Nipron GAZE into the future

MEDICAL
Medical Standard Approved

2020 August

Medical Standard Approved Single Output Power Supply mUZP series / mOZP-350 series

mUZP-120 series

mUZPT-120 series

mUZP-150 series

mUZP-220 series

mOZP-350 series

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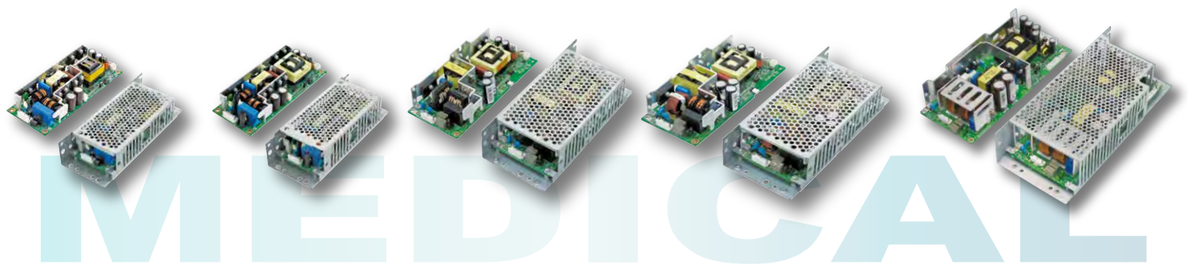
Nipron Co., Ltd.

Power supply for electrical devices in the medical sector

Medical standard approved open frame AC-DC power supply

mUZP / mOZP-350 series



Nipron Medical Solutions

About medical standards

In the medical sector, electrical devices are required to conform to each country's medical standards in accordance with IEC 60601-1, the technical standard for medical electrical equipment published by the International Electrotechnical Commission (IEC). Because of the emphasis on safety, the required specifications are quite strict in comparison with IEC 60950-1, the standard for safety of information processing equipment.

Benefits of using certified power supplies in medical equipment

In order to obtain certification of compliance with a medical standard, a company must apply to a certification agency and undergo an examination. If one of that company's products includes a power supply that has not yet been certified as conforming to the standards for medical electrical equipment, the power supply undergoes testing that entails high costs and a very long waiting period from submission of the application until certification is obtained. If the product incorporates a power supply that has been certified as conforming to the standards for medical electrical equipment, testing of the power supply is essentially unnecessary, resulting in a reduction in the application period and application costs.
To be clear, a power supply listed as certified according to the medical standard must incorporate features such as integrated fuses in both the L and N lines, compatibility with reinforced insulation, and low leakage current characteristics. This eliminates the need for preparation of expensive separate medical isolation transformers, fuses, and breakers, resulting in low-cost, secure, and safe medical electrical equipment.

▶ In the case that a power supply unit has not obtained medical standard.

It is necessary to provide separately a fuse, a transformer, etc.

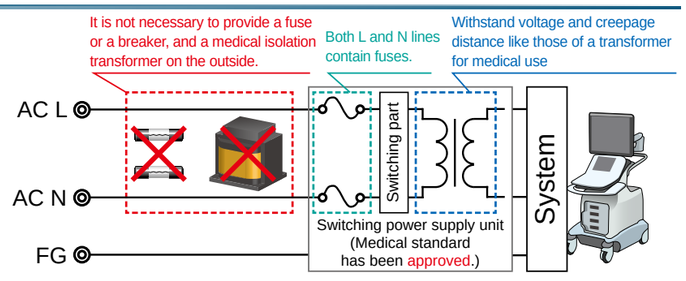
A fuse and a transformer shall be installed separately from a power supply unit.

The system becomes enlarged and more expensive.

▶ In the case that a power supply unit has obtained medical standard.

It is not necessary to provide separately a fuse, a transformer, etc.

The system becomes miniaturized and less expensive.



Products lineup

mUZP-120 series

Small, ultra-high efficiency 94%
PCB type single output power supply

IEC60601-1 Ed.3.1 (MOOP) approved

Output voltage (single output)
+12V +24V

Continuous output 100.8-120W
Peak output 200.4-201.6W

P7-

mUZPT-120 series

Small, ultra-high efficiency 94%
PCB type single output power supply

IEC60601-1 Ed.2&Ed.3.1 (MOPP) approved

Output voltage (single output)
+12V +15V +24V

Continuous output 100.8-120W
Peak output 200.4-201.6W

P17-

mUZP-150 series

High efficiency 92% PCB type single output power supply

IEC60601-1 Ed.2&Ed.3.1 (MOPP) approved

Output voltage (single output)
+12V +18V +24V +48V

Continuous output 150-153.6W
Peak output 400.8-401.4W

P27-

mUZP-220 series

Ultra-high efficiency 94%
PCB type single output power supply

IEC60601-1 Ed.2&Ed.3.1 (MOPP) approved

Output voltage (single output)
+12V +18V +24V +48V

Continuous output 180-223.2W
Peak output 400.8-401.4W

P35-

mOZP-350 series

High efficiency 95% PCB type single output power supply

IEC60601-1 Ed.2&Ed.3.1 (MOPP) approved

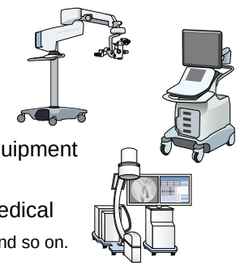
Output voltage (single output)
+12V +15V +24V +30V +36V +48V

Continuous output 300-352.8W
Peak output 504-601W

P43-

Adoption result

- C-arm
- Operating microscope
- Ultrasonic diagnostic equipment
- Medical DVR
- Cooler equipment for medical
- Immunology analyzer and so on.



List of compatibility with standard

Name of series	IEC60601-1 Ed.2	IEC60601-1 Ed.3.1		Output voltage (single output)	Continuous output	Peak output
		MOPP	MOOP			
mUZP-120 series	×	×	○	12, 24V	100.8-120W	200.4-201W
mUZPT-120 series	○	○	○	12, 15, 24V	100.5-120W	200.4-201W
mUZP-150 series	○	○	○	12, 18, 24, 48V	150-153.6W	400.8-401.4W
mUZP-220 series	○	○	○	12, 18, 24, 48V	180-223.2W	400.8-401.4W
mOZP-350 series	○	○	×	12, 15, 24, 30, 36, 48V	300-350W	504-601W

* It is planned that mUZP-150/220, mOZP-350 will also be renewed to IEC60601-1 Ed.3.1 one after another.

Protective measures

- Protective measures for the operator:
  MOOP (Means of Operator Protection)
  ⇒ Protective measures to reduce the risk of electric shock to people other than the patient
- Protective measures for the patient:
  MOPP (Means of Patient Protection)
  ⇒ Protective measures to reduce the risk of electric shock to the patient
  The criteria for certification are harder than MOOP.

Leakage current (one example of actual measurement during rated load)

Name of series	At 110 VAC input	At 264 VAC input
mUZP-120 series	0.06mA typ	0.14mA typ
mUZPT-120 series	0.06mA typ	0.17mA typ
mUZP-150 series	0.06mA typ	0.15mA typ
mUZP-220 series	0.06mA typ	0.15mA typ
mOZP-350 series	0.06mA typ	0.11mA typ

Medical standard certified AC-DC switching-mode power supply

mUZP-120/150/220 series

mUZP-120

ULTRA ZERO POWER SUPPLY

IEC60601-1 Ed.3.1 (MOOP) approved high efficiency/ultra thin type

mUZP-120 Series

Continuous: 100-120W
Peak: 200W
Output voltage: 12/24V

Efficiency (at output voltage 24V)
At 100VAC: 92.0%
At 230VAC: 94.0%

*Measured with mUZP-120-24-JBH
An example of actual measurement

mUZPT-120

IEC60601-1 Ed.2,Ed3.1 (MOOP,MOPP) approved/high efficiency

mUZPT-120 Series

Continuous: 100-120W
Peak: 200W
Output voltage: 12/15/24V

Efficiency (at output voltage 24V)
At 100VAC: 92.0%
At 230VAC: 94.0%

*Measured with mUZPT-120-24-JBH
An example of actual measurement

mUZP-150

IEC60601-1 Ed.2,Ed.3.1 (MOOP,MOPP) approved/economy type

mUZP-150 Series

Continuous: 150W
Peak: 400W
Output voltage: 12/18/24/48V

Efficiency (at output voltage 24V)
At 100VAC: 88.5%
At 230VAC: 92.0%

*An example of actual measurement

mUZP-220

IEC60601-1 Ed.2,Ed.3.1 (MOOP,MOPP) approved high efficiency/high functionality type

mUZP-220 Series

Continuous: 180/220W
Peak: 400W
Output voltage: 12/18/24/48V

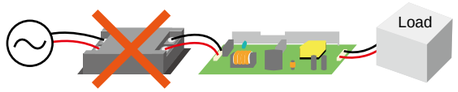
Efficiency (at output voltage 24V)
At 100VAC: 91.5%
At 230VAC: 94.0%

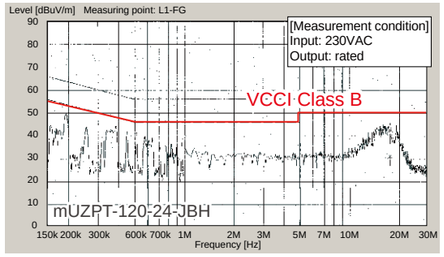
*An example of actual measurement

Low leakage current & low noise

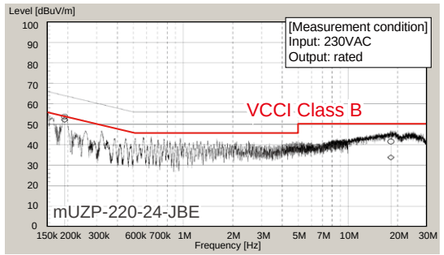
While the leakage current is reduced to 0.06mA at 110VAC and 0.14mA at 264VAC (mUZP-120-24), the conducted emission is compliant to VCCI Class B without an external noise filter due to enhanced noise filter circuit and optimized arrangement of parts. Since the noise filter is not necessary, it contributes to cost reduction and workload.

Reduction of noise filters becomes possible!





(Leakage current and conducted emission are examples of actual measurement.)



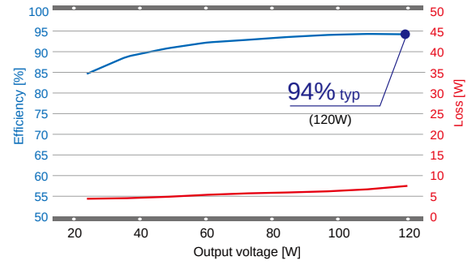
(An example of actual measurement)

High-efficiency design

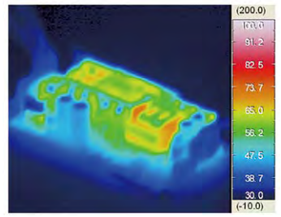
It is an energy-saving power supply unit with ultra-high efficiency of 94% typ during rated output minimizing unlimitedly loss. Its high efficiency resulting in low heat generation enables miniaturization and long life.

mUZP-120-24-JBH

■Efficiency & loss [Measurement condition: 230VAC input]
(an example of actual measurement)



■Temperature rise
[Measurement condition: 100VAC input, 100W output]



Backup for instantaneous power failure

For mUZP-150/220, a product which allows for a countermeasure against instantaneous power failure is available. You can select an appropriate product depending on application and backup time.

Capacitor pack which allows for backup for instantaneous power failure (mUZP-220)

BS13A-EC400/422F

Photograph of internal view

Output capacity / Reference backup time
180W / Approximately 1 s

A capacitor with a countermeasure against instantaneous power failure enables backup for instantaneous power failure (*dedicated model).

Instantaneous power failure prevention capacitor

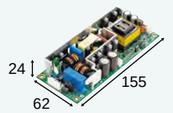
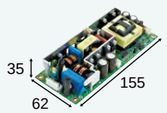
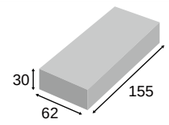
Output capacity / Reference backup time
130W / Approximately 80 ms

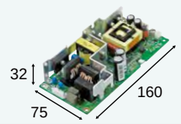
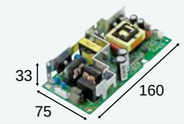
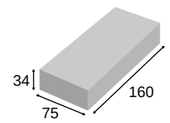
* For details, please contact us.

Small, large capacity

Compare to competitors' equivalent size PSUs, mUZP-120 series has advantages in many aspects such as efficiency, output power, and leakage current.
If you are thinking about miniaturization and energy-saving of products, please consider mUZP series.

■Comparison with competitors' equivalent size PSU [24V output] (Efficiency and leakage current are examples of actual measurement)

Power supply	mUZP-120-24-JBH	mUZPT-120-24-JBH	Competitor's 100W PSU
Size *Height from the bottom of PCB			
Efficiency (at 100VAC/240VAC input)	92/94% typ	92/94% typ	84/86% typ
Leakage current (at 110VAC/264VAC input)	0.06/0.07mA	0.06/0.17mA	0.06/0.17mA
Output power (continuous)	120.0W	120.0W	103.2W
Output power (forced air cooling)	162W	162W	- W
Output power (peak)	201.6W	201.6W	206.4W

Power supply	mUZP-150-24	mUZP-220-24	Competitor's 150W PSU
Size *Height from the bottom of PCB			
Efficiency (at 100VAC/240VAC input)	88.5/92% typ	91.5/94% typ	85/87.4% typ
Leakage current (at 110VAC/264VAC input)	0.06/0.15mA	0.06/0.15mA	0.06/0.17mA
Output power (continuous)	151.2W	220.8W	151.2W
Output power (forced air cooling)	252W	331.2W	- W
Output power (peak)	400.8W	400.8W	302.4W

Medical standard certified AC-DC switching-mode power supply

mOZP-350 series

Open frame

With chassis and cover

IEC60601-1 Ed.2,Ed.3.1 (MOPP) approved high efficiency/high functionality type

mOZP-350 Series

Continuous: 300-350W

Peak: 500-600W

Output voltage: 12/15/24/30/36/48V

Efficiency
(at output voltage 24V)

At 100VAC: 92%

At 230VAC: 95%

*An example of actual measurement

***mOZP-350* series**

"mOZP-350 series", 350W PCB type AC/DC switching power supply, is now available. "mOZP-350" is an ultra-high efficient single output power supply with its 95%typ efficiency at maximum. Continuous 350W/500W* and peak 600W* output are available in the same size as competitors' 300 W equivalent models.

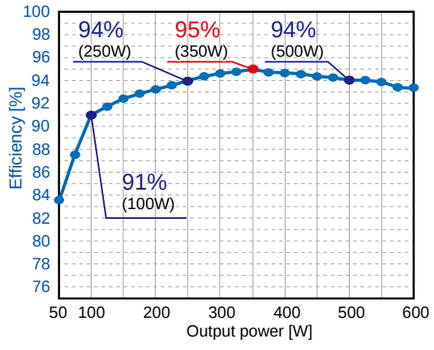
*Output voltage: more than 24V

Ultra-high efficiency 95%

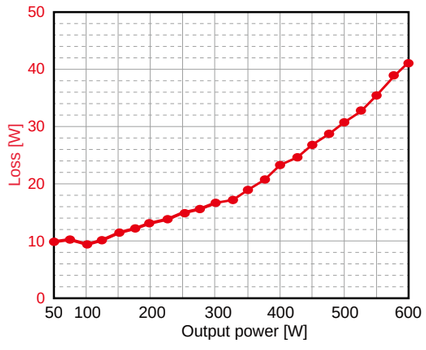
Ultra-high efficiency of 95%typ

Ultra-high efficiency of 95%typ is achieved for a 24 V output type. It can contribute for saving energy and reducing CO_2. Its high efficiency resulting in low heat generation enables miniaturization and long life.

■Efficiency graph



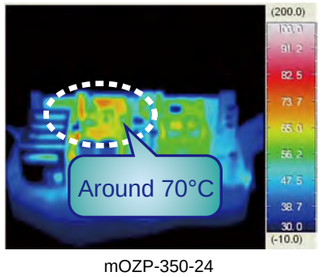
■Loss graph



Mitigation of temperature rise due to ultra-high efficiency

Ultra-high efficiency of mOZP-350 resulting in low power loss and low heat generation enables reduction of temperature inside the equipment and long life.

[Measurement condition:
100 VAC input, Load 300 W, Ambient temperature 25°C]



mOZP-350-24

Instantaneous power failure prevention

Possible to connect a capacitor package

Possible to connect a capacitor package (BS13A-EC400/422F)

*Connectable to mOZP-350 series

Capacitor pack which allows backup for instantaneous power failure

BS13A-EC400/422F

Photograph of internal view

Output capacity / Reference backup time

180W / Approximately 1 s

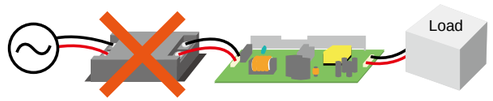
- Expected life is 12 years or more (with 40°C)
- Supports wide range of temperature
- 1.4kg typ lightweight size

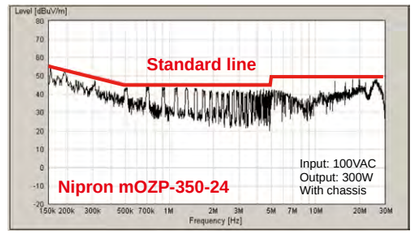
Low leakage current & low noise

The single power supply unit clears conducted emission Class B

While the leakage current is reduced to 0.06mA at 110VAC and 0.11mA at 264VAC, the conducted emission is compliant to VCCI Class B without an external noise filter due to enhanced noise filter circuit and optimized arrangement of parts. Since the noise filter is not necessary, it contributes to cost reduction and workload.

Reduction of noise filters becomes possible!





Leakage current (An example of actual measurement)

Input voltage	Rated load	Min. load
110VAC	0.06mA	0.07mA
264VAC	0.11mA	0.12mA

Various features are available

Large capacity output

Continuous 350W* output is possible at the same size as competitors' 300W equivalent models. Due to the large capacity output, 500W* at forced air cooling and peak output of 600W*, it is possible to replace a unit model power supply or build a large capacity fanless power supply.

*Output voltage: more than 24V

Product specifications

Model (mOZP-350-)	12	15	24	30	36	48
Output voltage	12V	15V	24V	30V	36V	48V
Max. current/power (Natural air cooling)	25A 300W	20A 300W	14.6A 350.4W	11.7A 351W	9.8A 352.8W	7.3A 350.4W
Max. current/power (Forced air cooling)	36A 432W	29A 435W	21A 504W	16.8A 504W	14A 504W	10.5A 504W
Peak current/power (within 10 s)	42A 504W	40A 600W	25A 600W	20A 600W	16.7A 600W	12.5A 600W
Min. current	0A	0A	0A	0A	0A	0A
Input voltage	85 - 264 VAC (with PFC, worldwide range)					
W×H×D(mm)	95×47×222 (Open frame) 107×57×252 (With chassis)					
Safety standards	UL/CSA/IEC60950-1 approved. Medical standard IEC60601-1 Ed.2,Ed.3.1(MOPP) is available.					

Benefits from the replacement with mOZP-350

Competitors' products	mOZP-350
PCB type 300 W PSU × 1 unit At forced air cooling 360 W	mOZP-350× 1 unit Continuous: 350W Peak: 600W ➢ Fanless configuration achieved
Unit type (with a built-in fan) 300W PSU	mOZP-350× 1 unit Continuous: 350W Peak: 600W ➢ Fanless configuration achieved
Unit type (with a built-in fan) 600W PSU	mOZP-350× 1 unit Continuous: 500W (at forced air cooling) Peak: 600W Cooling by a case fan ➢ Cost and weight can be reduced.

Other features

Output voltage remote sensing

Line drop of output cable etc. can be compensated by connecting this signal to the end of load to monitor the output voltage. (supports the line drop of positive side pole)

Variable resistor for output voltage equipped

A chassis or/and cover can be attached.

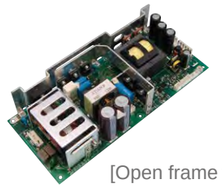
Selectable from 3 types: without chassis and cover, with a chassis, or with a chassis and cover.

The blackout detection signal is equipped

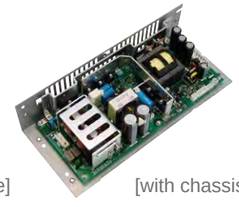
The blackout detection signal is equipped as a standard feature, therefore the cost for preparing a detection board can be reduced.

Connector type or block terminal type are available for I/O terminal blocks

Output ON/OFF control function is equipped



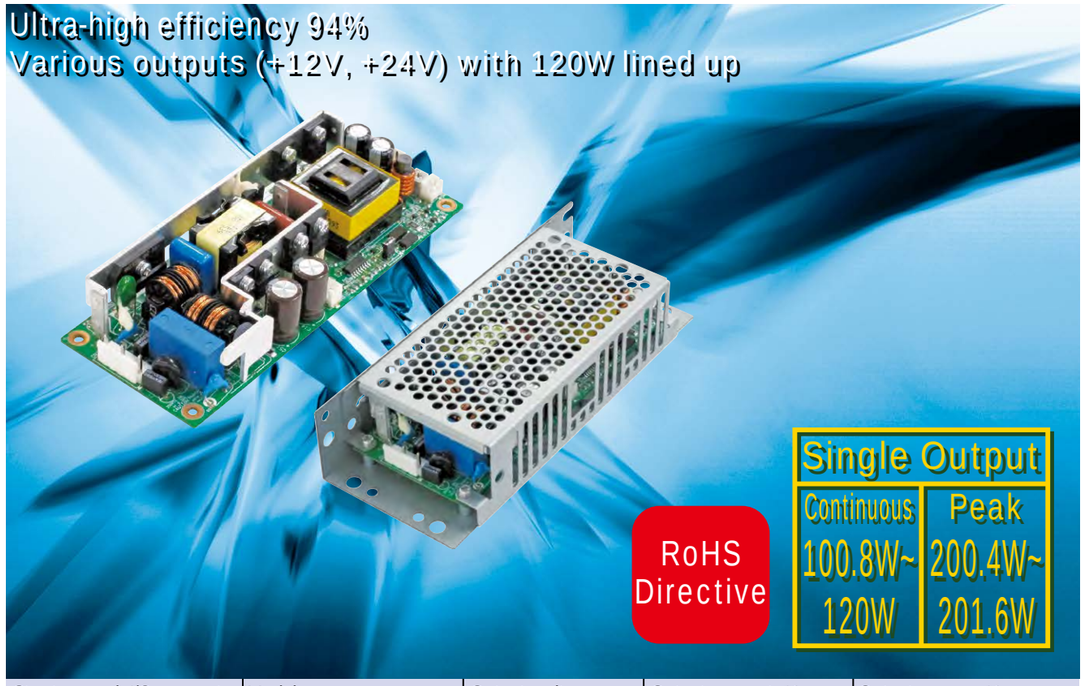
[Open frame type]



[with chassis]

[with chassis and cover]

Single Output Power Supply mUZP-120 series



Structure and I/O connector	Model	Output voltage	Output current *1	Output power *1
Open frame type/ Nylon connector	mUZP-120-12-J0L	+12V	8.4A (16.7A)	100.8W (200.4W)
	mUZP-120-12-JB0	+12V	8.4A (16.7A)	100.8W (200.4W)
	mUZP-120-12-JBH	+12V	10A (16.7A)	120W (200.4W)
	mUZP-120-24-J0L	+24V	5A (8.4A)	120W (201.6W)
	mUZP-120-24-JB0	+24V	5A (8.4A)	120W (201.6W)
	mUZP-120-24-JBH	+24V	5A (8.4A)	120W (201.6W)

Structure	Description
With chassis	'-C' is added after open frame model name (Ex: mUZP-120-12-JBH-C)
With chassis and cover	'-K' is added after open frame model name (Ex: mUZP-120-12-JBH-K)

■ Model name coding

mUZP-120-**-J***-*
① ② ③ ④⑤⑥⑦ ⑧

① Series name
② Output power
③ 12:12V 24:24V
④ Input/Output connector J:Nylon connector
⑤ Optional joint connector "0":Without connector "B":With connector
⑥ Presence or absence of function
"L": Without output ON/OFF control signal, without variable resistor to adjust output voltage, low cost type
"O": With output ON/OFF control signal, with variable resistor to adjust output voltage
"H": With output ON/OFF control signal, with variable resistor to adjust output voltage, high-efficiency type
⑦ Modification
⑧ Blank:Without chassis and cover C:With chassis K:With chassis and cover

*1 Values in ( ) above show peak current and power.

Features

- Significantly reduced heat generation with high-efficiency design
- It is not necessary to provide a noise filter on the outside.
  Low leakage current is also realized.
- The cost competitive models are available.
- Equipped with a variable resistor to adjust output voltage (except -J0L type)

Medical standard IEC60601-1 Ed.3.1 (MOOP) approved

An amazing high level of efficiency 94% has been achieved for a 24 V output type, and peak power of 200 W also supported.*

*mUZP-120-24-JBH with 230 VAC input and load of 120 W

Safety standard	UL	CSA	EN	CE	CCC
Reliability grade	HFA	FA	HQA	QA	

●Function

TTL PFC RoHS Directive

●Input

AC input	85-264 VAC (Worldwide range)

●Dimension

W×H×D (mm)	Without chassis and cover	62×27×155
	With chassis and cover	72×38.8×185

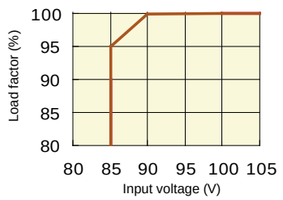
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items		Specification				Measurements conditions, etc.
AC Input	Rated Voltage		100-240VAC (85*-264VAC)				Worldwide range *See <Fig.1> Low input voltage derating on the following page.
	Input Frequency		50-60Hz				Frequency range 47-63Hz
	Efficiency	100VAC	87.5% typ (-JOL,-JB0/12V output), 89.5% typ (-JBH/12V output) 90.0% typ (-JOL,-JB0/24V output), 92.0% typ (-JBH/24V output)				At 100W output *Characteristic data: Fig.5, 21
		200VAC	90.0% typ (-JOL,-JB0/12V output), 91.5% typ (-JBH/12V output) 92.0% typ (-JOL,-JB0/24V output), 94.0% typ (-JBH/24V output)				
	Power Factor	100VAC	99% typ				At continuous rated output1 (natural air cooling) *Characteristic data: Fig.6, 22
		200VAC	90% typ				
	Inrush Current		17A typ (100VAC), 34A typ (200VAC) *Characteristic data: Fig.7, 23				Power thermistor system at cold start (25°C)
	Model	mUZP-120-	12-J0L,JB0	12-JBH	24-J0L,JB0	24-JBH	
	Input Current	100VAC	1.16A typ	1.35A typ	1.35A typ	1.32A typ	At continuous rated output1 (natural air cooling) *Characteristic data: Fig.5, 21
			1.87A typ	1.83A typ	1.82A typ	1.78A typ	At continuous rated output2 (forced air cooling)
		200VAC	0.62A typ	0.73A typ	0.72A typ	0.71A typ	At continuous rated output1 (natural air cooling)
			1.00A typ	0.98A typ	0.98A typ	0.96A typ	At continuous rated output2 (forced air cooling)
Output	Model	mUZP-120-	12-J0L,JB0	12-JBH	24-J0L,JB0	24-JBH	
	Rated Voltage		+12V	+12V	+24V	+24V	
	Continuous Rated Output1 (natural air cooling)		8.4A	10A	5A	5A	At rated input Refer to <Fig.4> output derating on the following page.
			100.8W	120W	120W	120W	
	Continuous Rated Output2 (forced air cooling)		13.5A	13.5A	6.75A	6.75A	
			162W	162W	162W	162W	
	Peak Current/Power		16.7A	16.7A	8.4A	8.4A	*Refer to peak output power condition on the following page.
			200.4W*	200.4W*	201.6W*	201.6W*	Natural air cooling and forced air cooling
	Factory Setting		-J0L: 12V±4% -JB0: 12V±2%	12V±2%	-J0L: 24V±4% -JB0: 24V±2%	24V±2%	At continuous rated output1 (natural air cooling)
	Adjustable Voltage Range		-5%,+10%	-5%,+10%	-5%,+20%	-5%,+20%	*Model: mUZP-120-**-J*L-* is equipped without this function.
	Static Input Regulation		48mV max.	48mV max.	94mV max.	94mV max.	
	Static Load Regulation		100mV max.	100mV max.	150mV max.	150mV max.	
	Temperature Regulation		0.02%/°C max.				
	Max. Ripple Voltage	0-70°C	120mV max.				Connect 150mm max. lead wire to output connectors, and then connect a 10uF electrolytic capacitor with a 0.1uF ceramic capacitor in parallel to the other ends of the wires to measure by an oscilloscope with 100MHz frequency band. *Characteristic data: Fig.18, 34
		-10-0°C	160mV max.				
	Max. Spike Voltage	0-70°C	150mV max.				
		-10-0°C	180mV max.				
Protection	Over Current Protection	OCP point (A)	101% min. of peak rated current				
		Method	Blocking oscillation *Characteristic data: Fig.20, 36				
		Recovery	Automatic recovery				
	Over Voltage Protection	OVP point (V)	13.8-16.2V	13.8-16.2V	30.0-35.0V	30.0-35.0V	
		Method	Output shutdown (latch lock)				
		Recovery	Reclosing of AC input				
Environment	Operating Temp./ Humidity	Open Frame	-10-60°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%				*<Fig.3> on the next page shows the guideline of forced air cooling. Refer to <Fig.4> output derating.
		With Chassis and Cover	-10-55°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%				
	Storage Temp./Humidity		-20-85°C/10-95%				There shall be no condensation
	Vibration		To endure the vibration acceleration of 2G with vibration frequency of 10 to 55Hz for 10 sweep cycles in each X, Y, Z direction.				Follow JIS-C-60068-2-6 at no operation
	Mechanical Shock		Left one bottom edge of the unit 50mm high with the opposite edge placed on the test bench, and let it fall. Repeat 3times for each of four bottom edges, and no malfunction shall be observed.				Follow JIS-C-60068-2-31 at no operation
Insulation	Dielectric Strength		3kVAC/1minute between input and output/RC				Cut-off current 10mA
			2kVAC/1minnute between input and FG				Cut-off current 10mA
			500VAC/1minute between each output /RC/FG				Cut-off current 100mA
	Insulation Resistance		50MΩmin. between each input/output/RC/FG				At 500VDC
	Leakage Current		0.06mA typ (100VAC), 0.12mA typ (200VAC) *Characteristic data: Fig.8, 24				
EMC	Line Noise Immunity		±2000V (pulse width of 100/1000nS,cycle period of 30 to 100Hz, Normal/Common mode with Positive/Negative polarity for 10 minutes)				There shall be no fluctuation of DC output or malfunction.
	Electrostatic Discharge		EN61000-4-2 compliant				Apply to FG and case. There shall be no malfunction, nor failure.
	Radiated, Radio-Frequency, Electromagnetic Field		EN61000-4-3 compliant				There shall be no malfunction, nor failure.
	Fast Transient Burst		EN61000-4-4 compliant				
	Lightning Surge		EN61000-4-5 compliant				
	Radio Frequency Conducted Immunity		EN61000-4-6 compliant				
	Power-Frequency Magnetic Field Immunity		EN61000-4-8 compliant				
	Voltage dips/Regulation		EN61000-4-11 compliant				
	Conducted Emmision		VCCI-B,FCC-B,CISPR22-B, and EN55022-B compliant *Characteristic data: Fig.9, 10, 25, 26				At rated input and rated output (natural air cooling), with chassis
	Harmonic Current Regulations		IEC61000-3-2 (edition 2.1) classD, EN61000-3-2 (A14) classD compliant.				At rated input/output
Others	Safety Standard		UL60950-1, CSA60950-1 (c-UL), CE Marking (LVD,EMCD), ANSI/AAMI ES60601-1 approved PSE (Ordinance item 2) compliant				IEC60601-1(Ed.3.1,MOOP) approved
	Cooling System		Natural air cooling/Forced air cooling				
	Output Grounding		Capacitor grounding				
	Output Hold-up Time		AC cut-off → 90% of rated voltage within 16ms min.				Rated input, output: 100W
	Reliability Grade		FA (Industrial equipment grade to use double-sided PWBs with through holes)				Following our standard
	Weight		250g typ (without chassis and cover), 430g typ (with chassis and cover)				
	Warranty		Three years after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost.				Except for errors caused by operation not specified in this specification.

General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

<Fig.1> Low input voltage derating

Follow the derating below to derate rated current/power.

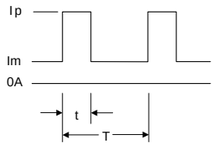


Peak output power condition

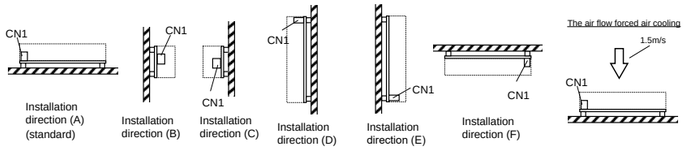
- Duty ratio of peak current shall be 30% or less.
- Energized period of peak current shall be 10 seconds or less.
- Energized period of peak current shall be 5 seconds or less at natural air cooling and 40 deg. or higher of ambient temperature.
- The value resulting from the formula below shall not exceed continuous rated current, Io, after derating specified in the output derating on the following page.

$\sqrt{((Ip^2 \times D)+(Im^2 \times (1-D)))} \leqq Io$

Ip=Peak current value
Im= Min. current value
D= Duty ratio, t/T
t= Pulse width of peak current
T= Cycle
Io= Continuous rated current specified in output derating



<Fig.2> Installation/Air cooling



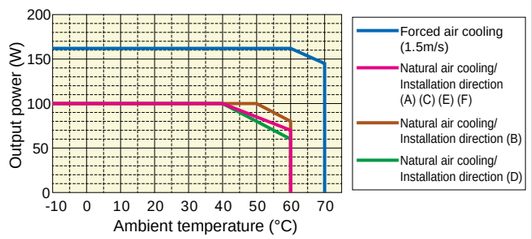
<Fig.3> Guideline for forced air cooling

Ask us separately about the guideline for temperature rise of each component at forced air cooling.

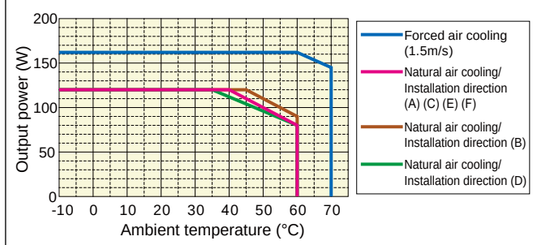
<Fig.4> Output derating

Follow the derating diagram below for output according to (A) ambient temperature and installation direction. Ask us separately except installation direction (A). In case of using the type with chassis and cover, input voltage range shall be 90 VAC or higher, and shall not use in direction (F). Also, forced air cooling condition in the diagram shall be provided that the air flow of 1.5 m/s is applied from the direction shown <Fig.2>.

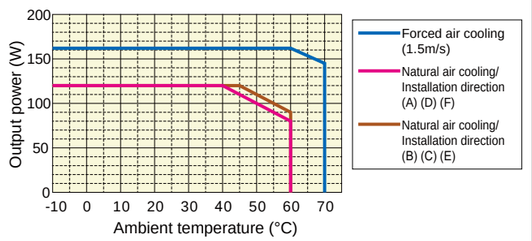
For open frame (mUZP-120-12-J0L, 12-JB0)



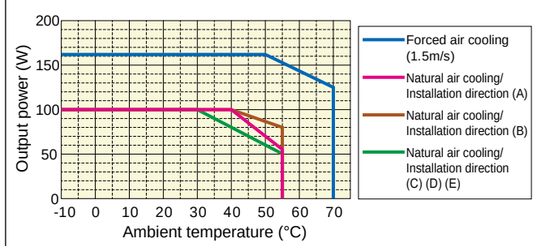
For open frame (mUZP-120-24-J0L, 24-JB0)



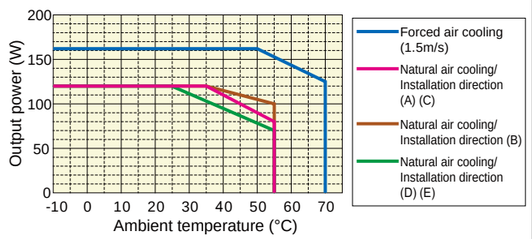
For open frame (mUZP-120-12-JBH, 24-JBH)



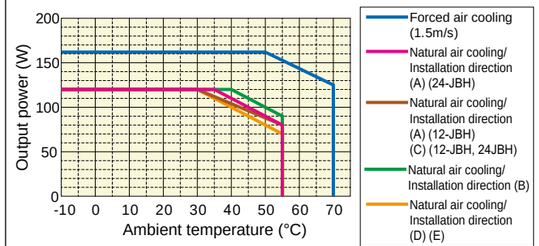
With chassis and cover (UZP-120-12-J0L, 12-JB0)



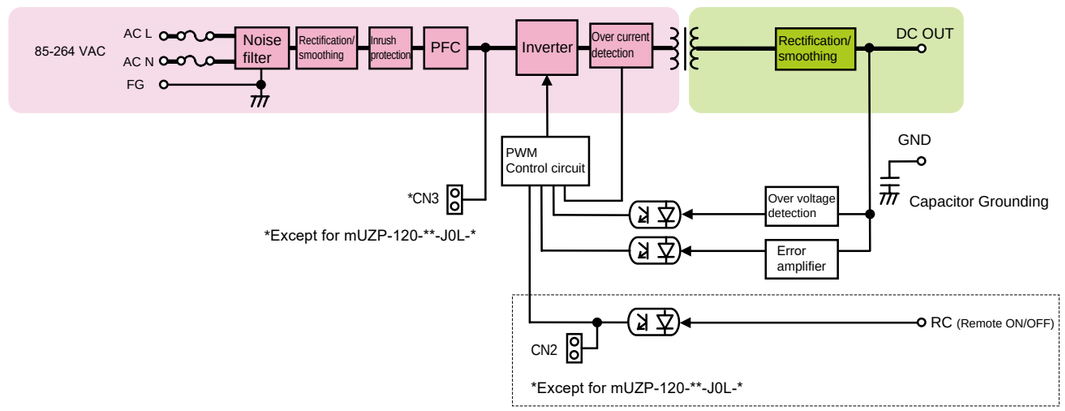
With chassis and cover (UZP-120-24-J0L, 24-JB0)



With chassis and cover (UZP-120-12-JBH, 24-JBH)



Block Diagram



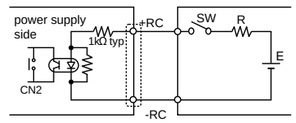
Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.) *Except for mUZP-120-**-J0L-*

	Items	Specification	Note
Input Signal	Output ON/OFF control signal (RC signal) *Remove the shorting plug of CN2 in using RC signal.	Operating mode Between +RC and -RC: Output SW ON (4.5V or higher): ON SW OFF (0.8V or lower): OFF External power supply and Load-limiting resistor External power supply: E / Load-limiting resistor: R 4.5 ~ 12.5Vdc: Not required 12.5 ~ 30Vdc: 1.5kΩ 30 ~ 48Vdc: 8.2kΩ	Shorting Plug With shorting plug (CN2) connected, output starts up when AC input is applied regardless of RC signal. To control Start/Stop of output by RC signal, uncap shorting plug of CN2. Note: Shorting plug (CN2) is primary circuit components. Make sure to operate the plug after the AC input is turned off.

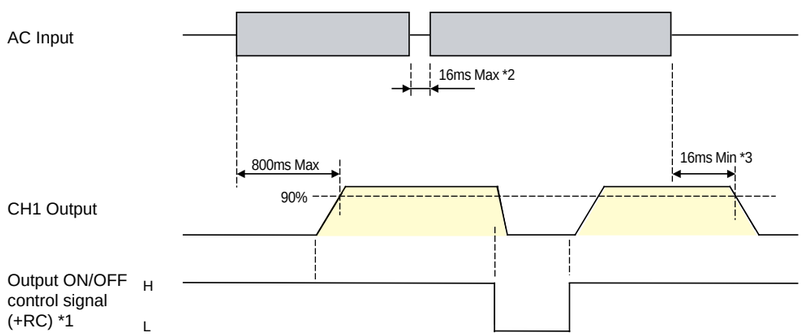
Signal Circuit

Input Signal Circuit

(RC signal)
Connection example:
using external power supply



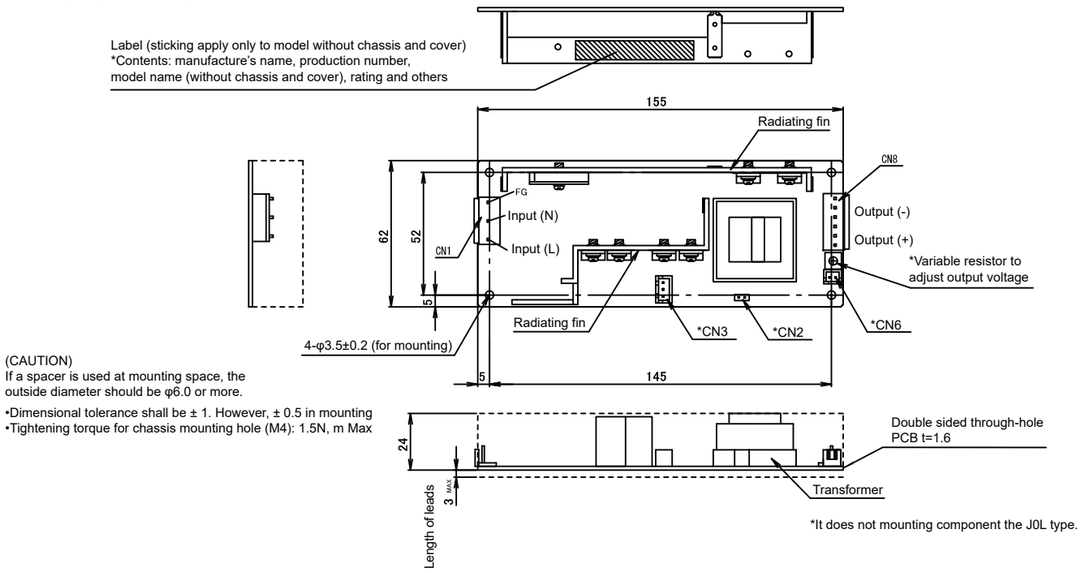
Sequence Timing Chart



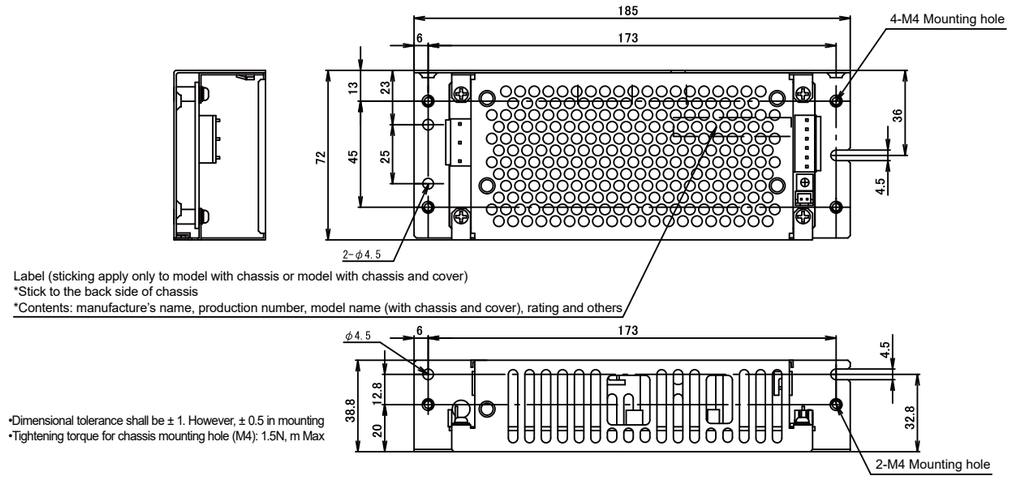
*1 Model: mUZP-120-**-J0L is equipped without output ON/OFF function.
*2 At rated input/80 W output
*3 At rated input/100 W output

Outline Drawing

■ PCB type (open frame) model

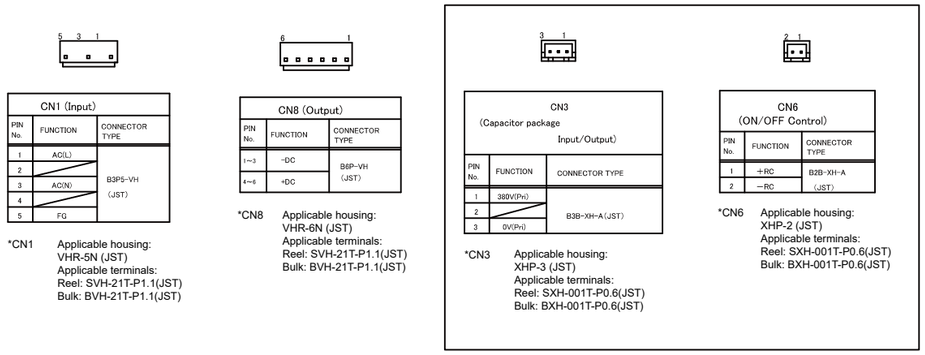


■ Model with chassis and cover



■ Connector pin allocation

The components are not mounted to J0L type.



CN1 (Input)

PIN No.	FUNCTION	CONNECTOR TYPE
1	AC(L)	B3P5-VH (JST)
2		
3	AC(N)	
4		
5	FG	

*CN1 Applicable housing: VHR-5N (JST)
Applicable terminals:
Reel: SVH-21T-P1.1(JST)
Bulk: BVH-21T-P1.1(JST)

CN8 (Output)

PIN No.	FUNCTION	CONNECTOR TYPE
1~3	-DC	B6P-VH (JST)
4~6	+DC	

*CN8 Applicable housing: VHR-6N (JST)
Applicable terminals:
Reel: SVH-21T-P1.1(JST)
Bulk: BVH-21T-P1.1(JST)

CN3
(Capacitor package Input/Output)

PIN No.	FUNCTION	CONNECTOR TYPE
1	380V(Pri)	B3B-XH-A (JST)
2		
3	0V(Pri)	

*CN3 Applicable housing: XHP-3 (JST)
Applicable terminals:
Reel: SXH-001T-P0.6(JST)
Bulk: BXH-001T-P0.6(JST)

CN6
(ON/OFF Control)

PIN No.	FUNCTION	CONNECTOR TYPE
1	+RC	B2B-XH-A (JST)
2	-RC	

*CN6 Applicable housing: XHP-2 (JST)
Applicable terminals:
Reel: SXH-001T-P0.6(JST)
Bulk: BXH-001T-P0.6(JST)

Options (Sold separately)

Cable

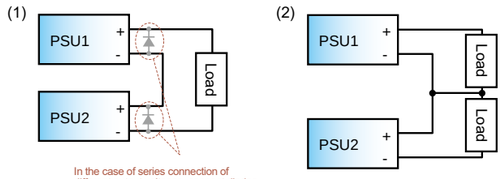
Photos	Model	Category	Description
	WH-C05VH-800	Input harness	For nylon connector.
	WH-C05VH-800-01	Input harness (with ferrite core)	For nylon connector.
	WH-C06VH-500-03	Output harness	For nylon connector.
	WH-02XH02XH-500	Signal harness for RC signal	Connection harness to use output ON/OFF control signal (RC signal). * Except for mUZP-120-**-J0L

Connection in Series and Parallel

■ Series operation

Series connection is available as in figure (1) and (2) on the right.
Series connection between different output voltages is available, such as 12 V and 24 V.

Note: In the case that different voltages are connected in series as in figure (1) on the right;
1. The output current shall be the rated current or less of the smaller rated current among the PSU1 and PSU2 connected in series.
2. Connect diodes for protection as show in the figure (1).
The rated current of the diodes shall be 1.5 times or more of the peak output current of the power supply which has larger peak output current among PSU1 and PSU2.
Also, use Schottky diodes whose forward voltage is lower than the forward voltage of the diodes used in the PSU.

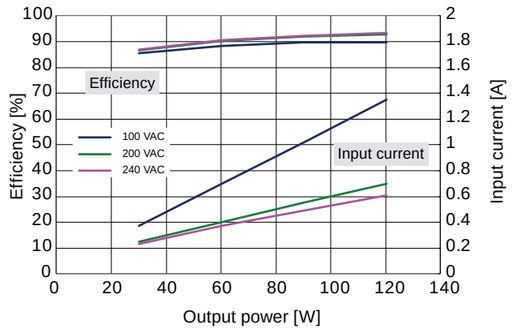


■ Parallel operation

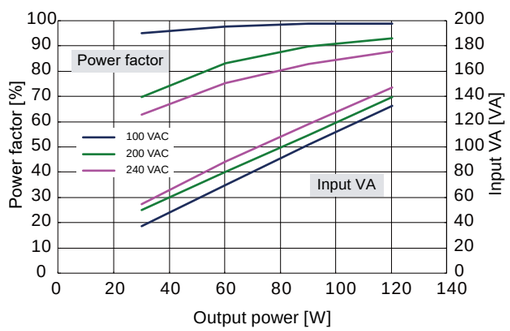
Parallel operation is unacceptable.

Characteristics Data (Typical features of the product series) mUZP-120-24-JB0 (Examples of actual measurement)

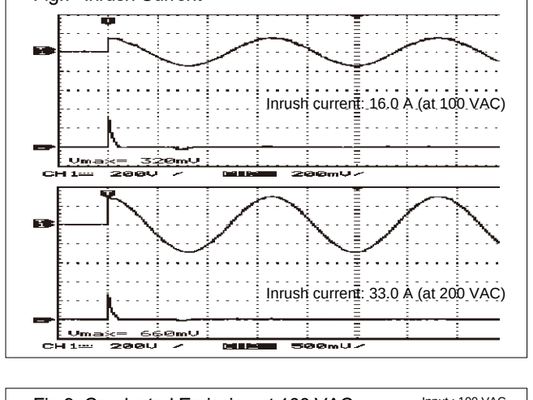
● Fig.5 Efficiency/Input Current vs. Output Power



● Fig.6 Power Factor/Input VA vs. Output Power



● Fig.7 Inrush Current



● Fig.8 Leakage Current

Input : 110, 264 VAC, 60 Hz
Load : Rated load and Min. load

	Rated load	Min. load
110 VAC	0.06 mA	0.06 mA
264 VAC	0.15 mA	0.15 mA

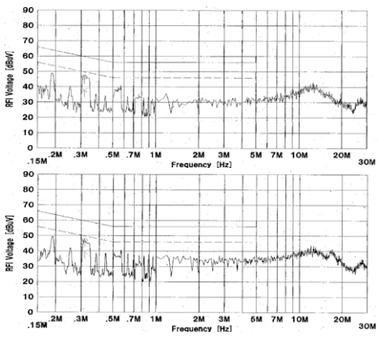
● Fig.9 Conducted Emission at 100 VAC

Input : 100 VAC
Load : Rated
Mode : Peak

VCCI Class B

Measuring point: N-FG

Measuring point: L1-FG



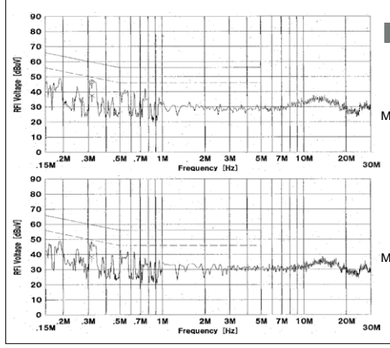
● Fig.10 Conducted Emission at 230 VAC

Input : 230 VAC
Load : Rated
Mode : Peak

VCCI Class B

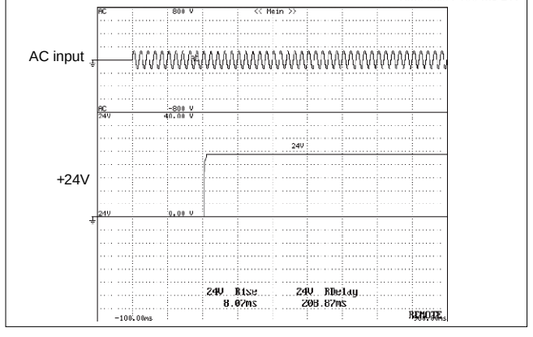
Measuring point: N-FG

Measuring point: L1-FG



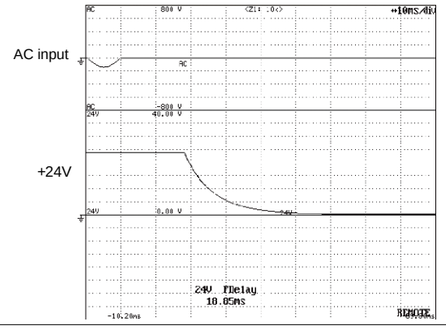
● Fig.11 Rising Characteristics at 100 VAC

Input : 100 VAC
Load : Rated
Time axis : 100 ms/DIV



● Fig.12 Falling Characteristics at 100 VAC

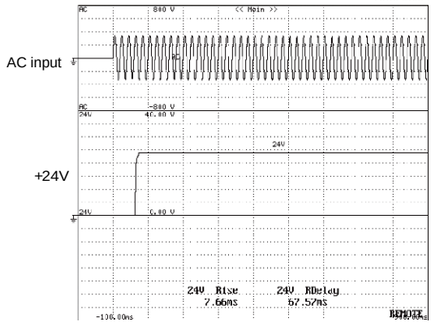
Input : 100 VAC
Load : 100 W
Time axis : 10 ms/DIV



Characteristics Data (Typical features of the product series) mUZP-120-24-JB0 (Examples of actual measurement)

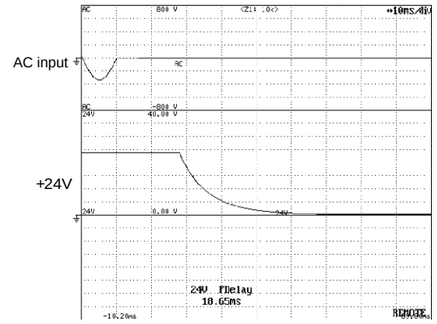
● Fig.13 Rising Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 100 ms/DIV

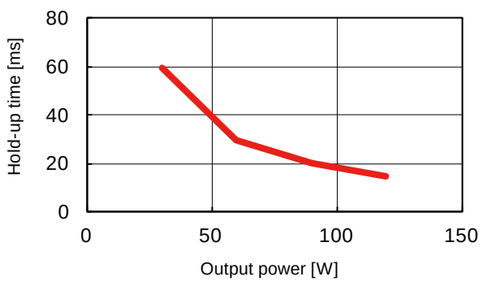


● Fig.14 Falling Characteristics at 240 VAC

Input : 240 VAC
Load : 100 W
Time axis : 10 ms/DIV

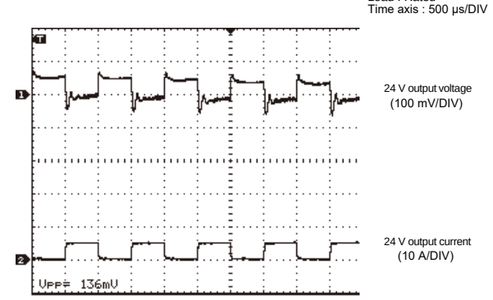


● Fig.15 Output Hold-up Time vs. Output Power

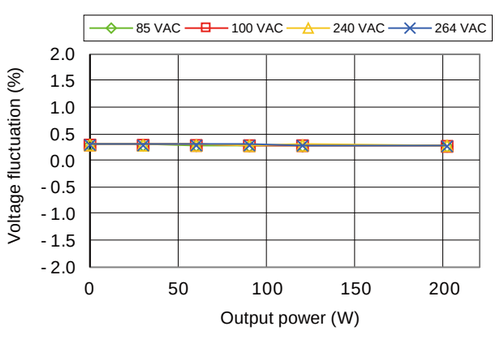


● Fig.16 Dynamic Load Fluctuation Characteristics at 1 kHz

Input : 100 VAC
Load : Rated
Time axis : 500 µs/DIV



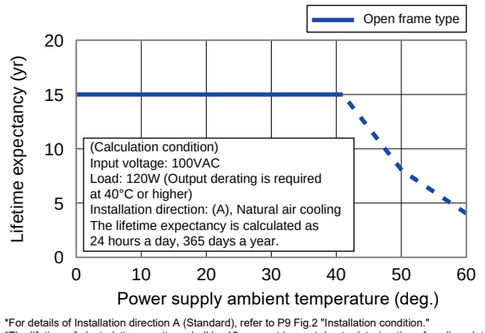
● Fig.17 Output Voltage Regulation (Load Fluctuation)



● Fig.18 Ripple and Spike Voltage

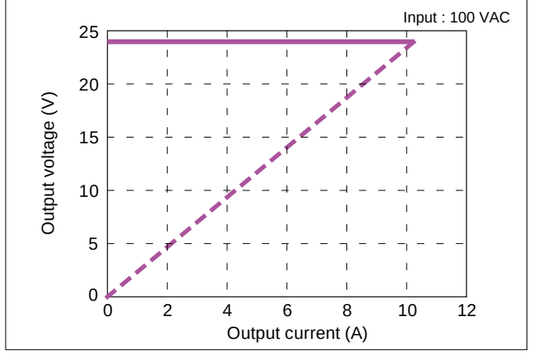
Temperature	AC Input voltage	24V					
		Minimum load		50% load		Rated load	
		Ripple(mV)	Noise(mV)	Ripple(mV)	Noise(mV)	Ripple(mV)	Noise(mV)
-15℃	85V	6.5	14.0	87.5	112.3	107.7	143.3
	100V	6.4	14.6	85.0	108.9	101.7	137.8
	240V	6.5	16.1	84.1	108.1	105.4	140.3
	264V	6.5	15.7	84.7	106.0	104.6	133.8
25℃	85V	6.3	13.3	13.8	34.7	20.4	57.6
	100V	6.5	14.7	14.3	34.6	20.3	55.4
	240V	6.6	14.4	13.7	32.5	19.5	49.6
	264V	6.5	14.6	13.6	33.3	19.6	51.2
45℃	85V	6.1	13.3	10.6	31.4	15.4	50.7
	100V	6.1	13.6	10.4	31.3	15.0	49.9
	240V	6.1	14.3	10.1	28.2	14.2	42.8
	264V	5.9	14.4	9.9	29.5	14.4	44.3
65℃	85V	6.3	13.9	9.3	26.8	11.1	37.5
	100V	6.3	14.1	9.1	26.3	11.1	35.8
	240V	6.3	15.1	8.6	23.0	10.3	33.7
	264V	6.1	15.5	8.3	24.0	10.2	34.2

● Fig.19 Ambient Temperature vs. Lifetime Expectancy



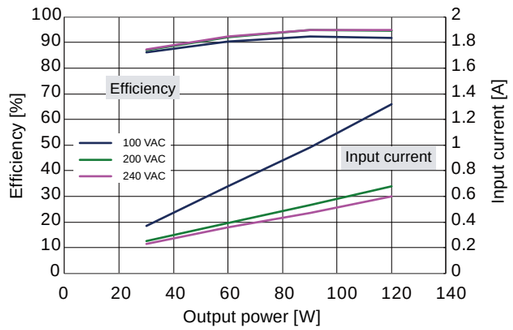
*For details of Installation direction A (Standard), refer to P9 Fig.2 "Installation condition."
*The lifetime of electrolytic capacitors shall be 15 years at longest due to deterioration of sealing plates.

●Fig.20 Overcurrent Protection Characteristics (V - I Characteristics)

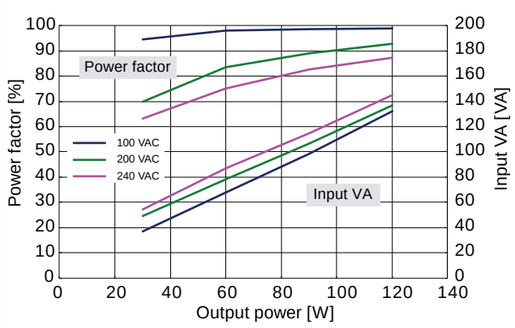


Characteristics Data (Typical features of the product series) mUZP-120-24-JBH (Examples of actual measurement)

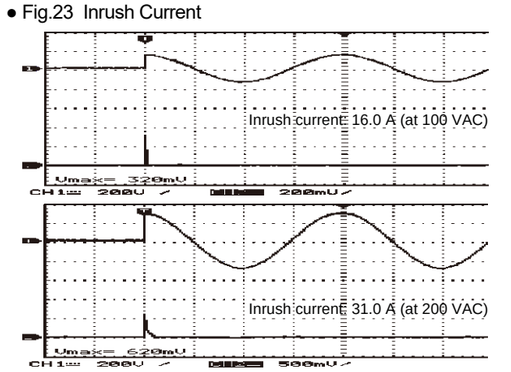
● Fig.21 Efficiency/Input Current vs. Output Power



● Fig.22 Power Factor/Input VA vs. Output Power



● Fig.23 Inrush Current



● Fig.24 Leakage Current

Input : 110, 264 VAC, 60 Hz
Load : Rated load and Min. load

	Rated load	Min. load
110 VAC	0.06 mA	0.06 mA
264 VAC	0.14 mA	0.14 mA

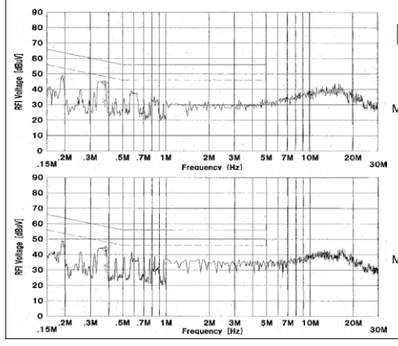
● Fig.25 Conducted Emission at 100 VAC

Input : 100 VAC
Load : Rated
Mode : Peak

VCCI Class B

Measuring point: N-FG

Measuring point: L1-FG



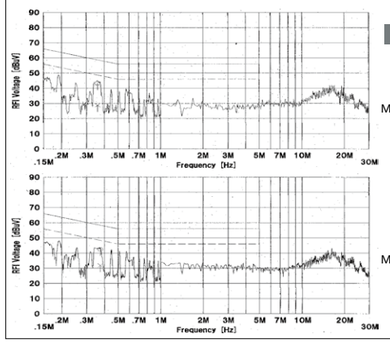
● Fig.26 Conducted Emission at 230 VAC

Input : 230 VAC
Load : Rated
Mode : Peak

VCCI Class B

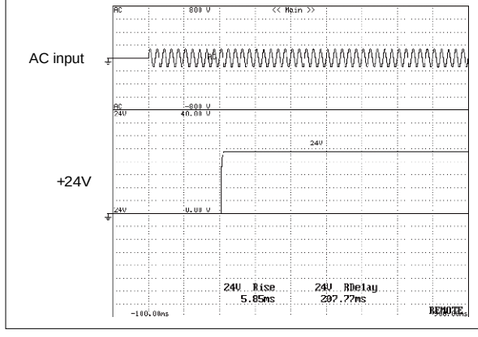
Measuring point: N-FG

Measuring point: L1-FG



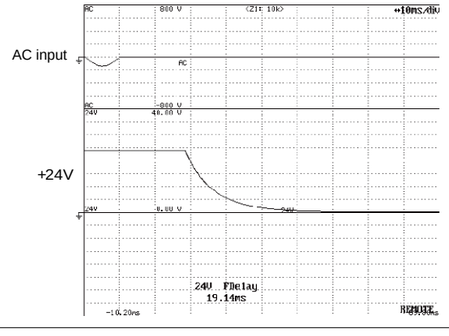
● Fig.27 Rising Characteristics at 100 VAC

Input : 100 VAC
Load : Rated
Time axis : 100 ms/DIV



● Fig.28 Leakage Current

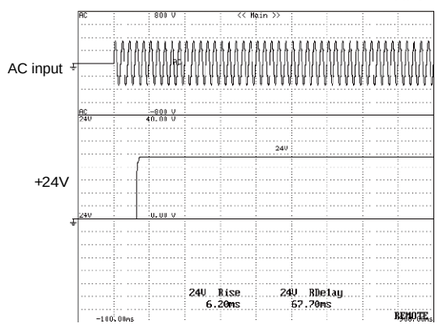
Input : 100 VAC
Load : 100 W
Time axis : 10 ms/DIV



Characteristics Data (Typical features of the product series) mUZP-120-24-JBH (Examples of actual measurement)

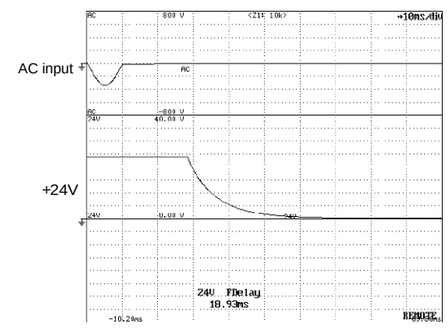
● Fig.29 Rising Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 100 ms/DIV

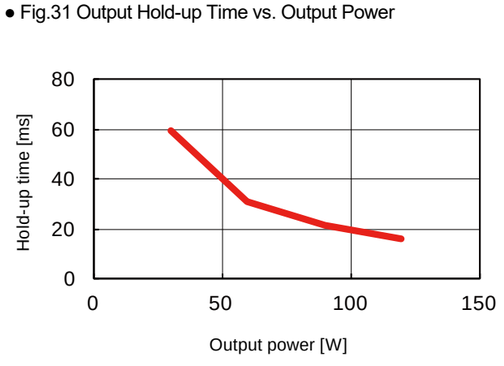


● Fig.30 Falling Characteristics at 240 VAC

Input : 240 VAC
Load : 100 W
Time axis : 10 ms/DIV

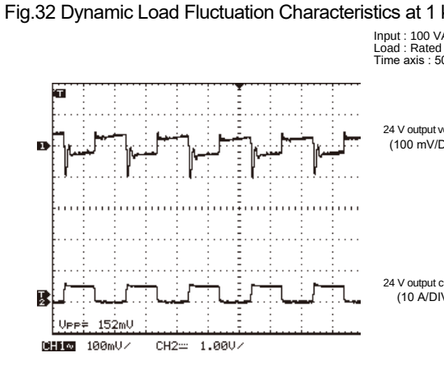


● Fig.31 Output Hold-up Time vs. Output Power

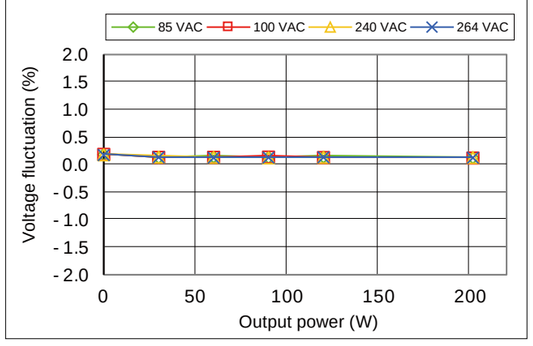


● Fig.32 Dynamic Load Fluctuation Characteristics at 1 kHz

Input : 100 VAC
Load : Rated
Time axis : 500 µs/DIV



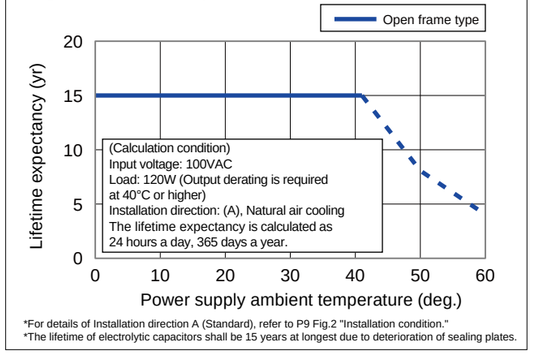
● Fig.33 Output Voltage Regulation (Load Fluctuation)



● Fig.34 Ripple and Spike Voltage

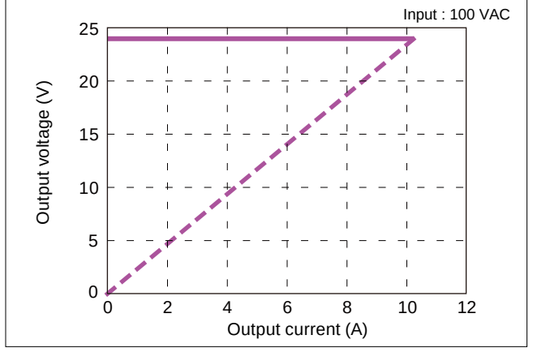
Temperature	AC Input voltage	24V					
		Minimum load		50% load		Rated load	
		Ripple(mV)	Noise(mV)	Ripple(mV)	Noise(mV)	Ripple(mV)	Noise(mV)
-15℃	85V	7.3	15.4	38.5	69.1	84.1	148.5
	100V	6.7	15.6	37.5	67.3	79.2	136.3
	240V	6.8	13.2	33.7	62.3	64.1	116.9
	264V	6.8	13.1	33.9	62.2	60.5	111.4
25℃	85V	6.2	12.7	11.1	36.0	18.9	62.5
	100V	6.5	14.7	11.0	35.3	18.7	59.5
	240V	6.5	12.5	10.0	33.8	17.7	55.0
	264V	6.5	12.6	9.8	35.1	18.3	57.8
45℃	85V	7.5	15.1	10.2	34.2	13.9	57.4
	100V	7.3	11.6	10.3	33.5	13.6	55.9
	240V	6.1	12.2	9.4	32.6	12.6	49.3
	264V	6.1	12.1	9.2	34.5	13.1	51.7
65℃	85V	7.3	11.7	9.1	26.9	10.9	41.2
	100V	6.1	11.9	9.0	27.1	10.9	38.6
	240V	6.1	12.0	8.5	25.6	9.7	37.1
	264V	6.0	11.7	8.4	26.9	9.6	38.8

● Fig.35 Ambient Temperature vs. Lifetime Expectancy

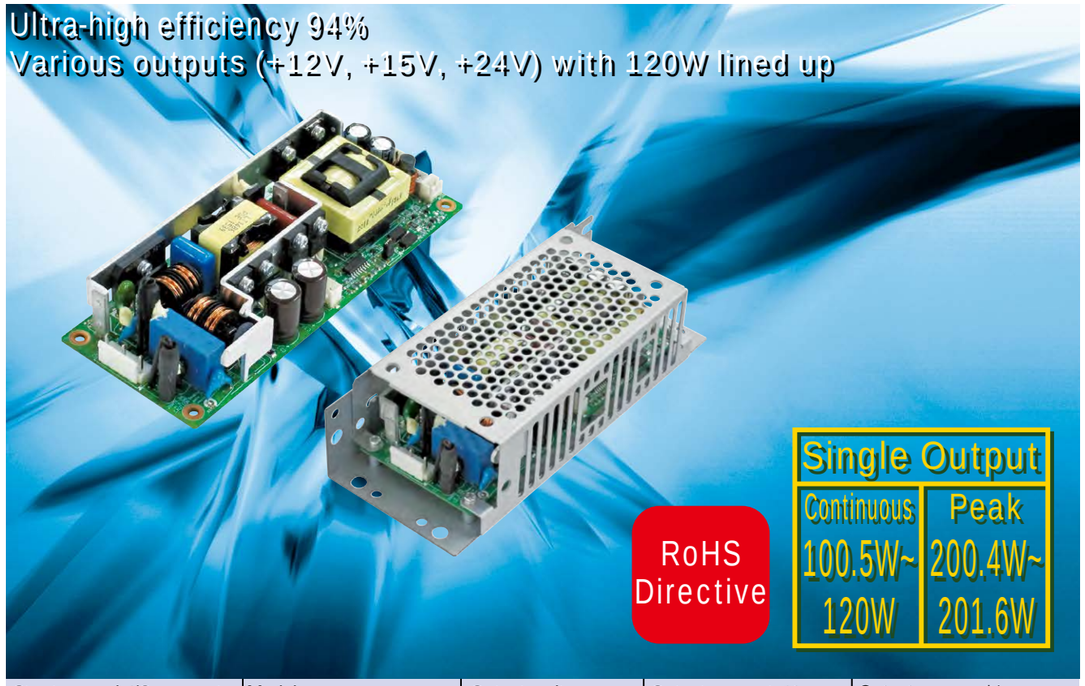


*For details of Installation direction A (Standard), refer to P9 Fig.2 "Installation condition."
*The lifetime of electrolytic capacitors shall be 15 years at longest due to to deterioration of sealing plates.

●Fig.36 Overcurrent Protection Characteristics (V - I Characteristics)



Single Output Power Supply mUZPT-120 series



Structure and I/O connector	Model	Output voltage	Output current *1	Output power *1
Open frame type/ Nylon connector	mUZPT-120-12-J0L	+12V	8.4A (16.7A)	100.8W (200.4W)
	mUZPT-120-12-JB0	+12V	8.4A (16.7A)	100.8W (200.4W)
	mUZPT-120-12-JBH	+12V	10A (16.7A)	120W (200.4W)
	mUZPT-120-15-J0L	+15V	6.7A (13.4A)	100.5W (201.0W)
	mUZPT-120-15-JB0	+15V	6.7A (13.4A)	100.5W (201.0W)
	mUZPT-120-15-JBH	+15V	8.0A (13.4A)	120W (201.0W)
	mUZPT-120-24-J0L	+24V	5A (8.4A)	120W (201.6W)
	mUZPT-120-24-JB0	+24V	5A (8.4A)	120W (201.6W)
	mUZPT-120-24-JBH	+24V	5A (8.4A)	120W (201.6W)

Structure	Description
With chassis	'-C' is added after open frame model name (Ex: mUZPT-120-12-JBH-C)
With chassis and cover	'-K' is added after open frame model name (Ex: mUZPT-120-12-JBH-K)

■ Model name coding

mUZPT-120-**-J***-*
① ② ③ ④⑤⑥⑦ ⑧

① Series name
② Output power
③ 12:12V
15:15V
24:24V
④ Input/Output connector
J:Nylon connector
⑤ Optional joint connector
"0":Without connector
"B":With connector
⑥ Presence or absence of function
"L": Without output ON/OFF control signal, without variable resistor to adjust output voltage, low cost type
"O": With output ON/OFF control signal, with variable resistor to adjust output voltage
"H": With output ON/OFF control signal, with variable resistor to adjust output voltage, high-efficiency type
⑦ Modification
⑧ Blank:Without chassis and cover
C:With chassis
K:With chassis and cover

*1 Values in ( ) above show peak current and power.

Features

- Significantly reduced heat generation with high-efficiency design
- It is not necessary to provide a noise filter on the outside.
  Low leakage current is also realized.
- The cost competitive models are available.
- Equipped with a variable resistor to adjust output voltage (except -J0L type)

Medical standard IEC60601-1 Ed.2, Ed.3.1 (MOOP, MOPP) approved

An amazing high level of efficiency 94% has been achieved for a 24 V output type, and peak power of 200 W also supported.*

*mUZPT-120-24-JBH with 230 VAC input and load of 120 W

Safety standard	UL	CSA	EN	CE	CCC
Reliability grade	HFA	FA	HOA	OA	

●Function

TTL PFC RoHS Directive

●Input

AC input	85-264 VAC (Worldwide range)

●Dimension

W×H×D (mm)	Without chassis and cover	62×38×155
	With chassis and cover	72×45×185

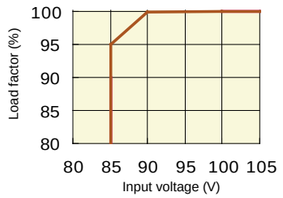
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items		Specification	Measurements conditions, etc.
AC Input	Rated Voltage		100-240VAC (85*-264VAC)	Worldwide range *See <Fig.1> Low input voltage derating on the following page.
	Input Frequency		50-60Hz	Frequency range 47-63Hz
	Efficiency	100VAC	87.5% typ (-JOL,-JB0/12,15V output), 89.5% typ (-JBH/12,15V output) 90.0% typ (-JOL,-JB0/24V output), 92.0% typ (-JBH/24V output)	At 100W output *Characteristic data: Fig.5, 21
		200VAC	90.0% typ (-JOL,-JB0/12,15V output), 91.5% typ (-JBH/12,15V output) 92.0% typ (-JOL,-JB0/24V output), 94.0% typ (-JBH/24V output)	
	Power Factor	100VAC	99% typ	At continuous rated output1 (natural air cooling) *Characteristic data: Fig.6, 22
		200VAC	90% typ	
	Inrush Current		17A typ (AC100V), 34A typ (AC200V) *Characteristic data: Fig.7, 23	Power thermistor system at cold start (25°C)
	Model	mUZPT-120-	12-J0L,JB0 / 12-JBH / 15-J0L,JB0 / 15-JBH / -24-J0L,JB0 / -24-JBH	
	Input Current	100VAC	1.16A typ / 1.35A typ / 1.16A typ / 1.35A typ / 1.35A typ / 1.32A typ	At continuous rated output1 (natural air cooling) *Characteristic data: Fig.5, 21
			1.87A typ / 1.83A typ / 1.87A typ / 1.83A typ / 1.82A typ / 1.78A typ	At continuous rated output2 (forced air cooling)
		200VAC	0.62A typ / 0.73A typ / 0.62A typ / 0.73A typ / 0.72A typ / 0.71A typ	At continuous rated output1 (natural air cooling)
			1.00A typ / 0.98A typ / 1.00A typ / 0.98A typ / 0.98A typ / 0.96A typ	At continuous rated output2 (forced air cooling)
Output	Model	mUZPT-120-	12-J0L,JB0 / 12-JBH / 15-J0L,JB0 / 15-JBH / -24-J0L,JB0 / -24-JBH	
	Rated Voltage		+12V / +12V / +15V / +15V / +24V / +24V	
	Continuous Rated Output1 (natural air cooling)		8.4A / 10A / 6.7A / 8.0A / 5A / 5A 100.8W / 120W / 100.5W / 120W / 120W / 120W	At rated input Refer to <Fig.4> output derating on the following page.
	Continuous Rated Output2 (forced air cooling)		13.5A / 13.5A / 10.8A / 10.8A / 6.75A / 6.75A 162W / 162W / 162W / 162W / 162W / 162W	
	Peak Current/Power		16.7A / 16.7A / 13.4A / 13.4A / 8.4A / 8.4A 200.4W* / 200.4W* / 201.0W* / 201.0W* / 201.6W* / 201.6W*	*Refer to peak output power condition on the following page. Natural air cooling and forced air cooling
	Factory Setting		-J0L: 12V±4% -JB0: 12V±2% / 12V±2% / -J0L: 15V±4% -JB0: 15V±2% / 15V±2% / -J0L: 24V±4% -JB0: 24V±2% / 24V±2%	At continuous rated output1 (natural air cooling)
	Adjustable Voltage Range		-5%,+10% / -5%,+10% / -5%,+10% / -5%,+10% / -5%,+20% / -5%,+20%	*Model: mUZPT-120-**-J*L-* is equipped without this function.
	Static Input Regulation		48mV max. / 48mV max. / 60mV max. / 60mV max. / 94mV max. / 94mV max.	
	Static Load Regulation		100mV max. / 100mV max. / 112mV max. / 112mV max. / 150mV max. / 150mV max.	
	Temperature Regulation		0.02%/°C max.	
	Max. Ripple Voltage	0-70°C	120mV max.	Connect 150mm max. lead wire to output connectors, and then connect a 10uF electrolytic capacitor with a 0.1uF ceramic capacitor in parallel to the other ends of the wires to measure by an oscilloscope with 100MHz frequency band. *Characteristic data: Fig.18, 34
		-10-0°C	160mV max.	
	Max. Spike Voltage	0-70°C	150mV max.	
		-10-0°C	180mV max.	
Protection	Over Current Protection	OCP point (A)	101% min. of peak rated current	
		Method	Blocking oscillation *Characteristic data: Fig.20, 36	
		Recovery	Automatic recovery	
	Over Voltage Protection	OVP point (V)	13.8-16.2V / 13.8-16.2V / 17.3-20.3V / 17.3-20.3V / 30.0-35.0V / 30.0-35.0V	
		Method	Output shutdown (latch lock)	
		Recovery	Reclosing of AC input	
Environment	Operating Temp./ Humidity	Open Frame	-10-60°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%	*<Fig.3> on the next page shows the guideline of forced air cooling. Refer to <Fig.4> output derating.
		With Chassis and Cover	-10-55°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%	
	Storage Temp./Humidity		-20-85°C/10-95%	There shall be no condensation
	Vibration		To endure the vibration acceleration of 2G with vibration frequency of 10 to 55Hz for 10 sweep cycles in each X, Y, Z direction.	Follow JIS-C-60068-2-6 at no operation
	Mechanical Shock		Left one bottom edge of the unit 50mm high with the opposite edge placed on the test bench, and let it fall. Repeat 3times for each of four bottom edges, and no malfunction shall be observed.	Follow JIS-C-60068-2-31 at no operation
Insulation	Dielectric Strength		4kVAC/1minute between input and output/RC	Cut-off current 10mA
			2kVAC/1minnute between input and FG	Cut-off current 10mA
			500VAC/1minute between each output /RC/FG	Cut-off current 100mA
	Insulation Resistance		50MΩmin. between each input/output/RC/FG	At 500VDC
	Leakage Current		0.06mA typ (100VAC), 0.12mA typ (200VAC) *Characteristic data: Fig.8, 24	
EMC	Line Noise Immunity		±2000V (pulse width of 100/1000nS,cycle period of 30 to 100Hz, Normal/Common mode with Positive/Negative polarity for 10 minutes)	There shall be no fluctuation of DC output or malfunction.
	Electrostatic Discharge		EN61000-4-2 compliant	Apply to FG and case. There shall be no malfunction, nor failure.
	Radiated, Radio-Frequency, Electromagnetic Field		EN61000-4-3 compliant	There shall be no malfunction, nor failure.
	Fast Transient Burst		EN61000-4-4 compliant	
	Lightning Surge		EN61000-4-5 compliant	
	Radio Frequency Conducted Immunity		EN61000-4-6 compliant	
	Power-Frequency Magnetic Field Immunity		EN61000-4-8 compliant	
	Voltage dips/Regulation		EN61000-4-11 compliant	
	Conducted Emmision		VCCI-B,FCC-B,CISPR22-B, and EN55022-B compliant *Characteristic data: Fig.9, 10, 25, 26	At rated input and rated output (natural air cooling), with chassis
	Harmonic Current Regulations		IEC61000-3-2 (edition 2.1) classD, EN61000-3-2 (A14) classD compliant.	At rated input/output
Others	Safety Standard		UL60950-1, CSA60950-1 (c-UL), CE Marking (LVD,EMCD), UL60601-1, CSA C22.2 NO. 601.1 (c-UL), ANSI/AAMI ES60601-1 approved PSE (Ordinance item 2) compliant	IEC60601-1 (Ed.2) and (Ed.3.1,MOOP, MOPP) approved
	Cooling System		Natural air cooling/Forced air cooling	
	Output Grounding		Capacitor grounding	
	Output Hold-up Time		AC cut-off → 90% of rated voltage within 16ms min.	Rated input, output: 100W
	Reliability Grade		FA (Industrial equipment grade to use double-sided PWBs with through holes)	Following our standard
	Weight		260g typ (without chassis and cover), 450g typ (with chassis and cover)	
	Warranty		Three years after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost.	Except for errors caused by operation not specified in this specification.

General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

<Fig.1> Low input voltage derating

Follow the derating below to derate rated current/power.

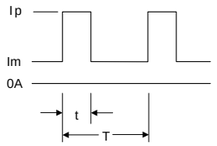


Peak output power condition

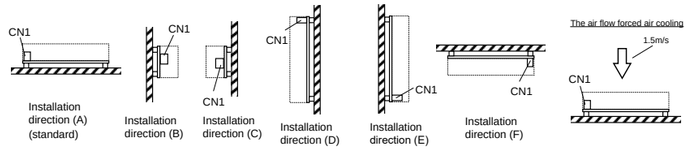
- Duty ratio of peak current shall be 30% or less.
- Energized period of peak current shall be 10 seconds or less.
- Energized period of peak current shall be 5 seconds or less at natural air cooling and 40 deg. or higher of ambient temperature.
- The value resulting from the formula below shall not exceed continuous rated current, Io, after derating specified in the output derating on the following page.

$\sqrt{((Ip^2 \times D)+(Im^2 \times (1-D)))} \leqq Io$

Ip=Peak current value
Im= Min. current value
D= Duty ratio, t/T
t= Pulse width of peak current
T= Cycle
Io= Continuous rated current specified in output derating



<Fig.2> Installation/Air cooling



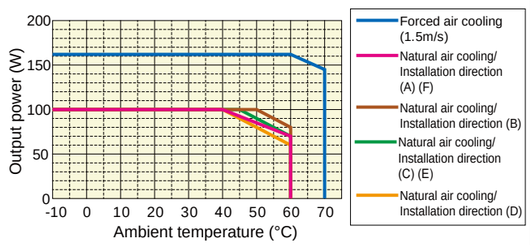
<Fig.3> Guideline for forced air cooling

Ask us separately about the guideline for temperature rise of each component at forced air cooling.

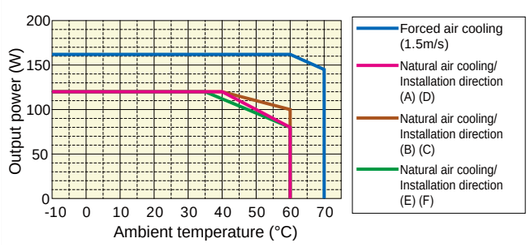
<Fig.4> Output derating

Follow the derating diagram below for output according to (A) ambient temperature and installation direction. Ask us separately except installation direction (A). In case of using the type with chassis and cover, input voltage range shall be 90 VAC or higher, and shall not use in direction (F). Also, forced air cooling condition in the diagram shall be provided that the air flow of 1.5 m/s is applied from the direction shown <Fig.2>.

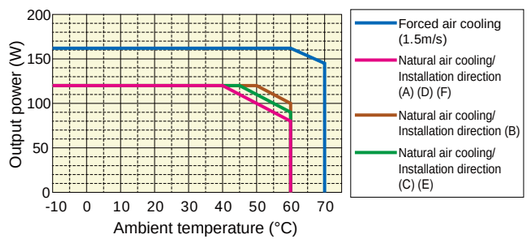
For open frame (mUZPT-120-12-J0L,12-JB0,15-J0L,15-JB0)



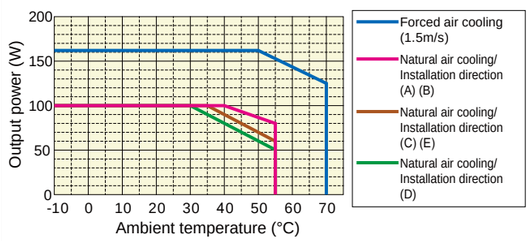
For open frame (mUZPT-120-24-J0L,24-JB0)



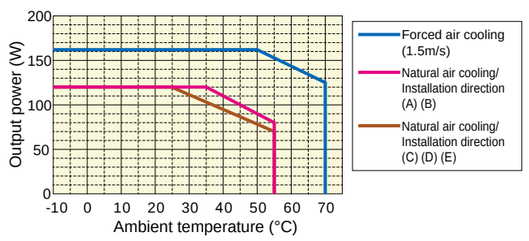
For open frame (mUZPT-120-12-JBH,15-JBH,24-JBH)



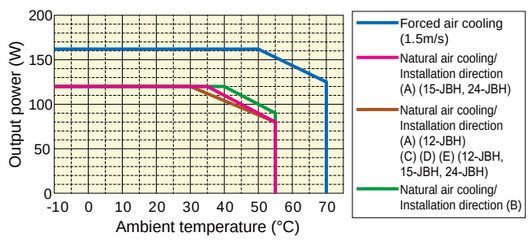
With chassis and cover (mUZPT-120-12-J0L,12-JB0,15-J0L,15-JB0)



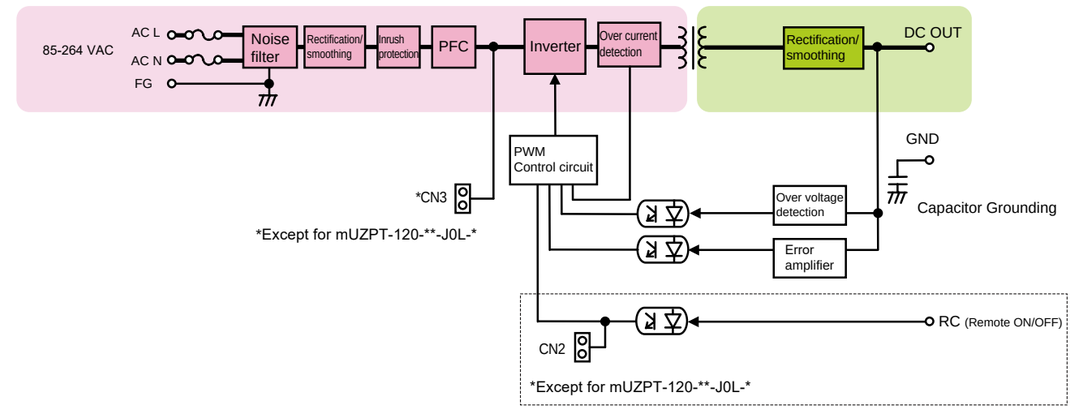
With chassis and cover (mUZPT-120-24-J0L,24-JB0)



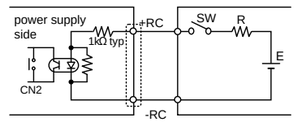
With chassis and cover (mUZPT-120-12-JBH,15-JBH,24-JBH)



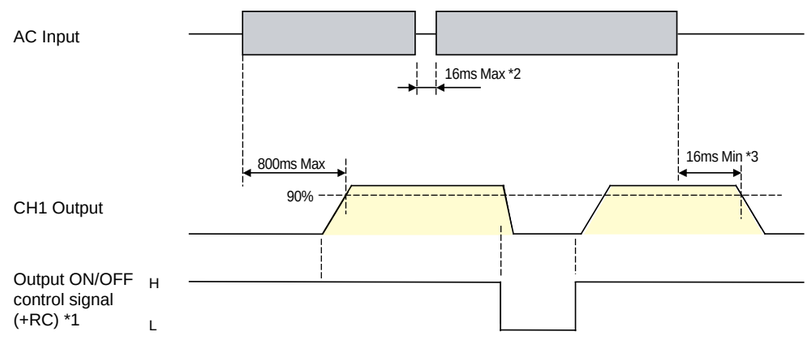
Block Diagram



Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.) *Except for mUZPT-120-**-J0L-*

	Items	Specification	Note
Input Signal	Output ON/OFF control signal (RC signal) *Remove the shorting plug of CN2 in using RC signal.	Operating mode Between +RC and -RC: Output SW ON (4.5V or higher): ON SW OFF (0.8V or lower): OFF External power supply and Load-limiting resistor External power supply: E / Load-limiting resistor: R 4.5 ~ 12.5Vdc: Not required 12.5 ~ 30Vdc: 1.5kΩ 30 ~ 48Vdc: 8.2kΩ	Shorting Plug With shorting plug (CN2) connected, output starts up when AC input is applied regardless of RC signal. To control Start/Stop of output by RC signal, uncap shorting plug of CN2. Note: Shorting plug (CN2) is primary circuit components. Make sure to operate the plug after the AC input is turned off.
Input Signal Circuit	Signal Circuit (RC signal) Connection example: using external power supply		

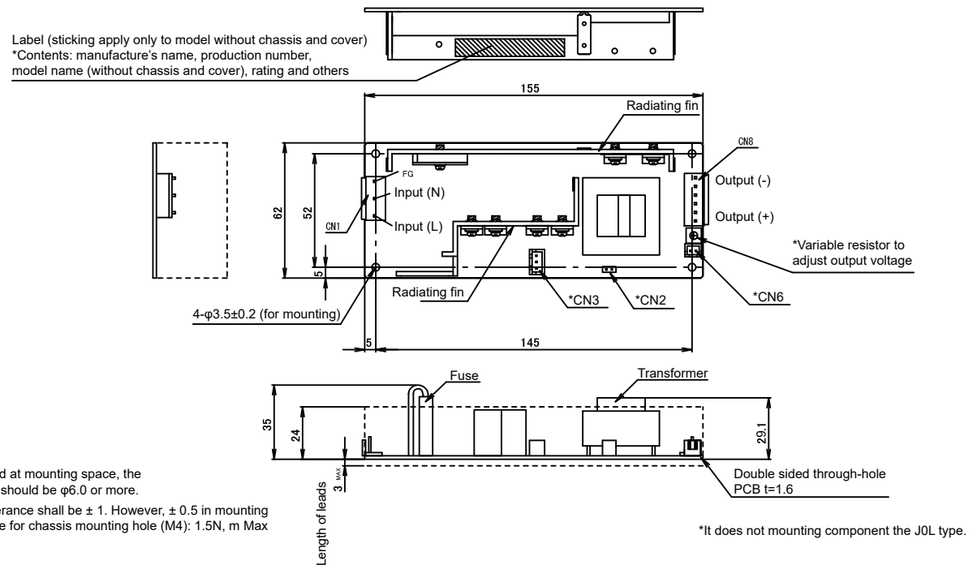
Sequence Timing Chart



*1 Model: mUZPT-120-**-J0L is equipped without output ON/OFF function.
*2 At rated input/80 W output
*3 At rated input/100 W output

Outline Drawing

■ PCB type (open frame) model

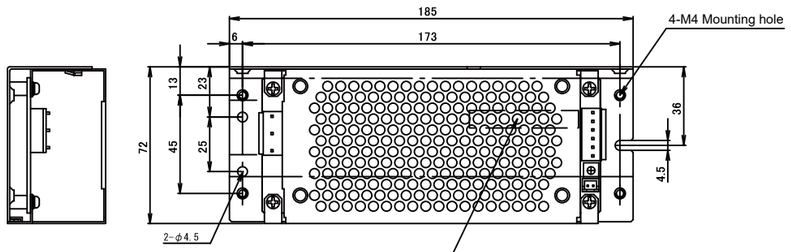


(CAUTION)
If a spacer is used at mounting space, the outside diameter should be φ6.0 or more.

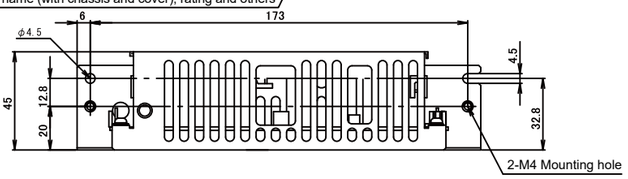
•Dimensional tolerance shall be ± 1. However, ± 0.5 in mounting
•Tightening torque for chassis mounting hole (M4): 1.5N, m Max

*It does not mounting component the J0L type.

■ Model with chassis and cover



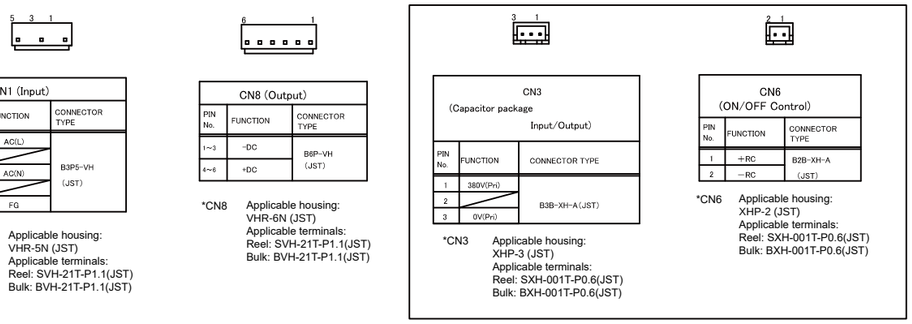
Label (sticking apply only to model with chassis or model with chassis and cover)
*Stick to the back side of chassis
*Contents: manufacture's name, production number, model name (with chassis and cover), rating and others



•Dimensional tolerance shall be ± 1. However, ± 0.5 in mounting
•Tightening torque for chassis mounting hole (M4): 1.5N, m Max

■ Connector pin allocation

The components are not mounted to J0L type.



CN1 (Input)

PIN No.	FUNCTION	CONNECTOR TYPE
1	AC(L)	B3P5-VH (JST)
2		
3	AC(N)	
4		
5	FG	

*CN1 Applicable housing:
VHR-5N (JST)
Applicable terminals:
Reel: SVH-21T-P1.1(JST)
Bulk: BVH-21T-P1.1(JST)

CN8 (Output)

PIN No.	FUNCTION	CONNECTOR TYPE
1~3	-DC	B6P-VH (JST)
4~6	+DC	

*CN8 Applicable housing:
VHR-6N (JST)
Applicable terminals:
Reel: SVH-21T-P1.1(JST)
Bulk: BVH-21T-P1.1(JST)

CN3
(Capacitor package Input/Output)

PIN No.	FUNCTION	CONNECTOR TYPE
1	380V(Pri)	B3B-XH-A(JST)
2		
3	0V(Pri)	

*CN3 Applicable housing:
XHP-3 (JST)
Applicable terminals:
Reel: SXH-001T-P0.6(JST)
Bulk: BXH-001T-P0.6(JST)

CN6
(ON/OFF Control)

PIN No.	FUNCTION	CONNECTOR TYPE
1	+RC	B2B-XH-A (JST)
2	-RC	

*CN6 Applicable housing:
XHP-2 (JST)
Applicable terminals:
Reel: SXH-001T-P0.6(JST)
Bulk: BXH-001T-P0.6(JST)

Options (Sold separately)

Cable

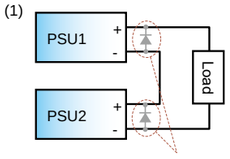
Photos	Model	Category	Description
	WH-C05VH-800	Input harness	For nylon connector.
	WH-C05VH-800-01	Input harness (with ferrite core)	For nylon connector.
	WH-C06VH-500-03	Output harness	For nylon connector.
	WH-02XH02XH-500	Signal harness for RC signal	Connection harness to use output ON/OFF control signal (RC signal). * Except for mUZPT-120-**-J0L

Connection in Series and Parallel

■ Series operation
Series connection is available as in figure (1) and (2) on the right.
Series connection between different output voltages is available, such as 12 V and 24 V.

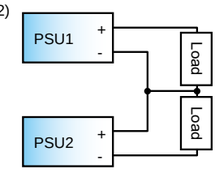
Note: In the case that different voltages are connected in series as in figure (1) on the right;
1. The output current shall be the rated current or less of the smaller rated current among the PSU1 and PSU2 connected in series.
2. Connect diodes for protection as show in the figure (1).
The rated current of the diodes shall be 1.5 times or more of the peak output current of the power supply which has larger peak output current among PSU1 and PSU2.
Also, use Schottky diodes whose forward voltage is lower than the forward voltage of the diodes used in the PSU.

(1)



In the case of series connection of different output voltages, connect diodes shown as above.

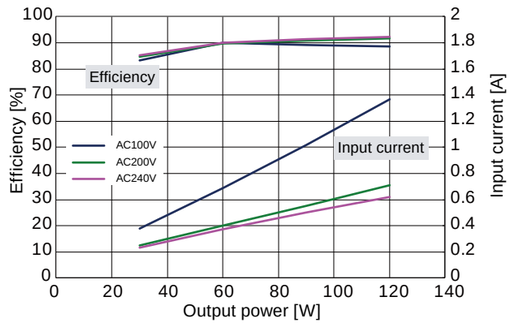
(2)



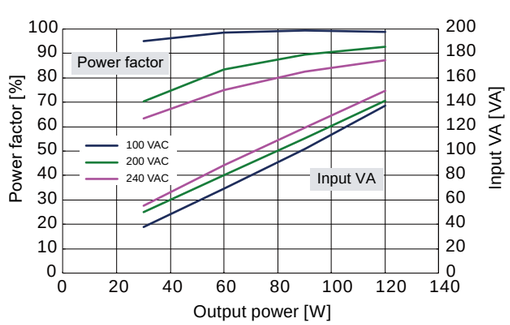
■ Parallel operation
Parallel operation is unacceptable.

Characteristics Data (Typical features of the product series) mUZPT-120-24-JB0 (Examples of actual measurement)

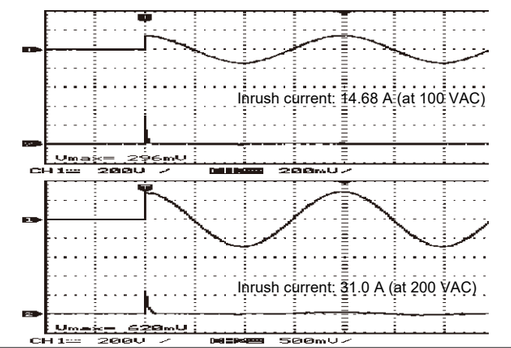
● Fig.5 Efficiency/Input Current vs. Output Power



● Fig.6 Power Factor/Input VA vs. Output Power



● Fig.7 Inrush Current



● Fig.8 Leakage Current

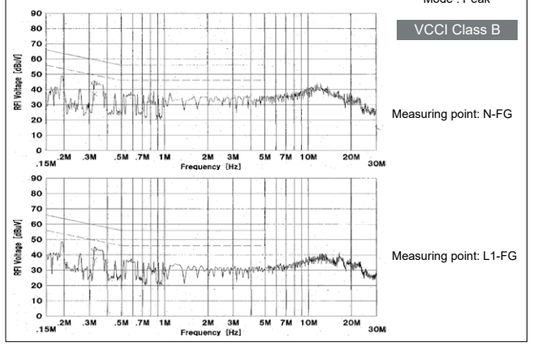
Input : 110, 264 VAC, 60 Hz
Load : Rated load and Min. load

	Rated load	Min. load
110 VAC	0.06 mA	0.07 mA
264 VAC	0.16 mA	0.17 mA

● Fig.9 Conducted Emission at 100 VAC

Input : 100 VAC
Load : Rated
Mode : Peak

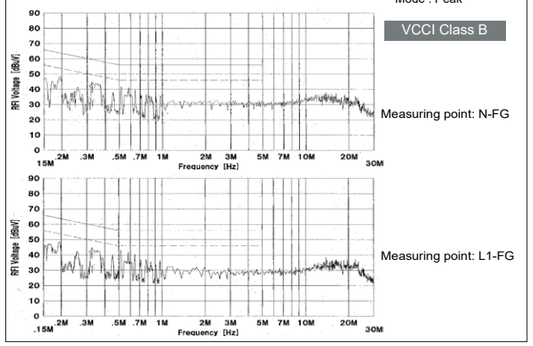
VCCI Class B



● Fig.10 Conducted Emission at 230 VAC

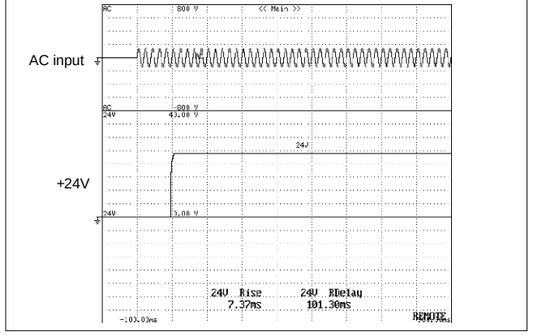
Input : 230 VAC
Load : Rated
Mode : Peak

VCCI Class B



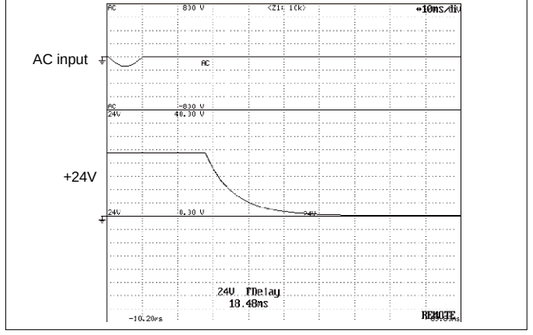
● Fig.11 Rising Characteristics at 100 VAC

Input : 100 VAC
Load : Rated
Time axis : 100 ms/DIV



● Fig.12 Falling Characteristics at 100 VAC

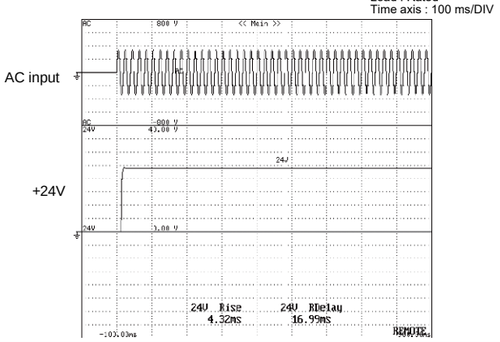
Input : 100 VAC
Load : 100 W
Time axis : 10 ms/DIV



Characteristics Data (Typical features of the product series) mUZPT-120-24-JB0 (Examples of actual measurement)

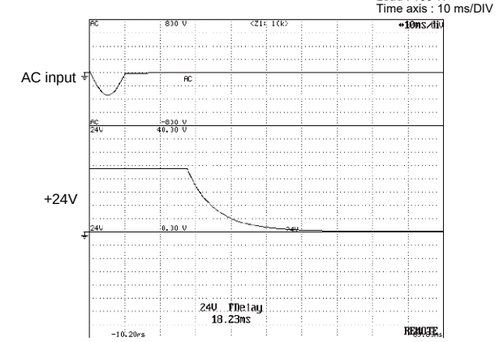
● Fig.13 Rising Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 100 ms/DIV

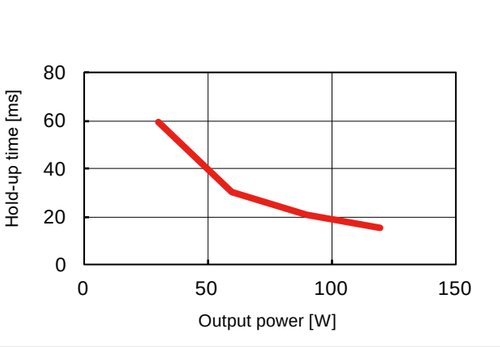


● Fig.14 Falling Characteristics at 240 VAC

Input : 240 VAC
Load : 100 W
Time axis : 10 ms/DIV

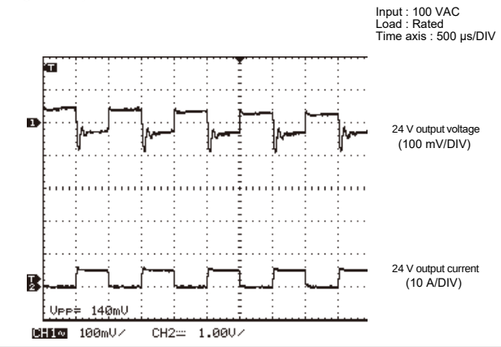


● Fig.15 Output Hold-up Time vs. Output Power

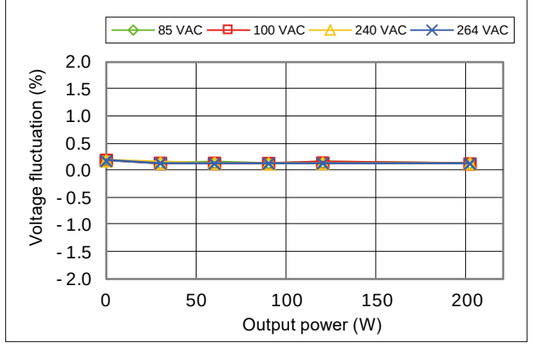


● Fig.16 Dynamic Load Fluctuation Characteristics at 1 kHz

Input : 100 VAC
Load : Rated
Time axis : 500 µs/DIV



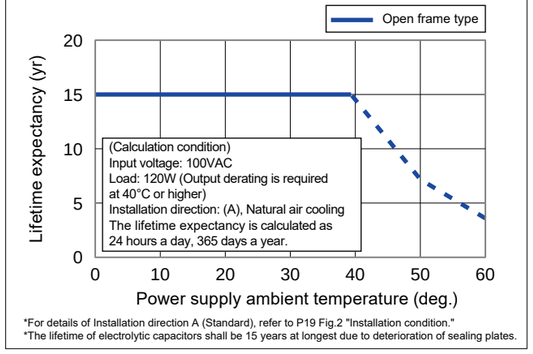
● Fig.17 Output Voltage Regulation (Load Fluctuation)



● Fig.18 Ripple and Spike Voltage

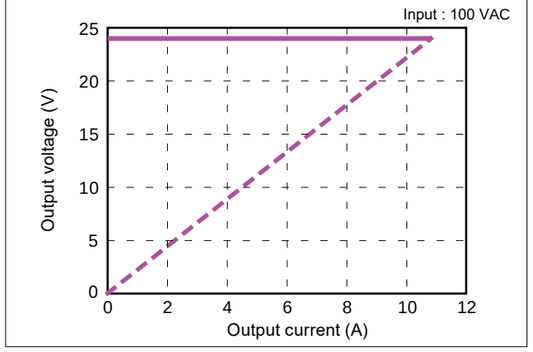
Temperature	AC Input voltage	24V Minimum load Ripple(mV)	Minimum load Noise(mV)	50% load Ripple(mV)	50% load Noise(mV)	Rated load Ripple(mV)	Rated load Noise(mV)
-15℃	85V	6.1	14.6	30.6	61.6	69.9	125.9
	100V	6.2	14.0	29.4	60.4	65.8	119.4
	240V	6.1	15.3	26.5	55.4	59.3	109.5
	264V	6.2	14.6	24.1	54.8	55.9	107.5
25℃	85V	6.0	13.6	9.8	38.0	16.7	67.3
	100V	6.1	13.5	9.8	37.8	16.3	65.0
	240V	6.3	16.0	9.0	34.9	15.7	58.9
	264V	6.3	14.0	9.3	36.6	15.8	61.0
45℃	85V	5.8	12.9	9.1	35.9	13.0	62.7
	100V	6.0	13.4	9.2	35.8	12.8	60.1
	240V	6.2	17.0	8.1	33.5	11.6	52.2
	264V	6.2	14.0	8.4	34.9	12.0	54.3
65℃	85V	5.2	12.3	7.6	27.8	9.5	42.6
	100V	5.2	12.1	7.6	27.7	9.2	39.7
	240V	5.1	12.8	7.2	25.1	8.4	37.8
	264V	5.2	12.6	7.0	27.0	8.4	38.6

● Fig.19 Ambient Temperature vs. Lifetime Expectancy



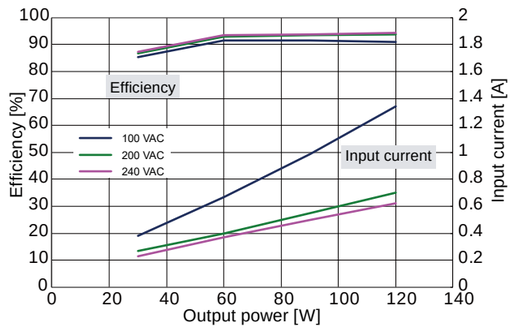
*For details of Installation direction A (Standard), refer to P19 Fig.2 "Installation condition."
*The lifetime of electrolytic capacitors shall be 15 years at longest due to deterioration of sealing plates.

●Fig.20 Overcurrent Protection Characteristics (V - I Characteristics)

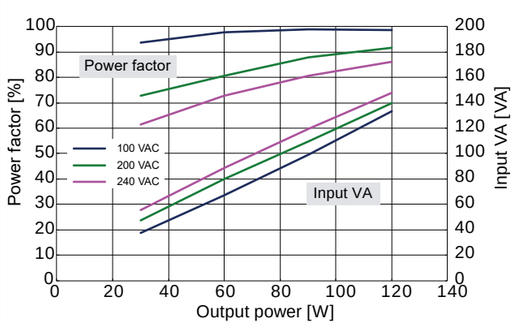


Characteristics Data (Typical features of the product series) mUZPT-120-24-JBH (Examples of actual measurement)

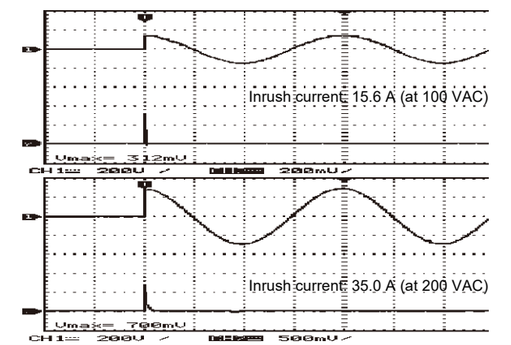
● Fig.21 Efficiency/Input Current vs. Output Power



● Fig.22 Power Factor/Input VA vs. Output Power



● Fig.23 Inrush Current



● Fig.24 Leakage Current

Input : 110, 264 VAC, 60 Hz
Load : Rated load and Min. load

	Rated load	Min. load
110 VAC	0.06 mA	0.07 mA
264 VAC	0.17 mA	0.17 mA

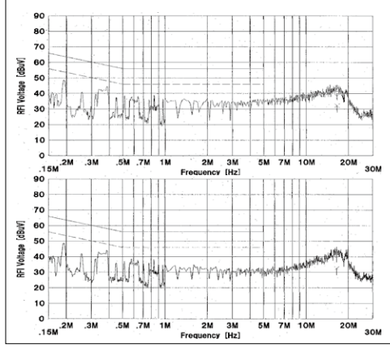
● Fig.25 Conducted Emission at 100 VAC

Input : 100 VAC
Load : Rated
Mode : Peak

VCCI Class B

Measuring point: N-FG

Measuring point: L1-FG



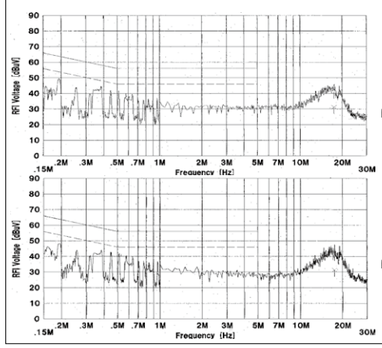
● Fig.26 Conducted Emission at 230 VAC

Input : 230 VAC
Load : Rated
Mode : Peak

VCCI Class B

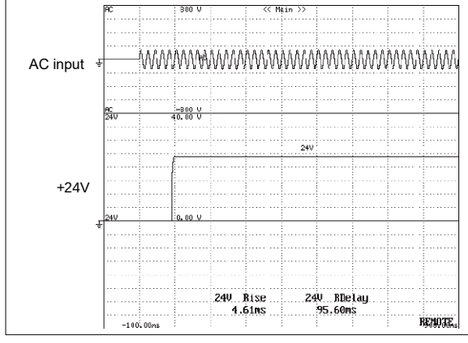
Measuring point: N-FG

Measuring point: L1-FG



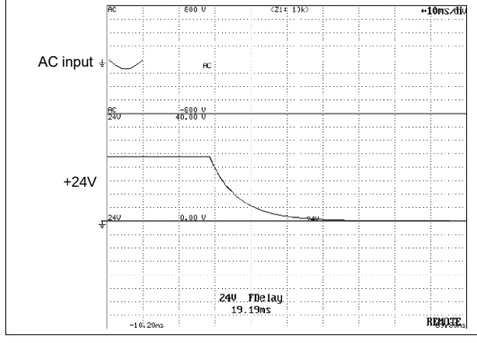
● Fig.27 Rising Characteristics at 100 VAC

Input : 100 VAC
Load : Rated
Time axis : 100 ms/DIV



● Fig.28 Falling Characteristics at 100 VAC

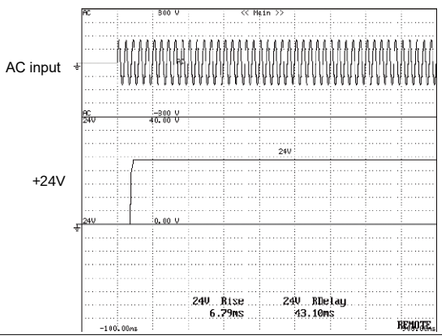
Input : 100 VAC
Load : 100 W
Time axis : 10 ms/DIV



Characteristics Data (Typical features of the product series) mUZPT-120-24-JBH (Examples of actual measurement)

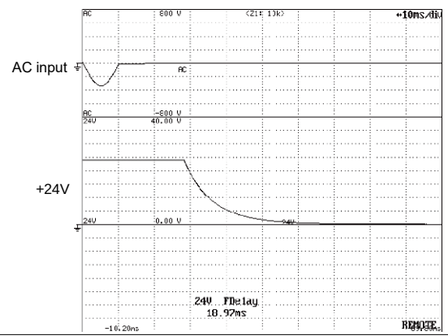
● Fig.29 Rising Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 100 ms/DIV

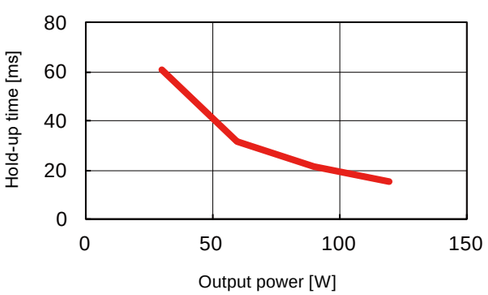


● Fig.30 Falling Characteristics at 240 VAC

Input : 240 VAC
Load : 100 W
Time axis : 10 ms/DIV



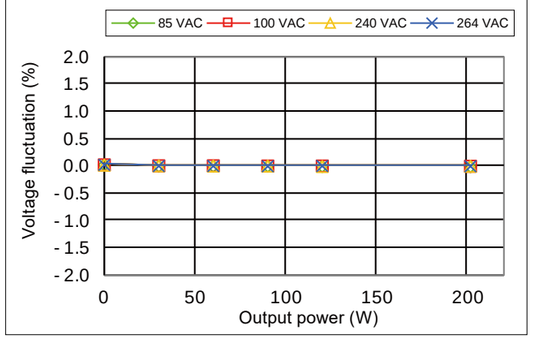
● Fig.31 Output Hold-up Time vs. Output Power



● Fig.32 Dynamic Load Fluctuation Characteristics at 1 kHz

Input : 100 VAC
Load : Rated
Time axis : 500 µs/DIV

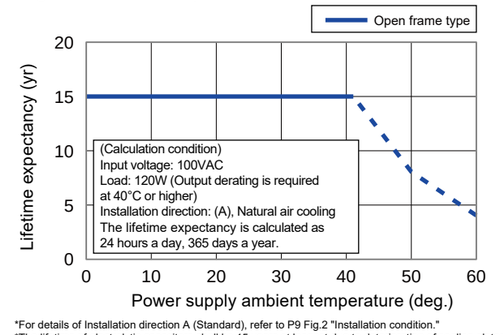
● Fig.33 Output Voltage Regulation (Load Fluctuation)



● Fig.34 Ripple and Spike Voltage

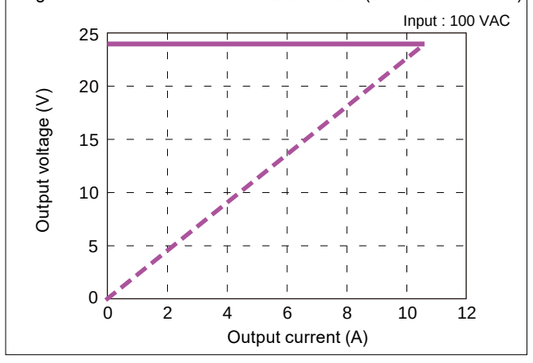
Temperature	AC Input voltage	24V					
		Minimum load		50% load		Rated load	
		Ripple(mV)	Noise(mV)	Ripple(mV)	Noise(mV)	Ripple(mV)	Noise(mV)
-15℃	85V	6.8	14.0	38.4	78.2	72.5	135.8
	100V	6.9	13.8	37.7	78.2	66.1	134.6
	240V	7.0	13.9	27.4	63.0	57.4	116.6
	264V	7.0	13.6	24.0	61.2	57.3	118.1
25℃	85V	7.2	15.5	11.6	42.9	16.4	73.6
	100V	7.5	15.8	11.7	43.0	16.1	71.3
	240V	8.1	17.0	10.7	40.4	14.7	64.4
	264V	8.3	18.0	10.3	42.8	14.7	66.1
55℃	85V	7.0	14.6	10.7	41.0	14.5	67.6
	100V	7.2	15.5	10.7	40.9	14.3	66.0
	240V	8.0	17.1	9.8	38.7	12.9	58.9
	264V	8.0	15.6	9.9	41.2	12.9	60.9
75℃	85V	5.8	11.9	9.1	32.2	11.2	47.9
	100V	5.9	12.1	9.0	31.5	11.0	43.7
	240V	5.9	13.4	8.5	29.1	10.2	43.0
	264V	5.9	11.7	8.4	30.7	10.0	45.3

● Fig.35 Ambient Temperature vs. Lifetime Expectancy



*For details of Installation direction A (Standard), refer to P9 Fig.2 "Installation condition."
*The lifetime of electrolytic capacitors shall be 15 years at longest due to deterioration of sealing plates.

●Fig.36 Overcurrent Protection Characteristics (V - I Characteristics)



Single Output Power Supply mUZP-150 series

Structure and I/O connector	Model	Output voltage	Output current *1	Output power *1
Open frame type/ Nylon connector	mUZP-150-12-J0E	+12V	12.5A (33.4A)	150W (400.8W)
	mUZP-150-18-J0E	+18V	8.4A (22.3A)	151.2W (401.4W)
	mUZP-150-24-J0E	+24V	6.3A (16.7A)	151.2W (400.8W)
	mUZP-150-48-J0E	+48V	3.2A (8.4A)	153.6W (403.2W)
Structure	Description			
With chassis	'-C' is added after open frame model name (Ex: mUZP-150-12-J0E-C)			
With chassis and cover	'-K' is added after open frame model name (Ex: mUZP-150-12-J0E-K)			
Input/Output connector type	Model			
Block terminal	'J' in the nylon connector model become 'T' (Ex: mUZP-150-12-T0E)			

■Model name coding

mUZP-150-**-*0E*-*
① ② ③ ④ ⑤⑥ ⑦⑧ ⑨

① Series name
② Peak output
③ Output power
④ 12:12V 18:18V 24:24V 48:48V
⑤ Input/Output connector J:Nylon connector T:Block terminal (2 poles without FG)
⑥ 0:Without backup function
⑦ Reduction of standby power E:Reduction of standby power function equipped (at RC signal OFF)
⑧ Modification
⑨ Blank:Without chassis and cover C:With chassis K:With chassis and cover

*1 Values in ( ) above show peak current and power.

Features
- Low standby power (at RC signal OFF, 0.02W typ/100VAC, 0.11W typ/240VAC)
- Equipped with a variable resistor to adjust output voltage
- It is not necessary to provide a noise filter on the outside. Low leakage current is also realized.
- Safety standard CCC approved

Medical standard IEC60601-1 Ed.2, Ed.3.1 (MOOP, MOPP) approved

An amazing high level of efficiency 92% has been achieved for a 24 V output type.
(*At 230VAC input, 150W load)

Peak power 400 W output, approx. over 2.6 times higher than continuous rated.

Safety standard	UL	CSA	EN	CE	CCC
Reliability grade	HFA	FA	HOA	OA	

●Function

TTL PFC RoHS Directive

●Input

AC input	85-264 VAC (Worldwide range)

●Dimension

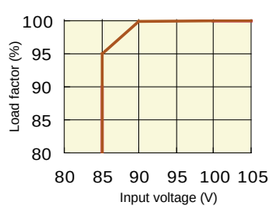
W×H×D (mm)	Without chassis and cover	75×35×160
	With chassis and cover	83.8×45×188

General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items		Specification				Measurements conditions, etc.
AC Input	Rated Voltage		100-240VAC (85*-264VAC)				Worldwide range *See <Fig.1> Low input voltage derating below.
	Input Frequency		50-60Hz				Frequency range 47-63Hz
	Efficiency	100VAC	88.0% typ (12V/18V output), 88.5% typ (24V/48V output)				At continuous rated output1 (natural air cooling) *Characteristic data: Fig.5
		200VAC	91.0% typ (12V/18V output), 91.5% typ (24V/48V output)				
	Power Factor	100VAC	99% typ				At continuous rated output1 (natural air cooling) *Characteristic data: Fig.6
		200VAC	90% typ				
	Inrush Current		17A typ (AC100V), 34A typ (AC200V) *Characteristic data: Fig.7				Power thermistor system at cold start (25°C)
	Input Current	100VAC	1.7A typ				At continuous rated output1 (natural air cooling) *Characteristic data: Fig.5
			2.9A typ (12V/18V at output), 3.1A typ (24V/48V at output)				At continuous rated output2 (forced air cooling)
		200VAC	0.9A typ				At continuous rated output1 (natural air cooling)
			1.5A typ (12V/18V at output), 1.6A typ (24V/48V at output)				At continuous rated output2 (forced air cooling)
Output	Model	mUZP-150-	12-*0E	18-*0E	24-*0E	48-*0E	
	Rated Voltage		+12V	+18V	+24V	+48V	
	Continuous Rated Output1 (natural air cooling)		12.5A 150W	8.4A 151.2W	6.3A 151.2W	3.2A 153.6W	At rated input Refer to <Fig.4> output derating on the following page.
	Continuous Rated Output2 (forced air cooling)		21A 252W	14A 252W	11.3A 271.2W	5.7A 273.6W	
	Peak Current/Power		33.4A 400.8W*	22.3A 401.4W*	16.7A 400.8W*	8.4A 403.2W*	*Refer to peak output power condition below. Natural air cooling and forced air cooling
	Factory Setting		12V±2%	18V±2%	24V±2%	48V±2%	At rated output
	Adjustable Voltage Range		-5%,+10%	-5%,+10%	-5%,+20%	-5%,+10%	At continuous rated output1 (natural air cooling)
	Static Input Regulation		48mV max.	72mV max.	94mV max.	192mV max.	
	Static Load Regulation		100mV max.	125mV max.	150mV max.	300mV max.	
	Temperature Regulation		0.02%/°C max.				
	Max. Ripple Voltage	0-70°C	120mV max.			150mV max.	Connect 150mm max. lead wire to output connectors, and then connect a 10uF electrolytic capacitor with a 0.1uF ceramic capacitor in parallel to the other ends of the wires to measure by an oscilloscope with 100MHz frequency band. *Characteristic data: Fig.18
		-10-0°C	160mV max.			200mV max.	
	Max. Spike Voltage	0-70°C	150mV max.			250mV max.	
		-10-0°C	180mV max.			400mV max.	
Protection	Over Current Protection	OCP point (A)	101% min. of peak rated current				
		Method	Blocking oscillation *Characteristic data: Fig.20				
		Recovery	Automatic recovery				
	Over Voltage Protection	OVP point (V)	13.8-16.2V	22.0-26.0V	30.0-35.0V	56.2-63.0V	
		Method	Output shutdown (latch lock)				
		Recovery	Reclosing of AC input				
Environment	Operating Temp./ Humidity	Open Frame	-10-70°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%				*<Fig.3> on the next page shows the guideline of forced air cooling. Refer to <Fig.4> output derating.
		With Chassis and Cover	-10-60°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%				
	Storage Temp./Humidity		-20-85°C/10-95%				There shall be no condensation
	Vibration		To endure the vibration acceleration of 2G with vibration frequency of 10 to 55Hz for 10 sweep cycles in each X, Y, Z direction.				Follow JIS-C-60068-2-6 at no operation
	Mechanical Shock		Left one bottom edge of the unit 50mm high with the opposite edge placed on the test bench, and let it fall. Repeat 3times for each of four bottom edges, and no malfunction shall be observed.				Follow JIS-C-60068-2-31 at no operation
Insulation	Dielectric Strength		4kVAC/1minute between input and output/RC				Cut-off current 10mA
			3kVAC/1minnute between input and FG				Cut-off current 10mA
			500VAC/1minute between each output /RC/FG				Cut-off current 100mA
	Insulation Resistance		50MΩmin. between each input/output/RC/FG				At 500VDC
	Leakage Current		0.06mA typ (100VAC), 0.12mA typ (200VAC) *Characteristic data: Fig.8				
EMC	Line Noise Immunity		±2000V (pulse width of 100/1000nS,cycle period of 30 to 100Hz, Normal/Common mode with Positive/Negative polarity for 10 minutes)				Measurement by INS-410 There shall be no fluctuation of DC output or malfunction.
	Electrostatic Discharge		EN61000-4-2 compliant				Apply to FG and case. There shall be no malfunction, nor failure.
	Radiated, Radio-Frequency, Electromagnetic Field		EN61000-4-3 compliant				
	Fast Transient Burst		EN61000-4-4 compliant				
	Lightning Surge		EN61000-4-5 compliant				
	Radio Frequency Conducted Immunity		EN61000-4-6 compliant				
	Power-Frequency Magnetic Field Immunity		EN61000-4-8 compliant				
	Voltage dips/Regulation		EN61000-4-11 compliant				
	Conducted Emmision		VCCI-B,FCC-B,CISPR22-B, and EN55022-B compliant *Characteristic data: Fig.9, 10				At rated input and rated output (natural air cooling), with chassis
	Harmonic Current Regulations		IEC61000-3-2 (edition 2.1) classD, EN61000-3-2 (A14) classD compliant.				At rated input/output
Others	Safety Standard		UL60601-1, CSA C22.2 NO.601.1 (c-UL), ANSI/AAMI ES60601-1, CCC, CE Marking (LVD,EMCD) approved PSE (Ordinance item 2) compliant				IEC60601-1 (Ed.2) and (Ed.3.1, MOOP, MOPP) approved. CCC is applicable in the tropics but the operating altitude should be under 2,000m.
	Cooling System		Natural air cooling/Forced air cooling				
	Output Grounding		Capacitor grounding				
	Output Hold-up Time		AC cut-off → 90% of rated voltage within 16ms min.				At rated input, 150W output
	Reliability Grade		FA (Industrial equipment grade to use double-sided PWBs with through holes)				Following our standard
	Weight		300g typ (without chassis and cover), 520g typ (with chassis and cover)				
	Warranty		Three years after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost.				Except for errors caused by operation not specified in this specification.

<Fig.1> Low input voltage derating

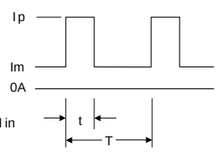
Follow the derating below to derate rated current/power.



Peak output power condition

- Duty ratio of peak current shall be 30% or less.
- Energized period of peak current shall be 10 seconds or less.
- Energized period of peak current shall be 5 seconds or less at natural air cooling and 50 deg. or higher of ambient temperature.
- The value resulting from the formula below shall not exceed continuous rated current, Io, after derating specified in the output derating on the following page.

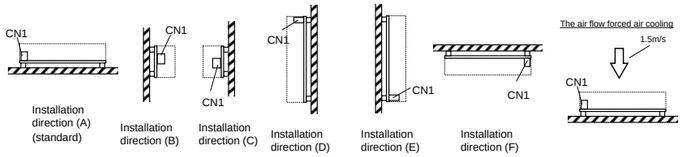
$\sqrt{((Ip^2 \times D)+(Im^2 \times (1-D)))} \leqq Io$
Ip=Peak current value
Im= Min. current value
D= Duty ratio, t/T
t= Pulse width of peak current
T= Cycle
Io= Continuous rated current specified in output derating



(Note) In case that temp. of power thermistor for prevention of inrush current does NOT go up enough (Resistance value is high), such as the amount of average load power is small, output power at peak power might drop for about 100ms.
If thin might cause any problem, please check output voltage waveform equipping and operating the power supply with actual device.

General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

<Fig.2> Installation/Air cooling



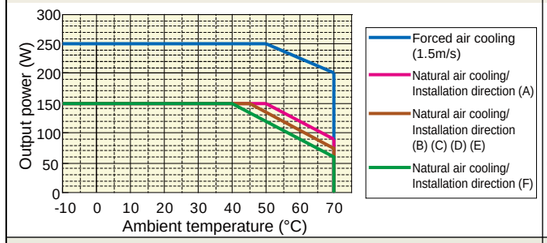
<Fig.3> Guideline for forced air cooling

Ask us separately about the guideline for temperature rise of each component at forced air cooling.

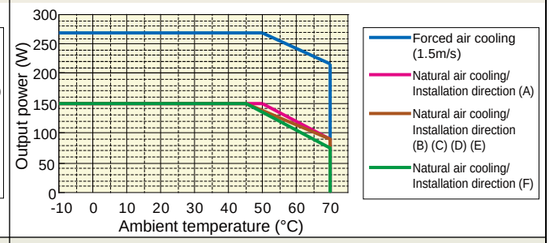
<Fig.4> Output derating

Follow the derating diagram below for output according to (A) ambient temperature and installation direction. Ask us separately except installation direction (A). In case of using the type with chassis and cover, input voltage range shall be 90 VAC or higher, and shall not use in direction (F). Also, forced air cooling condition in the diagram shall be provided that the air flow of 1.5 m/s is applied from the direction shown <Fig.2>.

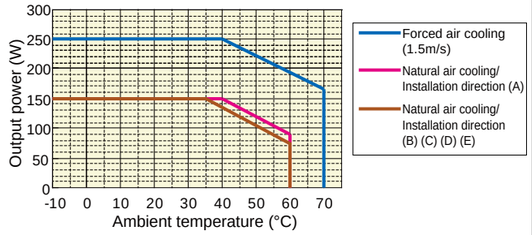
For open frame (12/18V)



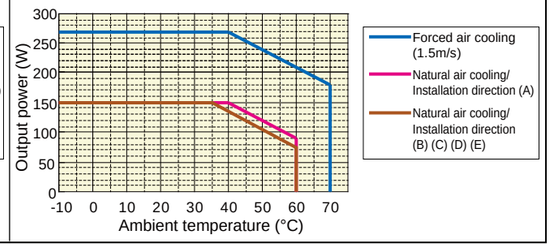
For open frame (24/48V)



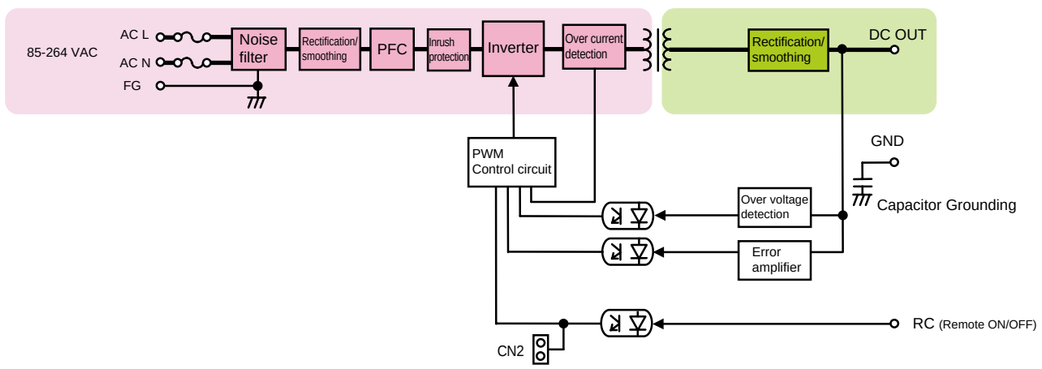
With chassis and cover (12/18V)



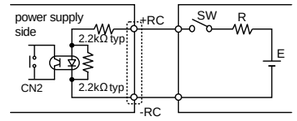
With chassis and cover (24/48V)



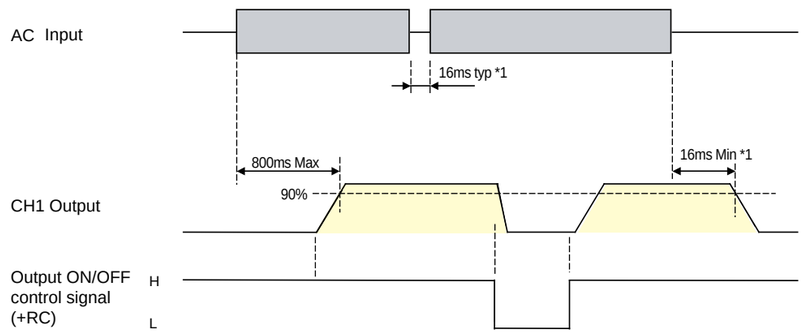
Block Diagram



Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items	Specification	Note
Input Signal	Output ON/OFF control signal (RC signal) *Remove the shorting plug of CN2 in using RC signal.	Operating mode Between +RC and -RC: Output SW ON (4.5V or higher): ON SW OFF (0.8V or lower): OFF External power supply and Load-limiting resistor External power supply: E / Load-limiting resistor: R 4.5 ~ 12.5Vdc: Not required 12.5 ~ 30Vdc: 1.5kΩ 30 ~ 48Vdc: 8.2kΩ	Shorting Plug With shorting plug (CN2) connected, output starts up when AC input is applied regardless of RC signal. To control Start/Stop of output by RC signal, uncap shorting plug of CN2. Note: Shorting plug (CN2) is primary circuit components. Make sure to operate the plug after the AC input is turned off.
Input Signal Circuit	Signal Circuit (RC signal) Connection example: using external power supply		

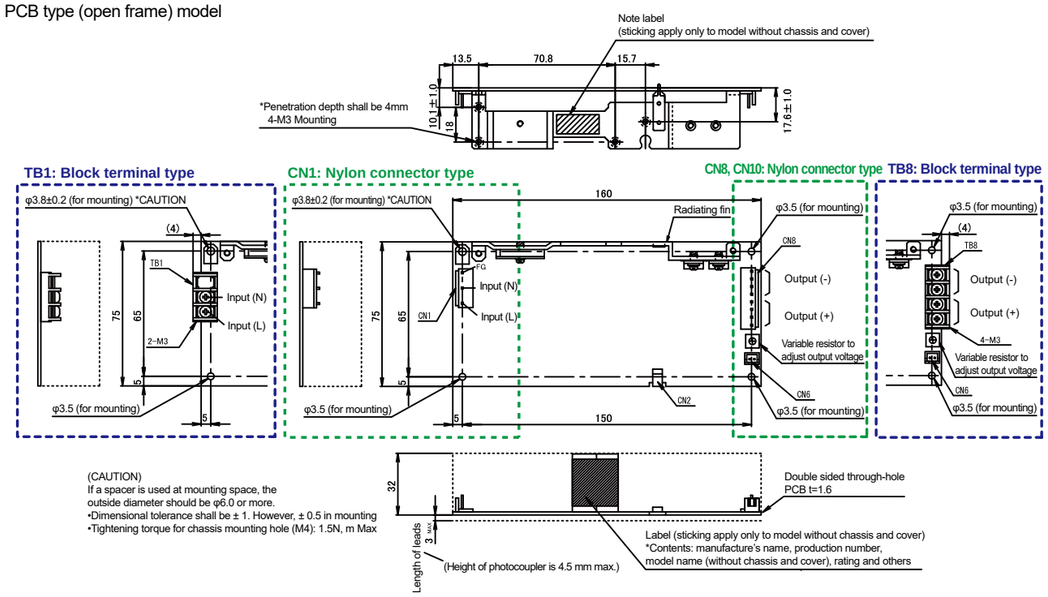
Sequence Timing Chart



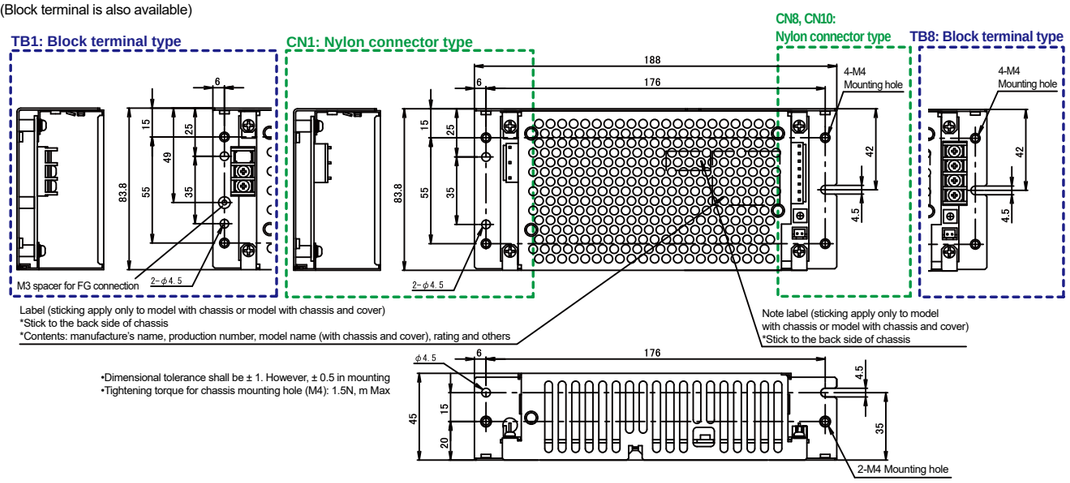
*1 At rated input, 150 W output

Outline Drawing

■ PCB type (open frame) model



■ Model with chassis and cover
(Block terminal is also available)



■ Connector pin allocation

Nylon connector type	Block terminal type
5 3 1 CN1 (Input) PIN No. / FUNCTION / CONNECTOR TYPE 1 AC(L) 2 3 AC(N) 4 5 FG B3P5-VH (JST) *CN1 Applicable housing: VHR-5N (JST) Applicable terminals: Reel: SVH-21T-P1.1(JST) Bulk: BVH-21T-P1.1(JST)	TB1 (INPUT) See the upper outline drawing
8 1 CN8 (Output) PIN No. / FUNCTION / CONNECTOR TYPE 1~4 −DC 5~8 +DC B8P-VH (JST) *CN8 Applicable housing: VHR-8N (JST) Applicable terminals: Reel: SVH-21T-P1.1(JST) Bulk: BVH-21T-P1.1(JST)	TB8 (OUTPUT) See the upper outline drawing
2 1 CN6 (ON/OFF Control) PIN No. / FUNCTION / CONNECTOR TYPE 1 +RC 2 −RC B2B-XH-A (JST) *CN6 Applicable housing: XHP-2 (JST) Applicable terminals: Reel: SXH-001T-P0.6(JST) Bulk: BXH-001T-P0.6(JST)	

Options (Sold separately)

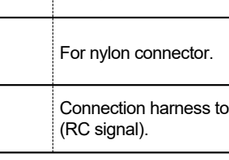
Cable			
Photos	Model	Category	Description
	WH-C05VH-800	Input harness	For nylon connector.
	WH-C05VH-800-01	Input harness (with ferrite core)	For nylon connector.
	WH-C08VH-500	Output harness	For nylon connector.
	WH-02XH02XH-500	Signal harness for RC signal	Connection harness to use output ON/OFF control signal (RC signal).

Connection in Series and Parallel

■ Series operation
Series connection is available as in figure (1) and (2) on the right.
Series connection between different output voltages is available, such as 12 V and 24 V.

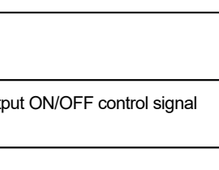
Note: In the case that different voltages are connected in series as in figure (1) on the right;
1. The output current shall be the rated current or less of the smaller rated current among the PSU1 and PSU2 connected in series.
2. Connect diodes for protection as show in the figure (1).
The rated current of the diodes shall be 1.5 times or more of the peak output current of the power supply which has larger peak output current among PSU1 and PSU2.
Also, use Schottky diodes whose forward voltage is lower than the forward voltage of the diodes used in the PSU.

(1)



In the case of series connection of different output voltages, connect diodes shown as above.

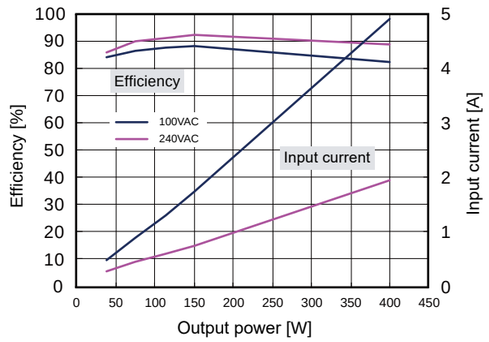
(2)



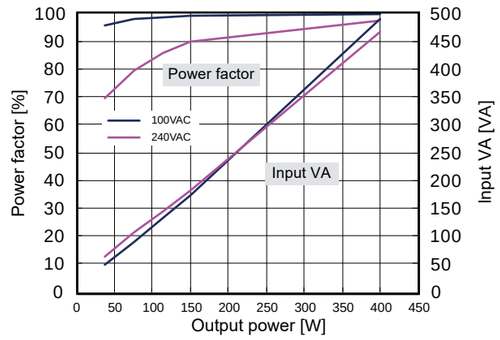
■ Parallel operation
Parallel operation is unacceptable.

Characteristics Data (Typical features of the product series) mUZP-150-24 (Examples of actual measurement)

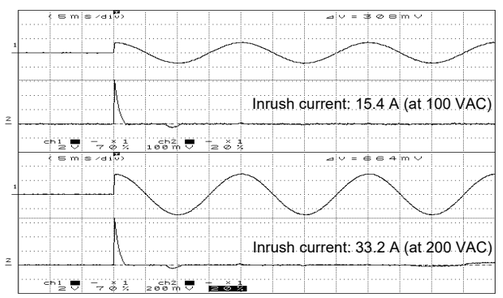
● Fig.5 Efficiency/Input Current vs. Output Power



● Fig.6 Power Factor/Input VA vs. Output Power



● Fig.7 Inrush Current



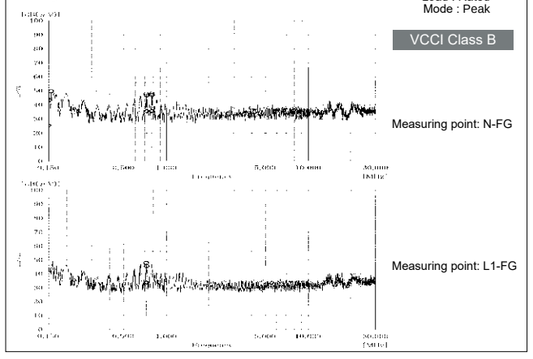
● Fig.8 Leakage Current

Input : 110, 264 VAC
Load : Rated load and Min. load

	Rated load	Min. load
110 VAC	0.06 mA	0.06 mA
264 VAC	0.15 mA	0.15 mA

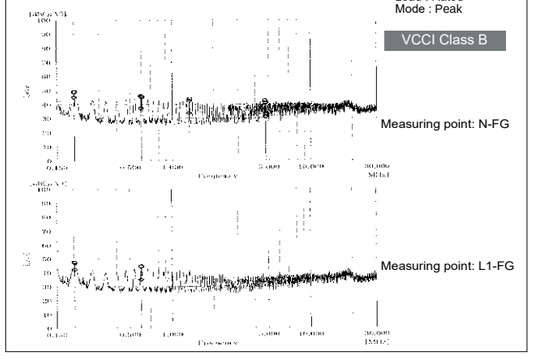
● Fig.9 Conducted Emission at 100 VAC

Input : 100 VAC
Load : Rated
Mode : Peak



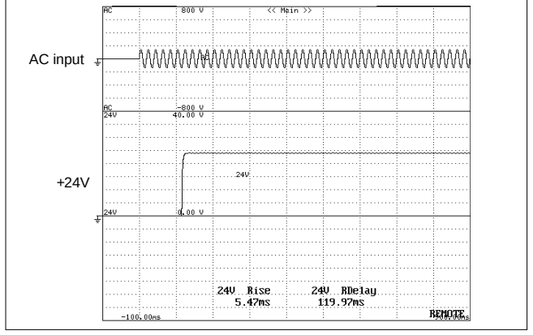
● Fig.10 Conducted Emission at 230 VAC

Input : 230 VAC
Load : Rated
Mode : Peak



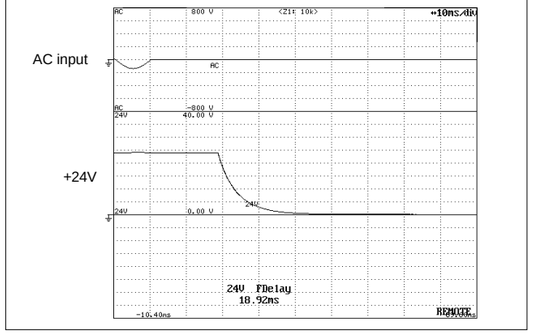
● Fig.11 Rising Characteristics at 100 VAC

Input : 100 VAC
Load : Rated
Time axis : 100 ms/DIV



● Fig.12 Falling Characteristics at 100 VAC

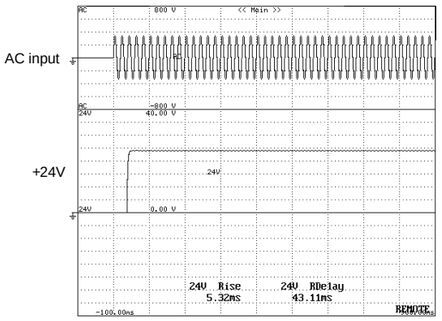
Input : 100 VAC
Load : Rated
Time axis : 10 ms/DIV



Characteristics Data (Typical features of the product series) mUZP-150-24 (Examples of actual measurement)

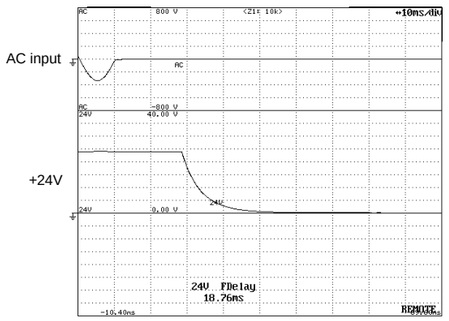
● Fig.13 Rising Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 100 ms/DIV

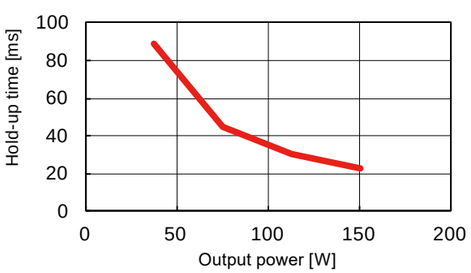


● Fig.14 Falling Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 10 ms/DIV

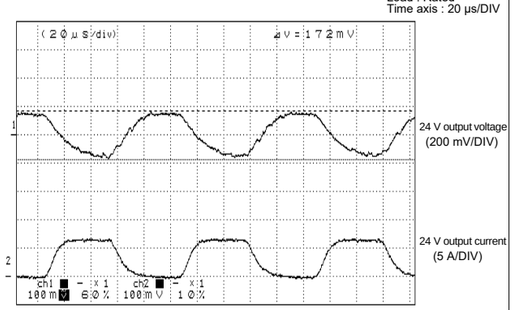


● Fig.15 Output Hold-up Time vs. Output Power

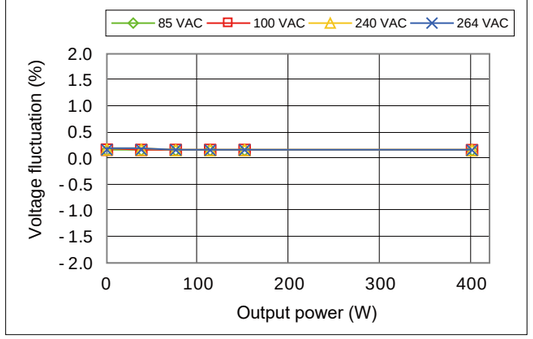


● Fig.16 Dynamic Load Fluctuation Characteristics at 10 kHz

Input : 100 VAC
Load : Rated
Time axis : 20 µs/DIV



● Fig.17 Output Voltage Regulation (Load Fluctuation)

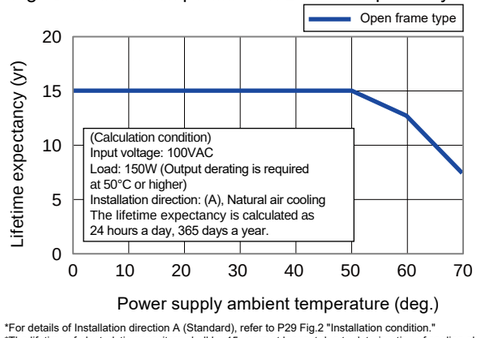


● Fig.18 Ripple and Spike Voltage

Ripple voltage	Load condition	Rated load
Temperature	Input voltage	24V
-15°C	100 VAC	33.4 mV
	240 VAC	31.6 mV
25°C	100 VAC	12.1 mV
	240 VAC	12.2 mV
55°C	100 VAC	11.5 mV
	240 VAC	11.4 mV
75°C	100 VAC	6.8 mV
	240 VAC	6.8 mV

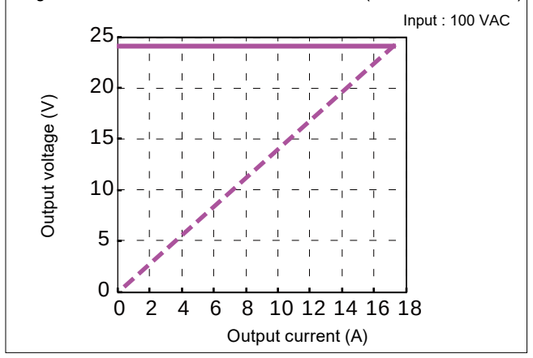
Spike voltage	Load condition	Rated load
Temperature	Input voltage	24V
-15°C	100 VAC	128.9 mV
	240 VAC	133.6 mV
25°C	100 VAC	106.7 mV
	240 VAC	111.9 mV
55°C	100 VAC	115.6 mV
	240 VAC	118.5 mV
75°C	100 VAC	65.8 mV
	240 VAC	70.8 mV

● Fig.19 Ambient Temperature vs. Lifetime Expectancy



*For details of Installation direction A (Standard), refer to P29 Fig.2 "Installation condition."
*The lifetime of electrolytic capacitors shall be 15 years at longest due to deterioration of sealing plates.

●Fig.20 Overcurrent Protection Characteristics (V - I Characteristics)



Single Output Power Supply mUZP-220 series

Structure and I/O connector	Model	Output voltage	Output current *1	Output power *1
Open frame type/ Nylon connector	mUZP-220-12-JBE	+12V	15A (33.4A)	180W (400.8W)
	mUZP-220-18-JBE	+18V	10A (22.3A)	180W (401.4W)
	mUZP-220-24-JBE	+24V	9.2A (16.7A)	220.8W (400.8W)
	mUZP-220-48-JBE	+48V	4.6A (8.35A)	220.8W (400.8W)
Structure	Model			
With chassis	'-C' is added after open frame model name (Ex: mUZP-220-12-JBE-C)			
With chassis and cover	'-K' is added after open frame model name (Ex: mUZP-220-12-JBE-K)			
Input/Output connector type	Model			
Block terminal	'J' in the nylon connector model become 'T' (Ex: mUZP-220-12-TBE)			

■Model name coding

mUZP-220-**-*BE*-*
① ② ③ ④ ⑤⑥ ⑦⑧ ⑨

① Series name
② Peak output
③ Output power
④ 12:12V, 18:18V, 24:24V, 48:48V
⑤ Input/Output connector J:Nylon connector T:Block terminal (2 poles without FG)
⑥ 0:Without backup function B:With backup function
⑦ Reduction of standby power: E:Reduction of standby power function equipped (at RC signal OFF)
⑧ Modification
⑨ Blank:Without chassis and cover C:With chassis K:With chassis and cover

*1 Values in ( ) above show peak current and power.

Features
- Low standby power (at RC signal OFF, 0.02Wtyp/100VAC, 0.09Wtyp/200VAC)
- Equipped with a variable resistor to adjust output voltage.
- It is not necessary to provide a noise filter on the outside. Low leakage current is also realized.

Medical standard IEC60601-1 Ed.2, Ed.3.1 (MOOP, MOPP) approved

An amazing high level of efficiency 94% has been achieved for a 24 V output type.
(*At 230VAC input, 220W load)

Peak power approx. over 1.8 times higher than continuous rated.

Safety standard	UL	CSA	EN	CE	CCC
Reliability grade	HFA	FA	HOA	OA	

●Function

TTL PFC RoHS Directive

●Input

AC input	85-264 VAC (Worldwide range)

●Dimension

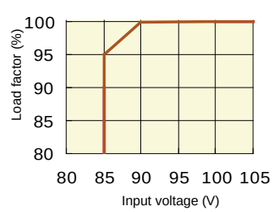
W×H×D (mm)	Without chassis and cover	75×36×160
	With chassis and cover	83.8×45×188

General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items		Specification				Measurements conditions, etc.
AC Input	Rated Voltage		100-240VAC (85*-264VAC)				Worldwide range *See <Fig.1> Low input voltage derating below.
	Input Frequency		50-60Hz				Frequency range 47-63Hz
	Efficiency	100VAC	90.0% typ (12V/18V output), 91.5% typ (24V/48V output)				At 180W output (natural air cooling) *Characteristic data: Fig.5
		200VAC	92.0% typ (12V/18V output), 93.5% typ (24V/48V output)				
	Power Factor	100VAC	99% typ				At continuous rated output1 (natural air cooling) *Characteristic data: Fig.6
		200VAC	90% typ				
	Inrush Current		17A typ (100VAC), 34A typ (200VAC) *Characteristic data: Fig.7				Power thermistor system at cold start (25°C)
	Input Current	100VAC	2.1A typ (at 12V/18V output), 2.4A typ (at 24V/48V output)				At continuous rated output1 (natural air cooling) *Characteristic data: Fig.5
			3.0A typ (at 12V/18V output),3.8A typ (at 24V/48V output)				At continuous rated output2 (forced air cooling)
		200VAC	1.1A typ (at 12V/18V output),1.2A typ (at 24V/48V output)				At continuous rated output1 (natural air cooling)
			1.6A typ (at 12V/18V output),1.5A typ (at 24V/48V output)				At continuous rated output2 (forced air cooling)
Output	Model	mUZP-220-	12-*BE	18-*BE	24-*BE	48-*BE	
	Rated Voltage		+12V	+18V	+24V	+48V	
	Continuous Rated Output1 (natural air cooling)		15A 180W	10A 180W	9.2A 220.8W	4.6A 220.8W	At rated input Refer to <Fig.4> output derating on the following page.
	Continuous Rated Output2 (forced air cooling)		21A 252W	14A 252W	13.8A 331.2W	6.9A 331.2W	
	Peak Current/Power		33.4A 400.8W*	22.3A 401.4W*	16.7A 400.8W*	8.35A 400.8W*	*Refer to peak output power condition below. Natural air cooling and forced air cooling
	Factory Setting		12V±2%	18V±2%	24V±2%	48V±2%	At rated output
	Adjustable Voltage Range		-5%,+10%	-5%,+10%	-5%,+20%	-5%,+10%	At continuous rated output1 (natural air cooling)
	Static Input Regulation		48mV max.	72mV max.	94mV max.	192mV max.	
	Static Load Regulation		100mV max.	125mV max.	150mV max.	300mV max.	
	Temperature Regulation		0.02%/°C max.				
	Max. Ripple Voltage	0-70°C	120mV max.			150mV max.	Connect 150mm max. lead wire to output connectors, and then connect a 10uF electrolytic capacitor with a 0.1uF ceramic capacitor in parallel to the other ends of the wires to measure by an oscilloscope with 100MHz frequency band. *Characteristic data: Fig.18
		-10-0°C	160mV max.			200mV max.	
	Max. Spike Voltage	0-70°C	150mV max.			250mV max.	
		-10-0°C	180mV max.			400mV max.	
Protection	Over Current Protection	OCP point (A)	101% min. of peak rated current				
		Method	Blocking oscillation *Characteristic data: Fig.20				
		Recovery	Automatic recovery				
	Over Voltage Protection	OVP point (V)	13.8-16.2V	22.0-26.0V	30.0-35.0V	56.2-63.0V	
		Method	Output shutdown (latch lock)				
		Recovery	Reclosing of AC input				
Environment	Operating Temp./ Humidity	Open Frame	-10-70°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%				*<Fig.3> on the next page shows the guideline of forced air cooling. Refer to <Fig.4> output derating.
		With Chassis and Cover	-10-60°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%				
	Storage Temp./Humidity		-20-85°C/10-95%				There shall be no condensation
	Vibration		To endure the vibration acceleration of 2G with vibration frequency of 10 to 55Hz for 10 sweep cycles in each X, Y, Z direction.				Follow JIS-C-60068-2-6 at no operation
	Mechanical Shock		Left one bottom edge of the unit 50mm high with the opposite edge placed on the test bench, and let it fall. Repeat 3times for each of four bottom edges, and no malfunction shall be observed.				Follow JIS-C-60068-2-31 at no operation
Insulation	Dielectric Strength		4kVAC/1minute between input and output/RC				Cut-off current 10mA
			3kVAC/1minnute between input and FG				Cut-off current 10mA
			500VAC/1minute between each output /RC/FG				Cut-off current 100mA
	Insulation Resistance		50MΩmin. between each input/output/RC/FG				At 500VDC
	Leakage Current		0.06mA typ (100VAC), 0.12mA typ (200VAC) *Characteristic data: Fig.8				
EMC	Line Noise Immunity		±2000V (pulse width of 100/1000nS,cycle period of 30 to 100Hz, Normal/Common mode with Positive/Negative polarity for 10 minutes)				Measurement by INS-410 There shall be no fluctuation of DC output or malfunction.
	Electrostatic Discharge		EN61000-4-2 compliant				Apply to FG and case. There shall be no malfunction, nor failure.
	Radiated, Radio-Frequency, Electromagnetic Field		EN61000-4-3 compliant				
	Fast Transient Burst		EN61000-4-4 compliant				
	Lightning Surge		EN61000-4-5 compliant				
	Radio Frequency Conducted Immunity		EN61000-4-6 compliant				
	Power-Frequency Magnetic Field Immunity		EN61000-4-8 compliant				
	Voltage dips/Regulation		EN61000-4-11 compliant				
	Conducted Emmision		VCCI-B, FCC-B, CISPR22-B, EN55022-B compliant *Characteristic data: Fig.9, 10				At rated input and rated output (natural air cooling)
	Harmonic Current Regulations		IEC61000-3-2 (edition 2.1) classD, EN61000-3-2 (A14) classD compliant.				At rated input/output
Others	Safety Standard		UL60601-1, CSA C22.2 NO.601.1 (c-UL), ANSI/AAMI ES60601-1 CE Marking (LVD,EMCD) approved. PSE (Ordinance item 2) compliant				IEC60601-1 (Ed.2) and (Ed.3.1, MOOP, MOPP) approved
	Cooling System		Natural air cooling/Forced air cooling				
	Output Grounding		Capacitor grounding				
	Output Hold-up Time		AC cut-off → 90% of rated voltage within 16ms min.				At rated input, output: 200W (at 24V, 48V), 180W (at 12V, 18V)
	Reliability Grade		FA (Industrial equipment grade to use double-sided PWBs with through holes)				Following our standard
	Weight		310g typ (without chassis and cover), 530g typ (with chassis and cover)				
	Warranty		Three years after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost.				Except for errors caused by operation not specified in this specification.

<Fig.1> Low input voltage derating

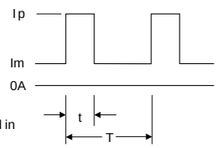
Follow the derating below to derate rated current/power.



Peak output power condition

- Duty ratio of peak current shall be 30% or less.
- Energized period of peak current shall be 10 seconds or less.
- Energized period of peak current shall be 5 seconds or less at natural air cooling and 50 deg. or higher of ambient temperature.
- The value resulting from the formula below shall not exceed continuous rated current, Io, after derating specified in the output derating on the following page.

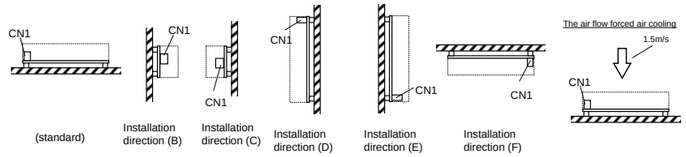
$\sqrt{((Ip^2 \times D)+(Im^2 \times (1-D)))} \leqq Io$
Ip=Peak current value
Im= Min. current value
D= Duty ratio, t/T
t= Pulse width of peak current
T= Cycle
Io= Continuous rated current specified in output derating



(Note) In case that temp. of power thermistor for prevention of inrush current does NOT go up enough (Resistance value is high), such as the amount of average load power is small, output power at peak power might drop for about 100ms.
If thin might cause any problem, please check output voltage waveform equipping and operating the power supply with actual device.

General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

<Fig.2> Installation/Air cooling



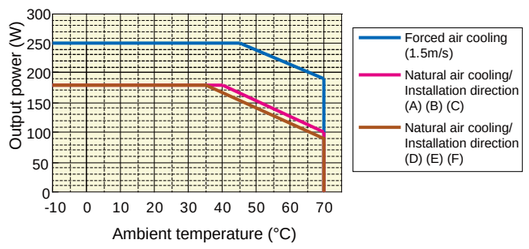
<Fig.3> Guideline for forced air cooling

Ask us separately about the guideline for temperature rise of each component at forced air cooling.

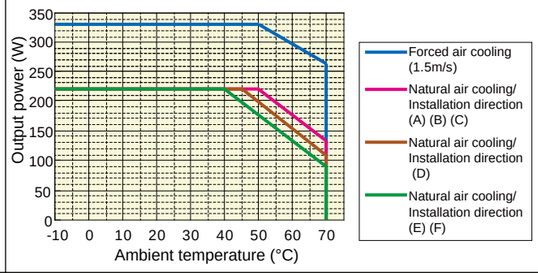
<Fig.4> Output derating

Follow the derating diagram below for output according to (A) ambient temperature and installation direction. Ask us separately except installation direction (A). In case of using the type with chassis and cover, input voltage range shall be 90 VAC or higher, and shall not use in direction (F). Also, forced air cooling condition in the diagram shall be provided that the air flow of 1.5 m/s is applied from the direction shown <Fig.2>.

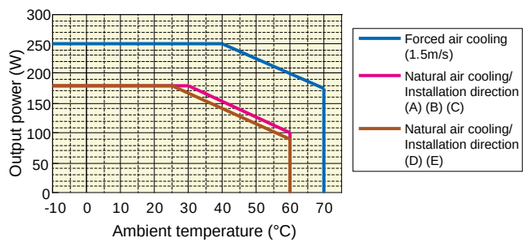
For open frame (12/18V)



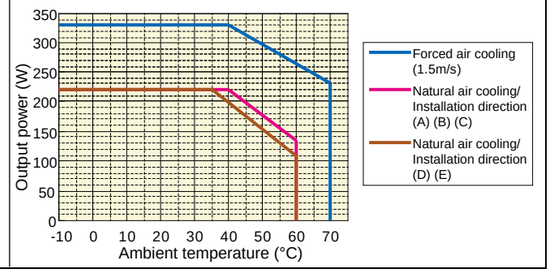
For open frame (24/48V)



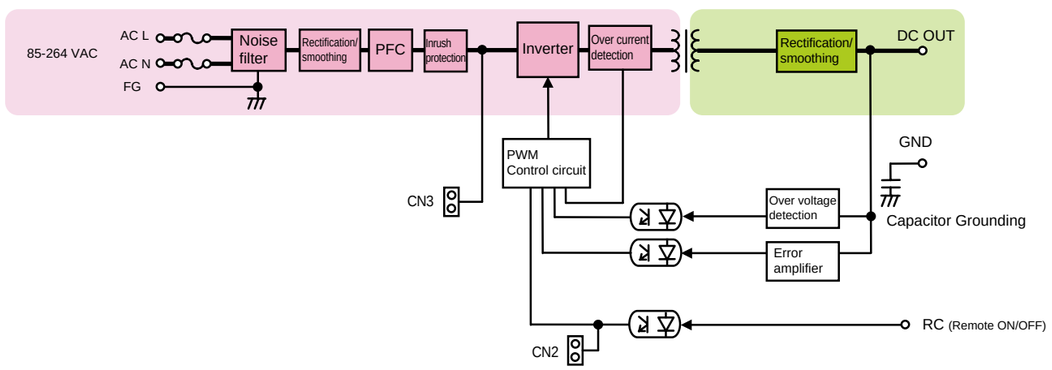
With chassis and cover (12/18V)



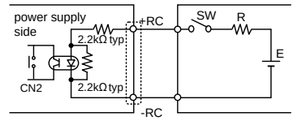
With chassis and cover (24/48V)



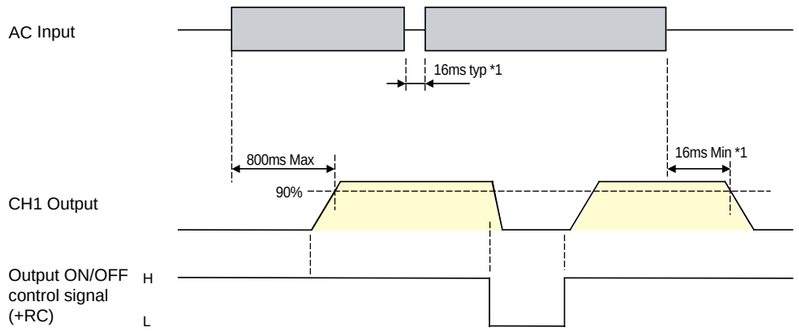
Block Diagram



Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items	Specification	Note
Input Signal	Output ON/OFF control signal (RC signal) *Remove the shorting plug of CN2 in using RC signal.	Operating mode Between +RC and -RC: Output SW ON (4.5V or higher): ON SW OFF (0.8V or lower): OFF External power supply and Load-limiting resistor External power supply: E / Load-limiting resistor: R 4.5 ~ 12.5Vdc: Not required 12.5 ~ 30Vdc: 1.5kΩ 30 ~ 48Vdc: 8.2kΩ	Shorting Plug With shorting plug (CN2) connected, output starts up when AC input is applied regardless of RC signal. To control Start/Stop of output by RC signal, uncap shorting plug of CN2. Note: Shorting plug (CN2) is primary circuit components. Make sure to operate the plug after the AC input is turned off.
Input Signal Circuit	Signal Circuit (RC signal) Connection example: using external power supply		

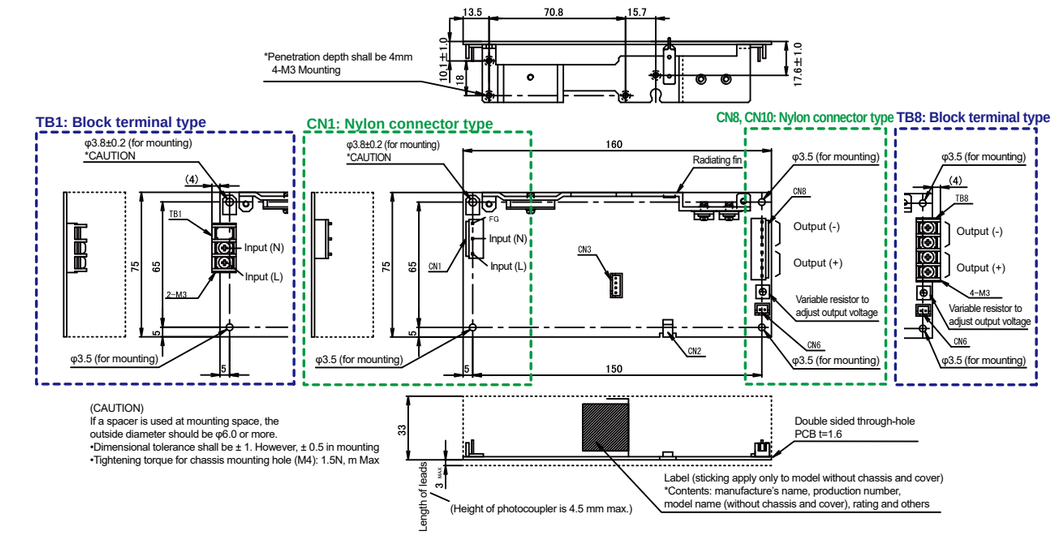
Sequence Timing Chart



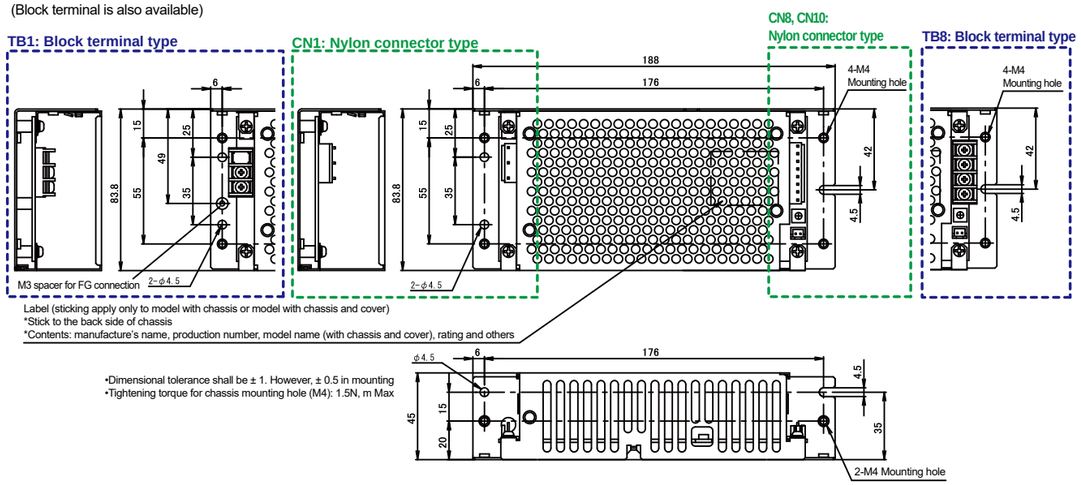
*1 At rated input, output: 200W (at 24V, 48V) /180W (at 12V, 18V)

Outline Drawing

■ PCB type (open frame) model



■ Model with chassis and cover
(Block terminal is also available)

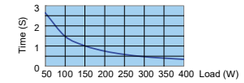


■ Connector pin allocation

Nylon connector type	Block terminal type
CN1 (Input) PIN No. 1: AC(L), 2: —, 3: AC(N), 4: —, 5: FG FUNCTION / CONNECTOR TYPE: B3P5-VH (JST) *CN1 Applicable housing: VHR-5N (JST) Applicable terminals: Reel: SVH-21T-P1.1(JST) Bulk: BVH-21T-P1.1(JST)	TB1 (INPUT) See the upper outline drawing
CN8 (Output) PIN No. 1~4: −DC, 5~8: +DC FUNCTION / CONNECTOR TYPE: B8P-VH (JST) *CN8 Applicable housing: VHR-8N (JST) Applicable terminals: Reel: SVH-21T-P1.1(JST) Bulk: BVH-21T-P1.1(JST)	TB8 (OUTPUT) See the upper outline drawing
CN6 (ON/OFF Control) PIN No. 1: +RC, 2: −RC FUNCTION / CONNECTOR TYPE: B2B-XH-A (JST) *CN6 Applicable housing: XHP-2 (JST) Applicable terminals: Reel: SXH-001T-P0.6(JST) Bulk: BXH-001T-P0.6(JST) CN3 (Capacitor package Input/Output) PIN No. 1: 380V(P+), 2: —, 3: —, 4: 0V(P−) FUNCTION / CONNECTOR TYPE: B4B-XH-A (JST) *CN3 Applicable housing: XHP-4 (JST) Applicable terminals: Reel: SXH-001T-P0.6(JST) Bulk: BXH-001T-P0.6(JST)	

Options (Sold separately)

Cable			
Photos	Model	Category	Description
	WH-C05VH-800	Input harness	For nylon connector.
	WH-C05VH-800-01	Input harness (with ferrite core)	For nylon connector.
	WH-C08VH-500	Output harness	For nylon connector.
	WH-02XH02XH-500	Signal harness for RC signal	Connection harness to use output ON/OFF control signal (RC signal).
 *Image	WH-03ELP04XH-200	Power harness for connecting the capacitor	Connection harness to connect power supply to capacitor package (BS13A-EC400/422F).

Capacitor package and Battery package				
Photos	Model	Battery	Description	Backup time
	BS13A-EC400/422F	Capacitor package	5 inch bay size	

*Backup time is just a guideline for first use, and not guaranteed.

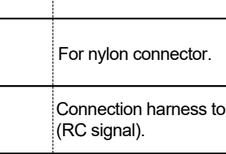
The backup time of BS13A is reference

Connection in Series and Parallel

■ Series operation
Series connection is available as in figure (1) and (2) on the right.
Series connection between different output voltages is available, such as 12 V and 24 V.

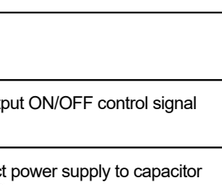
Note: In the case that different voltages are connected in series as in figure (1) on the right;
1. The output current shall be the rated current or less of the smaller rated current among the PSU1 and PSU2 connected in series.
2. Connect diodes for protection as show in the figure (1).
The rated current of the diodes shall be 1.5 times or more of the peak output current of the power supply which has larger peak output current among PSU1 and PSU2.
Also, use Schottky diodes whose forward voltage is lower than the forward voltage of the diodes used in the PSU.

(1)



In the case of series connection of different output voltages, connect diodes shown as above.

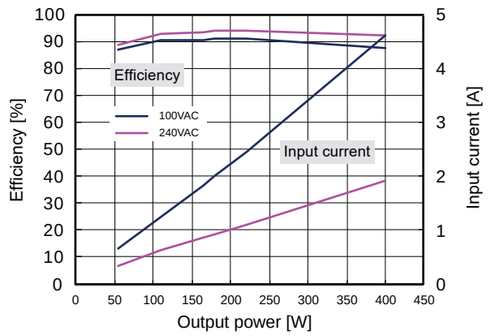
(2)



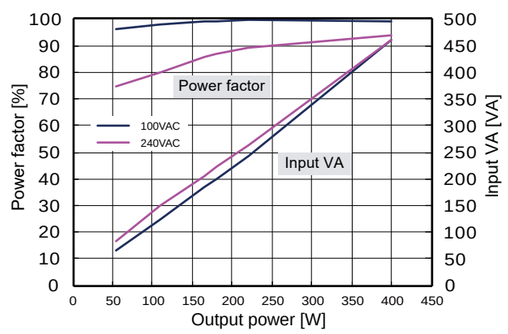
■ Parallel operation
Parallel operation is unacceptable.

Characteristics Data (Typical features of the product series) mUZP-220-24 (Examples of actual measurement)

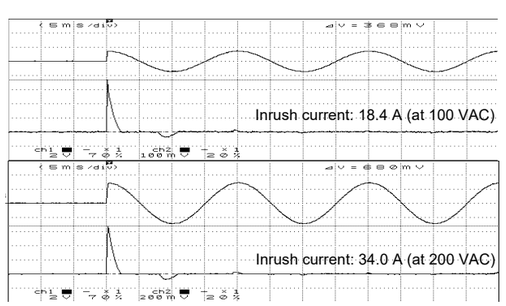
● Fig.5 Efficiency/Input Current vs. Output Power



● Fig.6 Power Factor/Input VA vs. Output Power



● Fig.7 Inrush Current



● Fig.8 Leakage Current

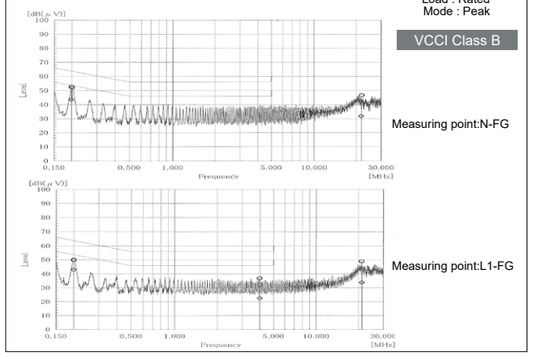
Input : 110, 264 VAC
Load : Rated load and Min. load

	Rated load	Min. load
110 VAC	0.06 mA	0.06 mA
264 VAC	0.15 mA	0.15 mA

● Fig.9 Conducted Emission at 100 VAC

Input : 100 VAC
Load : Rated
Mode : Peak

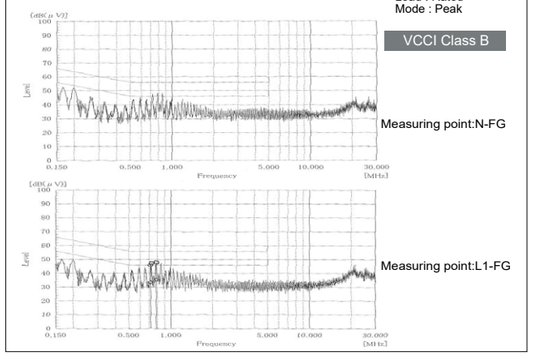
VCCI Class B



● Fig.10 Conducted Emission at 230 VAC

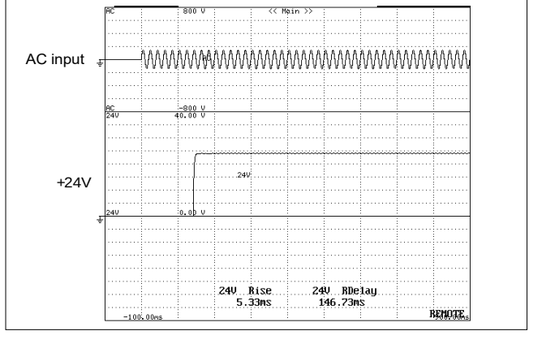
Input : 230 VAC
Load : Rated
Mode : Peak

VCCI Class B



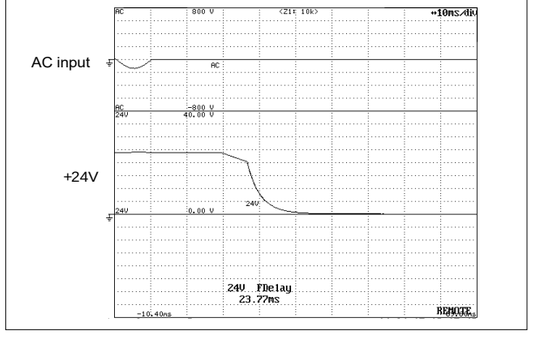
● Fig.11 Rising Characteristics at 100 VAC

Input : 100 VAC
Load : Rated
Time axis : 100 ms/DIV



● Fig.12 Falling Characteristics at 100 VAC

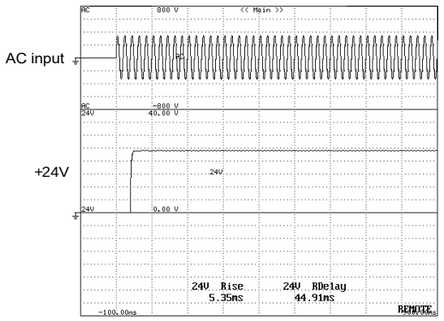
Input : 100 VAC
Load : Rated
Time axis : 10 ms/DIV



Characteristics Data (Typical features of the product series) mUZP-220-24 (Examples of actual measurement)

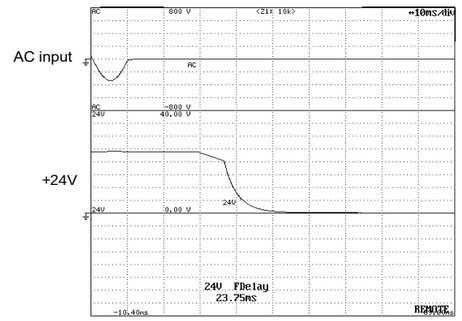
● Fig.13 Rising Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 100 ms/DIV

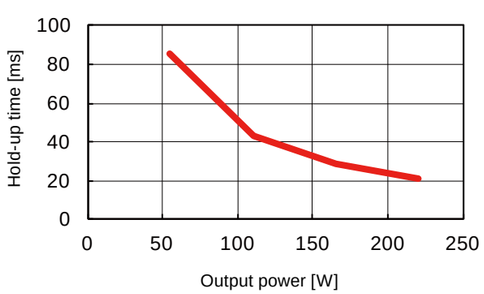


● Fig.14 Falling Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 10 ms/DIV

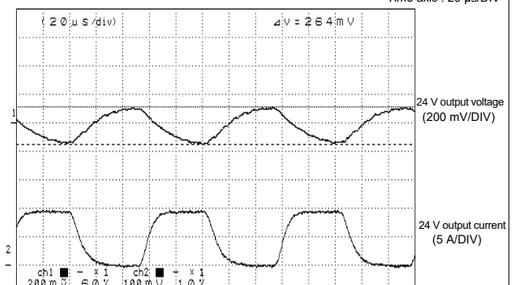


● Fig.15 Output Hold-up Time vs. Output Power

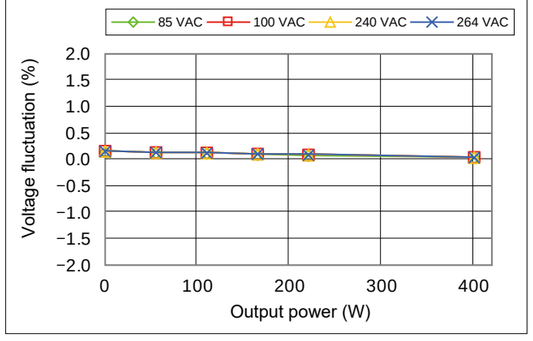


● Fig.16 Dynamic Load Fluctuation Characteristics at 10 kHz

Input : 100 VAC
Load : Rated
Time axis : 20 µs/DIV



● Fig.17 Output Voltage Regulation (Load Fluctuation)

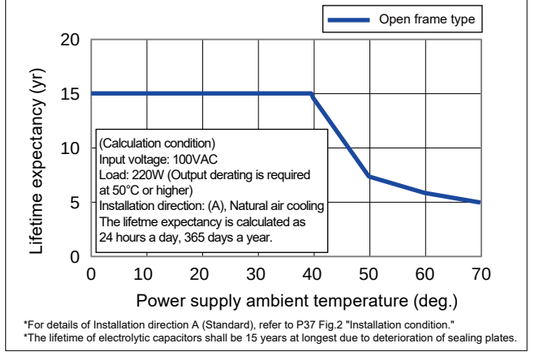


● Fig.18 Ripple and Spike Voltage

Ripple voltage	Load condition	Rated load
Temperature	Input voltage	24V
-15°C	100 VAC	40.4 mV
	240 VAC	31.7 mV
25°C	100 VAC	13.6 mV
	240 VAC	12.1 mV
55°C	100 VAC	9.5 mV
	240 VAC	9.2 mV
75°C	100 VAC	5.8 mV
	240 VAC	5.8 mV

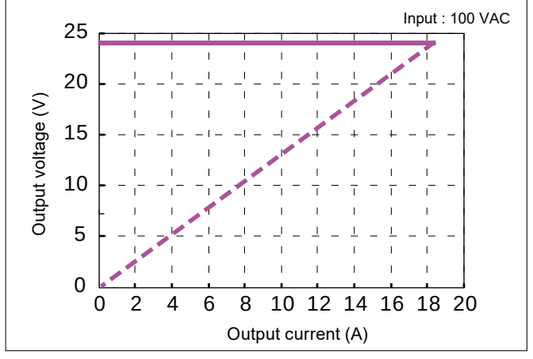
Spike voltage	Load condition	Rated load
Temperature	Input voltage	24V
-15°C	100 VAC	121.0 mV
	240 VAC	110.9 mV
25°C	100 VAC	99.8 mV
	240 VAC	95.3 mV
55°C	100 VAC	101.7 mV
	240 VAC	97.5 mV
75°C	100 VAC	66.2 mV
	240 VAC	64.5 mV

● Fig.19 Ambient Temperature vs. Lifetime Expectancy



*For details of Installation direction A (Standard), refer to P37 Fig.2 "Installation condition."
*The lifetime of electrolytic capacitors shall be 15 years at longest due to deterioration of sealing plates.

●Fig.20 Overcurrent Protection Characteristics (V - I Characteristics)



Single Output Power Supply mOZP-350 series

Structure and I/O connector	Model	Output voltage	Output current *1	Output power *1
Open frame type/ Nylon connector	mOZP-350-12-JSE	+12V	25A (42A)	300W (504W)
	mOZP-350-15-JSE	+15V	20A (40A)	300W (600W)
	mOZP-350-24-JSE	+24V	14.6A (25A)	350.4W (600W)
	mOZP-350-30-JSE	+30V	11.7A (20A)	351W (600W)
	mOZP-350-36-JSE	+36V	9.8A (16.7A)	352.8W (601W)
	mOZP-350-48-JSE	+48V	7.3A (12.5A)	350.4W (600W)

Structure	Model
With chassis	'-C' is added after open frame model name (Ex: mOZP-350-12-JSE-C)
With chassis and cover	'-K' is added after open frame model name (Ex: mOZP-350-12-JSE-K)

Input/Output connector type	Model
Block terminal	'J' in the nylon connector model become 'T' (Ex: mOZP-350-12-TSE)

■Model name coding

mOZP-350-**-*SE*-*
① ② ③ ④ ⑤⑥⑦⑧ ⑨

① Series name
② Peak output
③ Output power
④ 12:12V, 15:15V, 24:24V, 30:30V, 36:36V, 48:48V
⑤ Input/Output connector J:Nylon connector T:Block terminal
⑥ S:With current balance function
⑦ Reduction of standby power: E:Reduction of standby power function equipped (at RC signal OFF)
⑧ Modification
⑨ Blank:Without chassis and cover C:With chassis K:With chassis and cover

*1 Values in ( ) above show peak current and power.

Features

- Low standby power (at RC signal OFF, 0.06Wtyp/100VAC, 0.2Wtyp/200VAC)
- Expected life of more than 10 years
- Equipped with a variable resistor to adjust output voltage
- It is not necessary to provide a noise filter on the outside. Low leakage current is also realized.

Medical standard IEC60601-1 Ed.2, Ed.3.1 (MOPP) approved

An amazing high level of efficiency 95% has been achieved for a 24 V output type.
(*At 230VAC input, 350W load)

Rated 350W output is possible with the same size compared with competitors' 300W equivalent models. Peak power output, approx. over 1.6 times higher than continuous rated.

Safety standard	UL	CSA	EN	CE	CCC
Reliability grade	HFA	FA	HOA	OA	

●Function

TTL PFC RoHS directive

●Input

AC input	85-264 VAC (Worldwide range)

●Dimension

W×H×D (mm)	Without chassis and cover	95×47×222
	With chassis and cover	107×57×252

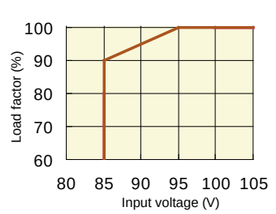
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items		Specification	Measurements conditions, etc.
AC Input	Rated Voltage		100-240VAC (AC85*-264V)	Worldwide range *See <Fig.1> Low input voltage derating below.
	Input Frequency		50-60Hz	Frequency range 47-63Hz
	Efficiency	100VAC	90% typ (12V/15V output), 92% typ (24V/30V/36V/48V output)	At 300W load *Characteristic data: Fig.6
		200VAC	92% typ (12V/15V output), 94% typ (24V/30V/36V/48V output)	
	Power Factor	100VAC	99% typ	At rated input/output (natural air cooling) *Characteristic data: Fig.7
		200VAC	96% typ	
	Inrush Current		14A typ (100VAC), 28A typ (200VAC) *Characteristic data: Fig.8	At rated output
	Input Current	100VAC	3.3A typ (at 12V/15V output, natural air cooling), 3.8A typ (at 24V/30V/36V/48V output, natural air cooling) 4.8A typ (at 12V/15V output, forced air cooling), 5.5A typ (at 24V/30V/36V/48V output, forced air cooling)	At rated output *Characteristic data: Fig.6
		200VAC	1.7A typ (at 12V/15V output, natural air cooling), 2.0A typ (at 24V/30V/36V/48V output, natural air cooling) 2.5A typ (at 12V/15V output, forced air cooling), 2.9A typ (at 24V/30V/36V/48V output, forced air cooling)	
Output	Model	mOZP-350-	12-*SE / 15-*SE / 24-*SE / 30-*SE / 36-*SE / 48-*SE	
	Rated Voltage		+12V / +15V / +24V / +30V / +36V / +48V	
	Rated Current/Power (natural air cooling)		25A / 20A / 14.6A / 11.7A / 9.8A / 7.3A	At rated input
			300W / 300W / 350.4W / 351W / 352.8W / 350.4W	Refer to <Fig.4> output derating on the following page.
	Rated Current/Power (forced air cooling)		36A / 29A / 21A / 16.8A / 14A / 10.5A	
			432W / 435W / 504W / 504W / 504W / 504W	
	Peak Current/Power		42A / 40A / 25A / 20A / 16.7A / 12.5A	At rated input/output voltage *Refer to peak output power condition below. Natural air cooling and forced air cooling
			504W* / 600W* / 600W* / 600W* / 601W* / 600W*	
	Factory Setting		12V±2% / 15V±2% / 24V±2% / 30V±2% / 36V±2% / 48V±2%	At rated output
	Adjustable Voltage Range		±10% / -14%,+10% / ±10% / ±10% / ±10% / ±10%	At a setting higher than rated voltage, use it within rated output power.
	Static Input Regulation		48mV max. / 60mV max. / 94mV max. / 120mV max. / 144mV max. / 192mV max.	
	Static Load Regulation		100mV max. / 120mV max. / 150mV max. / 180mV max. / 220mV max. / 300mV max.	
	Temperature Regulation		0.02%/°C max.	
	Max. Ripple Voltage	0-70°C	120mV max. / 150mV max.	Connect 150mm max. lead wire to output connectors, and then connect a 10uF electrolytic capacitor with a 0.1uF ceramic capacitor in parallel to the other ends of the wires to measure by an oscilloscope with 100MHz frequency band. *Characteristic data: Fig.19 Ripple/Spike voltage is 200mV/400mV max. at 70W max. output power.
		-10-0°C	160mV max. / 200mV max.	
	Max. Spike Voltage	0-70°C	150mV max. / 250mV max.	
		-10-0°C	180mV max. / 400mV max.	
Protection	Over Current Protection	OCP point (A)	101% min. of peak rated current	
		Method	Hold-down current limiting→Blocking oscillation *Characteristic data: Fig.21	
		Recovery	Automatic recovery	
	Over Voltage Protection	OVP point (V)	13.8-16.2V / 17.3-20.3V / 30.0-35.0V / 34.5-40.5V / 43.2-49.4V / 56.2-63.0V	
		Method	Output shutdown	
		Recovery	Reclosing of AC input or RC signal OFF→ON	
Environment	Operating Temp./ Humidity	Open Frame	-10-60°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%	*<Fig.3> on the next page shows the guideline of forced air cooling. Refer to <Fig.4> output derating.
		With Chassis and Cover	-10-55°C (at natural air cooling), -10-70°C (at forced air cooling) */20-90%	
	Storage Temp./Humidity		-20-75°C/10-95%	There shall be no condensation
	Vibration		To endure the vibration acceleration of 2G with vibration frequency of 10 to 55Hz for 10 sweep cycles in each X, Y, Z direction.	Follow JIS-C-60068-2-6 at no operation
	Mechanical Shock		Left one bottom edge of the unit 50mm high with the opposite edge placed on the test bench, and let it fall. Repeat 3times for each of four bottom edges, and no malfunction shall be observed.	Follow JIS-C-60068-2-31 at no operation
Insulation	Dielectric Strength		4kVAC/1minute between input and output/RC/AC_FAIL	Cut-off current 10mA
			4kVAC/1minnute between input and FG	Cut-off current 10mA
			500VAC/1minute between each output /RC/AC_FAIL/FG	
	Insulation Resistance		50MΩmin. between each input/output/RC/AC_FAIL/FG	At 500VDC
	Leakage Current		Refer to <Fig.5> Parallel connected units and leakage current on the next page. *Characteristic data: Fig.9	
EMC	Line Noise Immunity		±2000V (pulse width of 100/1000nS, cycle period of 30 to 100Hz, Normal/Common mode with Positive/Negative polarity for 10 minutes)	Measurement by INS-410 There shall be no fluctuation of DC output or malfunction.
	Electrostatic Discharge		EN61000-4-2 compliant	Apply to FG and case. There shall be no malfunction, nor failure.
	Radiated, Radio-Frequency, Electromagnetic Field		EN61000-4-3 compliant	
	Fast Transient Burst		EN61000-4-4 compliant	
	Lightning Surge		EN61000-4-5 compliant	
	Radio Frequency Conducted Immunity		EN61000-4-6 compliant	
	Power-Frequency Magnetic Field Immunity		EN61000-4-8 compliant	
	Voltage dips/Regulation		EN61000-4-11 compliant	
	Conducted Emmision		VCCI-B, FCC-B, CISPR22-B, EN55022-B compliant *Characteristic data: Fig.10, 11	At rated input and rated output (natural air cooling), with chassis*
	Harmonic Current Regulations		IEC61000-3-2 (edition 2.1) classD, EN61000-3-2 (A14) classD compliant.	At rated input/output
Others	Safety Standard		UL60601-1, CSA C22.2 No.601.1 (c-UL), ANSI/AAMI ES60601-1, UL60950-1, CSA60950-1 (c-UL), CE Marking (LVD,EMCD) approved PSE (Ordinance item 2) compliant	IEC60601-1 (Ed.2) and (Ed.3.1, MOPP)
	Cooling System		Natural air cooling/Forced air cooling	
	Output Grounding		Capacitor grounding	
	Output Hold-up Time		AC cut-off → 90% of rated voltage within 22ms min. *Characteristic data: Fig.16	At rated input, 300W output
	Reliability Grade		FA (Industrial equipment grade to use double-sided PWBs with through holes)	Following our standard
	Weight		650g typ (without chassis and cover), 1050g typ (with chassis and cover)	
	Warranty		Three years after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost.	The unit shall be operated at normal temperature and humidity. Except for lifetime of electrolytic capacitors due to operating environment.

*For the reduction of radiated noise, the input harness "WH-C05VH-800-02" (with ferrite core type) is recommended.

<Fig.1> Low input voltage derating

Follow the derating below to derate rated current/power.

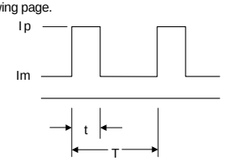


Peak output power condition

- Duty ratio of peak current shall be 45% or less.
- Energized period of peak current shall be 10 seconds or less.
- Energized period of peak current shall be 5 seconds or less at natural air cooling and 50 deg. or higher of ambient temperature.
- The value resulting from the formula below shall not exceed continuous rated current, Io, after derating specified in the output derating on the following page.

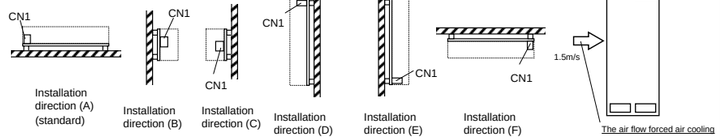
$\sqrt{((Ip^2 \times D)+(Im^2 \times (1-D)))} \leqq Io$

Ip=Peak current value
Im= Min. current value
D= Duty ratio, t/T
t= Pulse width of peak current
T= Cycle
Io= Continuous rated current specified in output derating



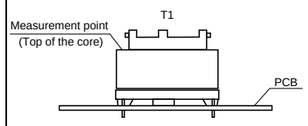
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

<Fig.2> Installation/Air cooling



<Fig.3> Guideline for forced air cooling

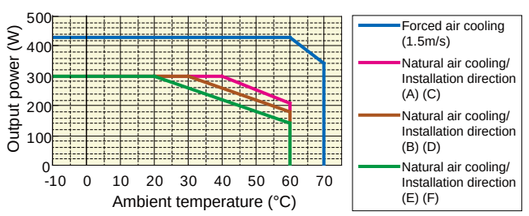
Set the core surface temperature of the transformer (T1) to 80℃ or lower.



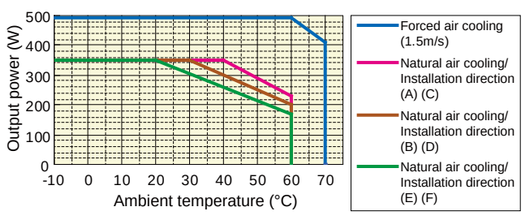
<Fig.4> Output derating

Follow the derating diagram below for output according to ambient temperature and installation direction. In case of using the type with chassis and cover, input voltage range shall be 90 VAC or higher. Also, forced air cooling condition in the diagram shall be provided that the air flow of 1.5 m/s is applied from the direction shown <Fig.2>.

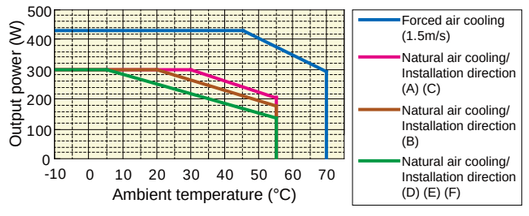
For open frame (12/15V)



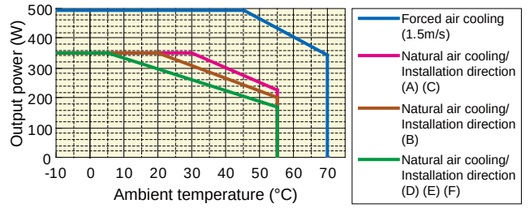
For open frame (24/30/36/48V)



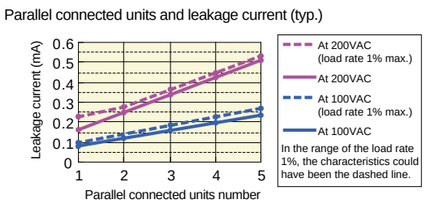
With chassis and cover (12/15V)



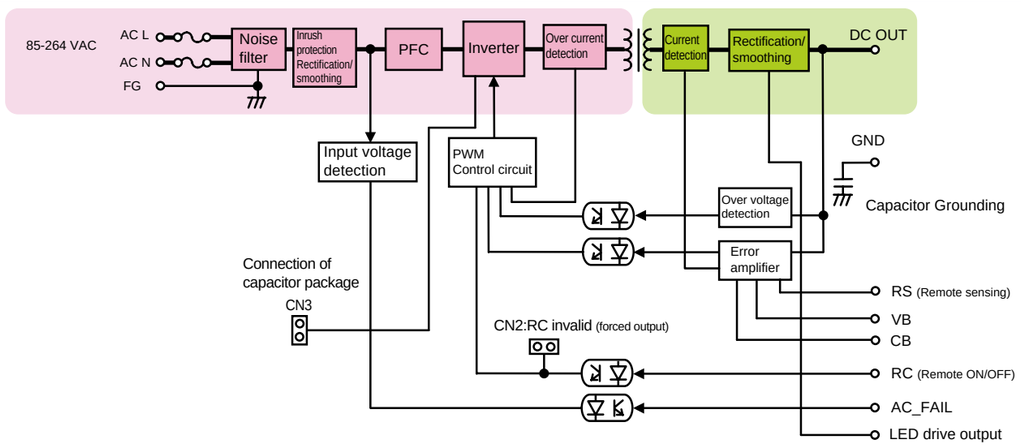
With chassis and cover (24/30/36/48V)



<Fig.5> Parallel connected units and leakage current



Block Diagram



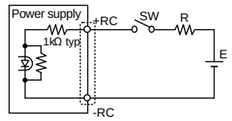
Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items	Specification	Note
Input Signal	Output ON/OFF control signal (RC signal) *Remove the shorting plug of CN2 in using RC signal.	Operating mode Between +RC and -RC: Output SW ON (4.5V or higher): ON SW OFF (0.8V or lower): OFF External power supply and Load-limiting resistor External power supply: E / Load-limiting resistor: R 4.5 ~ 12.5Vdc: Not required 12.5 ~ 30Vdc: 1.5kΩ 30 ~ 48Vdc: 8.2kΩ	Shorting Plug With shorting plug (CN2) connected, output starts up when AC input is applied regardless of RC signal. To control Start/Stop of output by RC signal, uncap shorting plug of CN2. Note: Shorting plug (CN2) and radiating fin next to it are primary circuit components. Make sure to operate the plug after the AC input is turned off.
	Remote sensing signal (RS signal)	Input terminal for detection of output voltage. Connecting RS signal to positive side of devices, it shall compensate line-drop at positive side such as output cable.	
	Current balance signal (CB signal)	Input terminal on current balance circuit. During parallel operation, connect CB signal terminals of each power supply.	Total output current at connecting N units in parallel shall be within "rated output current×N×0.9"A. (N ≦ 5)
	Voltage balance signal (VB signal)	Input terminal on voltage balance circuit. For parallel operation, connect VB signal terminals of each power supply.	Higher VR setting value of output voltage shall be preferential
Output Signal	Blackout detection signal (AC_FAIL)	The signal goes "OPEN" at low AC input voltage and power failure detection. Undefined at RC signal OFF. Detection voltage: 80 VAC typ. Detection delay time: 20-50 ms after AC input failure.	
	LED drive output	Delivers "Hi" when main inverter circuit is operating and an external LED on PCB will light. The LED light turn off during main inverter circuit is shut down, such as circuit failure, AC fail, or OFF operation by "output ON/OFF control signal". (In parallel operation, with connecting redundant diode to the output end, the operating condition of each power supply can be confirmed.)	Open voltage: 12 V typ. Max current: 7 mA max. (Built in 1.7 kΩ or equivalent)

Signal Circuit

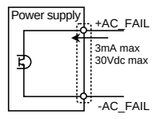
Input Signal Circuit

(RC Signal)

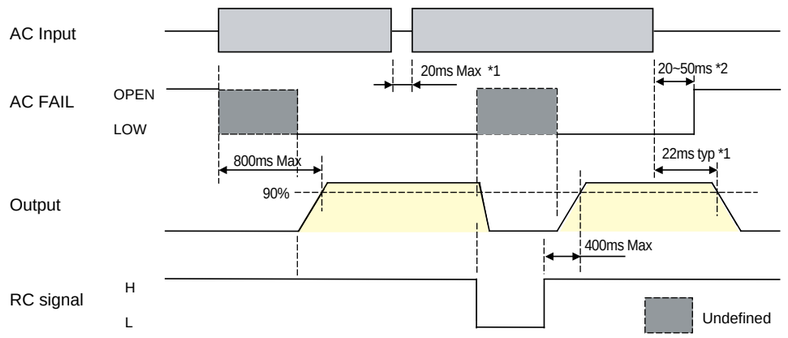


Output Signal Circuit

(AC_FAIL)



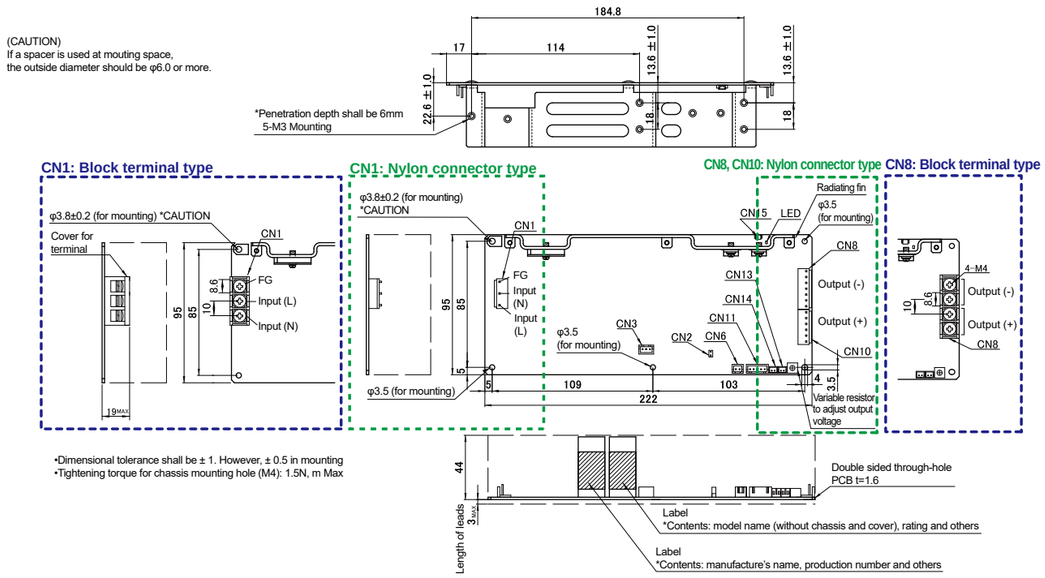
Sequence Timing Chart



*1: At rated input, 300W output
*2: If the output power is less than 10%, the input voltage is the maximum 150 ms in the range of 150 VAC or more.

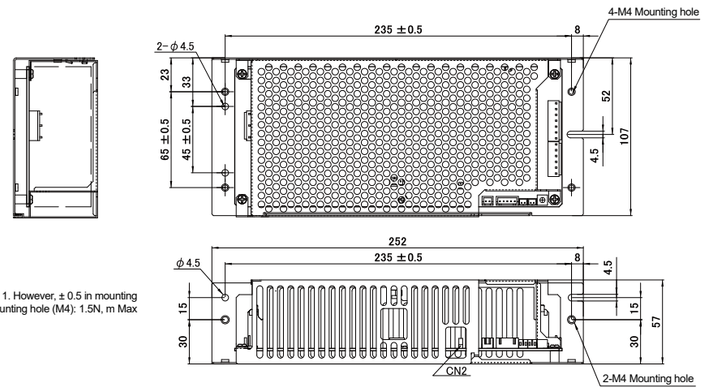
Outline Drawing

■ PCB type (open frame) model



•Dimensional tolerance shall be ± 1. However, ± 0.5 in mounting
•Tightening torque for chassis mounting hole (M4): 1.5N, m Max

■ Model with chassis and cover
(Block terminal is also available)



•Dimensional tolerance shall be ± 1. However, ± 0.5 in mounting
•Tightening torque for chassis mounting hole (M4): 1.5N, m Max

■ Connector pin allocation

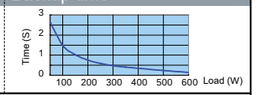
Nylon connector type	Block terminal type
CN1 (Input) PIN No. / FUNCTION / CONNECTOR TYPE 1 AC(L) 2 3 AC(N) 4 5 FG B3P5-VH (JST) *CN1 Applicable housing: VHR-5N (JST) Applicable terminals: Reel: SVH-21T-P1.1(JST) Bulk: BVH-21T-P1.1(JST)	CN1(INPUT) See the upper outline drawing
CN10(Output) PIN No. / FUNCTION / CONNECTOR TYPE 1~6 +DC B6P-VH (JST) *CN10 Applicable housing: VHR-6N (JST) Applicable terminals: Reel: SVH-41T-P1.1(JST) Bulk: BVH-41T-P1.1(JST) CN8 (Output) PIN No. / FUNCTION / CONNECTOR TYPE 1~7 −DC B7P-VH (JST) *CN8 Applicable housing: VHR-7N (JST) Applicable terminals: Reel: SVH-41T-P1.1(JST) Bulk: BVH-41T-P1.1(JST)	CN8(OUTPUT) See the upper outline drawing
CN6 (ON/OFF Control) PIN No. / FUNCTION / CONNECTOR TYPE 1 +RC 2 −RC B2B-XH-A (JST) *CN6 Applicable housing: XHR-2 (JST) Applicable terminals: Reel: SXH-001T-P0.6(JST) Bulk: BXH-001T-P0.6(JST) CN11 (Output signal) PIN No. / FUNCTION / CONNECTOR TYPE 1 RS 2 OS 3 OVP 4 +AC FAIL 5 −AC FAIL B5B-XH-A (JST) *CN11 Applicable housing: XHP-5 (JST) Applicable terminals: Reel: SXH-001T-P0.6(JST) Bulk: BXH-001T-P0.6(JST) CN13, CN14 (Current/Voltage Balance Signal) PIN No. / FUNCTION / CONNECTOR TYPE 1 VB 2 OB B2B-PH-K-S (JST) *CN13, CN14 Applicable housing: PHR-2 (JST) Applicable terminals: Reel: SPH-002T-P0.5S(JST) CN15 (LED Drive Output) PIN No. / FUNCTION / CONNECTOR TYPE 1 +LED 2 −LED 53261-0271 (MOLEX) *CN15 Applicable housing: 51021-0200(MOLEX) Applicable terminals: Reel: 50079-8000(MOLEX) Bulk: 50079-8100(MOLEX) CN3 (Capacitor package Input/Output) PIN No. / FUNCTION / CONNECTOR TYPE 1 380V(P+) 2 3 0V(P-) B3B-XH-A (JST) *CN3 Applicable housing: XHP-3 (JST) Applicable terminals: Reel: SXH-001T-P0.6(JST) Bulk: BXH-001T-P0.6(JST)	

Options (Sold separately)

Cable

Photos	Model	Category	Description
	WH-C05VH-800	Input harness	For nylon connector. *For the reduction of radiated noise, the input harness: "WH-C05VH-800-02" (with ferrite core type) is recommended.
	WH-C06VH-500	Output (+) harness	For nylon connector.
	WH-C07VH-500	Output (-) harness	For nylon connector.
	WH-02XH02XH-500	Signal harness for RC signal	Connection harness to use output ON/OFF control signal (RC signal).
	WH-05XH05XH-500	Signal harness for RS, AC_FAIL signal	Connection harness to use Remote sensing (RS), AC_FAIL signal.
	WH-02PH02PH-200	Signal harness for parallel operation	For connecting mOZP-350 in parallel. (Refer to the connection diagram below)
	WH-03ELP03XH-200	Connection harness for capacitor package	For using BS13A-EC400/422F.

Capacitor package

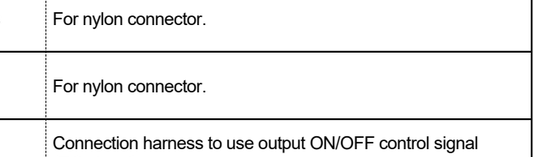
Photos	Model	Battery	Shape (size)	Backup time
	BS13A-EC400/422F	Capacitor package	(W×D×H=146×200×38mm)	

*Backup time is just a guideline for first use of capacitor package, and not guaranteed.

Connection in Series and Parallel

■ Series operation
Series connection is available as in figure (1) and (2) on the right.
•Series connection between different output voltages is available, such as 12 V and 24 V.

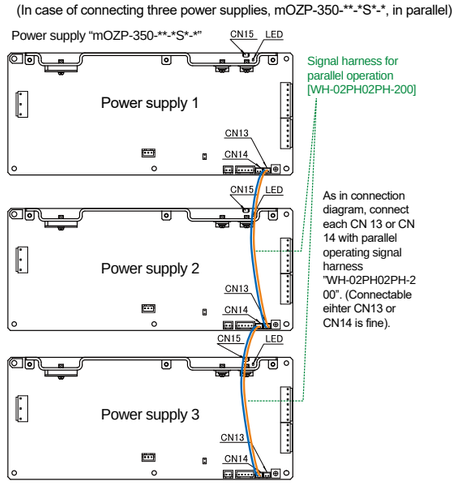
Note: In the case that different voltages are connected in series as in figure (1) on the right;
1. The output current shall be the rated current or less of the smaller rated current among the PSU1 and PSU2 connected in series.
2. Connect diodes for protection as show in the figure (1).
   The rated current of the diodes shall be 1.5 times or more of the peak output current of the power supply which has larger peak output current among PSU1 and PSU2.
   Also, use Schottky diodes whose forward voltage is lower than the forward voltage of the diodes used in the PSU.



■ Parallel operation
Parallel connection is available as in figure (3) on the right.
•By connecting the outputs of "N" power supplies in parallel, output capacity "rated output×N units×0.9" will be obtained. (N ≦ 5) In this case, please note the points written below.

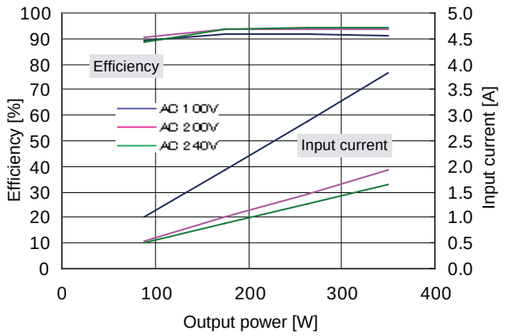
1. Please connect the dedicated cable (Model name: WH-02PH02PH-200) between the connectors "CN13" or "CN14" on the PCB of both power supplies connected in parallel. By connecting between these connectors, output current balances for each power supply are controlled to be equal.
2. Please equalize the impedance of the load wires from each power supply as much as possible.
3. Adjust output voltage by the variable resistor of the other power supply while the variable resistor of either one of the power supply is set minimum by turning it to hard left.
4. There might be heat increasing caused by installation interval, direction, and any shielding materials around power supply units when you connect in parallel. To avoid the heat increasing, please check temperature increasing with equipping actual device and operating. In case of the temperature of transformer (T1) exceeds 80°C (indication value), please change the installation interval, direction, or cut down the output power to reduce the heat.
5. LED on the PCB light green when the main inverter circuit is operating. It blacks out at circuit failure, at AC input failure, or when the main inverter circuit stops by turning off the "Output ON/OFF control signal".
6. A redundant diode is not embedded at the output of the power supply, therefore output power does not hold when one of the power supplies is damaged due to short mode etc. In addition, the output power does not hold normally when the power supply in operation is connected to the other power supply in non-operation in parallel.

■Connection diagram of signal harnesses for parallel operation
(In case of connecting three power supplies, mOZP-350-**-*S*-*, in parallel)

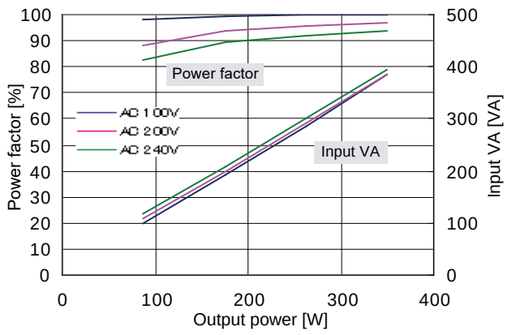


Characteristics Data (Typical features of the product series) mOZP-350-24 (Examples of actual measurement)

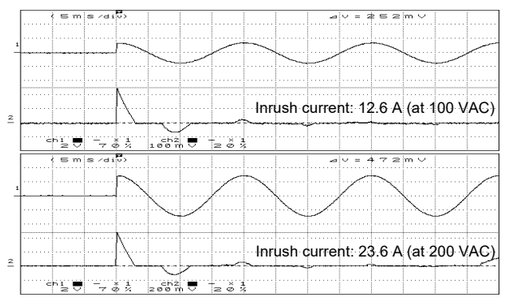
● Fig.6 Efficiency/Input Current vs. Output Power



● Fig.7 Power Factor/Input VA vs. Output Power



● Fig.8 Inrush Current



● Fig.9 Leakage Current

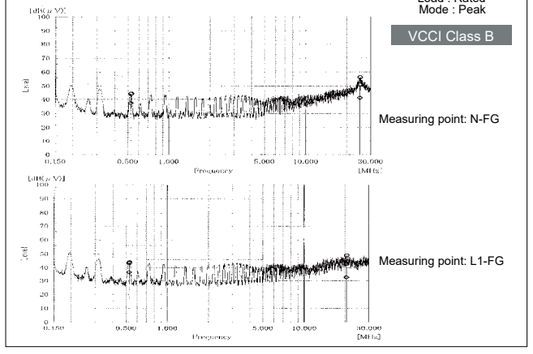
Input : 110, 264 VAC, 60Hz
Load : Rated load and Min. load

	Rated load	Min. load
110 VAC	0.06mA	0.07mA
264 VAC	0.11mA	0.12mA

● Fig.10 Conducted Emission at 100 VAC

Input : 100 VAC
Load : Rated
Mode : Peak

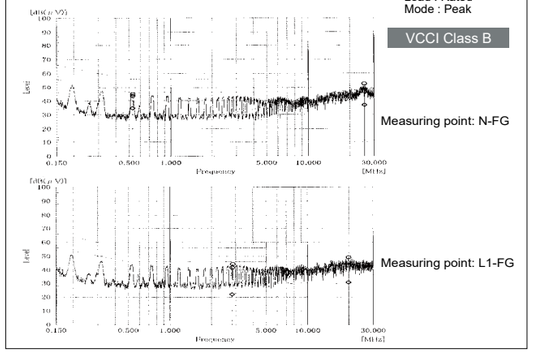
VCCI Class B



● Fig.11 Conducted Emission at 230 VAC

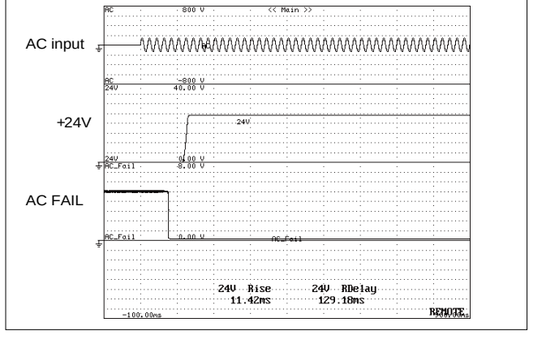
Input : 230 VAC
Load : Rated
Mode : Peak

VCCI Class B



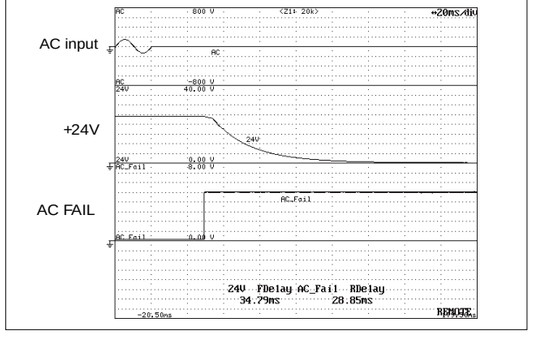
● Fig.12 Rising Characteristics at 100 VAC

Input : 100 VAC
Load : Rated
Time axis : 100 ms/DIV



● Fig.13 Falling Characteristics at 100 VAC

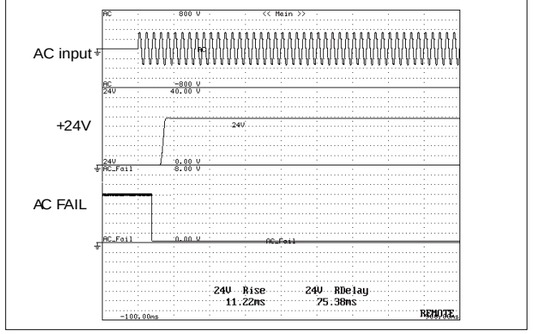
Input : 100 VAC
Load : Rated
Time axis : 20 ms/DIV



Characteristics Data (Typical features of the product series) mOZP-350-24 (Examples of actual measurement)

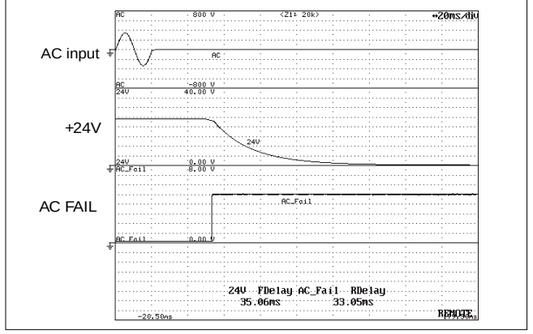
● Fig.14 Rising Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 100 ms/DIV



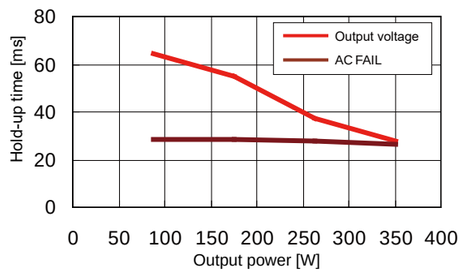
● Fig.15 Falling Characteristics at 240 VAC

Input : 240 VAC
Load : Rated
Time axis : 20 ms/DIV



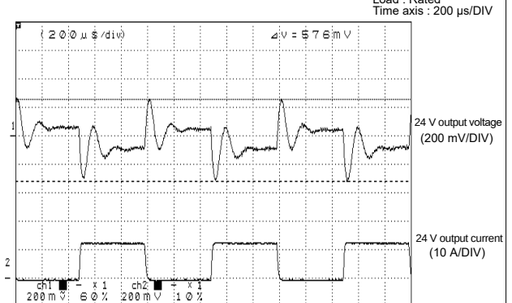
● Fig.16 Output Hold-up Time vs. Output Power

AC FAIL: the point that AC FAIL signal is delivered.
Output voltage: the point that output voltage fails down to 90%.

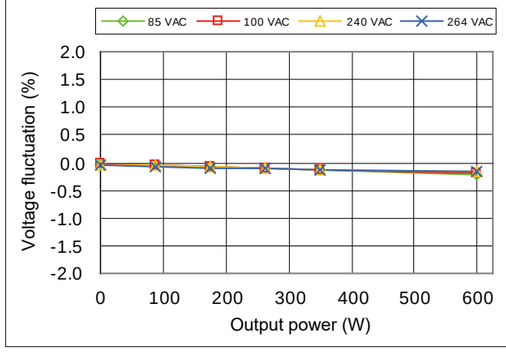


● Fig.17 Dynamic Load Fluctuation Characteristics at 1 kHz

Input : 100 VAC
Load : Rated
Time axis : 200 µs/DIV

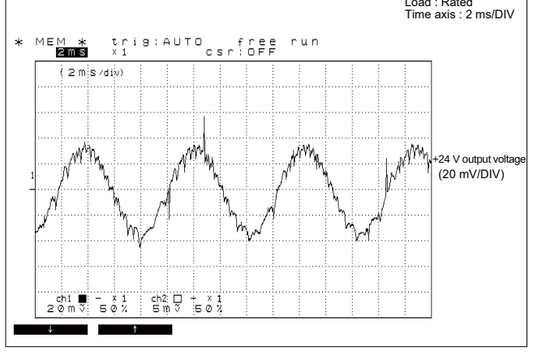


● Fig.18 Output Voltage Regulation (Load Fluctuation)

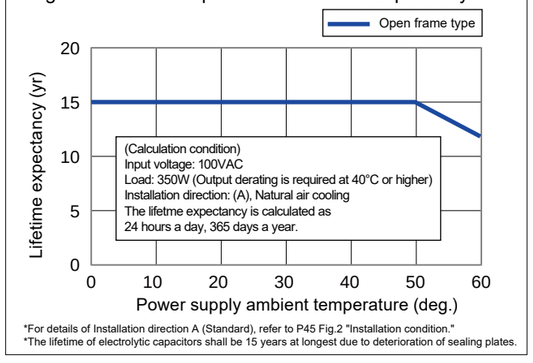


● Fig.19 Ripple and Spike Voltage

Input : 100 VAC
Load : Rated
Time axis : 2 ms/DIV



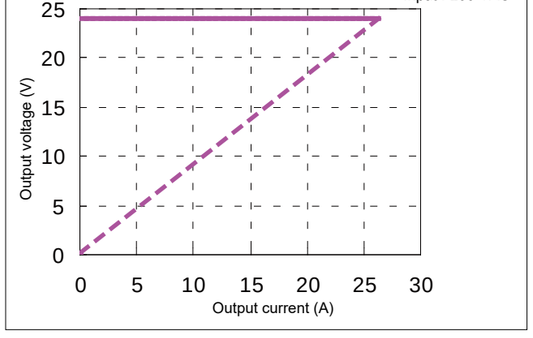
● Fig.20 Ambient Temperature vs. Lifetime Expectancy

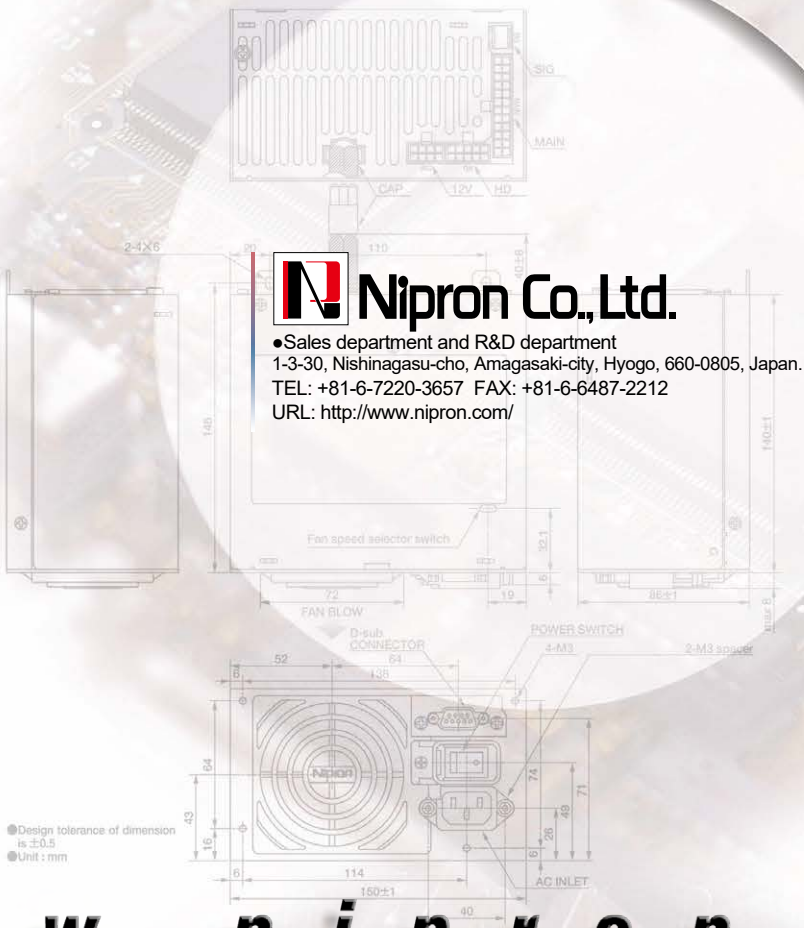


*For details of Installation direction A (Standard), refer to P45 Fig.2 "Installation condition."
*The lifetime of electrolytic capacitors shall be 15 years at longest due to deterioration of sealing plates.

●Fig.21 Overcurrent Protection Characteristics (V - I Characteristics)

Input : 100 VAC





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