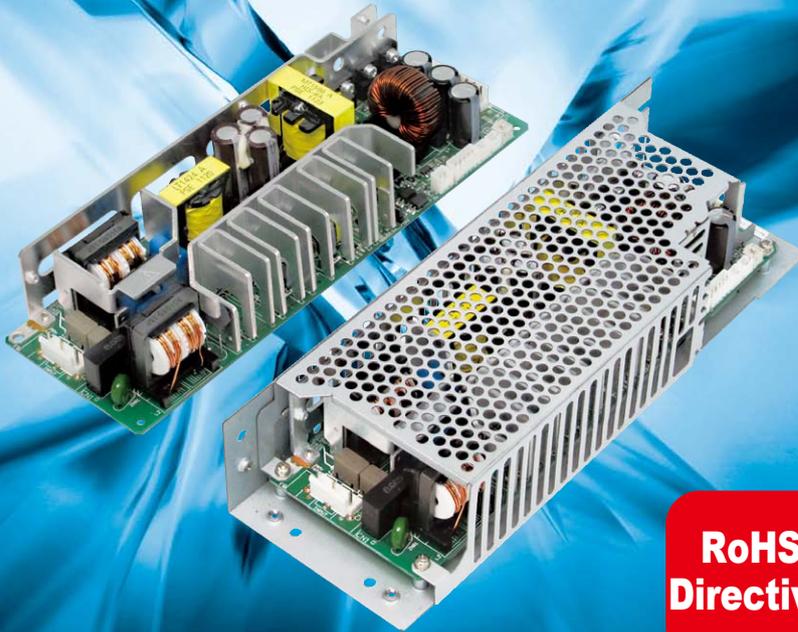


Single Output Power Supply mOZP-200 series

Medical standard IEC60601-1 3rd approved. Various output types are available (+3.3V, +5V, +12V, +15V, +24V, +36V, +48V)



With capacitor package connected to OZP-200 series, backup at blackout is available.



■ Capacitor Package BS13A-EC400/422F

RoHS Directive

Single Output	
Continuous Max.	Peak
132W~	198W
201.6W	~403.2W

Structure and In/Out connector	Model	Output voltage	Output current *1	Output power *1	Stock
Open frame type/ Nylon connector	mOZP-200-3R3-JSE	+3.3V	40A(60A)	132W(198W)	Standard Stock
	mOZP-200-5-JSE	+5V	40A(60A)	200W(300W)	Standard Stock
	mOZP-200-12-JSE	+12V	16.7A(33.4A)	200.4W(400.8W)	Standard Stock
	mOZP-200-15-JSE	+15V	13.4A(26.7A)	201W(400.5W)	Standard Stock
	mOZP-200-24-JSE	+24V	8.4A(16.7A)	201.6W(400.8W)	Standard Stock
	mOZP-200-36-JSE	+36V	5.6A(11.2A)	201.6W(403.2W)	Standard Stock
	mOZP-200-48-JSE	+48V	4.2A(8.4A)	201.6W(403.2W)	Standard Stock
Structure	Description	Stock			
W/T Chassis	'-C' is added after Open frame model name (Ex. mOZP-200-3R3-JSE-C)	10 days before delivery			
W/T Chassis & Cover	'-K' is added after Open frame model name (Ex. mOZP-200-3R3-JSE-K)	10 days before delivery			
Input/Output connector	Description	Stock			
Block terminal type	'T' from 'J' of nylon connector model (Ex. mOZP-200-3R3-TSE)	10 days before delivery			
<p>■ Model name coding</p> <p>mOZP-200-**-**SE**</p> <p>① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨</p> <p>① Series name ④ 3R3: +3.3V output ② Peak power available 5: +5V output ③ Output power 12: +12V output 15: +15V output 24: +24V output 36: +36V output 48: +48V output</p> <p>⑤ Input/Output connector ⑥ S: With current balance function J: Nylon connector ⑦ Reducing standby power T: Block terminal consumption functionality ⑧ Modification No.</p> <p>⑨ Blank: W/O Chassis and Cover C: W/T Chassis K: W/T Chassis and Cover</p>					

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

Features

- Low leakage current (0.06 mA typ. at 100VAC, 0.12 mA typ. at 200VAC)
- Conducted emission VCCI Class B passes.
- Lasting over 10 years longlife at ambient temp. 45°C (at 200VAC and 150W load).
- Standby power supply unit attachable
- Low standby power consumption (0.06W at 100VAC, 0.20W at 200VAC)

Medical standard IEC60601-1 3rd (MOOP) approved
Successfully with marvelous hi-efficiency of 90%* at 5V output type by synchronous rectifying circuit with FET. (* at 240V AC input and rated load)

And to this, strong feature for this power supply is peak power! which can gives twice as rated power(over 12V output). In addition, parallel operation is acceptable by current balance circuit.

Function



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

Input

Input	85V~264VAC (Worldwide range) 120V~370VDC*
-------	--

*Applied to safety safety standard based on the range of rated input voltage 100-240VAC (50/60Hz). When in use at DC input, please attach an external DC fuse for protecting the power supply at failure.

Dimension

W×H×D (mm)	W/O Chassis & Cover	73×40×222
	W/T Chassis & Cover	84×51×252

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

Items		Specification							Measurements, etc.	
AC Input	Rated voltage	AC100-240V(AC85*~264V) DC120-370V *1							Worldwide range * See <Fig.1> Low input voltage derating below.	
	Frequency	50/60Hz							Frequency range: 47-63Hz	
	Efficiency	AC100V	82%typ	85%typ	87%typ	88%typ	87%typ	88%typ	88%typ	at Rated Input/Output(Natural air cooling) (Characteristics data on Fig.7)
		AC200V	85%typ	88%typ	90%typ	91%typ	90%typ	90%typ	91%typ	
	Power factor	AC100V	99% typ							(Characteristics data on Fig.8) at Rated Input/Output(Natural air cooling)
	AC200V	92% typ(3.3V output), 94% typ(5V output), 95% typ(12V/15V/24V/36V/48V output)								
Inrush current	17A typ(AC100V),34A typ(AC200V)(Characteristics data on Fig.8)								Power thermistor system, at Rated load and Cold start (25 deg.)	
Input current	AC100V	1.7A typ(3.3V output, Natural air cooling),1.9A typ(3.3V output, Forced air cooling) 2.4A typ(5V output, Natural air cooling) 2.3A typ(12V/15V/24V/36V/48V output, Natural air cooling),2.8A typ(5V/12V/15V/24V/36V/48V output, Forced air cooling)							(Characteristics data on Fig.7) at Rated Input/Output and Max. output (25 deg.)	
	AC200V	1.2A typ(Natural air cooling), 1.4A typ(Forced air cooling) 3.3V output:0.9A typ(Natural air cooling), 1.0A typ(Forced air cooling)								
Output	Model	OZP-200-3R3	OZP-200-5	OZP-200-12	OZP-200-15	OZP-200-24	OZP-200-36	OZP-200-48		
	Rated voltage	+3.3V	+5V	+12V	+15V	+24V	+36V	+48V		
	Rated current/Power (Natural air cooling)	40A 132W	40A 200W	16.7A 200.4W	13.4A 201W	8.4A 201.6W	5.6A 201.6W	4.2A 201.6W	at Rated Input *Refer to the output derating at <Fig.4> on the next page.	
	Rated current/Power (Forced air cooling)	46A 151.8W	46A 230W	20A 240W	16A 240W	10A 240W	6.7A 241.2W	5A 240W		
	Peak current/Power	60A 198W*	60A 300W*	33.4A 400.8W*	26.7A 400.5W*	16.7A 400.8W*	11.2A 403.2W*	8.4A 403.2W*	* Follow Peak output power condition below. Natural air cooling or Forced air cooling.	
	Setup voltage at factory	3.3V±2% 5.0V±2% 12V±2% 15V±2% 24V±2% 36V±2% 48V±2%								at Rated output
	Voltage adjustable range	-10%,+20% ±20% -25%,+10% -20%,+15% ±20% -20%,+15% ±15%								At the larger setting of rated voltage of 5V/12V/15V/24V/36V/48V, please use it within the rated output power in each.
	Static input fluctuation	20mV max 20mV max 48mV max 60mV max 94mV max 144mV max 192mV max								
	Static load fluctuation	40mV max 40mV max 100mV max 120mV max 150mV max 220mV max 300mV max								
	Temperature fluctuation	0.02%/deg. max								
	Max. ripple voltage (mVp-p)	0-65deg. -10-0deg.	80mVp-p max 140mVp-p max		120mV max 160mV max			150mV max 200mV max		Connect wires to the output connector with a 10uF electrolytic capacitor and a 0.1 uF ceramic capacitor to measure with 100MHz oscilloscope. Lead length of the wires shall be 150mm or less. (Characteristics data on Fig.20)
	Max. spike voltage (mVp-p)	0-65deg. -10-0deg.	120mVp-p max 160mVp-p max		150mV max 180mV max			250mV max 400mV max		
	Protection	Overcurrent protection	OCP point (A)	101% min. of Peak rated current						
		Method	Hold-down current limiting → blocking oscillation(Characteristics data on Fig.22)							
		Recovery	Automatic recovery							
Overvoltage protection	OVP point(V)	4.5-5.5V	6.5-7.5V	13.8-16.2V	17.3-20.3V	30.0-35.0V	43.2-49.4V	56.2-63.0V	External voltage shall not be applied to output terminals of 3.3V/5V/12V/15V types.	
	Method	Output shutdown								
	Recovery	Reclosing of AC input								
Environment	Operating temperature and Humidity	Open frame	-10 to 60deg. at natural air cooling, -10 to 70deg. 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 and <Fig.5> output derating for startup at low temperature. No condensation
		W/T Chassis and Cover	-10 to 55deg. at natural air cooling, -10 to 70deg. at forced air cooling*/20-90%							
	Storage Temp. and Humidity	Open frame	-20-75deg./10-95%							No condensation
		W/T Chassis and Cover	-20-75deg./10-95%							
Vibration	Acceleration of 2G with vibration frequency of 10-55Hz for 10 sweep cycles in the X · Y · Z directions.							JIS-C-60068-2-6 at no operation When only radiating fin (label side) is fixed, acceleration should be 1g _r		
Mechanical strength(surface dropping)	Lift one bottom edge up to 50mm and let it fall. Repeat three times for each of four edges. No malfunction.							JIS-C-60068-2-31 at no operation		
Insulation	Dielectric strength	AC 3kV for one minute between AC input and DC output/RC/AC FAIL							Cut-off current: 10mA	
		AC 2kV for one minute between Input and FG.							Cut-off current: 10mA	
	Insulation resistance	AC 500V for one minute among DC output, RC, AC FAIL, and FG.								
Leakage current	50MΩ min. among AC input, DC output, RC, AC FAIL, and FG.							At DC 500V		
EMC	Line noise immunity	±2000V (Pulse width: 100/1000ns, Repeated cycle: 30 to 100Hz, Normal mode/Common mode with Positive/Negative polarity for 10 minute.)							To measure with INS-410. There shall be no DC-factor fluctuation of output and malfunction.	
	Electrostatic discharge	EN61000-4-2 Compliant							For applying FG and chassis. No malfunction and without any failure.	
	Radioactive radio frequency electromagnetic field	EN61000-4-3 Compliant								
	Fast Transient Burst	EN61000-4-4 Compliant								
	Lightning	EN61000-4-5 Compliant								
	Conductive radio frequency electromagnetic field	EN61000-4-6 Compliant								
	Power source frequency magnetic field Immunity	EN61000-4-8 Compliant								
	Voltage dips/Fluctuation	EN61000-4-11 Compliant								
	Conducted Emission	VCCI-B,FCC-B,EN55022-B, and CISPR22-B Compliant (Characteristics data on Fig.11,12)							At rated input/output by Natural air cooling, with Chassis	
	Harmonic current regulation	IEC61000-3-2(Ed. 2.1) Class D, and EN61000-3-2(A14) Class D Compliant							At rated Input/Output	
Others	Safety standard	Certified ANSI/AAMI ES60601-1, UL60950-1, CSA60950-1(c-UL), and CE Marking(LVD,EMCD)/ The Electrical Appliance and Material Safety Law, (section 2) Compliant							IEC 60601-1 (3rd, MOOP)	
	Cooling system	Natural air cooling/Forced air cooling								
	Output GND grounding	Capacitor grounding								
	Output hold-up time	20ms min.(Characteristics data on Fig.17)							At rated input, natural air cooling, rated output (3.3V/5V), at rated output 200W (12V/24V/36V/48V), 170W (15V)	
	Reliability Grade	FA (Industrial equipment grade to use double-sided PWBs with through holes)							To follow our standard	
	MTBF	207,000 H (3.3V/5V/12V/15V) 219,000 H (24V/36V/48V)							To follow EIAJRCR-9102	
	Weight	530g typical W/O Chassis and Cover, 830g typical W/T Chassis and Cover								
Warranty	Three years after delivery. However, if any faults 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.		

*1 Applied to safety safety standard based on the range of rated input voltage 100-240VAC (50/60Hz). When in use at DC input, please attach an external DC fuse for protecting the power supply at failure.

<Fig.1> Low input voltage derating

Follow the derating below to derate Rated current/Power.

Input voltage (V)	Load factor (%)
80	60
85	90
90	95
95	100
100	100
105	100

Peak output power condition

Duty ratio of Peak current shall be within 45%.
 Energized period of peak current shall be within 10 seconds.
 Energized period of peak current shall be within 5 seconds at natural air cooling and 50 deg. or higher of ambient temperature.
 The value derived from the equation below shall not exceed continuous rated current I_o specified in the output derating on the following page.

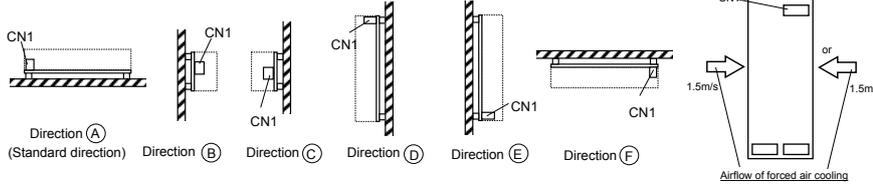
$$\sqrt{((I_p^2 \times D) + (I_m^2 \times (1-D)))} \leq I_o$$

I_p=Peak current
 I_m= Min. current
 D= Duty cycle, t/T
 t= Pulse width of peak current
 T=Cycle length
 I_o= Continuous rated current specified in output derating.

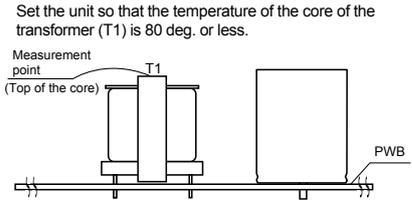
Note: In case of temperature of power thermistor for prevention of inrush current will not go enough, such as the amount of the average load power is small, (resistance value is high), output power at peak power might drop for about 100ms. If this might cause any problem, please check output voltage 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 condition



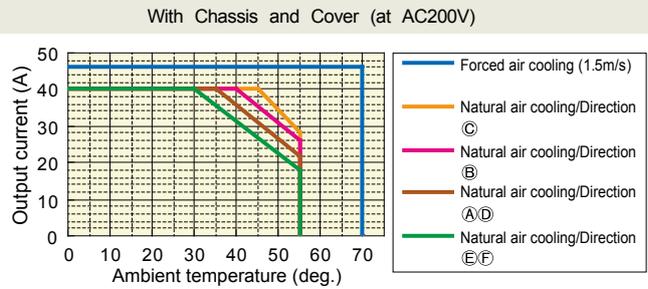
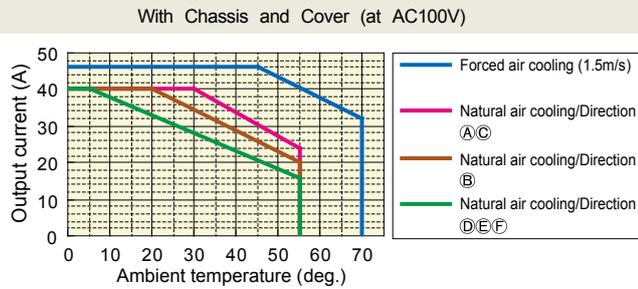
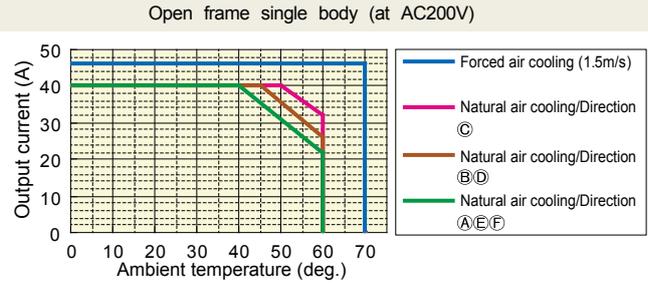
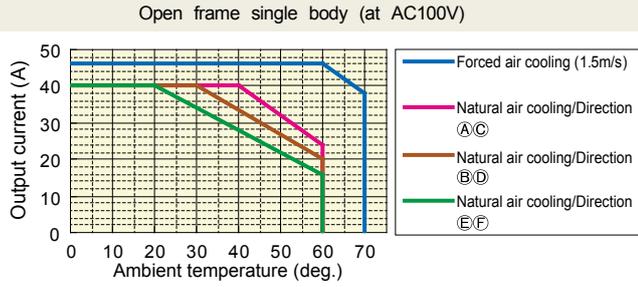
<Fig.3 > Guideline for Forced air cooling



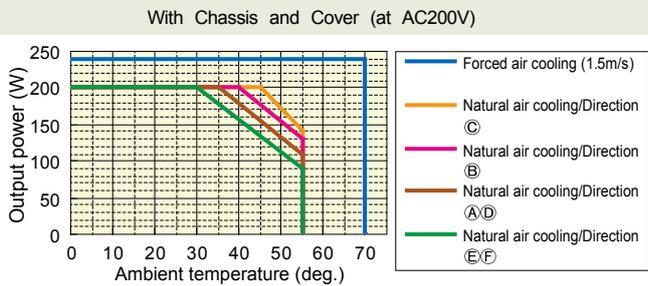
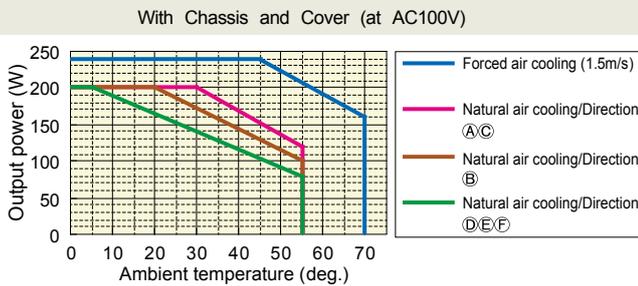
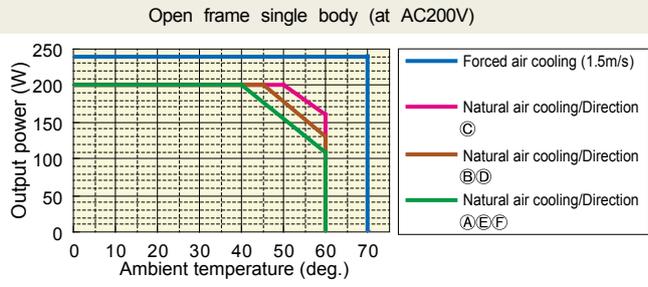
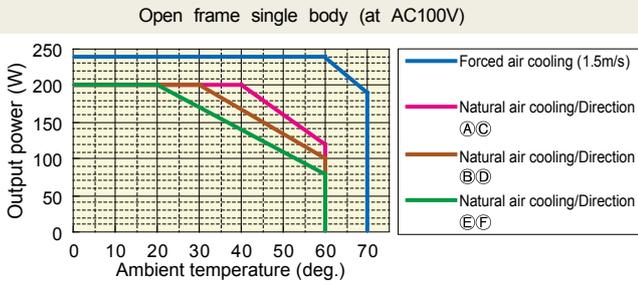
<Fig.4> Output derating

Follow the chart below to derate output power according to the ambient temperature and installation direction of the power supply. In addition, for the unit with Chassis and cover, input voltage shall be 90V or higher. Forced air cooling in this graph is the condition that blowing the air with the speed of 1.5 m/s from the direction of figure 2 as shown.

mOZP-200-3R3,mOZP-200-5

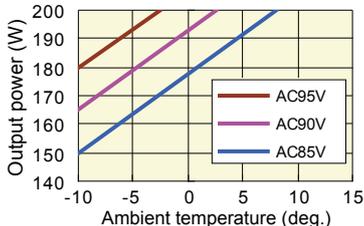


mOZP-200-12,mOZP-200-15,mOZP-200-24,mOZP-200-36,mOZP-200-48



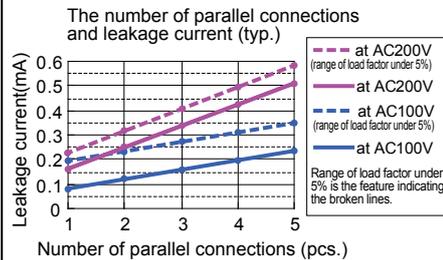
<Fig.5> Output derating for startup at low temperature

When power supply is operated at lower temperature, follow the derating diagram below to reduce the output power for startup.

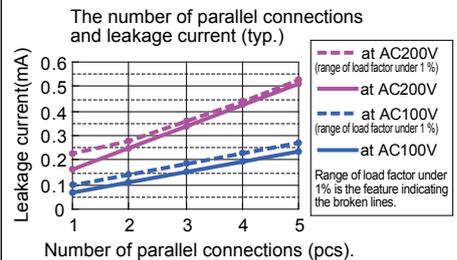


<Fig.6> The number of parallel connections and leakage current

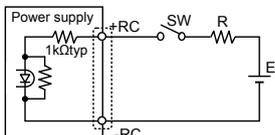
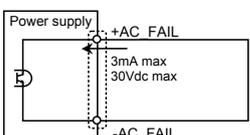
mOZP-200-3R3,mOZP-200-5,mOZP-200-12,mOZP-200-15



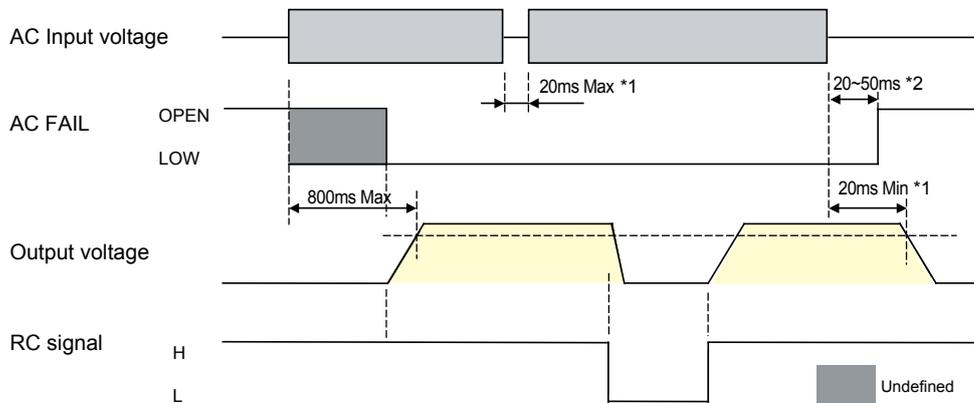
mOZP-200-24,mOZP-200-36,mOZP-200-48



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

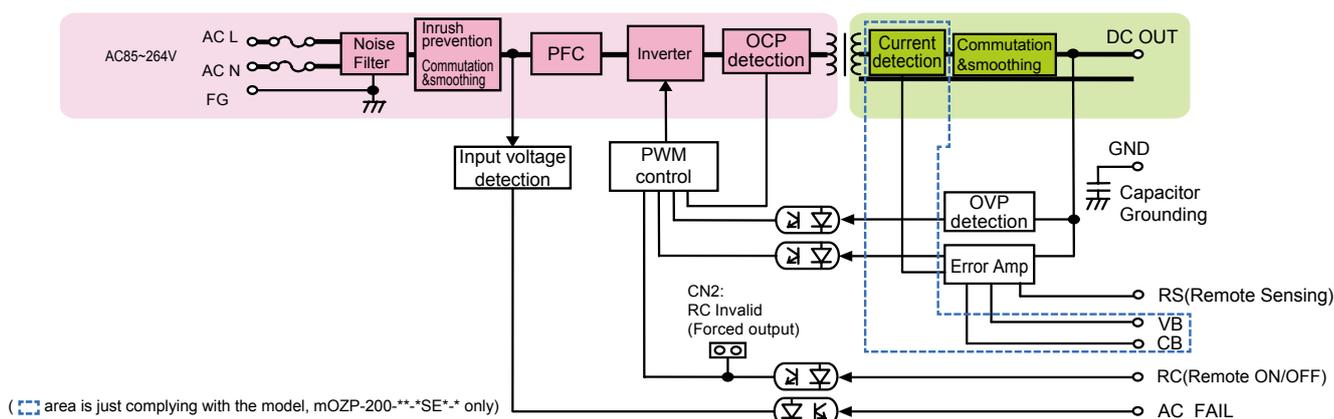
Items	Specification	Note							
Input signal	Output ON/OFF control signal (RC signal) * Remove the shorting plug of CN2 in using RC signal.	Operation mode <table border="1"> <tr> <td>between +RC and -RC</td> <td>Output</td> </tr> <tr> <td>SW ON(4.5V or higher)</td> <td>ON</td> </tr> <tr> <td>SW OFF(0.8V or lower)</td> <td>OFF</td> </tr> </table>	between +RC and -RC	Output	SW ON(4.5V or higher)	ON	SW OFF(0.8V or lower)	OFF	Shorting plug:When the shorting plug (CN2) is connected, Output stats up with AC input regardless of RC signal. In controlling output startup or shutdown by RC signal, remove the shorting plug of CN2. Note: The shorting plug (CN2) and adjacent radiation fin are in the primary side. Make sure to turn off AC input before operation on the plug.
	between +RC and -RC	Output							
	SW ON(4.5V or higher)	ON							
	SW OFF(0.8V or lower)	OFF							
Remote Sensing signal (RS signal)	Input terminal for detection of output voltage.Line-drop at positive side of output cable shall be covered by connecting RS signal to positive side of devices.								
Current balance signal (CB signal) * Only available with mOZP-200-**-SE**	Input terminal on current balance circuit.During parallel running,connect CB signal terminal of each power supply.	Total output current at parallel running shall be within 'rated output x N x 0.9A'(N≤5)							
Voltage balance signal (VB signal) * Only available with mOZP-200-**-SE**	Input terminal on voltage balance circuit. During parallel running, connect VB signal terminal of each power supply.	Higher VR setting value of output voltage shall be preferential.							
Output signal	Blackout detection signal (AC FAIL)	To become 'OPEN' (open collector) when AC input falls or blackout is detected. (Detection voltage: AC 80V typical, Detection delay time: 20 to 50ms after AC input is turned off.)							
	LED driving output	While the main inverter circuit is working, it outputs "Hi" and can turn on the external LED. LED is turned off while the main inverter circuit stops working due to circuit failure, blackout or input of OFF signal from "Output ON/OFF control signal".	Open voltage is 10V max. Max. current is 14mA max. (680Ω or equivalent is equipped) Note: Even while the main inverter circuit is working, LED light may get dimmer or flicker may occur at light load or pulsive load.						
Signal circuit									
Input signal circuit	(RC signal) 	Output signal circuit	(AC_FAIL) 						

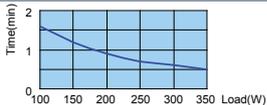
Sequence Timing Chart (At the time of the capacitor package is not connected.)



*1: At rated input, output and natural air cooling (3.3V/5V), 200W output (12V/24V/36V/48V), 170W (15V)
 *2: In the case that output power is 10% or less, the period shall be 300ms max. (3.3V/5V), 70ms (12V/15V/24V/36V/48V with AC input of 150V or higher).

Block Diagram

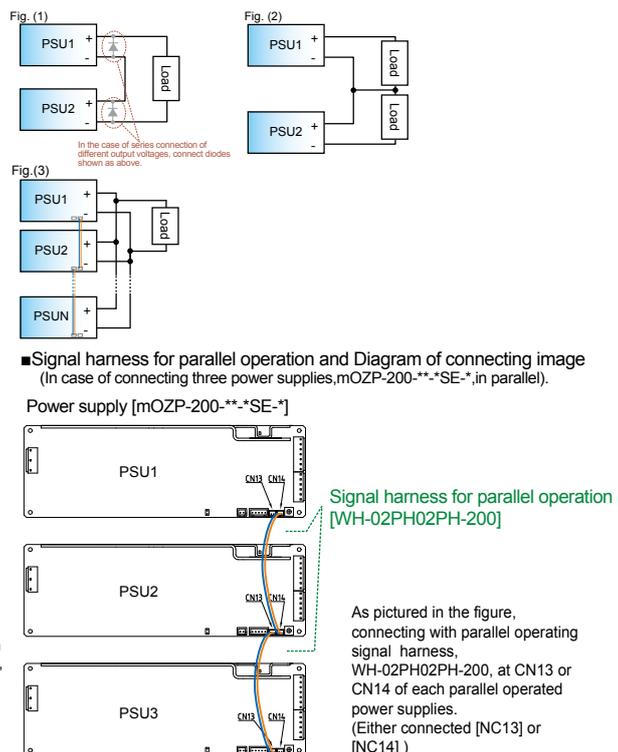


Capacitor package				
Photos	Model	Category	Dimension	Backup time
	BS13A-EC400/422F	Capacitor package	(W×D×H=146×200×38mm)	
*Backup time is just a guideline for first use, and not guaranteed value.				

Cable			
Photos	Model	Category	Description
	WH-C05VH-800	Input harness	Connection to nylon connector is acceptable.
	WH-C05VH-800-01	Input harness (with ferrite core)	Connection to nylon connector is acceptable.
	WH-C06VH-500	Output harness(+)	(+) harness for 3.3V, 5V output Connection to nylon connector is acceptable.
	WH-C07VH-500	Output harness(-)	(-) harness for 3.3V, 5V output Connection to nylon connector is acceptable.
	WH-C08VH-500	Output harness	For 12V to 48V output Connection to nylon connector is acceptable.
	WH-02XH02XH-500	Signal harness for RC signal	To connect for use of output ON/OFF control signal (RC signal)
	WH-05XH05XH-500	Signal harness for RS & AC_FAIL signal	To connect for use of Remote sensing (RS) and AC_FAIL signal
	WH-02PH02PH-200	Signal harness for parallel operation	Connect it in case of operating mOZP-200 in parallel. (Refer to following diagram of connecting image)
	WH-03ELP03XH-200	Capacitor package connection harness	Connecting the harness between power supply and BS13A-EC400/422F
	WH-03XH03XH-115	Standby power supply unit connection harness	Connecting the harness between mOZP-200 and standby power supply unit

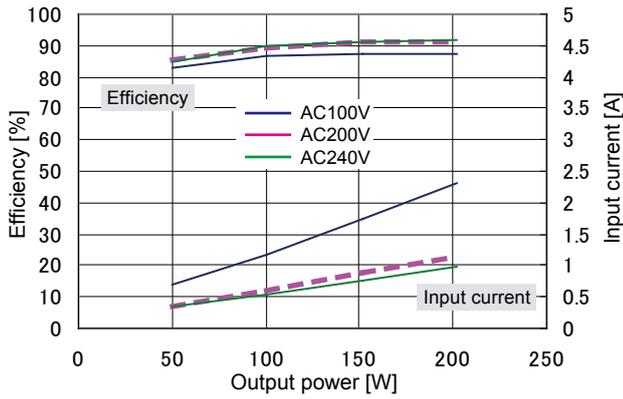
Connection In Series And Parallel

- Series connection
 - Series connection shown on the right is available.
 - Series connection between different output voltages is available, such as 12V and 24V.
 - Note: In the case that different voltages are connected in series like Fig. (1) on the right;
 - The output current shall be the rated current or less of the smaller rated current among the PSU1 and PSU2 connected in series.
 - Connect diodes for protection as shown in the Fig. (1). Current rating of the diode shall be 1.5 times or more of rated output current whose unit has larger rated 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
 - Connected in parallel possible by following the connecting method as shown on the right side (3).
 - By connecting the outputs of N power supplies in parallel, output capacity "rated output x N units x 0.9" will be obtained. In this case, please beware of the following. (N ≤ 5)
 - Please connect the applicable cable (Model type: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 balance for each power supplies are controlled to be equal.
 - Load wires from each power supplies should be wired to make both impedance equal as much as possible.
 - When adjusting the output voltage, set either one of the output voltage adjustable volume to the minimum (to the leftmost), and adjust the output voltage using output voltage adjustable volume of the other power supply.
 - Because it does not include ORing diode in the output terminal, output power does not remain when one of the power supplies is damaged due to short mode etc. In addition, output power does not remain normally when power supply in operation is connected to the one in shutdown condition in parallel.
 - During operating main inverter circuit, LED green light of the power supply PC board is On but during main inverter circuit is stopped, LED light is turned off as well by being informed of circuit failure, AC input blackout, or switching off [on/off output control signal]. If the output condition is closed to "no-load" condition, about less than 0.2A, even in the inverter circuit operated, LED light might get dim or flicker.
 - When starting up the power supply by AC input, operating waveform of output voltage may be tiered or dropped down (caused by the operation of over current protection circuit) due to dispersion of start up time of the power supplies connected in parallel. It can be prevented by starting up each output at the same time using output ON/OFF control signal of both power supplies connected in parallel.(3.3V / 5V only)
 - 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 temperature increase, please check temperature increasing with equipping actual device and operate. 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 avoid temperature increasing. (12V / 15V / 24V / 36V / 48V only)

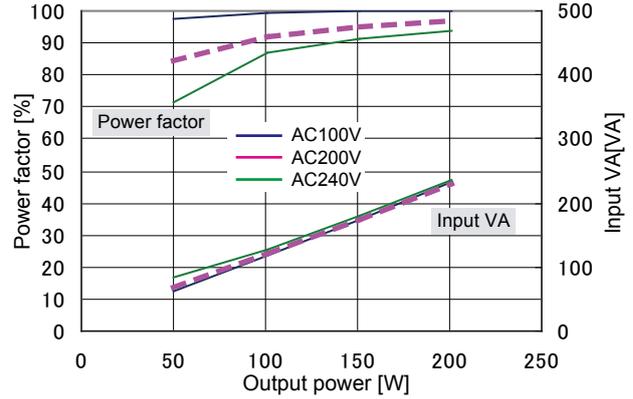


Characteristics Data(Typical features of the product series) mOZP-200-24 Series (Examples of actual measurement)

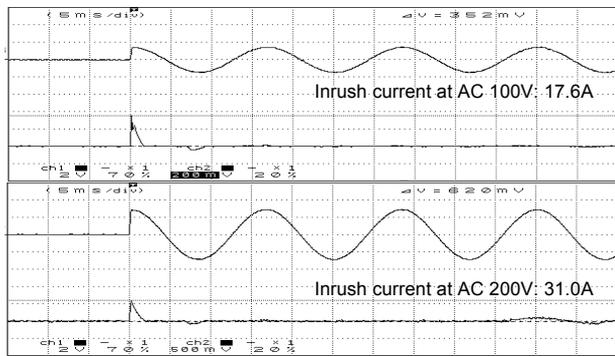
● Fig.7 Efficiency/Input Current Vs. Output Power



● Fig.8 Power Factor/Input VA Vs. Output Power



● Fig.9 Inrush Current



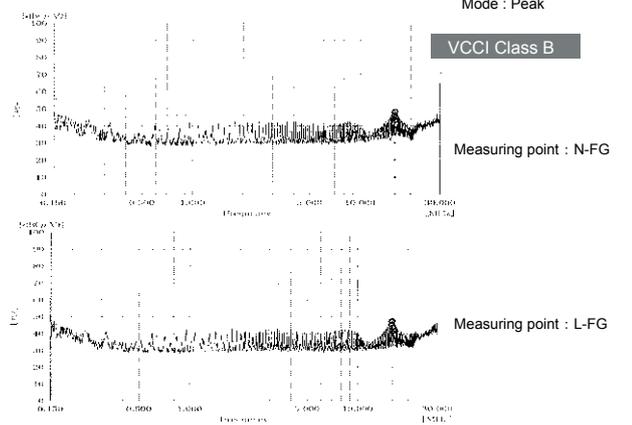
● Fig.10 Leakage Current

Input : AC100,200V
Load : Rated load and Min. load

	Rated load	Min. load
AC 100V	0.05mA	0.07mA
AC 200V	0.11mA	0.15mA

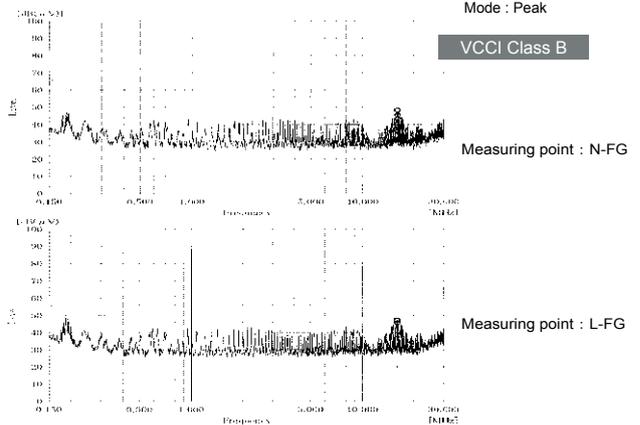
● Fig.11 Conducted Emission At 100V

Input : AC100V
Load : Rated
Mode : Peak



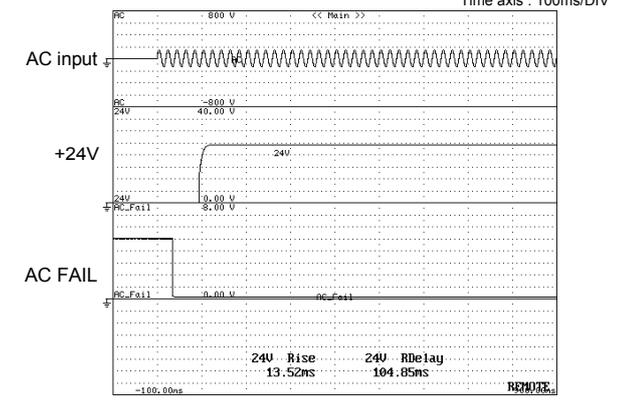
● Fig.12 Conducted Emission At 230V

Input : AC230V
Load : Rated
Mode : Peak



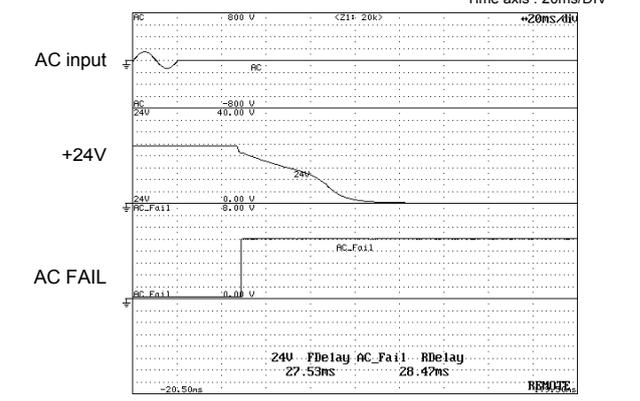
● Fig.13 Rising Characteristics At AC 100V

Input : AC100V
Load : Rated
Time axis : 100ms/DIV

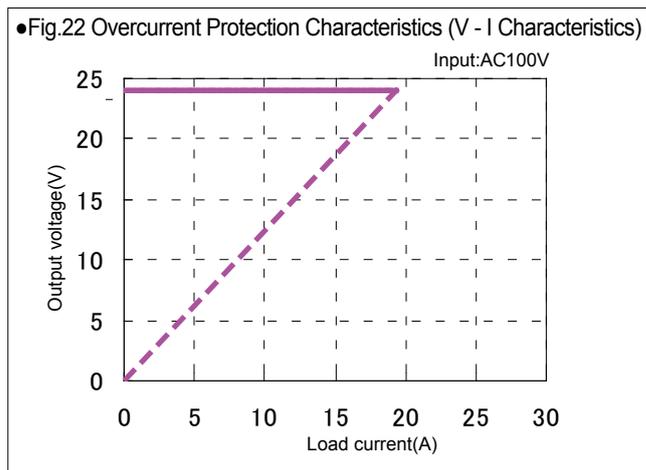
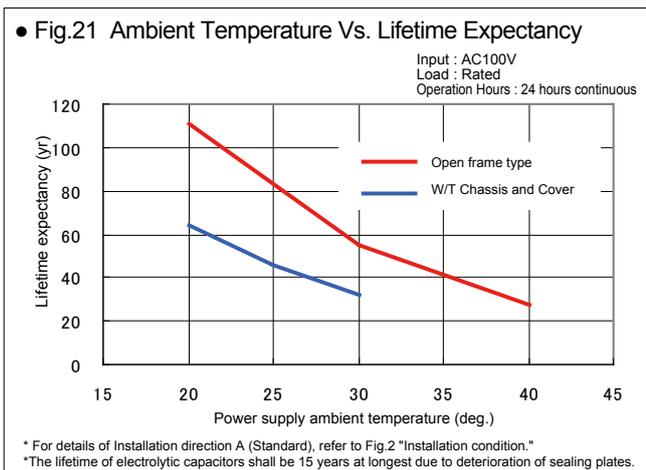
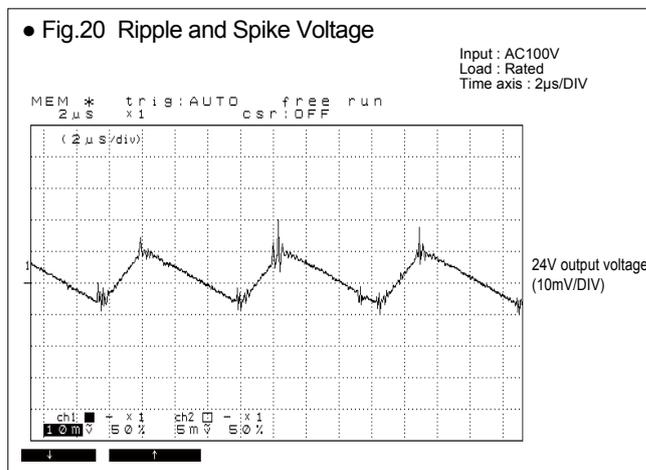
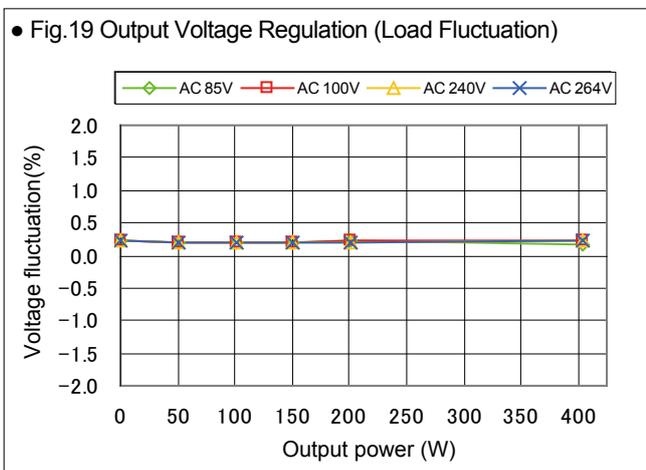
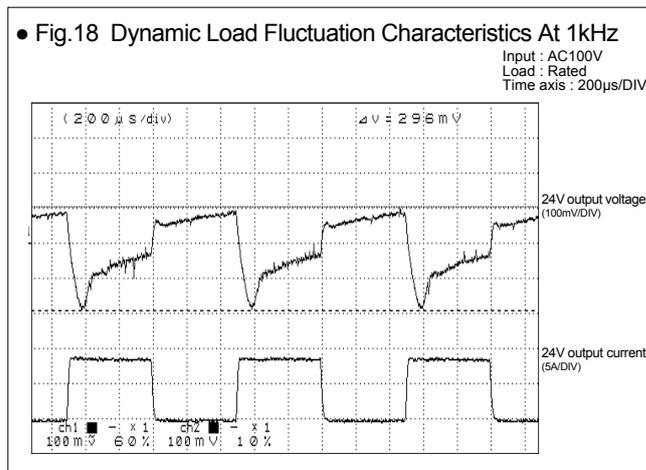
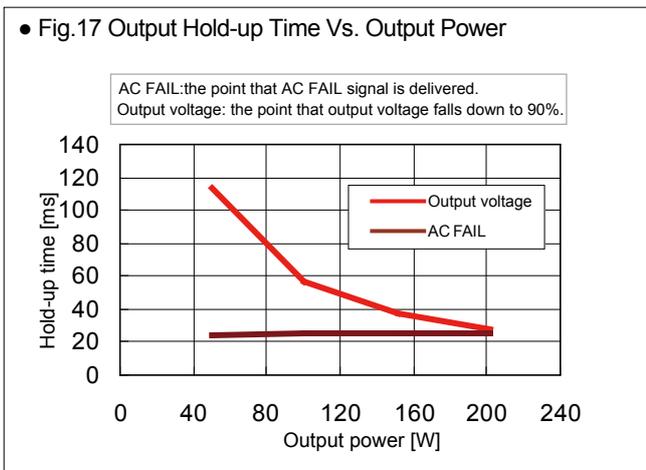
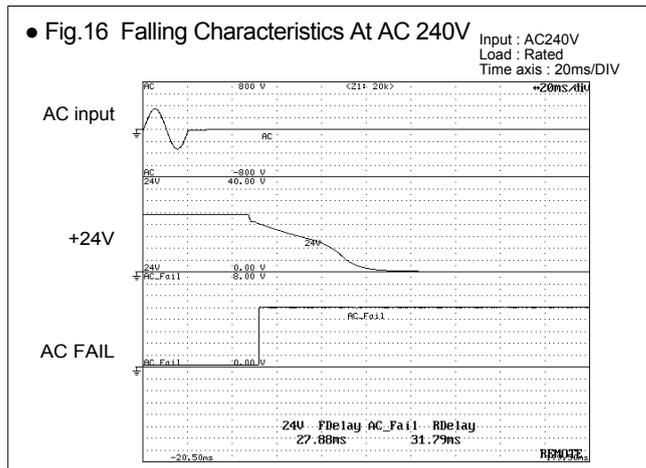
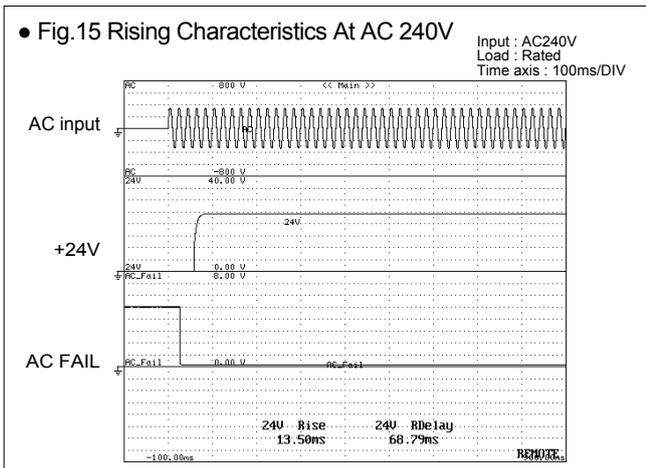


● Fig.14 Falling Characteristics At AC 100V

Input : AC100V
Load : Rated
Time axis : 20ms/DIV



Characteristics Data(Typical features of the product series) mOZP-200-24 Series (Examples of actual measurement)



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