Matsusada Precision

High speed, high voltage Amplifier

AMPS/AMP/AMS/AMT/COR/AMJ/AP/AS series

Selection Guide

High Speed High Voltage Amplifier

- Rack-mount type
- Handy type
- Module type

AMPS series P.02-05

AMP series P.06-09

AMS AMT series P.10-11

COR series P.12-13

AMJ series P.14-15

AP AS series P.16-17

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Ultra High Speed HV Amplifier

AMPS series is an ultra-high speed high voltage amplifier. It realized high voltage output of ±20kHz and very high slew rate 1200V/µs. The large current type of peak current 4A is also selectable.

FEATURES

- Broad lineup ±400V to ±20kV
- Generous peak current output 60mA to 4A
- High speed response Slew rate Max 1200V / µs

APPLICATIONS

- Beam deflection
- Laser modulation
- Ceramic materials testing
- HV cable testing
- Electrophotography process
- Piezo drive
- Evaluations of solar battery panel, secondary battery or display
- Various electrostatic testing

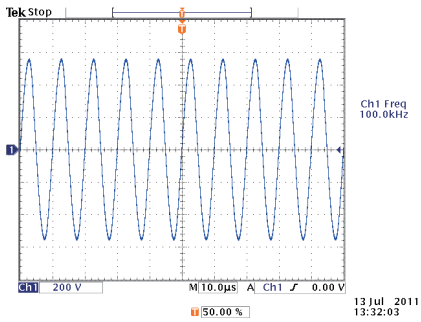
Ultra high slew rate 1200V / µs

±10kV and ±20kV output model achieved the conventional double high-speed response of slew rate 1200V / µs.
Laser modulation and beam deflection at unprecedented high speed are possible.

High-speed response of frequency bandwidth 100kHz

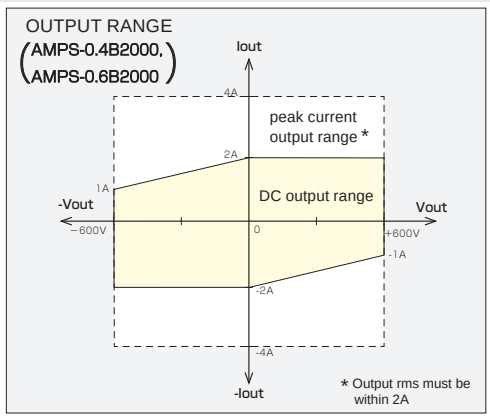
Frequency bandwidth with actual load is as high as 100kHz, and solve the problem of “When actual operation with load, the response become slow.” Ideal for higher speed printer or material evaluation testing.

Voltage rise waveform (at ±600V, ±2A output)
Model : AMPS-0.6B2000 (at rated load)



For measuring voltage and / or current

When the voltage at load is lower than the rated maximum output of AMPS series, constant voltage and high speed operation is possible by sinking the output current with current sink feature. As example of the development of ceramic and electrophotography process, by current sink, it is possible to absorb the voltage of a capacitive load quickly or to perform diselectrification smoothly.
And, because of double peak current of rated current in DC output, particularly, rise characteristics for the capacitive load can be improved.



LINEUP

Output Voltage	Output Current (DC+AC)	Rated output power	MODEL	Slew Rate (at rated output)	Frequency Response (Typical value at sine wave operation with resistive laod)	
					Full scale(-1dB)*	Small bandwidth (10% of full scale)(-3dB)
−400 to +400V	±2000mAmax or ±4000mApk 1mS	800W	AMPS-0.4B2000	400V / µs	DC to 100kHz	DC to 200kHz
−600 to +600V	±2000mAmax or ±4000mApk 1mS	1.2kW	AMPS-0.6B2000	500V / µs		
−2k to +2kV	±200mAmax or ±400mApk 1mS	400W	AMPS-2B200	1000V / µs	DC to 80kHz	DC to 160kHz
−5k to +5kV	±80mAmax or ±160mApk 1mS		AMPS-5B80		DC to 50kHz	DC to 100kHz
−10k to +10kV	±40mAmax or ±120mApk 1mS		AMPS-10B40	1200V / µs	DC to 20kHz	DC to 40kHz
−20k to +20kV	±20mAmax or ±60mApk 1mS		AMPS-20B20		DC to 10kHz	DC to 20kHz

*At frequency of full scale, output voltage may be clipped by power limitation.

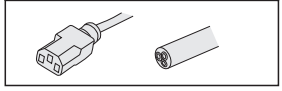
INPUT / OUTPUT CABLE

Input cable

[400W models]

CABLE TYPE 3 (Option)

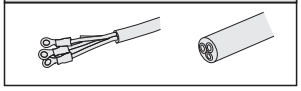
Inlet type / Flying lead / 250V rated / Single phase(3-core) / Black



[800W,1200W models]

CABLE TYPE 5 (Standard)

M4 roand terminal×3 / Flying lead / 250V rated /Single phase(3-core) / Black



The length is 2.5m for both.(Please see CABLE series catalog for details)

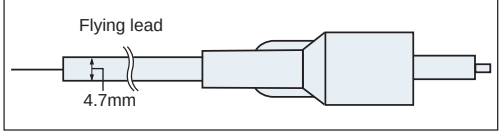
Output cable

Less than 600V models

using terminal block output line 1.5m (standard)

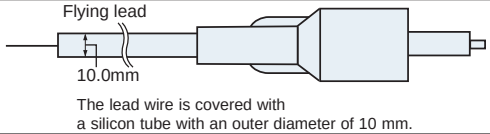
2kV to 10kV models

CN-40-AHVP HV output cable 1.5m (standard)
CN-40-AHVP(5) HV output cable 5m (-L(5m) option)



AMPS-20B20

CN-40-AHVP TU HV output cable 1.5m (standard)
CN-40 AHVP TU(5) HV output cable 5m (-L(5m) option)



The lead wire is covered with
a silicon tube with an outer diameter of 10 mm.

SPECIFICATIONS

Input voltage / current	230VAC±10% 50/60Hz single phase 8A typ(800W, 1200W models) 230VAC±10% 50/60Hz single phase 5A typ(400W model)
Output voltage control	External control voltage Vcon-in = -10V to +10V *1 (Input Impedance greater than 10kΩ)
DC Bias	Front panel 10-turn potentiometer enables setting between −100% and +100%
Regulation	Line : ±0.05% (input voltage ±10% input change) Load : 0.05% (10% to 100% load change) *2
Ripple	Less than 0.02% +0.5Vp-p *2
Stability	0.02% / Hr typ *2
DC output voltage display	3.5-digit digital meter *3
Output voltage monitor	-10V to +10V from front panel BNC terminal (Output impedance 1kΩ)
Output current monitor	-10V to +10V(10Vpeak) from front panel BNC terminal (Output impedance 1kΩ)
Remote switch ON / OFF	Output ON / OFF with external contact signal (Short : ON, Open : OFF)
Protection	Over current protection with cut off, over voltage protection, output short circuit, arc protection and blackout protection.
Operating Temp.	0°C to +40°C
Storage Temp.	-20°C to +60°C
Humidity	20% to 75%RH(no condensation)
Accessories	Input AC cable 2.5m (1) (up to 600V models : flying lead type more than 2kV models : inlet type) Output HV cable flying lead 1.5m (1) Instruction Manual (1)

∗1 Offset voltage at Vcon-in = 0V is less than 0.1% of rated output.
∗2 At DC operation with resistive load maximum rated output.
∗3 At DC output : DC voltage display. At more than 10Hz output : Average voltage display

OPTION

-LOc **Adjustable cut-off current setting ***

Limit setting value to trigger to cut off the output current becomes variable by adjusting the potentiometer on the front panel between the range 10% to 105% of the rated current.

-LC **Current limit ***

Output current will not be cut off but will be regulated by lowering the output voltage at a occurence of overcurrent.

-LCc **Variable current limit ***

Output current will not be cut off but will be regulated by lowering the output voltage at a occurence of overcurrent. The setting value to trigger to regulate the output current becomes variable by adjusting the potentiometer on the front panel between the range 10% to 105% of the rated current.

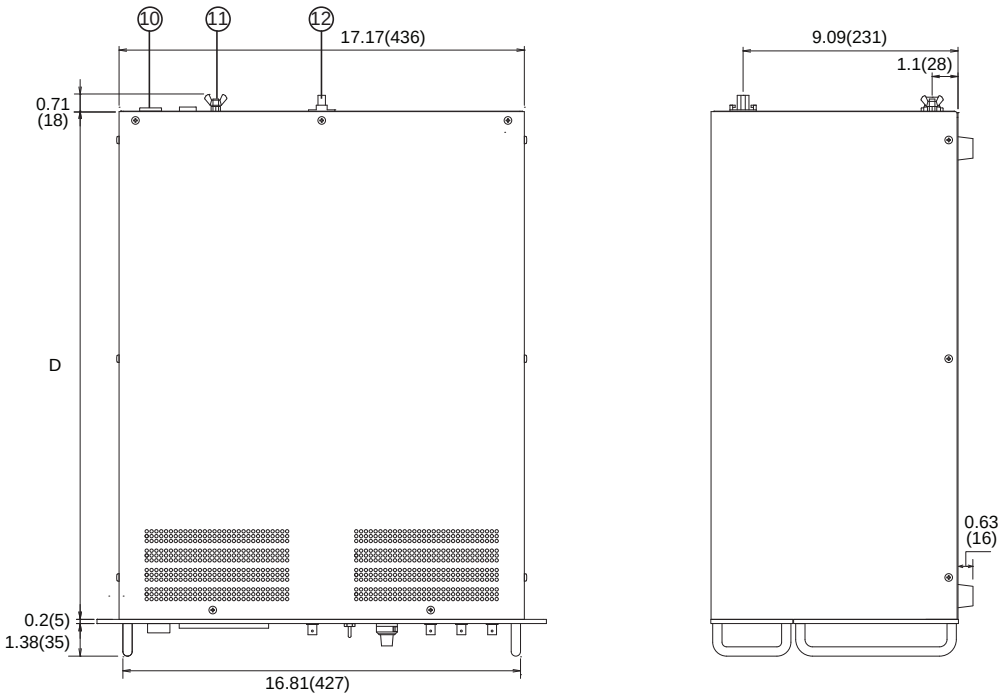
-LN **Cancellation of blackout protection**

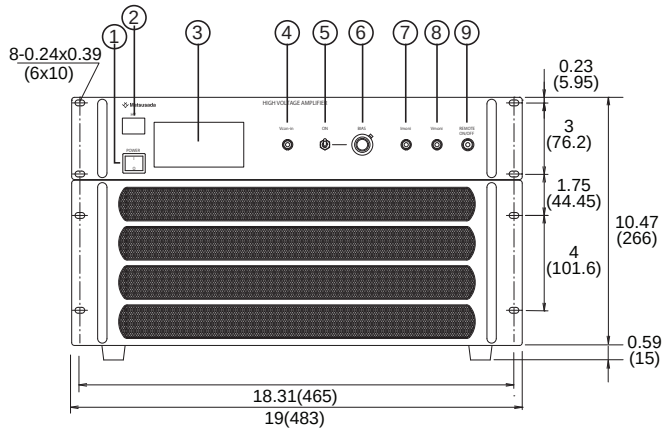
-L(5m) **HV output cable 5m (more than 2kV models)**

Please note that using 5-meter long cable may decrease slew rate, response time, and distort output waveforms. Please see Page 19 “Capacitive load” for details.

How to order When ordering, suffix the above option number to the model number.
Note that selecting -LOc and LC and -LCc together is not allowed.
<e.g.> AMPS-0.6B2000-LC

DIMMENSIONS inch(mm)





AMPS-2B200 AMPS-5B80 AMPS-10B40 AMPS-20B20	AMPS-0.4B2000 AMPS-0.6B2000
D=21.65(550)	D=24.02(610)
Weight : About 28kg	Weight : About 45kg

① **POWER ON / OFF switch** Have priority to all other operations for safety reason.

② **HV ON / OFF switch** To be also used to reset output cutoff status due to output over load, output short circuit protection or black out protection. Remote switch operation is possible only when output switch is on.

③ **OUTPUT voltage meter**

④ **External control voltage (Vcon-in)input connector** BNC receptacle

⑤ **Bias ON / OFF switch**

⑥ **Bias setting dial** 10-turn potentiometer

⑦ **OUTPUT current monitor terminal** BNC receptacle

⑧ **OUTPUT voltage monitor terminal** BNC receptacle

⑨ **Remote ON / OFF terminal** BNC receptacle

⑩ **Input terminal**
up to 600V models : terminal block
more than 2kV models : inlet

⑪ **Ground terminal** M6

⑫ **OUTPUT terminal**

Ultra High Speed HV Amplifier

Additional output ranges for solar battery panel evaluations!

AMP series is an ultra high speed high voltage amplifier. It realized as fast as 700V / µs even with load, and approximately 2 times faster than existing models. With the capability of peak current output of 3 times, it suppress the distortion of waveform when with capacitive load.

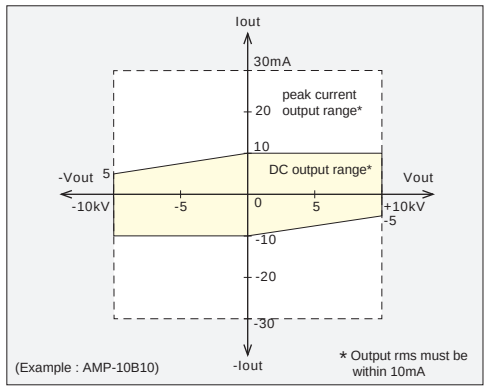
CE (Low Voltage Directive) approved.

For measuring voltage and / or current

When the voltage at load is lower than the rated maximum output of AMP series, constant voltage and high speed operation is possible by sinking the output current with current sink feature.

As example of solar battery application, cell / panel voltage and current data can be obtained by logging the change of current sink by changing the voltage to solar battery cell / panel gradually. At that time with its high slew rate of 300v / µs AMP can get more detailed sampling. AMP is a bi-polar power supply with 0 crossing, and so, it can measure the output short current at 0V. Moreover, it can output peak current of 3 times more than rated current(at DC). (see right chart)

OUTPUT RANGE



Suitable for the trend to higher voltage for cell / panel evaluation

Voltage rating required for solar battery(panel) evaluation is getting higher and higher. AMP series added more lineups raging from ±600V to ±30kV to meet the demand for evaluation of higher voltage solar battery panel as well as evaluation of cell / panel with wider output range.

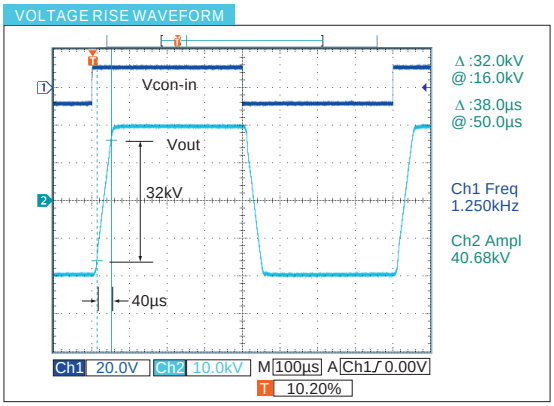
APPLICATION

- Solar battery panel evaluations
- Corona discharge
- Electrophotography process
- Electrorheological fluid
- Various electrostatic testing
- Beam deflection
- Electrostatic chuck
- Breakdown voltage testing
- Lighting discharge tube

High speed response of slew rate 700V/µs *

*Change model to model

VOLTAGE RISE WAVEFORM



Slew rate with actual load is as high as 700v / µs, and solve the problem of "When actual operation with load, the response become slow."

Ideal for higher speed printer or material evaluation testing.

Example of waveform : model AMP-20B20
Operation condition : Vcon-in=±10V Vout=±20kV
R_L=1MΩ F=1.25kHz
Slew rate: SR=32kV / 40µs > 700V / µs

LINEUP

Output Voltage	Output Current (DC+AC)	Max. output power	MODEL	Slew Rate	Frequency Response(−3db)*1	
					Full scale *2	Small bandwidth (10% of full scale)
−600V to +600Vdc	±2000mA max and ±4000mApk 1mS max	1200W	AMP-0.6B2000	≧ 300V / μs	DC to 40kHz	DC to 60kHz
−1kV to +1kVdc	±1200mA max and ±2400mApk 1mS max	1200W	AMP-1B1200		DC to 30kHz	DC to 50kHz
−2kV to +2kVdc	±200mA max and ±400mApk 1mS max	400W	CE *3 AMP-2B200	≧ 700V / μs	DC to 20kHz	DC to 50kHz
−5kV to +5kVdc	±80mA max and ±160mApk 1mS max	400W	CE *3 AMP-5B80		DC to 10kHz	DC to 30kHz
−10kV to +10kVdc	±10mA max and ±30mApk 1mS max	100W	CE *3 AMP-10B10		DC to 7kHz	DC to 25kHz
	±40mA max and ±120mApk 1mS max	400W	CE *3 AMP-10B40			
−20kV to +20kVdc	±20mA max and ±60mApk 1mS max	400W	CE *3 AMP-20B20		DC to 4kHz	DC to 20kHz
−30kV to +30kVdc	±10mA max and ±30mApk 1mS max	300W	AMP-30B10	≧ 360V / μs	DC to 1kHz	DC to 5kHz
−40kV to +40kVdc	±20mA max and ±40mApk 1mS max	800W	AMP-40B20		DC to 1kHz	DC to 5kHz

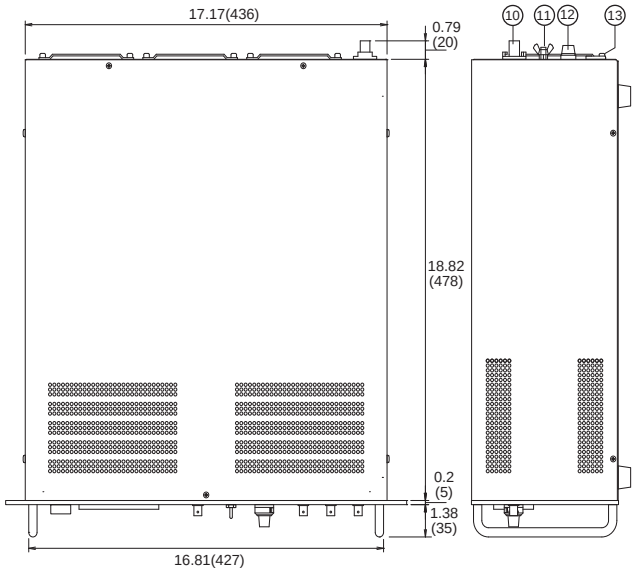
*1 Typical value at sine wave operation with resistive load.
*2 At frequency of full scale, output voltage may be clipped by power limitation.
*3 They comply with the low voltage directive.

SPECIFICATIONS

Input voltage / current	230VAC±10% 50 / 60Hz single phase 8Atyp(AMP-0.6B2000, AMP-1B1200) 230VAC±10% 50 / 60Hz single phase 5Atyp(AMP-2B200, AMP-5B80, AMP-10B40, AMP-20B20, AMP-30B10) 200V to 240VAC ±10% 50 / 60Hz single phase 10Atyp(AMP-40B20) 100V to 240VAC ±10% 50 / 60Hz single phase 3.5Atyp@100VAC(AMP-10B10)
Output voltage control	External control voltage Vcon-in = -10V to +10V *1 (Input Impedance greater than 10kΩ)
DC Bias	Front panel 10-turn potentiometer enables setting between −100% and +100%
Regulation	Line : ±0.05%(115V or 230V ±10% input change) Load : 0.05%(10% to 100% load change) *2
Ripple	Less than 0.02% +1Vp-p *2
Stability	0.016% / Hr typ *2
DC output voltage display	3.5-digit digital meter *3
Output voltage monitor	-10V to +10V from front panel BNC terminal (Output impedance 1kΩ)
Output current monitor	-10V to +10V(10Vpeak) from front panel BNC terminal (Output impedance 1kΩ. Up to 3kHz bandwidth)
Remote switch ON/OFF	Output ON / OFF with external contact signal (Short : ON, Open : OFF)
Protection	Over current protection with cut off, over voltage protection output short circuit protection, arc protection and blackout protection.
Operating Temp.	0°C to +40°C
Storage Temp.	-20°C to +60°C
Humidity	20 to 75%RH(no condensation)
Accessories	Input AC cable 2.5m (1) ■With 3-pin connector for 115VAC input ■Flying lead(open end) for 230VAC input Output HV cable flying lead (1) (Please refer to P.9 "Output cable" about the length of output cable.) Instruction Manual (1)

*1 Offset voltage at Vcon-in = 0V is less than 0.1% of rated output.
*2 At DC operation with resistive load maximum rated output.
*3 At DC output : DC voltage display. At more than 10Hz output : Average voltage display

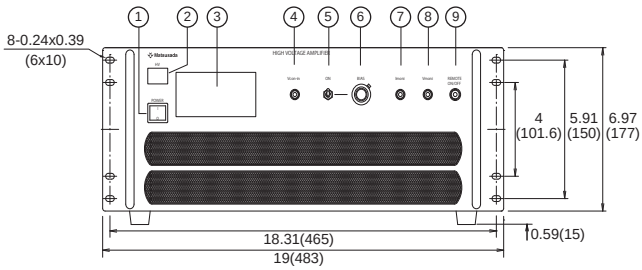
DIMENSIONS inch(mm)



① **POWER ON / OFF switch**	Have priority to all other operations for safety reason.
② **HV ON / OFF switch**	To be also used to reset output cutoff status due to output over load, output short circuit protection or black out protection. Remote switch operation is possible only when output switch is on.
③ **OUTPUT voltage meter**	
④ **External control voltage (Vcon-in)input connector**	BNC receptacle
⑤ **Bias ON/OFF switch**	
⑥ **Bias setting dial**	10-turn potentiometer
⑦ **OUTPUT current monitor terminal**	BNC receptacle
⑧ **OUTPUT voltage monitor terminal**	BNC receptacle
⑨ **Remote ON/OFF terminal**	BNC receptacle
⑩ **OUTPUT connector**	
⑪ **Ground terminal**	M6
⑫ **FUSE**	
⑬ **AC inlet**	

AMP-10B10
D=19.06(484)*
Weight : 23kg approx.

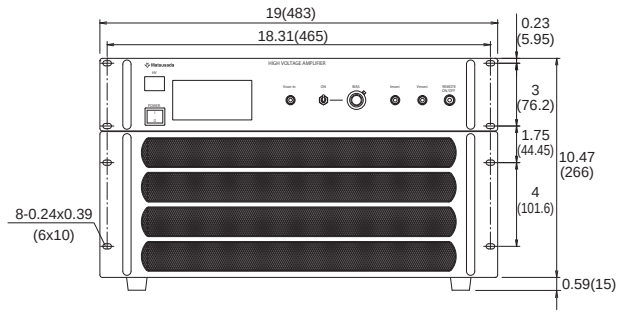
*Except projection



AMP-2B200, AMP-5B80
AMP-10B40, AMP-20B20
D=21.65(550)*
Weight : 28kg approx.

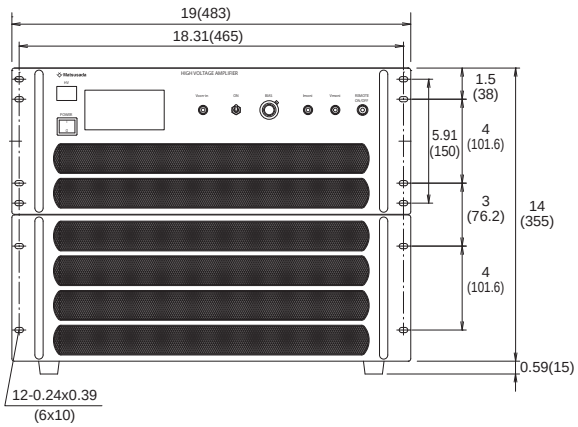
AMP-0.6B2000
D=24.02(610)*
Weight : 45kg approx.

*Except projection



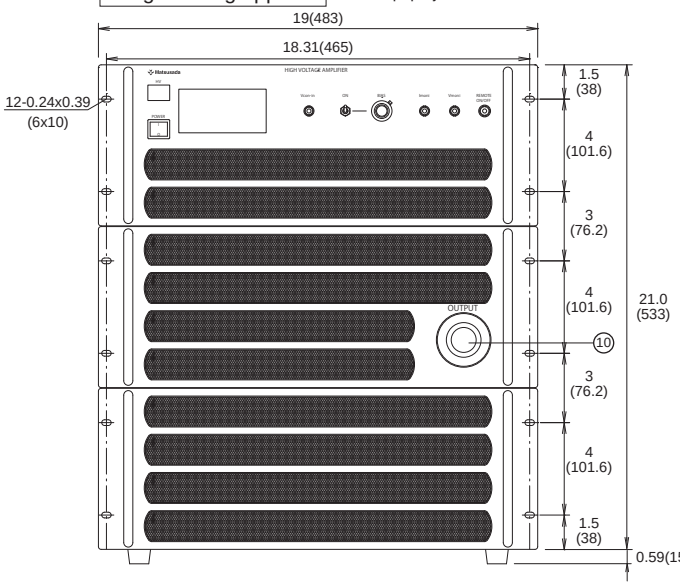
AMP-1B1200
D=24.02(610)*
Weight : 50kg approx.

*Except projection



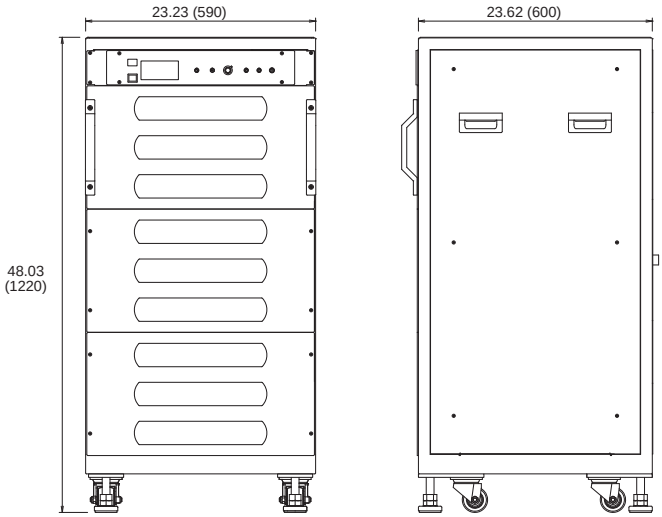
AMP-30B10
D=21.65(550)*
Weight : 50kg approx.

*Except projection



AMP-40B20
Weight : 100kg approx.

*Except projection



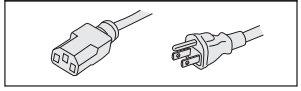
INPUT / OUTPUT CABLE

Input cable

[AMP-10B10]

CABLE TYPE 1 (Standard)*

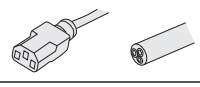
3-pin plug(Type-A) / Inlet type / 125V rated / Single phase(3-core) / Black



[300W and 400W models]

CABLE TYPE 3 (Standard)

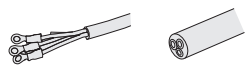
Inlet type / Flying lead / 250V rated / Single phase(3-core) / Black



[800W,1200W models]

CABLE TYPE 5 (Standard)

M4 roand terminal×3 / Flying lead / 250V rated /Single phase(3-core) / Black



The length is 2.5m for both.(Please see CABLE series catalog for details)

*CABLE TYPE 3 is needed separately when the input voltage is 200V to 240VAC.

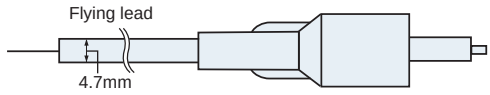
Output cable

Less than 1kV models

using terminal board output line 1.5m (standard)

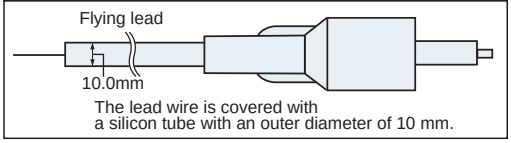
2kV to 10kV models

CN-40-AHVP HV output cable 1.5m (standard)
CN-40-AHVP(5) HV output cable 5m (-L(5m) option)



AMP-20B20

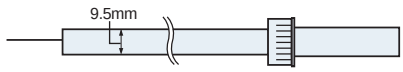
CN-40-AHVP TU HV output cable 1.5m (standard)
CN-40 AHVP TU(5) HV output cable 5m (-L(5m) option)



The lead wire is covered with a silicon tube with an outer diameter of 10 mm.

AMP-30B10, AMP-40B20

CN-50-AHVP HV output cable 3m (standard)



No Shielded silicon Flying lead

OPTION

-LOc **Adjustable cut-off current setting value ***
Limit setting value to trigger to cut off the output current becomes variable by adjusting the potentiometer on the front panel between the range 10% to 105% of the rated current.

-LC **Current limit ***
Output current will not be cut off but will be regulated by lowering the output voltage at a occurence of overcurrent.

-LCc **Variable current limit ***
Output current will not be cut off but will be regulated by lowering the output voltage at a occurence of overcurrent.
The setting value to trigger to regulate the output current becomes variable by adjusting the potentiometer on the front panel between the range 10% to 105% of the rated current.

-LN **Cancellation of blackout protection**

-L(5m) **HV output cable 5m (more than 2kV models except AMP-30B10 and AMP-40B20)**
Please note that using 5-meter long cable may decrease slew rate, response time, and distort output waveforms.Please see Page 19 “Capacitive load” for details.

How to order When ordering, suffix the above option number to the model number.
Note that selecting -LOc and LC and -LCc together is not allowed.
<e.g.> AMP-10B10-LCN(5m) AMP-2B200-LNOc(5m)
in alphabetical, cable length order

High Voltage Amplifier

AMS·AMT series is a rack mountable type, fast response high voltage operational amplifier. It gives quick response as fast as 100kHz and provides high voltage outputs in reference to its input wave forms such as Sine, Triangle, Saw Tooth, Square Wave Forms and more.
13 different models are available as an standard unit. They are all solid state. Output voltage ranges from ±600V to ±20kV.

FEATURES

- Output ±600V to ±20kV
- High speed response 360V /μ sec (AMT)
- Various types of output wave forms according to the input wave
- DC bias function
- DC output voltage monitor(3.5-digit digital meter)

APPLICATIONS

- Beam deflection
- Corona discharge
- Electrostatic chuck
- Electrophotography process
- Breakdown voltage testing
- Electrorheological fluid
- Lighting discharge tube
- Various electrostatic testing

LINEUP

< AMS series : High Speed model >

Output			MODEL	Slew Rate	Frequency Response(-3dB)*	
Voltage(Vdc)	Current(mA)	Max.power(W)			full scale	10% of full scale
-600 to +600	±50	30	AMS-0.6B50	30V / μs	DC to 15kHz	DC to 30kHz
-1k to +1k	±30		AMS-1B30		DC to 10kHz	DC to 20kHz
-1.5k to +1.5k	±20		AMS-1.5B20		DC to 6kHz	DC to 12kHz
-3k to +3k	±10		AMS-3B10		DC to 3kHz	DC to 6kHz
-5k to +5k	±6		AMS-5B6		DC to 2kHz	DC to 4kHz
-10k to +10k	±2	20	AMS-10B2		DC to 1kHz	DC to 2kHz

< AMT series : Ultra High Speed · High Power model >

Output			MODEL	Slew Rate	Frequency Response(-3dB)*	
Voltage(Vdc)	Current(mA)	Max.power(W)			full scale	10% of full scale
-600 to +600	±100	60	AMT-0.6B100	250V / μs	DC to 100kHz	DC to 100kHz
-1k to +1k	±60		AMT-1B60		DC to 60kHz	
-1.5k to +1.5k	±40		AMT-1.5B40		DC to 40kHz	DC to 80kHz
-3k to +3k	±20		AMT-3B20	360V / μs	DC to 30kHz	DC to 60kHz
-5k to +5k		100	AMT-5B20		DC to 20kHz	DC to 40kHz
-10k to +10k	±10		AMT-10B10		DC to 10kHz	DC to 20kHz
-20k to +20k		200	AMT-20B10		DC to 5kHz	DC to 10kHz

* Typical value at sine wave.

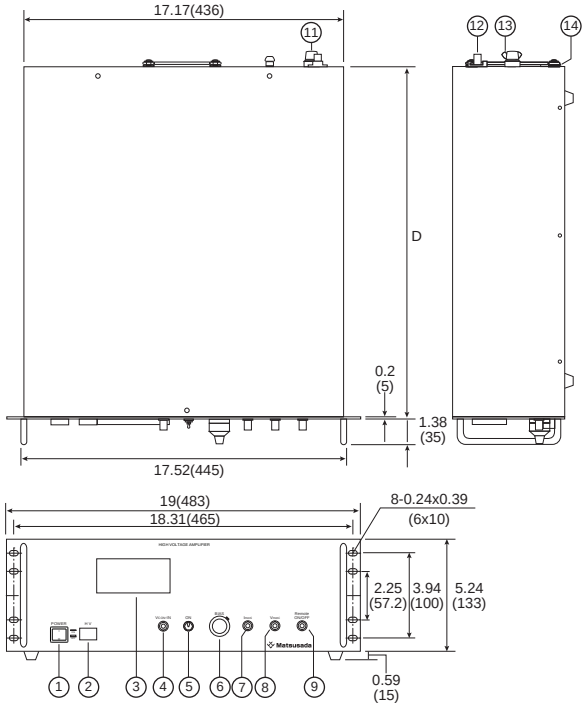
SPECIFICATIONS

Input voltage	115VAC ±10% 50 / 60Hz single phase
Output control	External voltage control Vcon-in -10V to +10V *¹ (input impedance : ≧10kΩ)
DC Bias	Front panel 10-turn potentiometer enables setting between −100% and +100%
Regulation	Line : ±0.05%(±10% line change) Load : 0.05%(10 to 100% load change)*²
Ripple	AMS : ≦ 0.1% p-p *² AMT : ≦ 0.02%+1Vp-p *²
Stability	0.016% / Hr typ. *²
Digital Panel Meter	3.5-digit display *³
Voltage Monitor	-10V to +10V from BNC connector on front panel. (output impedance 1kΩ)
Remote ON/OFF	Enable to output ON/OFF by external contact signal (short:ON, open:OFF)
Protection	Protection against over current by cutting of HV output. Output short circuit and over voltage. Arc protection and blackout protection.
Operating Temp.	0℃ to +40℃
Storage Temp.	-20℃ to +60℃
Humidity	20 to 80%RH(no condensation)
Accessories	Input AC cable 2.5m (1) Output HV cable flying lead 1.5m (1) Instruction Manual (1)

*¹ Offset voltage : within 0.5% of rated output at Vcon-in = 0V
*² Value at DC output with resistive load maximum rating
*³ DC output : DC voltage
More than 10Hz output : Average voltage

DIMENSIONS inch(mm)

AMS, AMT



Model	D	Weight
AMS : all models	19.06(484)	14 to 18kg
AMT : 600V to 10kV	19.06(484)	14 to 23kg
AMT-20B10	24.06(611)	27kg

① **POWER ON / OFF switch** — Have priority to all other operations for safety reason.

② **HV ON/OFF switch** — To be also used to reset output cutoff status due to output over load, output short circuit protection or black out protection. Remote switch operation is possible only when output switch is on.

③ **OUTPUT voltage meter**

④ **External control voltage (Vcon-in)input connector** — BNC receptacle

⑤ **Bias ON / OFF switch**

⑥ **Bias setting dial** — 10-turn potentiometer

⑦ **OUTPUT current monitor terminal(option)** — BNC receptacle

⑧ **OUTPUT voltage monitor terminal** — BNC receptacle

⑨ **Remote ON/OFF terminal** — BNC receptacle

⑩ **Air Intake**

⑪ **FUSE**

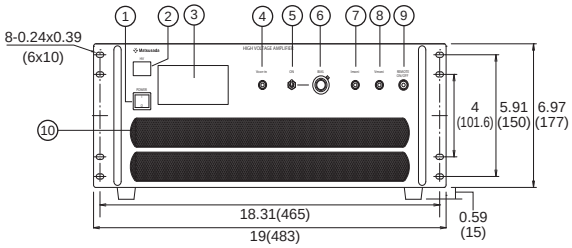
⑫ **OUTPUT connector**

⑬ **Ground terminal** — M6

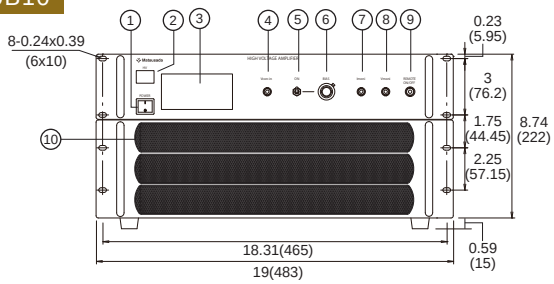
⑭ **AC inlet**

* Design of rear panel can be slightly different from model to model. Please contact our sales office if details are required.

AMT(±600V to ±10kV models)

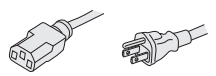
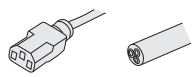


AMT-20B10



INPUT / OUTPUT CABLE

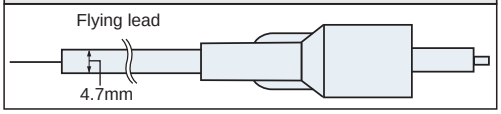
Input cable

CABLE TYPE 1 (Standard)	**CABLE TYPE 3** (Option) only for -L(230V)optional models
3-pin plug(Type-A) / Inlet type / 125V rated / Single phase(3-core) / Black	Inlet type / Flying lead / 250V rated / Single phase(3-core) / Black
	

The length is 2.5m for both.(Please see CABLE series catalog for details)

Output cable

CN-40-AHVP **HV output cable 1.5m (standard)**
CN-40-AHVP(5) **HV output cable 5m (-L(5m) option)**



OPTIONS

-LC	CURRENT LIMIT Limits the output current at time of overload
-LN	Cancellation of blackout protection
-L1	Output current monitor -10V to +10V from BNC connector on front panel(output impedance 1kΩ up to 2kHz bandwidth)
-L(230V)	Input Voltage AC230V ±10% single phase
-L(5m)	HV output cable 5m Please note that using 5-meter long cable may decrease slew rate, response time, and distort output waveforms. Please see Page 19 “Capacitive load” for details.

How to order When ordering, suffix the above option number to the model number.
<e.g.> AMS-1B30-LC, AMS-1B30-LCN1(230V)(50m)
in alphabetical, cable length order

Constant Voltage and Constant Current HV Amplifier

COR-10B2 is a bi-polar high speed HV amplifier developed with our long experience and expertise in HV power supply field. High performance and reliability is achieved by all-solid-state configuration.

FEATURES

- COR is the high voltage amplifier which can be controled with CC mode and CV mode.
- Return current terminal is standard and best for corona current control
- Four-quadrant output ±10kV, ±2mA

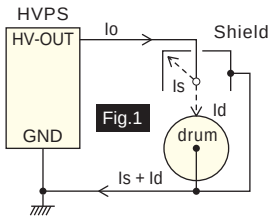
APPLICATIONS

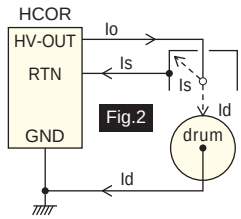
- Photosensitive drum testing
- Experiment of corona discharge
- Research and Development of electro photographic process

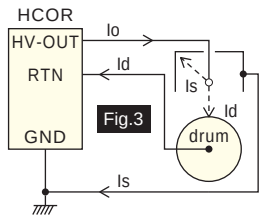
Corona current control (return current control)

When a HV power supply is used to charge the photo sensitive drum, in most case the purpose is to control the drum current(Id). Normal power supply can only control the drum current(Id) and lead current to shield. (fig 1.)

Using the RTN terminal COR enable you to control the drum current(Id) precisely even if the drum is grounded or not. (fig2. and 3.)







LINEUP

Output voltage	Output current	Max.output power	MODEL	Slew Rate	Frequency Response(-3dB)* (full scale)
-10kV to +10kVdc	-2mA to +2mA	20W	COR-10B2	more then 30V / µs	DC to 1kHz

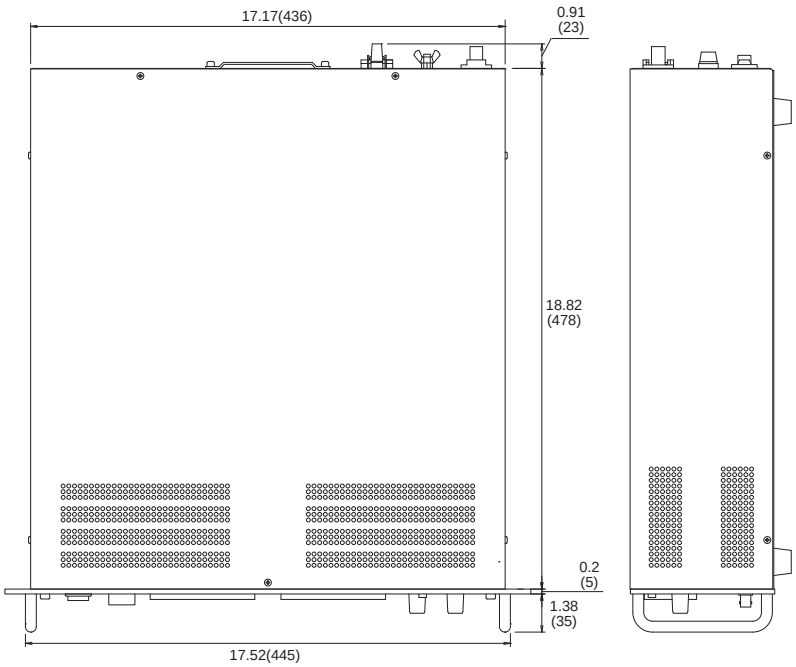
* Typical value at sine wave.

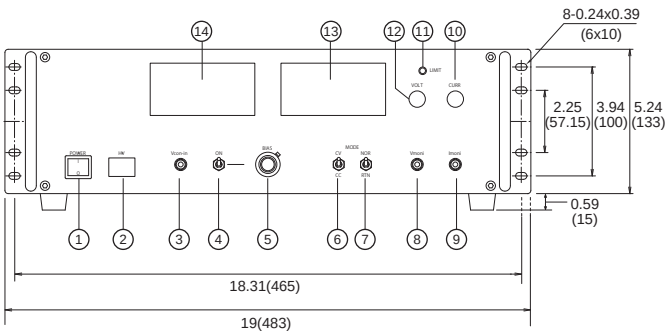
SPECIFICATIONS

Input Voltage	115VAC±10% 50 / 60Hz single phase
Output Voltage Control (Vcon-in)	-10V to +10V (input impedance : ≧ 10kΩ)
Constant Voltage mode	Output voltage(V) = Vcon-in × 1000
Constant Current mode	Output current(mA) = Vcon-in × 0.2
DC Bias	Front panel 10-turn potentiometer enables setting between –100% and +100%
Return Current Control	Enable to control corona discharge current by using return terminal
Regulation(DC)	Line : ±0.1% (±10% line change) Load : 0.1% (10% to 100% load change)
Ripple	≦ 0.1%p-p
Remote ON / OFF	Enable to output ON / OFF by external contact signal (short : ON, open : OFF)

Stability	0.016% / Hr typ.
DC Output Display	Output Voltage 3.5 digits digital meter Output Current 3.5 digits digital meter
Output Monitor	Output Voltage : -10V to +10V Output Current : -10V to +10V (Output current monitor is tuned with detect current switch)
Protection	Output short circuit and arc protection, over voltage and over current protection. Blackout protection
Operation Temp.	0°C to +40°C
Storage Temp.	-20°C to +60°C
Humidity	20 to 80%RH(no condensation)
Accessories	Input AC cable 2.5m (1) Output HV cable flying lead 1.5m (1) Instruction Manual (1)

DIMENSIONS inch(mm)

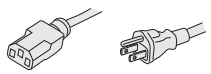
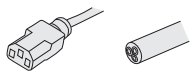




① POWER ON / OFF switch
② HV ON / OFF switch
③ Vcon-in connector
④ Bias ON / OFF switch
⑤ Bias setting dial
⑥ CC / CV mode change switch
⑦ CC mode NOR / RTN select switch
⑧ Output voltage monitor
⑨ Output current monitor
⑩ Current limit setting dial
⑪ Limit indication LED
⑫ Voltage limit setting dial
⑬ Digital current meter
⑭ Digital voltage meter

INPUT / OUTPUT CABLE

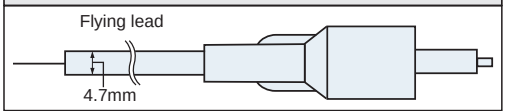
Input cable

CABLE TYPE 1 (Standard)	**CABLE TYPE 3** (Option) only for -L(230V)optional models
3-pin plug(Type-A) / Inlet type / 125V rated / Single phase(3-core) / Black	Inlet type / Flying lead / 250V rated / Single phase(3-core) / Black
	

The length is 2.5m for both.(Please see CABLE series catalog for details)

Output cable

CN-40-AHVP	**HV output cable 1.5m (standard)**
CN-40-AHVP(5)	**HV output cable 5m (-L(5m) option)**



OPTIONS

-L(230V) Input Voltage AC230V ±10% single phase

-L(5m) HV output cable 5m
Please note that using 5-meter long cable may decrease slew rate, response time, and distort output waveforms.
Please see Page 19 “Capacitive load” for details.

How to order When ordering, suffix the above option number to the model number.
<e.g.> COR-10B2-L(230V)(5m)

Ultra Compact and Fast Responce HV Amplifier

40W model

20W model

AMJ series is a rack mountable type, fast response high voltage operational amplifier.
It provide high voltage and fast response as high as 75kHz according to its input waveforms including Sine, Triangle, Saw Tooth, Square and more.
7 different models are available as an standard unit. They are all solid state power supplies.
Output voltage ranges from ±500V to ±4kV.

FEATURES

- Ultra compact
- High speed response 75kHz max
- Various types of output wave forms
- according to the input wave
- DC bias function
- DC output voltage monitor (3.5-digit digital meter)

APPLICATIONS

- Beam deflection
- Breakdown voltage testing
- Electrophotography process
- Lighting discharge tube
- Corona discharge
- Electrostatic chuck
- Electrorheological fluid
- Various electrostatic testing

LINEUP

Output voltage (Vdc)	Output current (mA)	MODEL	Slew rate	Frequency response (−3 dB)	Dimensions (P.3)
−500 to +500	40	AMJ-0.5B40	150 V / µs	DC to 75 kHz	A
	80	AMJ-0.5B80		DC to 75 kHz	B
−1 k to +1 k	20	AMJ-1B20		DC to 40 kHz	A
	40	AMJ-1B40		DC to 40 kHz	B
−1.5 k to +1.5 k	20	AMJ-1.5B20		DC to 25 kHz	B
−2 k to +2 k	10	AMJ-2B10		DC to 18 kHz	A
	20	AMJ-2B20		DC to 18 kHz	B
−4 k to +4 k	10	AMJ-4B10		DC to 9 kHz	B

SPECIFICATIONS

Input voltage	185 to 264 Vac 50 / 60Hz single phase
Output voltage control	External control voltage Vcon-in = -10V to +10V*1 (Input Impedance greater than 10kΩ)
DC Bias	Front panel 10-turn potentiometer enables setting between −100% and +100%
Regulation	Line : ±0.05%(115V ±10% input change) Load : 0.05%(10 to 100% load change) *2
Ripple	Less than 0.1% *2
Stability	0.016% / H typ *2
DC output voltage display	3.5-digit digital meter *3
Output voltage monitor	−10V to +10V from front panel BNC terminal (Output impedance 1kΩ)
Remote switch ON / OFF	Output ON / OFF with external contact signal (Short : ON, Open : OFF)
Protection	Over current protection with cut off, over voltage protection, output short circuit, arc protection and blackout protection.
Operating Temp.	0°C to +40°C
Storage Temp.	−20°C to +60°C
Humidity	20 to 80%RH(no condensation)
Accessories	Input AC cable 2.5m (1) Output HV cable flying lead 1.5m (1) Instruction Manual (1)

∗1 Offset voltage at Vcon-in = 0V is less than 0.5% of rated output.
∗2 At DC operation with resistive load maximum rated output.
∗3 At DC output : DC voltage display.
At more than 10Hz output : Average voltage display

OPTION

-LCs Over current protection setting function The over current value is set by external voltage +0.5 to +10.5 Vdc.
When this option is chosen, please be sure to output, where external voltage is impressed to AMJ.

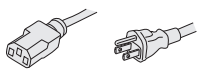
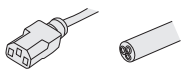
-L(5m) The length of HV output non-shielded cable is changed into 5 m to 1.5 m of a standard.

-L1 Output current monitor
Output voltage : −10 to +10 Vdc from BNC terminal on front panel
The Output impedance is 1 kΩ with up to 2kHz of bandwidth.

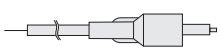
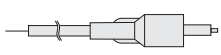
How to order When ordering, suffix the above option number to the model number.
Note that selecting -LCs and -L1 together is not allowed.
<e.g.> AMJ-4B10-LCs(5m) AMJ-0.5B40-L1(5m)
in alphabetical, cable length order

INPUT / OUTPUT CABLE

Input cable

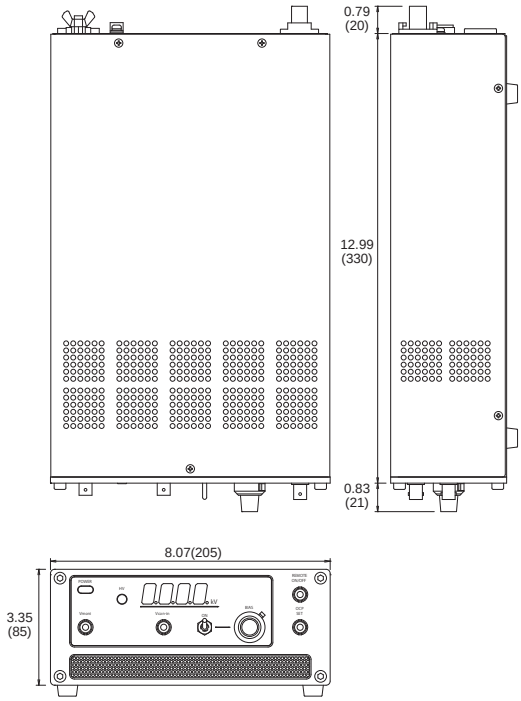
CABLE TYPE 1 (Standard)	**CABLE TYPE 3** (Option)
3-pin plug(Type-A) / Inlet type / 125V rated / Single phase(3-core) / Black	Inlet type / Flying lead / 250V rated / Single phase(3-core) / Black
	

Output cable

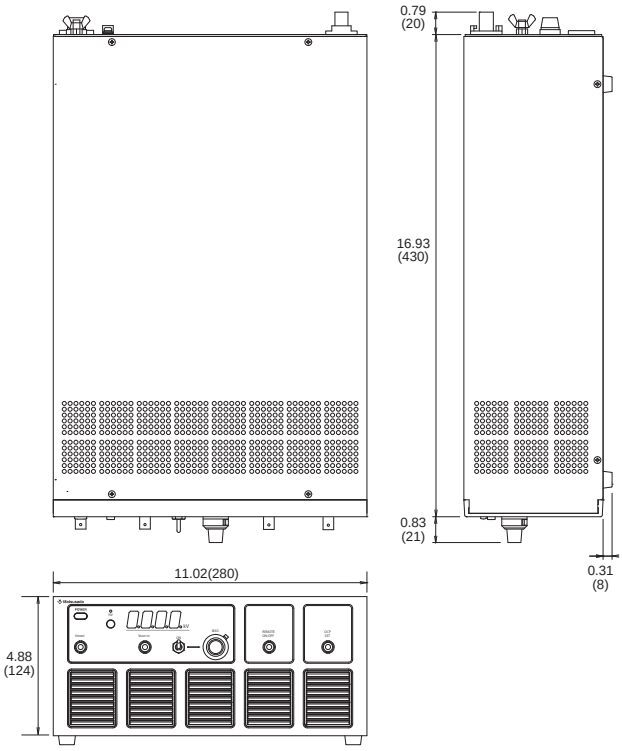
CN-40-AHVP (Standard)	**CN-40-AHVP(5)** (only for -L(5m) option)
40 kV / 0.5 A	40 kV / 0.5 A
	

DIMENSIONS inch(mm)

A



B



High Speed and High Voltage Amplifier Module

AP/AS series is an ultra-high speed high voltage amplifier through our experience and expertise on high voltage.
The series provides high response in AP series with 250 Hz to 3 kHz as well as in AS series with 1.5kHz to 50kHz, and it enables the high voltage output in sine waves, traingle waves, saw tooth waves and square waves based on the input wavefrom.
The all-solid-state models also provide the output voltage in a wide lineup of the positive or negative polarity output type with 300V to 10kV,and the bipolar output type with ±300V to 3kV.
Moreover, we provide special specifications according to customers' requests.

Compact and high performance module

FEATURES

1. Wide Output Range
The wide lineup by frequency, output voltage and output polarity will enable users to select the best suitable model for various application among 10 different models.

2. Fast Responsibility Maximum 30kHz
AS series achieved the higher speed and wider bandwidth of maximum 30kHz. 5 time faster than AP series.

3. Desired output waveform reference to input waveform.
External control voltage to BNC input terminal on front panel, -10V to +10V, controls the high voltage output with desired waveform.

4. Compact module type
The compact size is ideal for developing compact products and systems as integrated module. The encapsulation molding which is well resistive to moisture, dust, vibration or impact gain the reliability of the product.

5. 24V input voltage
Simple operation with only 24V input voltage and -10V to +10V control voltage.

6. High reliability
With Matsusada's unique technology and know-how developed by HV DCPS technologies, we provide highly reliable and safe products.

7. All-Solid-State
Longer life time with all-solid-state configuration.

APPLICATIONS

- Beam deflection
- Insulation and breakdown voltage test
- Electro photography process
- Various Electrostatic tests
- Corona discharge
- Electrostatic chuck
- Electrorheological fluid

LINEUP

AP series

Output voltage (Vdc)	Current (mA)	MODEL	Frequency Response(-3dB)*1	Case No.
-300 to +300	±10	AP-0.3B10(A)	DC to 2kHz	C6A
-600 to +600	±5	AP-0.6B5(A)		
-1k to +1k	±3	AP-1B3(A)	DC to 1kHz	C6E
-1.5k to +1.5k	±2	AP-1.5B2(A)	DC to 500Hz	
-3k to +3k	±1	AP-3B1(A)	DC to 250Hz	C7

*1 Response time remains same for small amplitude

AS series

Output voltage (Vdc)	Current (mA)	MODEL	Frequency Response(-3dB)*2		Slew Rate (full scale)	Case No.
			full scale	10% of full scale		
-300 to +300	±10	AS-0.3B10(A)	DC to 12kHz	DC to 24kHz	12V / µs	C6A
-600 to +600	±5	AS-0.6B5(A)	DC to 6kHz	DC to 12kHz		
-1k to +1k	±3	AS-1B3(A)	DC to 3.5kHz	DC to 7kHz		C6E
	±5	AS-1B5(A)				C7
-1.5k to +1.5k	±2	AS-1.5B2(A)	DC to 2.5kHz	DC to 5kHz		C6E
-3k to +3k	±1	AS-3B1(A)	DC to 1.5kHz	DC to 3kHz		C7

*2 Reference value calculated from slew rate 12V / µsec

SPECIFICATIONS

Input voltage	24Vdc ±5% 0.6A typ. (AS-1B5(A) : 0.8A typ.)
Output voltage control	External control voltage Vcon-in -10V to +10V *1 (input impedance : ≧10kΩ)
Regulation	Line : ±0.1%(±5% line change) Load : 0.1%(10% to 100% load change) *2
Ripple	≦0.025% rms *2
Stability	0.016% / Hr typ. *2
Protection	Protection against Input reverse connection, and intermittent output short circuit *3
Output voltage monitor	

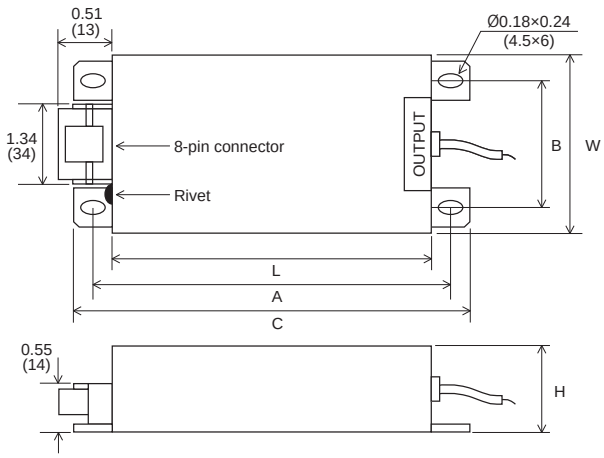
Output Voltage (kV)	0.3 -0.3 to +0.3	0.6 -0.6 to +0.6	1 -1 to +1	1.5 -1.5 to +1.5	3 -3 to +3
monitor / V-out	1V / 100V	1V / 1 kV			

Please use the voltage meter which input impedance is ≧10MΩ. (Accuracy : ±2.5% / Full scale)

Operating Temp.	0°C to +45°C
Storage Temp.	-20°C to +60°C
Humidity	20% to 80%(no condensing)
Input terminals	8-pin connector Compatible connector to CN8R(lead wire length 25 cm) is attached. Mating connector and pins are assorted (Recommendations : wire for pin ①, ② are AWG18 wire for pin ③ to ⑧ are AWG22 to 18)
Output	High Voltage lead wire 500mm

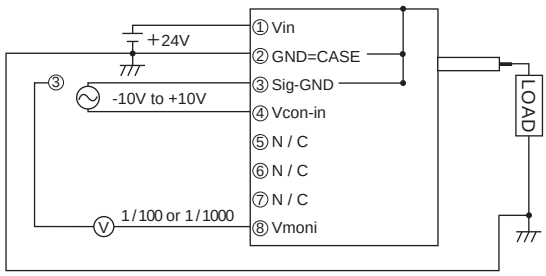
*1) Offset voltage : within 0.5% of rated output at Vcon-in = 0V
*2) Value at maximum rated output with resistive load and DC output.
*3) Single are shall be within 5sec and not to be repeated.
Frequent short shall shorten the life time and to be avoided.
★ No instruction manuals for module type power supply

DIMENSIONS inch(mm)



Case No.	Mounting hole pitch A	Mounting hole pitch B	C	W	L	H	Weight(g) approx.
C6A	6.69 (170)	2.76 (70)	7.09 (180)	3.94 (100)	6.30 (160)	1.50 (38)	1400
C6E	7.68 (195)	3.54 (90)	8.07 (205)	4.72 (120)	7.28 (185)	1.69 (43)	2100
C7	7.68 (195)	4.80 (122)	8.07 (205)	5.98 (152)	7.28 (185)	1.69 (43)	2600

CONNECTION



OPTION

-L1 Output current monitor

-10V to +10V (up to 2kHz bandwidth)

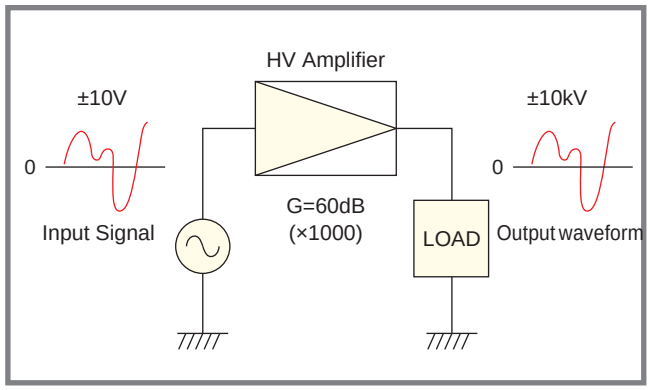
Accuracy : ±2.5%F.S. (Monitor voltage need to be measured by the voltmeter whose input impedance is more than 10MΩ.)

HIGH SPEED
HIGH VOLTAGE AMPLIFIER

HV Amplifier

High voltage amplifier converts input voltage to high voltage waveform as it is as shown in fig. 1. These days the demand of HV amplifier is growing more and more, and now becoming an indispensable tool for research and development, experiments and integrating to a system for such fields as electronics, physics, biochemical and medical industries. With high voltage technologies Matsusada Precision Inc. manufactures various HV amplifiers to meet all requirements from customers.

* In addition to these models in this catalog we have amplifiers developed specially for electrostatic chuck or PZT. Please ask for details to our sales staff.



(fig.1)

Four-quadrant Output Range

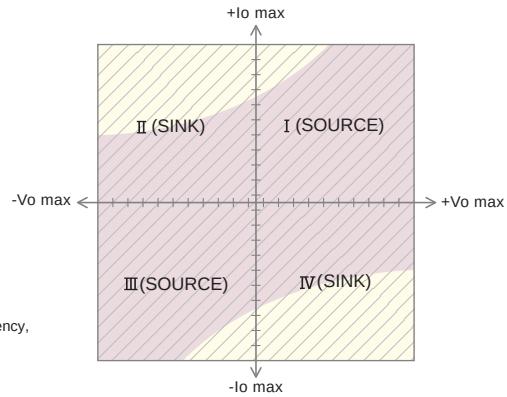
HV amplifier is generally equipped with the "sink" function for output currents that provides constant voltage operation without regard to the type of load whether it is capacitive or conductive. (Fig.2) As it gives fast response, it is an ideal power supply for applications which require AC output.

Matsusada HV amplifiers are all bi-polar type and can be operated in full four-quadrant area.(I · II · III · IV area)

Vomax : Rated output voltage
Iomax : Rated output current

AC operation range (with 50 Hz or more frequency, 50% of duty cycle and without any DC bias)

DC operation range



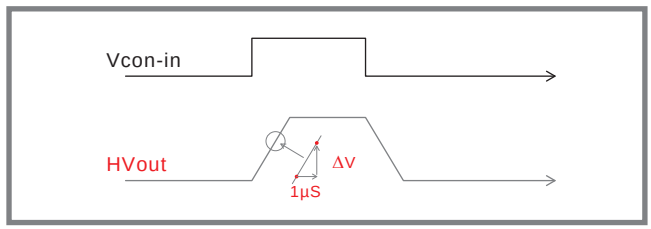
(fig.2) Voltage and Current operation range

Slew Rate

The responsibility of our high speed amplifier is determined with slew rate(SR). The step responsibility of our amplifier is as shown in fig.3.

SR = ΔV / μS In case of output amplitude is smaller the response time become shorter.

AMP series reach to greater than SR =700V / μS at maximum.



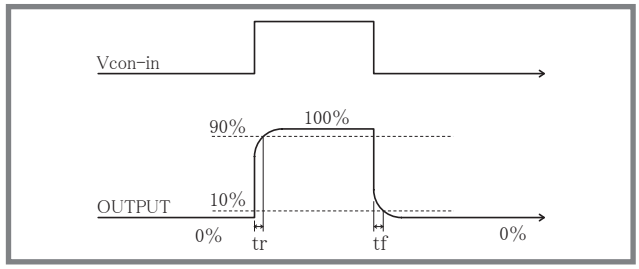
(fig.3)

Rise Time(step response)

Step response can be indicated with rise time. (fig.4) Usually the rise time of amplifier of response (= bandwidth)fc (Hz) is given by a formula below.

$tr \fallingdotseq 0.35 / fc$

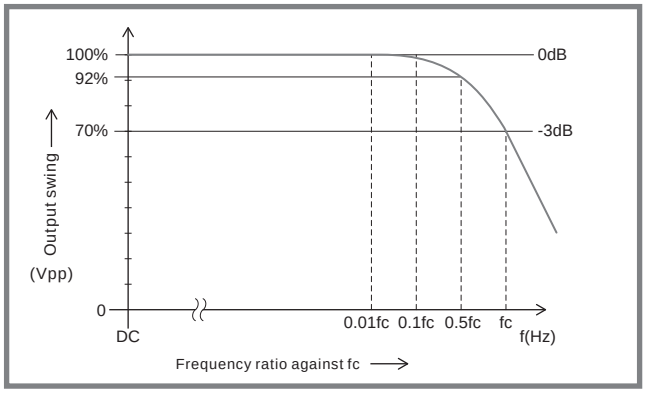
The fall time tf is equals to tr.



(fig.4)

Frequency Response

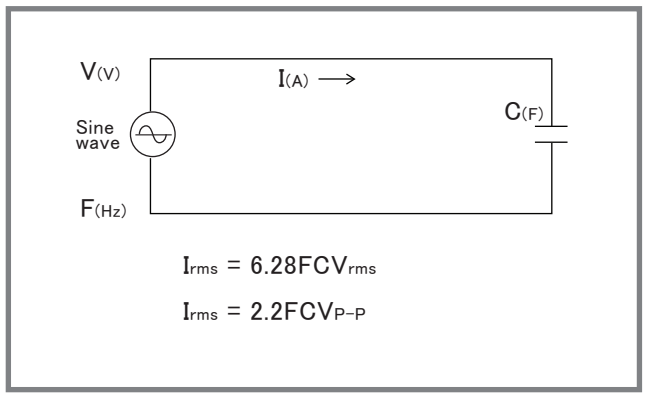
Response of Matsusada amplifiers are described as "frequency bandwidth". When swing the output with sinusoidal waveform with rated resistive load, output swing (amplitude) is reduced as input frequency become faster. Frequency response in the specification is the frequency fc is where output swing is 70% (-3dB). (fig. 5)
In case clear output waveform is required, please select a HV amplifier which has high enough frequency bandwidth against required frequency. In general 3 to 5 times more frequency bandwidth for sinusoidal waveform, and about 10 times more for rectangular waveform, is required. In case of insufficient frequency bandwidth the output swing shall be reduced, and also the phase difference be large, so some solutions, such as monitoring output waveform, shall be required.



(fig.5) Declination of output swing by frequency

Capacitive Load

When a capacitive load is more than 100pF (including a stray capacitance of output wire), the resonance in the output may occur.
In that case, install 100-ohm (@0.1μF) to 1000-ohm (@1000pF) of high voltage resistance in the output in series. Please note that the frequency band will be limited as the formula written in the right figure when an amplifier is used with a capacitive load.
In addition, when an amplifier is used for the use such as a corona discharge, the current which is higher than rating will flow and it will affect the amplifier badly. In this case, as well as the time to use an amplifier with a capacitive load, please install the output resistance and limit the current.

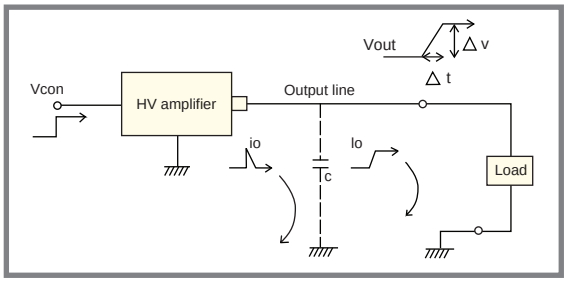


*Please avoid continuous inputting of high frequency which reduces output frequency of an amplifier.
An amplifier will be broken because of increase of internal loss.

Important note to utilize the full performance of high speed HV amplifier

Output cable of HV amplifiers is not shielded. If the output cable has some stray capacity against ground(earth ground or metal objects), output voltage will be sinusoidal or step waveform and extra current will be drawn. As this current draw parallel to load, the following appearance might be happened.

(1) Slew rate or response frequency drop (2) The waveform is distorted or changed



When there is output stray capacitance C the leak current by C will be as below.

$$io = \frac{dQ}{dt} = C\frac{dV}{dt}$$ Q: capacity(C)

Solution Make sure to have proper connection to make stray capacitance of HV cable as low as possible.

(1) Keep the length of output cable as short as possible.
(2) Keep the output cable away from floor, desks, or metal objects.
(3) Have no shielding on the output cable.

FAX

USA/Canada : +1-888-652-8651

other countries : +81-6-6150-5089

Customer Inquiry Sheet

Please copy this page and above fax number after filling out form below.

■ I would like

☐ A quotation ☐ An explanation of product ☐ A demonstration ☐ To purchase

☐ Other ( )

■ Give us your requirement / comment

■ Please fill in below.

Address:	
Company:	
Dept.:	Title:
Name:	
Tel:	Fax:
E-mail:	

Manufacturer warranty

We warrant the specification, unless otherwise specified, at max. rated output after warm up, and scope of application is between 10% and 100% of max. rated output. We warrant that products contained in this catalog (hereinafter, the “Products”) are free from defects in material and workmanship under normal use for a period of one (1) year from the date of shipment thereof. However, the warranty period for X-ray detectors and X-ray source shall be either one (1) year from the date of shipment or 1,000 hours, whichever shorter. The above warranty shall not apply to any Product which, at our sole judgment, has been: i) Repaired or altered by persons unauthorized by us; or ii) Connected, installed, adjusted or used otherwise than in accordance with the instructions furnished by us (including being used in an inappropriate installation environment, such as in corrosive gas, high temperature and humidity). We are not liable for any loss, damage or failure of the Products after the shipment thereof caused by external factors such as disasters. We will not inspect, adjust or repair any of our power supply products in the field or at any customer site. If you suspect that there has been a power supply failure in the field, please inspect your whole unit by yourself in an effort to determine that the problem is, in fact, arising out of our power supply products. If it is found that the problem is arising out of such power supply product after inspection, please contact your local sales office for additional troubleshooting. A “Return Merchandise Authorization” is required in case the power supply must be sent back to the factory in Japan for inspection and repair. We, at our sole discretion repair or replace such defective products at no cost to the purchaser. We assume no liability to the purchaser or any third party for special, incidental, consequential, or other damages resulting from a breach of the foregoing warranty. This warranty excludes any and all other warranties not set forth herein, express or implied, including without limitation the implied warranties of merchantability or fitness for a particular purpose. The Products are not designed and produced for such applications as requiring extremely high reliability and safety, or involving human lives (such as nuclear power, aerospace, social infrastructure facility, medical equipment, etc.). The use under such environment is not covered by this warranty and may require additional design and manufacturing processes. No modification or supplement of this warranty shall be binding unless in writing and signed by a duly authorized officer of Matsusada. Matsusada reserves the right to make any changes in the contents of catalogs or specifications at any time without advance notice. Due to compelling reason such as unavailability of components used, products might be un available or unable to repair. The products specified in catalogs or specifications are designed for use by the person who has enough expertise or under the control of such person, and not for general consumers. Schematics of products shall not be submitted to users. Test result or test data for the products shall be available upon request with charge.
Make sure you read the specification in the latest catalog before you order. Contact nearby sales office for the latest catalog.
PLEASE SEE THE LINK BELOW FOR THE COMPLETE WARRANTY TERMS
https://www.matsusada.com/site/warranty.html

Matsusada Precision Inc.

Headquarters / Factory : 745 Aoji-cho Kusatsu Shiga 525-0041 Japan

Contact Us **www.matsusada.com**