Conditions Iout : 100%
Ta : 25°C

24V

Vin : 115VAC

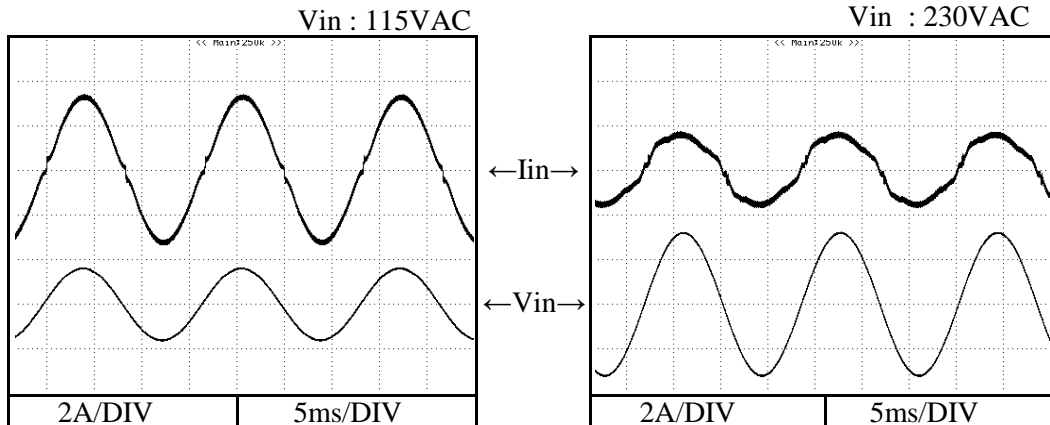


Vin : 230VAC



2.12 Input current waveform

Conditions Iout : 100%
Ta : 25°C

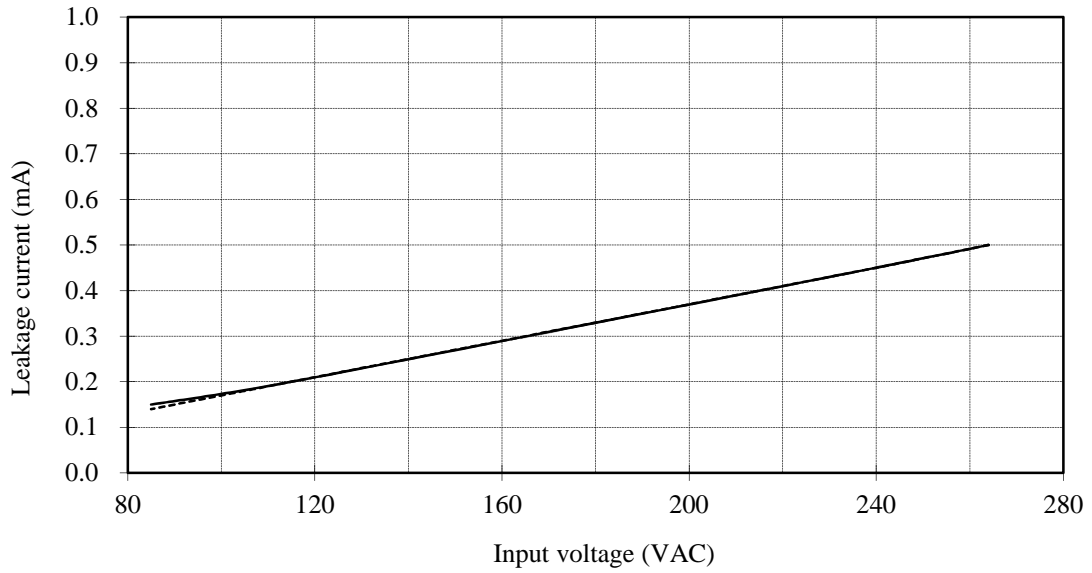


2.13 Leakage current characteristics

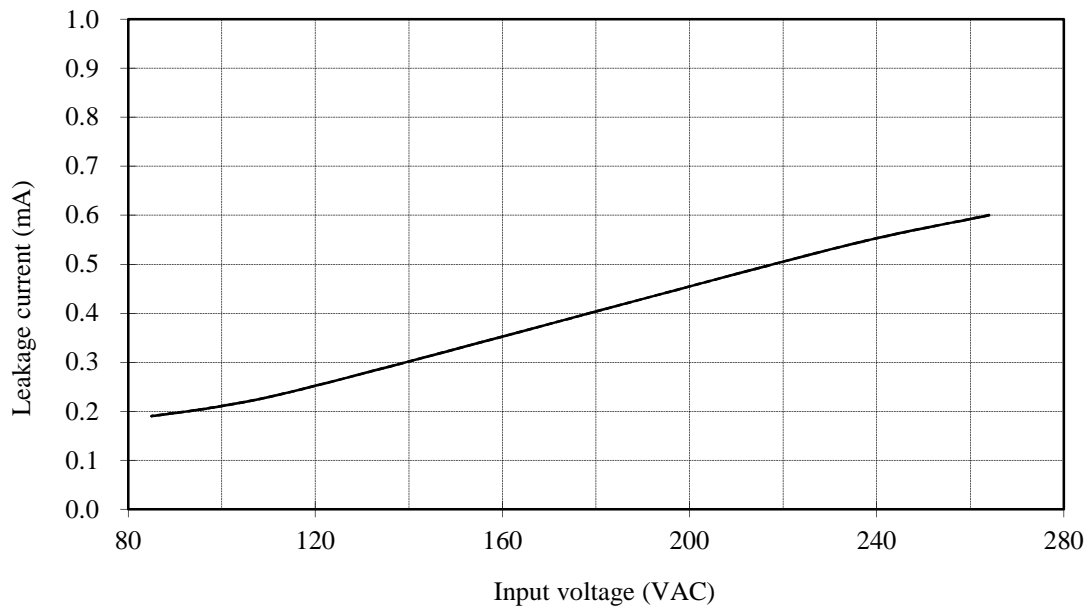
Conditions Iout : 0% -----
100% ———
Ta : 25°C

24V

f : 50Hz



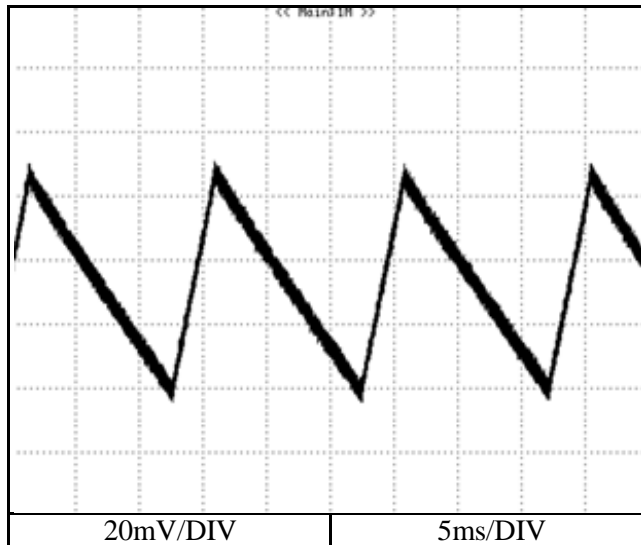
f : 60Hz



2.14 Output ripple and noise waveform

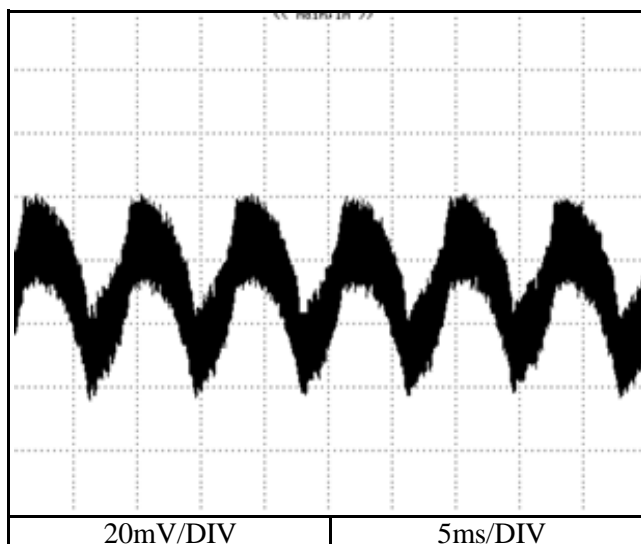
Conditions Vin : 230VAC
Iout : 0%
Ta : 25°C

24V



Conditions Vin : 230VAC
Iout : 100%
Ta : 25°C

24V



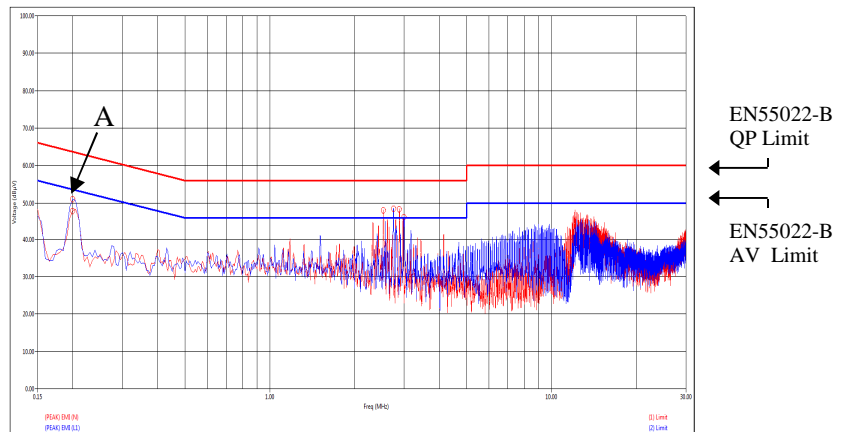
2.15 Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC
 Iout : 100%
 Ta : 25°C
 Phase N : ——— (red)
 Phase L : ——— (blue)

Conducted Emission

24V

Point A (0.2MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	63.6	46.2
AV	53.6	39.6



2.15 Electro-Magnetic Interference characteristics

Conditions Vin : 230VAC
 Iout : 100%
 Ta : 25°C
 Horizontal : — (orange line)
 Vertical : — (green line)

Radiated Emission

24V

Point A (155MHz)		
Ref. Data	Limit (dBuV)	Measure (dBuV)
QP	40.0	35.4

