



Ultra low noise and overwhelming high stability

High performance

High voltage power supply

AF / AE series

1 kV to 150 kV / 15 W to 300 W



AF / AE series



AF series is one of the best seller model of Matsusada as high performance standard high voltage power supply.

AE series has even greater ripple noise and stability, and has long been selected from various national laboratories.

We succeed to keep the ripple and spike noise low with our proprietary switching circuit, and it provides highly stable HV output with well-selected components and highly-stabilized circuit. They are well suited for R&D applications which require high accuracy, and among them for Electron Microscope and Mass spectrometer application AF/AE series demonstrate outstanding performance.

Needless to say its reliability has been proved high with its long history, and in addition it has double and triple protections for safer operations. Various remote control and monitor functions are equipped as standard for building systems.

FEATURES

- Low ripple 10 ppm, High stability 50 ppm / Hr (AE series)
- Wide line-up of high voltage power supply from 1 kV to 150 kV and 15 W to 300 W
- Local and remote operation
- Adjustable overload trip level on the front panel
- Remote and front panel monitoring of DC output voltage and current
- Automatic protection against overload, short circuit and arc

APPLICATIONS

- Electron Microscope
- Stand power Supply
- Electronic component evaluation test
- MASS spectrometry
- Electron Beams
- X-ray tube
- Electron gun
- Ion Beams
- Insulator Testing
- Lithography
- SEM
- All kinds of High-Voltage Testing etc.

LINEUP AF series

Output voltage (kVdc)	Output current (mA)	Output power (W)	MODEL			(*)2 Case Type
			Positive polar output	Negative polar output	Reversible polar output (*1)	
1	30	30	AF-1P30	AF-1N30	AF-1R30	A
	60	60	AF-1P60	AF-1N60	AF-1R60	
	120	120	AF-1P120	AF-1N120	AF-1R120	C
3	10	30	AF-3P10	AF-3N10	AF-3R10	A
	20	60	AF-3P20	AF-3N20	AF-3R20	
	40	120	AF-3P40	AF-3N40	AF-3R40	C
	60	180	AF-3P60	AF-3N60	AF-3R60	
	80	240	AF-3P80	AF-3N80	AF-3R80	
5	6	30	AF-5P6	AF-5N6	AF-5R6	A
	12	60	AF-5P12	AF-5N12	AF-5R12	
	25	125	AF-5P25	AF-5N25	AF-5R25	C
	35	175	AF-5P35	AF-5N35	AF-5R35	
	50	250	AF-5P50	AF-5N50	AF-5R50	
10	3	30	AF-10P3	AF-10N3	AF-10R3	A
	6	60	AF-10P6	AF-10N6	AF-10R6	
	12	120	AF-10P12	AF-10N12	AF-10R12	C
	18	180	AF-10P18	AF-10N18	AF-10R18	
	25	250	AF-10P25	AF-10N25	AF-10R25	
20	30	300	AF-10P30	AF-10N30	AF-10R30	B
	1.5	30	AF-20P1.5	AF-20N1.5	AF-20R1.5	
	3	60	AF-20P3	AF-20N3	AF-20R3	
	6	120	AF-20P6	AF-20N6	AF-20R6	C
	9	180	AF-20P9	AF-20N9	AF-20R9	
	12	240	AF-20P12	AF-20N12	AF-20R12	
30	15	300	AF-20P15	AF-20N15	AF-20R15	B
	1	30	AF-30P1	AF-30N1	AF-30R1	
	2	60	AF-30P2	AF-30N2	AF-30R2	
	4	120	AF-30P4	AF-30N4	AF-30R4	C
	6	180	AF-30P6	AF-30N6	AF-30R6	
40	8	240	AF-30P8	AF-30N8	AF-30R8	C
	10	300	AF-30P10	AF-30N10	AF-30R10	
	0.75	30	AF-40P0.75	AF-40N0.75	AF-40R0.75	
	1.5	60	AF-40P1.5	AF-40N1.5	AF-40R1.5	C
	3	120	AF-40P3	AF-40N3	AF-40R3	
	4.5	180	AF-40P4.5	AF-40N4.5		
6	240	AF-40P6	AF-40N6			
50	7.5	300	AF-40P7.5	AF-40N7.5		C
	0.6	30	AF-50P0.6	AF-50N0.6	AF-50R0.6	
	1.2	60	AF-50P1.2	AF-50N1.2	AF-50R1.2	
	2.5	125	AF-50P2.5	AF-50N2.5	AF-50R2.5	C
	3.5	175	AF-50P3.5	AF-50N3.5		
60	5	250	AF-50P5	AF-50N5		C
	0.5	30	AF-60P0.5	AF-60N0.5	AF-60R0.5	
	1	60	AF-60P1	AF-60N1	AF-60R1	
	2	120	AF-60P2	AF-60N2	AF-60R2	C
	3	180	AF-60P3	AF-60N3		
80	4	240	AF-60P4	AF-60N4		D
	0.75	60	AF-80P0.75	AF-80N0.75	AF-80R0.75	
100	1.5	120	AF-80P1.5	AF-80N1.5		D
	0.1	10	AF-100P0.1	AF-100N0.1	AF-100R0.1	
	0.3	30	AF-100P0.3	AF-100N0.3	AF-100R0.3	
	0.6	60	AF-100P0.6	AF-100N0.6		D
	1	100	AF-100P1	AF-100N1		
120	1.2	120	AF-100P1.2	AF-100N1.2		D
	0.5	60	AF-120P0.5	AF-120N0.5		
150	1	120	AF-120P1	AF-120N1		E
	0.5	75	AF-150P0.5	AF-150N0.5		
150	0.8	120	AF-150P0.8	AF-150N0.8		E

LINEUP AE series

Output voltage (kVdc)	Output current (mA)	Output power (W)	MODEL			(*)2 Case Type
			Positive polar output	Negative polar output	Reversible polar output (*1)	
1	15	15	AE-1P15	AE-1N15	AE-1R15	A
	30	30	AE-1P30	AE-1N30	AE-1R30	
3	10	30	AE-3P10	AE-3N10	AE-3R10	A
	20	60	AE-3P20	AE-3N20	AE-3R20	
5	6	30	AE-5P6	AE-5N6	AE-5R6	A
	12	60	AE-5P12	AE-5N12	AE-5R12	
10	3	30	AE-10P3	AE-10N3	AE-10R3	A
	6	60	AE-10P6	AE-10N6	AE-10R6	
20	1.5	30	AE-20P1.5	AE-20N1.5	AE-20R1.5	B
	3	60	AE-20P3	AE-20N3	AE-20R3	
30	1	30	AE-30P1	AE-30N1	AE-30R1	B
	2	60	AE-30P2	AE-30N2	AE-30R2	
40	0.75	30	AE-40P0.75	AE-40N0.75	AE-40R0.75	C
	1.5	60	AE-40P1.5	AE-40N1.5	AE-40R1.5	
50	0.5	25	AE-50P0.5	AE-50N0.5	AE-50R0.5	C
	1	50	AE-50P1	AE-50N1	AE-50R1	
60	0.5	30	AE-60P0.5	AE-60N0.5	AE-60R0.5	C
	1	60	AE-60P1	AE-60N1	AE-60R1	
80	0.3	24	AE-80P0.3	AE-80N0.3		D
	0.75	60	AE-80P0.75	AE-80N0.75		
100	0.3	30	AE-100P0.3	AE-100N0.3		D
	0.25	30	AE-120P0.25	AE-120N0.25		
120	1	120	AE-120P1	AE-120N1		E
	0.2	30	AE-150P0.2	AE-150N0.2		

* P...Positive output N...Negative output
 <e.g.> AF-1R30 : 0 to ±1 kV / 30 mA
 AE-150N0.2 : 0 to -150 kV / 0.2 mA

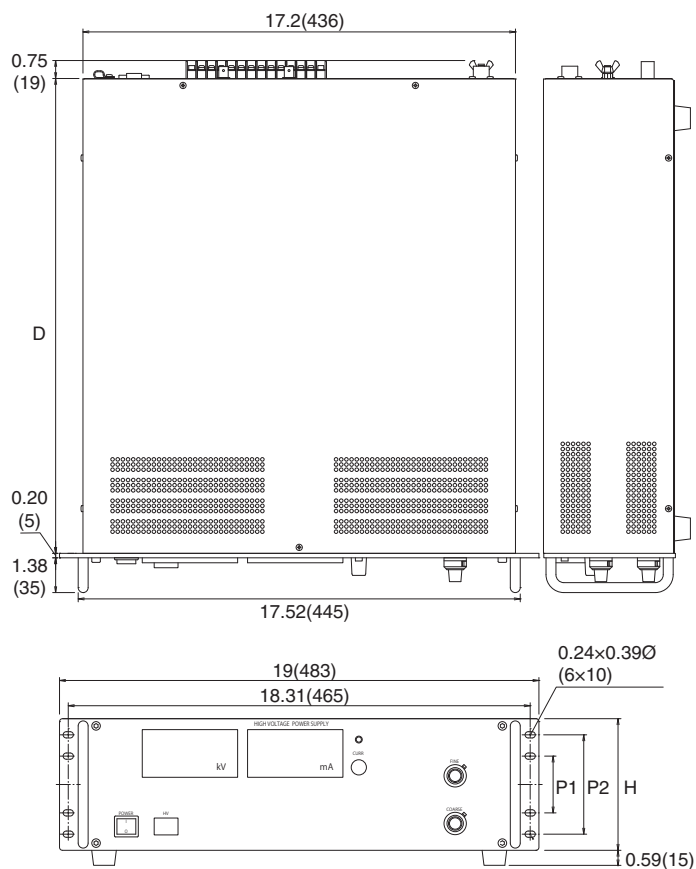
*1) Unit less than 60 kV, the polarity may be reversed by swapping the internal cable.
 Unit over 80 kV, by swapping internal high voltage module.

*2) See Dimensions.(P5)

SPECIFICATIONS

Input Voltage	115 VAC±10 % 50 / 60 Hz single phase												
	AC Input power (MAX)												
	<table border="1"> <tr> <td>30 W models</td> <td>115 VA</td> <td>Up to 150 W models</td> <td>330 VA</td> </tr> <tr> <td>60 W models</td> <td>160 VA</td> <td>Up to 300 W models</td> <td>600 VA</td> </tr> <tr> <td>75 W models</td> <td>230 VA</td> <td></td> <td></td> </tr> </table>	30 W models	115 VA	Up to 150 W models	330 VA	60 W models	160 VA	Up to 300 W models	600 VA	75 W models	230 VA		
30 W models	115 VA	Up to 150 W models	330 VA										
60 W models	160 VA	Up to 300 W models	600 VA										
75 W models	230 VA												
Output Voltage Control	Local : "Coarse" and "Fine" 10-turn potentiometers on the front panel Remote : External control voltage 0 to 10 Vdc (input impedance 10 kΩ typ.) or by External 5 kΩ potentiometer.												
Voltage Regulation	AF : Line : ±30 ppm of maximum voltage for ±10 % input line change Load : 30 ppm of maximum voltage for 10 % to 100 % load change AE : Line : ±10 ppm of maximum voltage for ±10 % input line change Load : 10 ppm of maximum voltage for 10 % to 100 % load change												
Ripple	AF : 100 ppm rms AE : 10 ppm rms												
Stability	AF : 100 ppm / Hr 300 ppm / 8 Hr AE : 50 ppm / Hr 100 ppm / 8 Hr												
Temperature Coef.	AF : 100 ppm / °C AE : 50 ppm / °C												
Overload Trip Level Adjust	Front panel 1-turn potentiometer 10 % to 105 % of maximum output current (With -LC option, current limit value is adjustable.)												
Output Display	AF : Output voltage 3.5-digit digital meter ±1999 Output current 3.5-digit digital meter 1999 AE : Output voltage 4.5-digit digital meter ±19999 Output current 3.5-digit digital meter 1999												
Monitor Output	Voltage monitor : ±10 V / maximum output voltage (output impedance 1 kΩ) Current monitor : 10 V / maximum output current (output impedance 1 kΩ)												
Protections	Over voltage protection(limiting when approx. 105 % of rating) Over current protection(standard : High-voltage cut-off, manual recovery or recovery by remote set) (with -LC option : Limit the output current by dropping output voltage) Enable to change current by front panel 1-turn dial. Protection against output short-circuit and arc discharge												
Other Functions	Remote switch ON / OFF(by external relay) Door switch(by external relay) Remote reset(Reset the Over Current cut off mode by remote signal. Not for models with -LC option)												
Temperature	Operating : 0 to +45 °C Storage : -20 °C to +75 °C												
Humidity	20 % to 80 %RH(no condensation)												
Accessories	AC line input cable 2.5 m (1) Shielded HV output cable 2.5 m(flying lead) (1) Instruction manual (1)												

DIMENSIONS inch(mm)



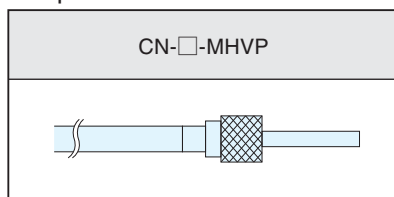
Case Type	H	P1(EIA)	P2(JIS)	D
Ⓐ	5.24(133)	2.25(57.15)	3.94(100)	18.98(482)
Ⓑ	6.97(177)	4(101.6)	5.91(150)	18.98(482)
Ⓒ	6.97(177)	4(101.6)	5.91(150)	21.65(550)
Ⓓ	8.74(222)	5.75(146)	7.87(200)	21.65(550)
Ⓔ	10.47(266)	7.5(190.5)	7.87(200)	24.02(610)

INPUT / OUTPUT CABLE

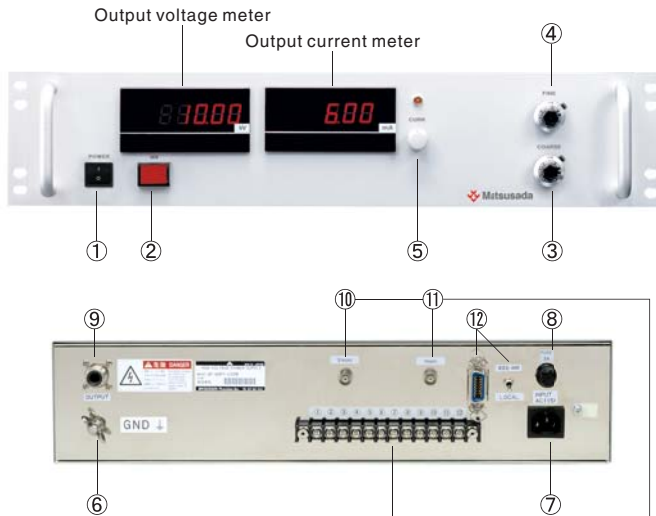
Input

Standard		with -L(230V) option	
CABLE TYPE1 (with 3 pin plug)		CABLE TYPE3 (Flying lead)	
Rated voltage	Max. current	Rated voltage	Max. current
125 V	10 A	250 V	10 A

Output



FUNCTIONS

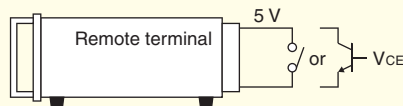


Normal Operation: Output ①→⑤, conversely to stop operation.

- ① **POWER ON/OFF switch** : This has priority over all operations.
- ② **HV ON/OFF switch** : Output is enable when this is ON. Remote switch can be turned ON/OFF only when HV switch is ON. This switch is also used for resetting interlock and cut off mode.
- ③ **COARSE potentiometer** (10-turn, lockable)
- ④ **FINE potentiometer** (10-turn, lockable)
- ⑤ **Overload trip level setting dial** : 1-turn LED is lit up when protection circuit is operating.
- ⑥ **GND Terminal(M6)**
- ⑦ **AC Inlet**
- ⑧ **Fuse**
- ⑨ **Output connector (Matsusada's property)**
- ⑩ **Output voltage monitor**
- ⑪ **Output current monitor**
- ⑫ **Connector for USB, RS-232C, RS-485, and GPIB interface, and changing-over switch(option)**

REMOTE CONTROL CONNECTOR M4

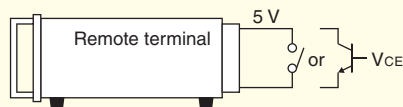
REMOTE SWITCH ON/OFF *



Output	External relay	Open collector
ON	Short	$V_{CE} \leq 0.4 \text{ V}$
OFF	Open	$V_{CE} \geq 2 \text{ V}$

Sink Current $\geq 10\text{mA}$

DOOR SWITCH



Sink Current $\geq 10 \text{ mA}$

OUTPUT CONTROL *

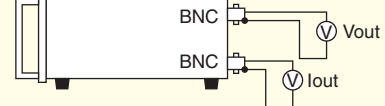


Output voltage	LR	Vcon
0 to MAX	R2 : 0Ω to $5 \text{ k}\Omega$	0 V to 10 V Input imp $\geq 10 \text{ k}\Omega$

Output is possible in external relay short or a status of V_{CE} less than 0.4 V. Output will be cut off when open or 2 V or mote. To output again, turn OUTPUT switch ON after resetting by turning OUTPUT switch OFF in a status of short or 0.4 V or less.

* -LG option : When switch ⑫ is on IEEE-488 side, remote switch and output control is not enable from remote terminal, but from only IEEE-488 operation.

OUTPUT MONITOR BNC receptacle *



V_{out} : 0 V to $\pm 10 \text{ V}$ (0 V to +10 V)

[standard] Monitor polarity equals output polarity.

[-LG option] Positive polarity regardless of HV polarity.

I_{out} : 0 V to +10 V

Output imp is 1 $\text{k}\Omega$.

* -LG option : Generates output no matter switch ⑫ is on or off.

OPTIONS

- LC** **Current limiting**
Front panel adjustable 10 % to 105 % of maximum output current.
- LW** **Slow start**
10 second HV output ramp up
- LG** **Connector for GPIB, RS-232C, RS485, USB Interface.**
(CO-HV adapter is required. Please refer to CO-HV catalog for details.)
- L(230V)** **Input Voltage AC230 V \pm 10 % single phase**
- L(3m)** **The length of HV output shielded cable is changed to 3 m.**
- L(5m)** **The length of HV output shielded cable is changed to 5 m.**
(only for $\leq 40 \text{ kV}$ models)
- L(7m)** **The length of HV output shielded cable is changed to 7 m.**
(only for $\leq 10 \text{ kV}$ models)

When ordering, suffix the above option mark to the model number.
<e.g.>AF-60P1-LCGW(230V)(3m)
Alphabetical, input voltage and cable length order

Introduction of High Voltage Power Supplies

Rack mount type High voltage power supply



AUH series

Max. output voltage	150 kV to 200 kV
Max. output current	6 mA to 13.3 mA
Max. output power	1.2 kW, 2 kW

- Ultra high voltage of 200 kV and high power of 2 kW.
- The safety design without the exposure of the high-voltage part.
- The high reliable design that is hard to be affected by the use environment.

High Power High voltage power supply



AU series

Max. output voltage	1 kV to 120 kV
Max. output current	0.25 mA to 2200 mA
Max. output power	30 W, 2.2 kW

- It realized high power of 60 kV / 300 W and slim size.
- Wide range of lineup and full of remote functions
- Ultra low profile / Space saving

Desk-top size high power High voltage power supply



EPR series

Max. output voltage	1 kV to 30 kV
Max. output current	1 mA to 150 mA
Max. output power	30 W, 60 W, 150 W

- 150 W high-power unit with just 3.3-inch(84 mm) width.
- Available for accepting commercial voltage all over the world without an adaptor.
- The control by SCPI commands is available by optional optical communication.

Module type / PCB mountable type HV power supplies

Typical use

- PMT, MCP
- APD, PD
- SEM
- MASS spectrometry
- E-Beam
- FIB
- Electrophoresis etc.



Module type / PCB mountable high voltage power supplies has been developed and released to market, utilizing our advanced low noise technology.

The power supplies have been developed for specific uses such as PMT, APD, SEM and MASS, whereby excellent reliable high voltage supply is required.

All models proudly realized "space saving", "low noise", "stable output".

Our sales staff can propose optimized usage of the power supplies for various customer applications.

