ASAHI SUNAC

Operation and Maintenance Manual

Electrostatic Controller

BPS1600

CE

Ec'Coater™ エコーター

This manual contains important information on warnings and cautions. Read the manual thoroughly before starting to operate this equipment, and follow the instructions. Always keep the manual handy until such time as the equipment is no longer being used. If your manual is lost or worn badly, do not hesitate to contact our agency which is closest to you, or the Asahi Sunac Corporation, directly, and ask us to send you a new one.

ASAHI FORM 1013

12th Edition : April 1, 2022

Preface

Thank you very much for choosing our Electrostatic controller (BPS1600).

In order to keep the equipment in the best condition for an extended period, please carefully read this manual before use. Above all, the specifications, warnings and prohibitory or cautionary instructions shown herein shall be fully understood and observed during the use of the equipment.

The equipment covered by this manual is designed for industrial coating work. It shall be used by those who have been duly trained regarding the handling and scope of application and have an understanding of the operating procedure.

If you need further information about this manual, please call us described on the back cover by specifying the “model” and “serial No.” of your equipment.

ASAHI FORM 1013

12th Edition : April 1, 2022

Contents

1 For Safety and Correct Use

Contents of this instruction manual shall be fully understood and the instructions shown herein strictly observed.
Using the machine without following instructions in this manual may lead to bodily injury or damage to properties.

The safety measures described herein are the minimum requirements and additional measures may also be required. All requirements provided by laws and legislations as well as rules and guidelines laid by your company or office shall be observed.

The cautionary instructions shown below shall be construed as minimum basic requirements for safety in the use of our product.

● Cautionary instructions are shown in three levels as defined below.

⚠**WARNING**	Calls the user's attention to a situation that may lead to bodily injury and describes how to avoid that situation.
⚠**CAUTION**	Calls the user's attention to a situation that may lead to damage or breakdown to the equipment and describes how to avoid that situation.
NOTE	Gives important or helpful information.

∗ Please remember that the situation mentioned under ⚠CAUTION may also lead to a serious disaster under certain circumstances. All instructions are important for your safety and prevention of machine disorder and shall be strictly observed.

This manual only describes the BPS1600.

For the electrostatic gun and coating equipment to be connected with it, see the respective instruction manuals.

⚠ WARNING

Adequate conditions of use for the product

The product covered by this instruction manual is a controller specially designed to supply a high-frequency power to the hand-held electrostatic gun contained in the 24VAC high-voltage generator described in the specifications and to control high-voltage charges on the gun. Do not use other than the specified guns.

The product is not explosion-proof. Do not use it in hazardous areas Zone 0 to 2 specified in IEC 60079-10.

Because this product has a panel mount structure, be sure to install the product to the control panel having a protection class of IP54 or higher. Provide the control panel with the power switch because the product has no power on/off switch.

Install all electrical equipment and wiring in accordance with national and local electrical codes and regulations.

If you have any doubt about the intended use of the product or materials used for it, please consult us.

Using the product under conditions other than specified above will be considered as abuse unless specially approved by us. In this case, great caution must be exercised to prevent possible accidents.

Danger from abuse

<<General safety requirements>>

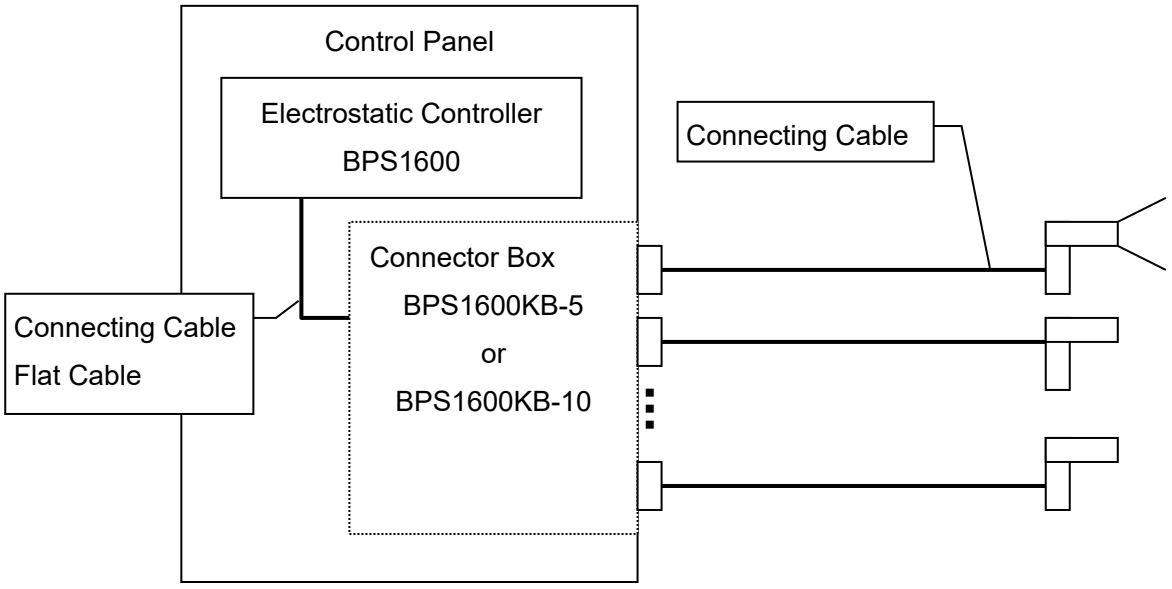
- Thoroughly check the supply voltage before use. Applying a voltage other than selected may lead to a failure and/or fire.
- The controller handles high voltages and, therefore, must be properly grounded.
  Failure to ground it may lead to a failure, electric shock, injury and/or fire.
  Always ground the protective earth terminal (class D grounding).
  Do not fail to tighten screws on the terminal block and attach connectors.
- Do not modify the wiring when it is live.
- **The controller is not explosion-proof. Do not use it in hazardous areas Zone 0 to 2. Use only the control panel having an explosion-proof structure in the above hazardous area.**
- Do not use it in a place where it will be subject to a higher temperature or humidity or excessive vibration. Doing so may lead to a failure.
- If the controller fails, immediately stop it and turn it off. After checking that it has been discharged, short the charging terminal to the ground.
  If the protector or fuse has been tripped may lead to a failure and/or fire, do not turn it on again, please consult us.
- Do not operate the controller with the door open. Do not touch the charger and hot parts contained in the case. Doing so may lead to a burn, injury and/or electric shock.

2 Outline of the system

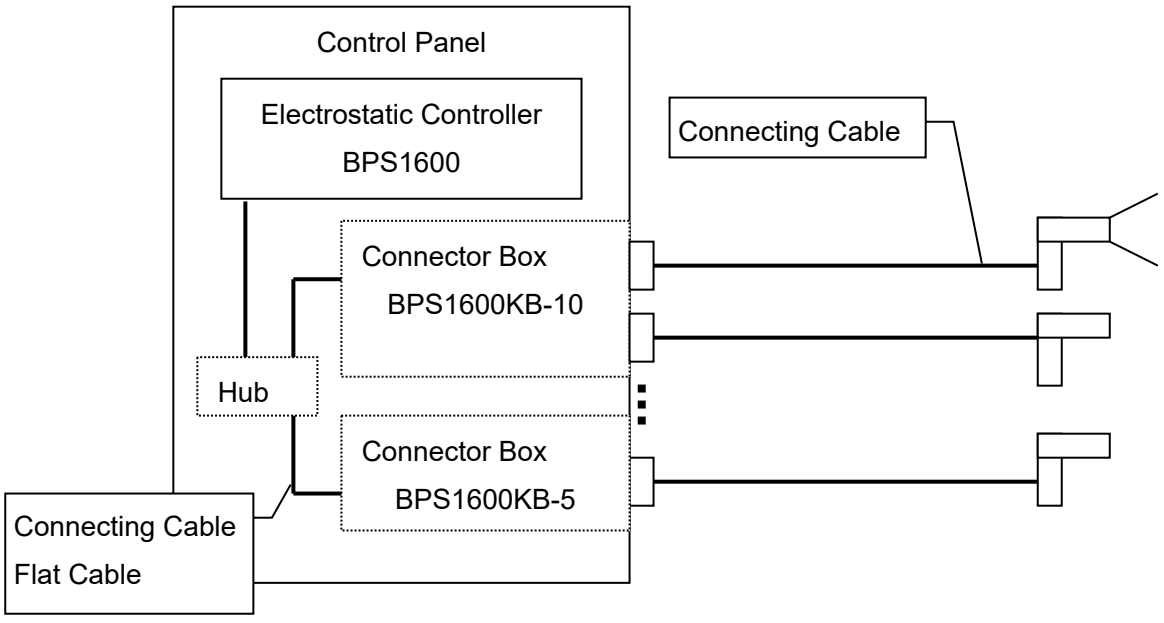
This System is designed to supply high frequency electric power to manual electrostatic spray gun having a high voltage generator from 24VAC received power, and to control charging of such high voltage

It can control 15 sets of spray guns at maximum. Status of System operation and guns operation can be indicated on front panel of it.

High voltage is generated only on the gun for which gun flow switch is input first. When two or more gun is input at the same time, high voltage is not generated in each gun. Numbers of guns to be selected can be extended by selection on Connector Box. There are two type of the Connector Box, i.e., for 5 guns and for 10 guns.



＜BPS1500-15＞



3 Specifications

3.1 Main Controller

Item \ Gun type	-60kV max. Electrostatic Gun	-30kV max. Electrostatic Gun
Name	Electrostatic Controller	
Model	BPS1600	
Numbers of Guns	25 at maximum	
Safety Devices	Fixed Current Protecting Circuit Absolute Value Current Detection Type Shut-down Circuit(OCL) Input Error Alarming Circuit (CABLE) Air Leakage Detection Circuit (TIME OVER) Variable Current Value Detection Type Shut—down (di-dt)	
Generated Voltage at Non-Load	-60kVDC ± 3kVDC	-60kVDC ± 3kVDC
Rated Output Current	80μA(37kV)	80μA(17.5kV)
Constant Current Point	25 to 80μA ± 5μA	
Short Circuit Current	80μA ± 10μA	
Over-Current Setting	Absolute Value: 30 to 160μA	
	Variable Value: 2 to 40μA	
Output Voltage Adjust't	-10 to –60kV	-10 to –60kV
Transmission Voltage	24VAC ± 2VAC	
Transmission Frequency	20kHz ± 1kHz	
Operating Conditions	Circumferential Temperature: 0 to 45℃ Humidity: 20to 85%RH(without dewing) Altitude: 2000m or less	
Operating Atmosphere	Free from corrosive gas, dust, steam, water dropping and direct sun beam	
Protection Grade	Front Face: IP54 Inside of panel: IP20	
Input Power	100 to 120VAC	
Voltage Allowance Value	± 10%	
Input Power Frequency	50/60Hz	
Power Source Capacity	50VA	
Overvoltage category	Ⅱ	
Pollution degree	2	
Color	Mansel N-4.0	
Max. air input	100psi(0.8MPa)	
Weight	Approx. 5.0kg	
Obtained Approval to Standards	,EN61010-1:2010	

3.2 Connector Box

Gun No.s / Item	5 Guns	10 Guns
Name	Connector Box for Electrostatic Controller	
Model	BPS1600KB-5	BPS1600KB-10
No.s of Guns	5 sets at maximum	10 sets at maximum
Operating Conditions & Circumstances	Same as for main Body	
Protection Grade	Front Face: IP54	
Color	Mansel N-4.0	
Weight	Approx. 1.0kg	Approx. 2.0kg

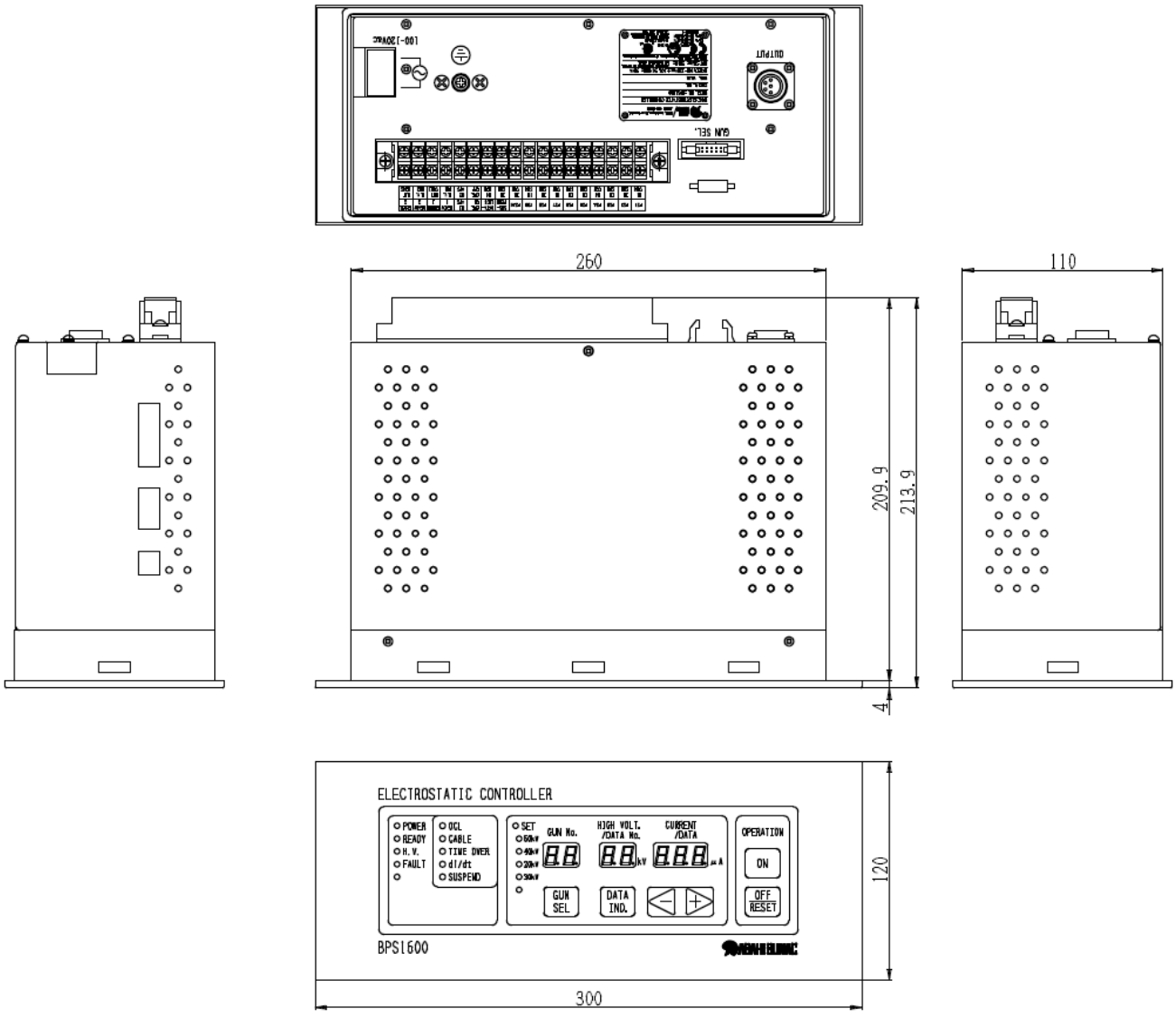
Specific conditions of use

These electrostatic gun and controller shall only be used in one of the following combinations.

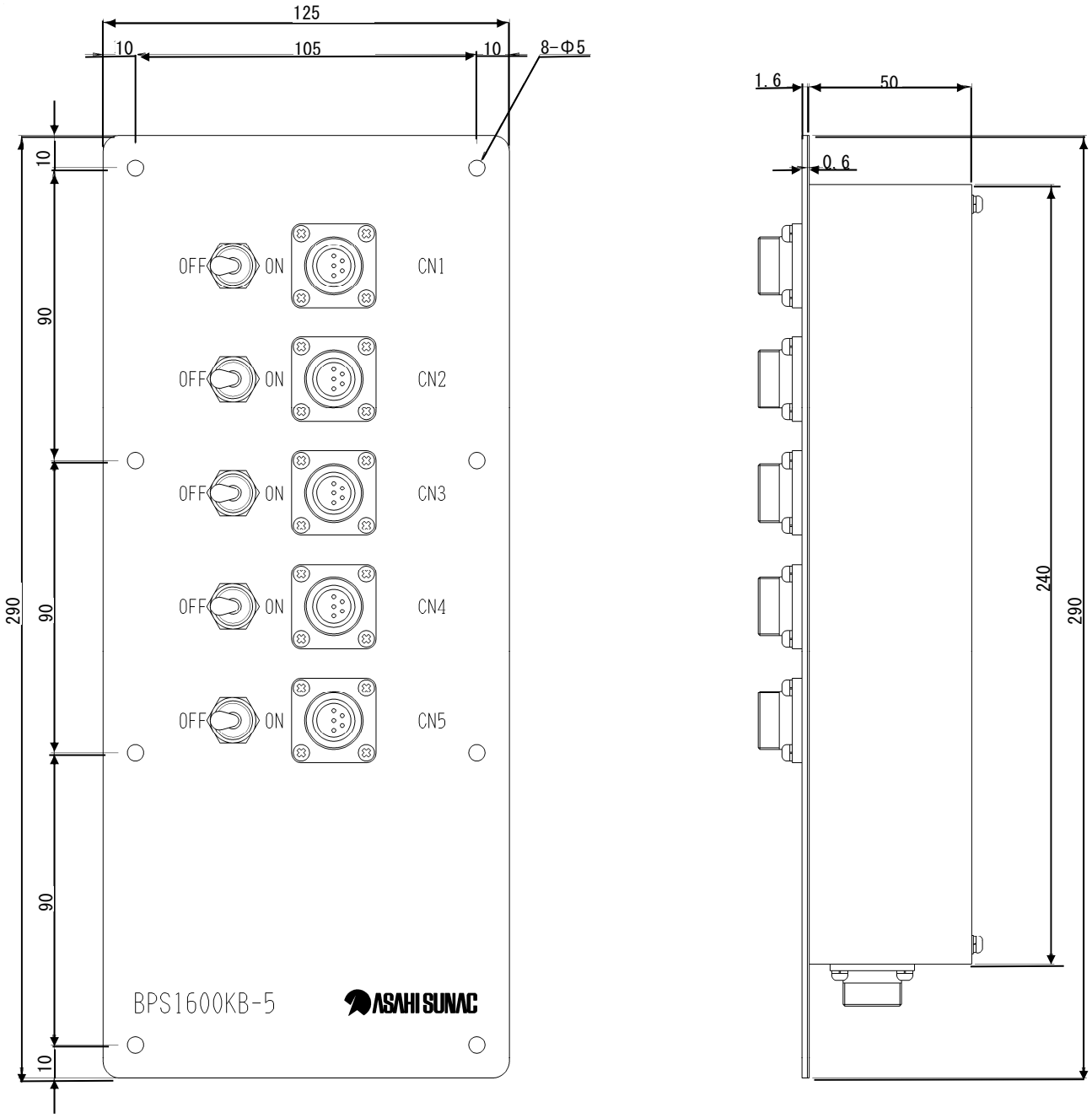
Certificate No.	Controller	Gun
03ATEX5417X	BPS1600	HB5000 HB6000 HB-X3
03ATEX5418X	BPS1600	EAB90

4 Overall dimensional drawing

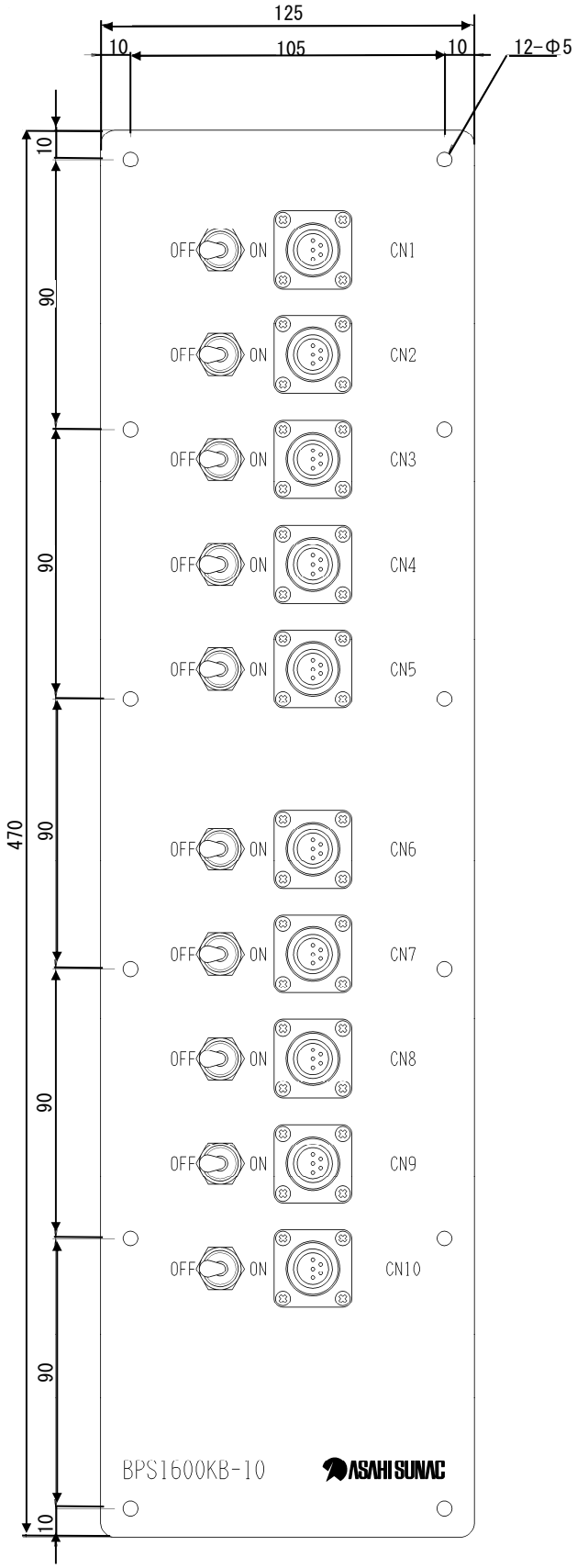
4.1 Main Controller

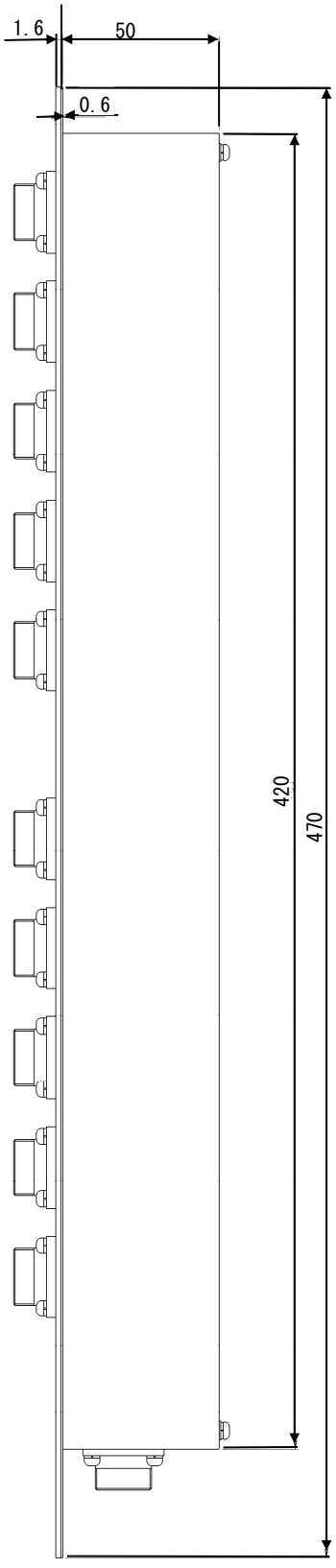


4.2 Connector Box(5 Guns Specifications)

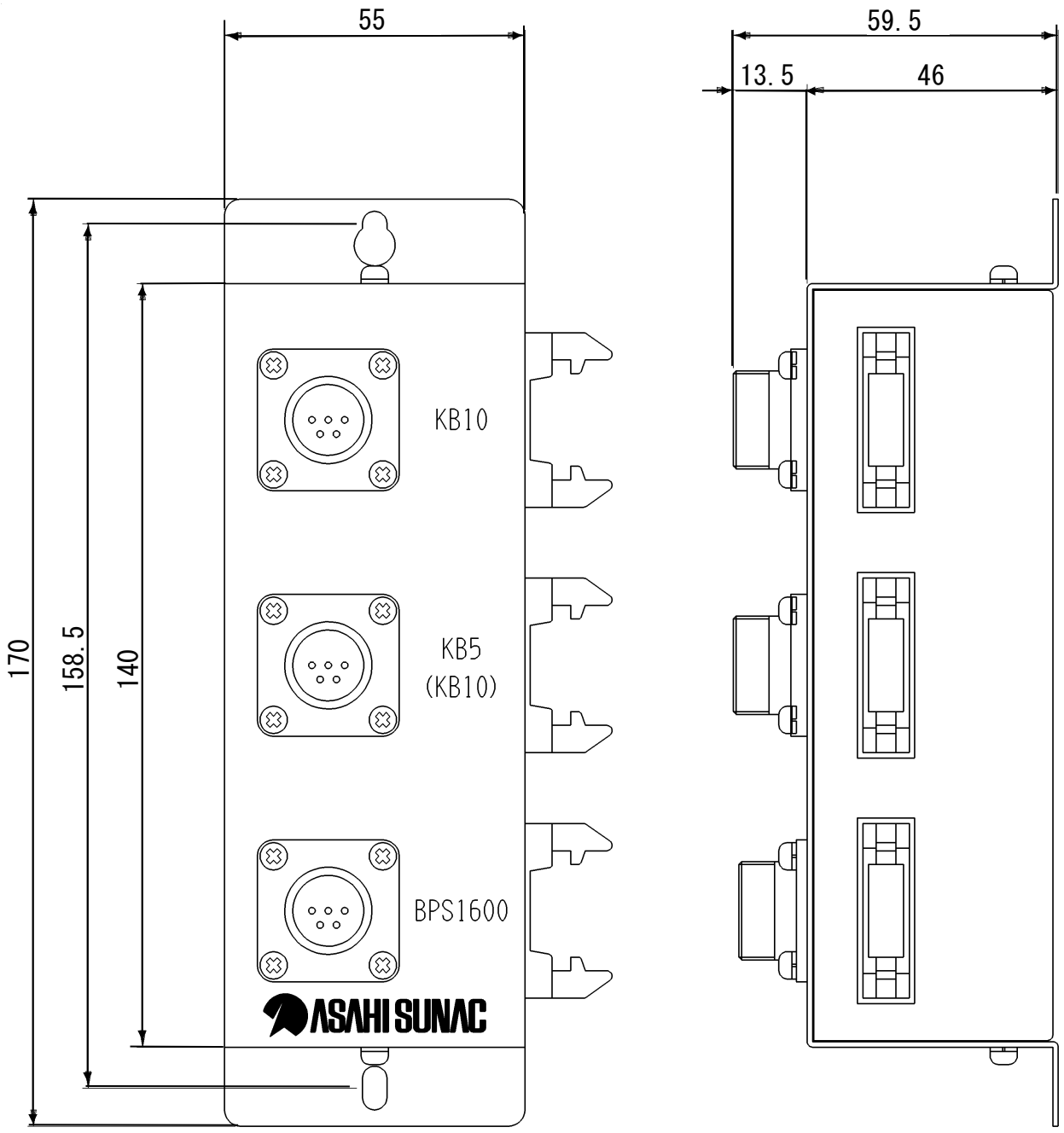


4.3 Connector Box(10 Guns Specifications)



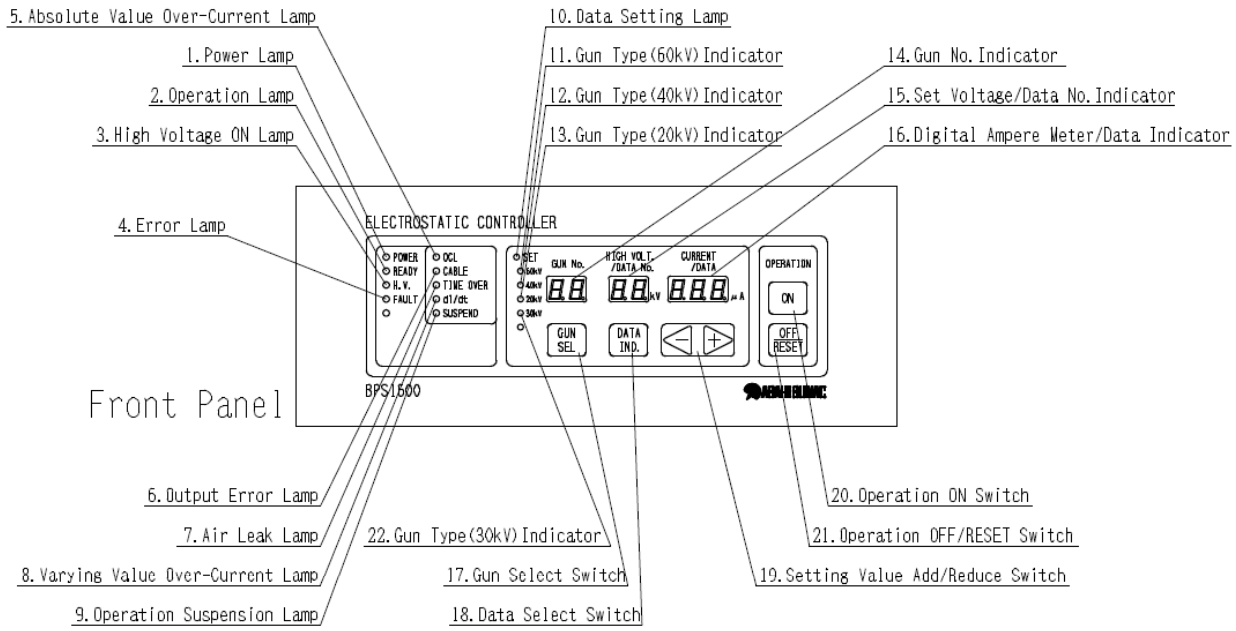


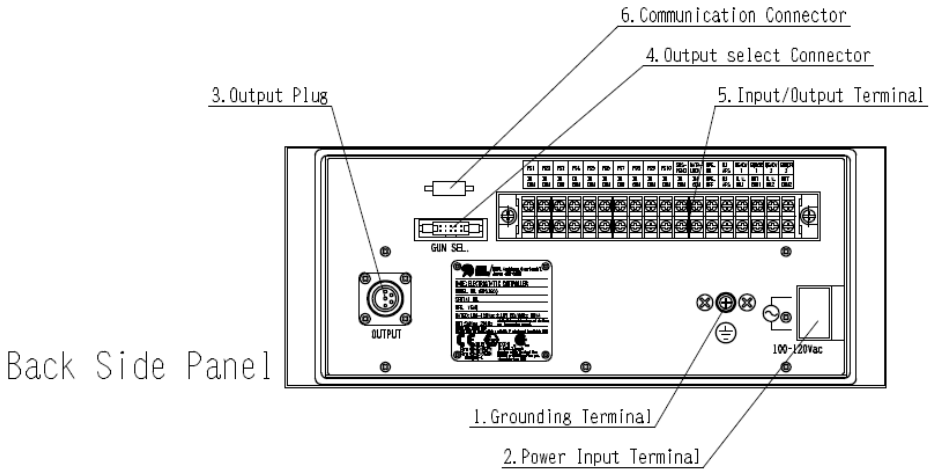
4.4 HUB

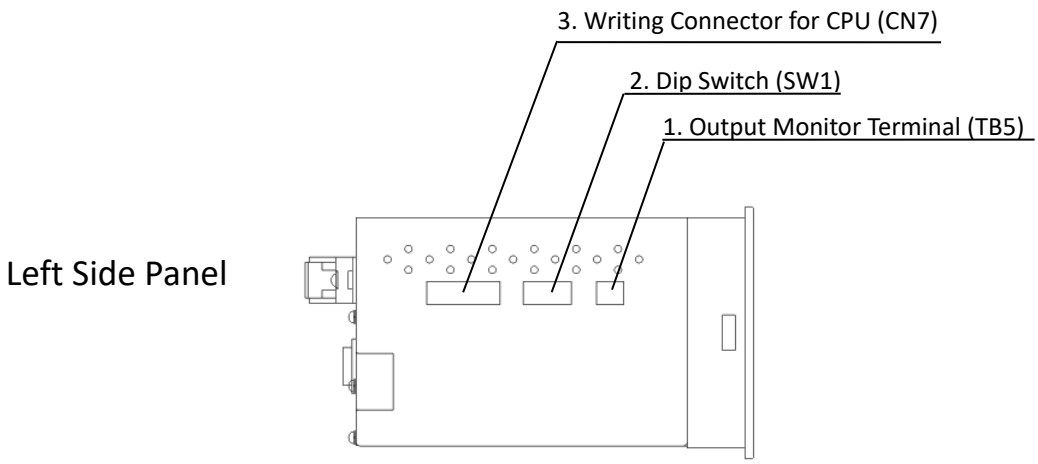


5 Name and function of each part

5.1 Name of each Part







5.2 Function of each Part

[Front Panel]

1. Power Lamp [POWER]
   Lights up when power is supplied to Power Input Terminal.

2. Operation Lamp [READY]
   Lights up when Operation ON Switch is pushed to indicate the system is ready to generate high voltage. In this state, if the Gun Trigger is pulled, high voltage is generated. When [OFF/RESET] Switch is pushed, the Lamp is off.

3. High Voltage ON Lamp [H. V.]
   In the state of high voltage [READY], if Air Flow Switch is ON(Gun Trigger is pulled), this Lamp lights up to indicated high voltage is being generated.

4. Error Lamp [FAULT]
   Lights on intermittently when any error occurs.

5. Absolute Value Over-Current Lamp [OCL]
   Lights up intermittently when high voltage current output from High Voltage Generator exceeds the preset value. Also, lights on intermittently when any error occurs in high voltage current passage from High Voltage generator and when return current is detected during Air Flow Switch [OFF]. When this Lamp is being on, the value on DATA Indicator goes back to show the current is monitored.

6. Output Error Lamp [CABLE]
   Lights up intermittently when any error occurs in power transmitting passage to High Voltage generator or in high voltage current passage from the High Voltage generator, detecting wire cut or short circuit in grounding wire or returning current line. Also, lights up when transmitted current or returning current is detected while Air Flow Switch is [OFF]. When this Lamp is being on, the value on Data Indicator shows that the transmission current is monitored.

7. Air Leak Lamp [TIME OVER]
   Lights up intermittently when Signal for Air Flow Switch is kept [ON] even after the setting time is over, and makes generating of high voltage be stopped, detecting air leakage from Guns or welding of lead switch.
   When this Lamp is being on, value on Data Indicator shows that the time length of continuous [ON] of Air Flow Switch is monitored.

8. Variable Value Over-Current Lamp [di/dt]
   Lights up intermittently when varying value of high voltage current output from High Voltage Generator exceeds the preset value, making the supply of high frequency power be stopped. At the same time, [H. V.] Lamp is off.

9. Operation Suspension Lamp [SUSPEND]
   Lights up when suspending terminal on Input/Output Terminal Block on Back Side Panel is short circuited to COM, making the high voltage be temporarily suspended(transmission to High Voltage Generator is stopped.).

10. Data Setting Lamp [SET]
Lights up when [Data Lock] Terminal is [OFF], making setting of output voltage and current value for shut-off be possible. When the [Data Lock] Terminal is [ON], this Lamp lights up intermittently to show that any change in setting is not possible.

11. Gun Type(60kV) Lamp [60kV]
Lights up while Gun for 60kV is being selected.

12. Gun Type(40kV) Lamp [40kV]
Lights up while Gun for 40kV is being selected.

13. Gun Type(20kV) Lamp [20kV]
Lights up while Gun for 20kV is being selected.

14. Gun No. Indicator [GUN No.]
Shows No. of the Gun being selected in 2 digits.
Figures corresponding to each of the Guns No. 1 to 15(may be varied depending on numbers of the Guns on System Parameter) is indicated.

15. Set Voltage/Data No. Indicator [HIGH VOLT./DATA No.]
Preset voltage or data No. for preset function corresponding to the selected Gun is indicated in 2 digits.

16. Digital Ampere Meter/Data Indicator [CURRENT/DATA]
High voltage current value or data for each setting and function setting is indicated in 3 digits. While high voltage is being generated, high voltage current value is indicated here.

17. Gun Selection Switch [GUN SEL]
To be used to select Gun No..

18. Data Selection Switch [DATA IND.]
To be used to change over the indications or data.

19. Setting Value Add/Reduce Switch [+ · —]
To be used to increase or decrease the set value.

20. Operation On Switch [ON]
If recognized, the Operation Lamp [READY] lights up to make the System be ready for high voltage generating. When [PREFER OUTSIDE] is being effective, this switch becomes ineffective.

21. Operation Off/Reset Switch [OFF/RESET]
Effective as long as the [READY] Lamp is on and, if recognized, the [READY] Lamp is off to show that status of being ready for high voltage generating is released. Also, this switch is kept effective even when [PREFER OUTSIDE] is in effect as same as outside switches.
Also this switch is used to reset the System when output error alarm works.

22. Gun Type(30kV) Lamp [30kV]
Lights up while Gun for 30kV is being selected.

[Back Side Panel]

1. Grounding terminal

This is the terminal to ground the BPS1600 Controller. The controller handles high voltages, confirm it is ground the earth terminal by Class D method.

⚠ WARNING

If not grounded correctly, it may cause serious troubles of system breakage, electric shock, bodily injury or fire.

2. Power Input Terminal Block [POWER SOURCE]

This terminal block for electric power input. Supply power 100V to 120VAC here. If different power is input, it may cause trouble of system breakage or fire.

3. Output Plug [OUTPUT]

Here connect cable to transmit power of 24VAC to Connector Box.

4. Output Select Connector [GUN SEL.]

Here connect flat cable to send signal to Connector Box to which Gun(s) the power should be transmitted.

5. Input/Output Terminal Block

1) Input

No.	Symbol	Terminal No	Name	Details
①	FS1	A1	Air Flow Switch 1	Input to Air Flow Switch for Gun 1/11
②	FS2	A2	Air Flow Switch 2	Input to Air Flow Switch for Gun 2/12
③	FS3	A3	Air Flow Switch 3	Input to Air Flow Switch for Gun 3/13
④	FS4	A4	Air Flow Switch 4	Input to Air Flow Switch for Gun 4/14
⑤	FS5	A5	Air Flow Switch 5	Input to Air Flow Switch for Gun 5/15
⑥	FS6	A6	Air Flow Switch 6	Input to Air Flow Switch for Gun 6
⑦	FS7	A7	Air Flow Switch 7	Input to Air Flow Switch for Gun 7
⑧	FS8	A8	Air Flow Switch 8	Input to Air Flow Switch for Gun 8
⑨	FS9	A9	Air Flow Switch 9	Input to Air Flow Switch for Gun 9
⑩	FS10	A10	Air Flow Switch 10	Input to Air Flow Switch for Gun10
⑪	SUSPEND	A11	High Voltage Suspend	Input for suspending high voltage generating
⑫	DATA LOCK	A12	Data Lock	Input to make Function Setting ineffective
⑬	OPE. ON	A13	Operation On	Input to make operation on from outside
⑭	OPE.OFF	B13	Operation Off(Error Reset)	Input to make operation off from outside
⑮	G1AFS	A14	Gun Group 1 - 10	Input to select Gun 1 to 10
⑯	G2AFS	B14	Gun Group 11 - 20	Input to select Gun 11 to 15
⑰	INCOM	B1-B12	Input Common	Common for Input

※ Connect signals of dry contact. (12VDC, 12mA or less)

2) Output

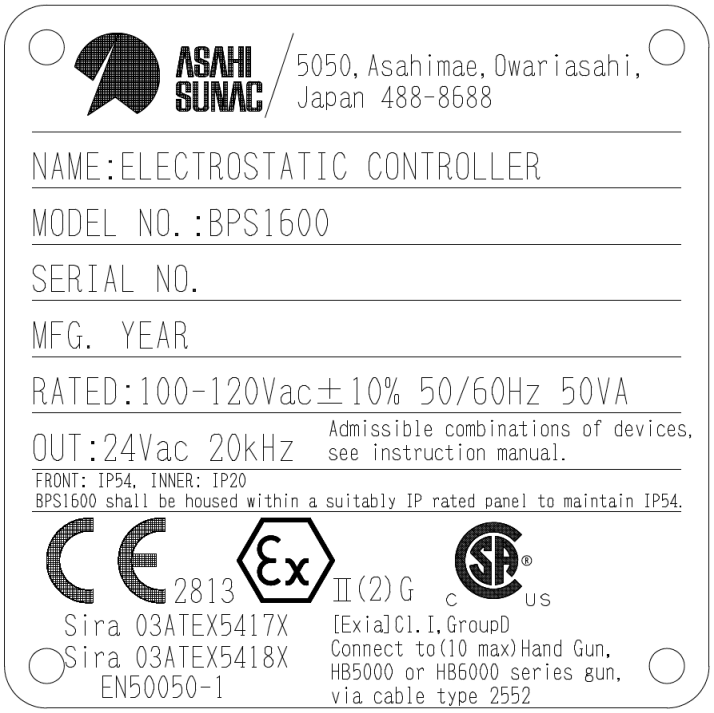
No.	Symbol	Terminal No	Name	Details
①	READY1	A15-B16	Operation On 1	Outputs when operation is on.
②	ERROR1	A16-B16	Error occurring 1	Outputs when error occurs.
③	H. V. 1	B15-B16	High Voltage On 1	Outputs when high voltage is being generated.
④	READY2	A17-B18	Operation On 2	Outputs when operation is on.
⑤	ERROR2	A18-B18	Error occurring 2	Outputs when error occurs.
⑥	H. V. 2	B17-B18	High Voltage On	Outputs when high voltage is being generated.

※Can be output by A contact dry. (30VDC, 2A or less)

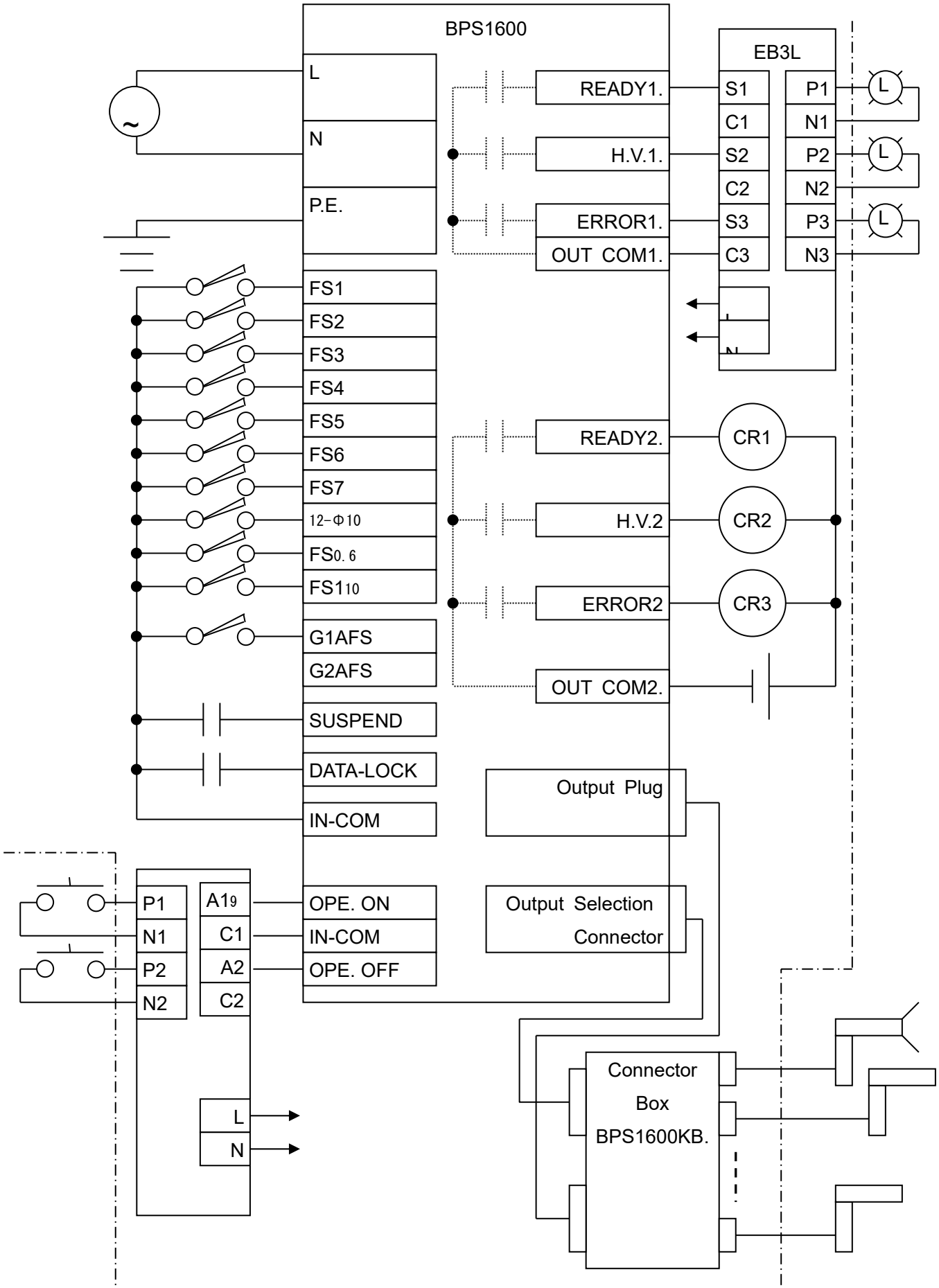
6.Communication Connector

It's used for BPS1600EX.

<Rating Plate>



[Example of Connection]



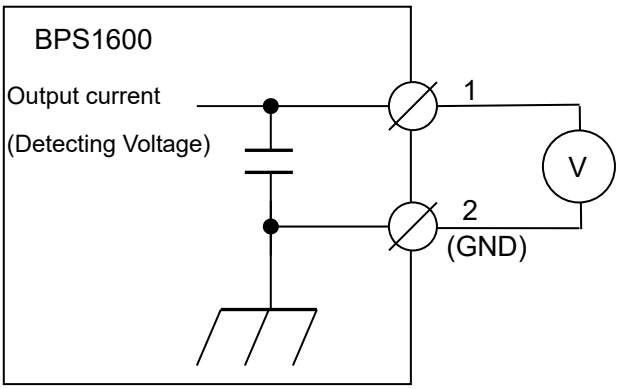
[Left Side Panel]

1. Output monitor terminal

   To be used to monitor output current.

1	2
Output current (Detecting Voltage)	GND

Recommended circuit example



2. Dip switch

   Unused. Do not change the setting.

1	
2	
3	
4	
5	
6	
7	
8	

3. Writing connector for CPU

   To be used to update a CPU program.

6 How to operate controller

6.1 Wiring and Operation

(1) Before operation, confirm that the equipment has been installed according to the installation manual. Confirm it is ground the earth terminal by Class D method.

⚠ WARNING

If not grounded securely and sufficiently, it may cause serious troubles of electric shock, fire or explosion.

(2) Connect the necessary wirings from outside to Input/Output Terminals on Back Side Panel of the Controller.

(3) Following to Function Setting Steps, confirm that the Data No.24 “OCL Yes.No./Output Error” in Function Setting Mode is not “0”.

⚠ WARNING

If “OCL Yes.No/Output Error” shows “0”, safety devices do not work, which may cause serious troubles of fire or electric shock.

(4) Connect power source line to Input Terminal Block. Confirm that its voltage is correct.

⚠ WARNING

Power source of different voltage may cause trouble of system breakage or fire.

(5) Connect transmission cable for Electrostatic Spray Gun to Output Plug.

(6) Connect hose and air hose to Electrostatic Spray Gun.

(7) Connect air hose to Air Flow Switch.

(8) Supply air and painting material.

(9) Supply correct electric voltage to power source line.

(10) Then, Power Source Lamp [POWER] will light up and Program Version No. is indicated on Digital Ampere Meter for approx. 3 seconds.

(11) Push Operation On Switch[ON] to make Operation Lamp [READY] be on.

(12) You can start spray by pulling Gun trigger.

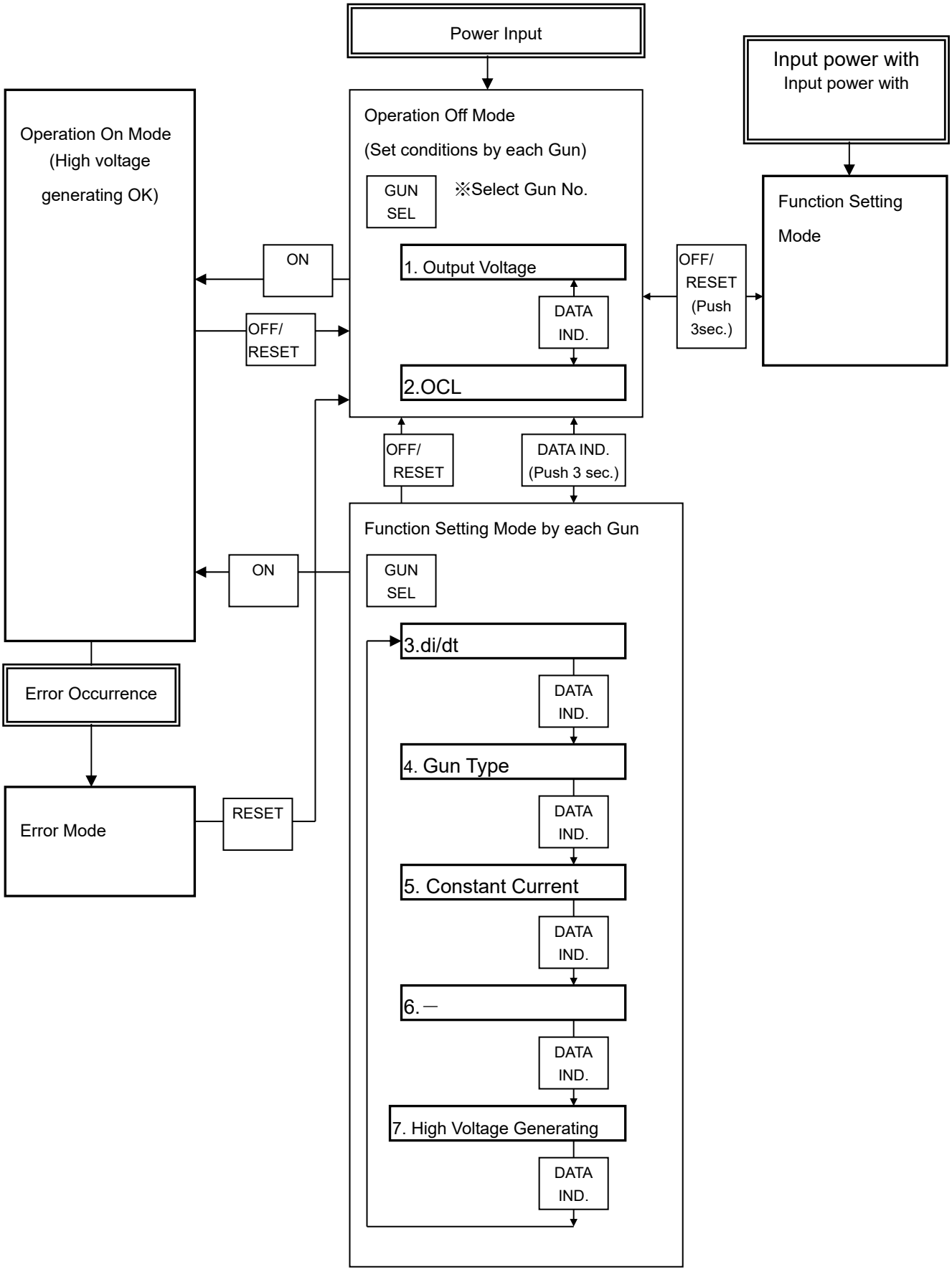
(13) If Gun nozzle comes too close to any grounded article, safety device works to make alarming buzzer sound and to stop high voltage.
※In case of Electrostatic Gun for water-borne paint, its construction does not make OCL work even if Gun nozzle approaches any grounded article.

(14) The safety device is reset by releasing Gun trigger.

(15) When to stop temporarily or to finish coating work, push Operation Off/Reset Switch [OFF/RESET].

6.2 How to change Mode

See the diagram shown below for changing over modes, Operation On Mode, Function Setting Mode by each Memory, Function Setting Mode, Operation Off Mode and Error Mode.



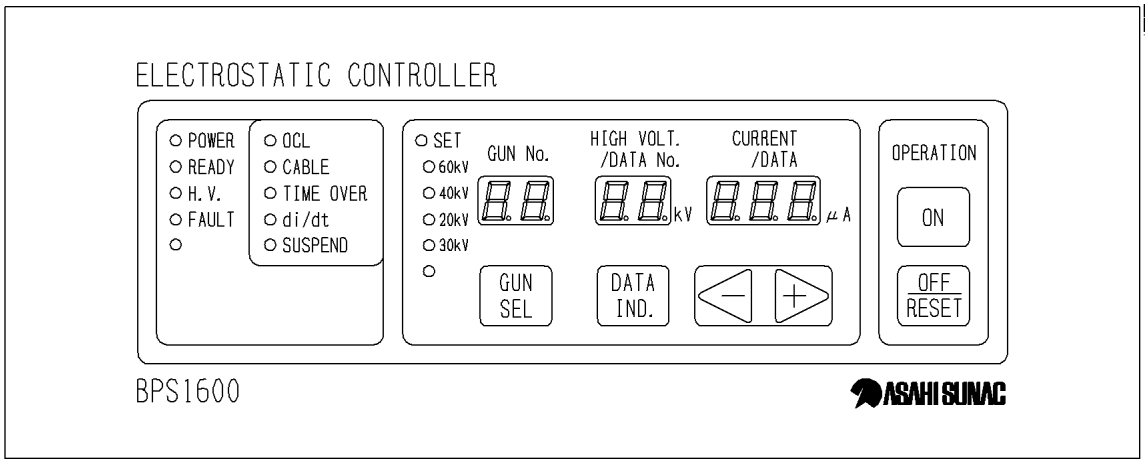
6.3 Operation and Indications in Operation On Mode(Condition Setting by each Gun)

To change set voltage and OCL settings required by changed coating conditions, take the following steps.

(1) By normal power input or pushing of [OFF/RESET] Switch, the Lamp [SET] lights up or twinkles to enter into [Operation Off Mode].

(2) Select Gun No. by pushing [GUN SEL] Switch and select [HIGH VOLT.] and [CURRENT] by pushing [DATA IND] where high voltage value or OCL settings can be changed by using [—] and [+] keys. While [SET] Lamp is twinkling, you can not change the set values.

(3) To secure the changed data, never forget to push key switches other than [—] and [+], ([GUN SEL], [DATA IND.], [ON] and [OFF/RESET].



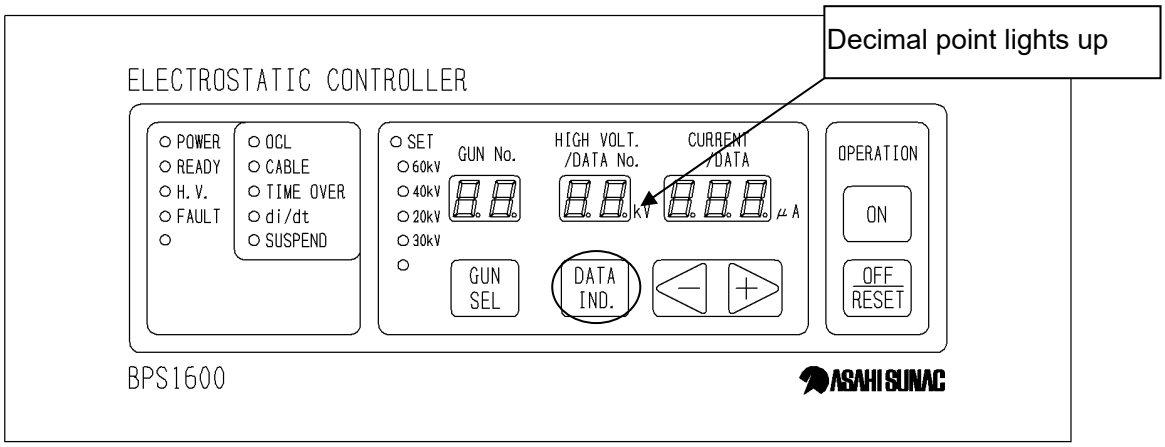
Key Switch	Status	Contents
GUN SEL	Effective	①Change Gun No. ②In case of single Gun specifications without input of outside selection, or the system is set as Priority on Panel, here you can select Manual Memory.
DATA IND.	Effective	①Change over H.V. setting and OCL setting alternatively here. ②By pushing over 3 seconds, you can move to [Function Setting Mode by each Memory].
— +	Effective*	Increase and decrease(*Only when [Data lock] is released.)
ON	Effective	Move to Operation On Mode.
OFF/RESET	Effective	By pushing over 3 seconds, you can move to [Function Setting Mode].

[Items of Condition Setting by each Gun]

Item	Name	Initial Value	Remarks
HIGH VOLT.	Output Voltage	30	For –40kV Output voltage at non-load For –60kV Output voltage at non-load For –30kV Output voltage at non-load
CURRENT	OCL	80	Maximum limit of over-current

6.4 Operation and Indications in Function Setting Mode by each Gun

If it is necessary to change set values of di/dt, Gun type, Constant current, (nil) and high voltage generating subject to changed coating conditions, etc., the following steps should be taken.
(1) Push [DATA IND] key for 3 seconds. The decimal point in [DATA No.] lights up to show the system moves into Function Setting Mode for each Memory.
(2) Select Gun No. by pushing [GUN SEL] and select Data No. by pushing [DATA IND.].
Then, using [—] or [+] key, change di/dt, Gun type, Constant current, (nil) and high voltage generating.
(3) To secure the changed data, never forget to push Key Switches, i.e., [GUN SEL], [DATA IND.], [ON] and [OFF/RESET].



Key Switch	Status	Contents
GUN SEL	Effective	Change Gun No.
DATA IND.	Effective	①Change over Data No. between 3 to 7 ②By pushing over 3 seconds, move to [Operation Off Mode].
— +	Effective*	Increase and decrease figures.(*Only in case Data Lock is released.)
ON	Effective	Move to [Operation On Mode].
OFF/RESET	Effective	Move to [Operation Off Mode].

[Items of Function Settings by each Gun]

Data No.	Name	Initial Value	Remarks
3	di/dt	30	Maximum limit of varying value
4	Gun Type	4	0: -20kV 1: -40kV 2: -60kV 4:-30kV (In case of plural numbers of Guns used.)
5	Constant current	80	
6	-	-	※Not used
7	High voltage generating	0	0: Effective 1: Ineffective (In case of plural numbers of Guns used)

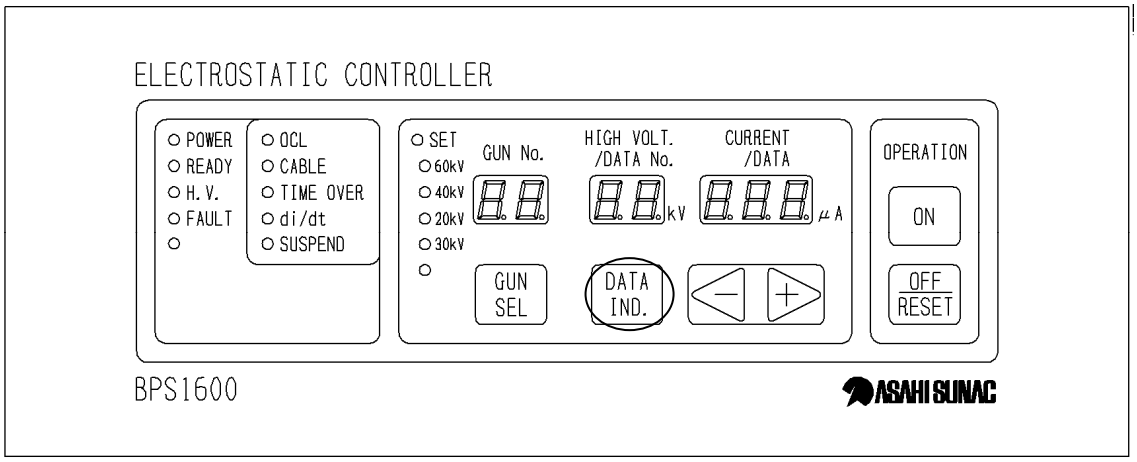
6.5 Operation and Indications in Operation On Mode

In this Mode, the system is in the state ready for high voltage generating.

(1) High voltage generating is on and off by signals from Air Flow Switch. While high voltage is being generated, [H. V.] Lamp lights up. No. of the Gun on which high voltage is being generated is shown in [GUN No.].

(2) By pushing [DATA IND.] key, values in [CURRENT/DATA] are changed and you can monitor values of returning current([OCL] lights up.), transmitted current([CABLE] lights up.), time length of Air Flow Switch ON([TIME OVER] lights up.), variation degree of returning current([di/dt] lights up.) and constant current generating time([OCL] and [TIME OVER] light up.).

※These monitorings are changed to the main monitorings set by Data No.34 if there is no other operation over 60 seconds.



Key Switch	Status	Contents
GUN SEL	Ineffective	--
DATA IND.	Effective	Change indications in [CURRENT/DATA]. (Returning current (Weighted average) →Returning current→Transmitted current→Time length of Air Flow Switch ON→Variation degree of returning current→Constant current generating time)
— +	Ineffective	High voltage adjustment for Gun under H.V. generating is possible if High Voltage Setting(Function Setting No.33) in operation is set at [1](Allowed), but the set value is not memorized.
ON	Ineffective	-
OFF/RESET	Effective	Moves to [Operation Off Mode].

6.6 Operation and Indications in Function Setting Mode(Setting of System Parameters)

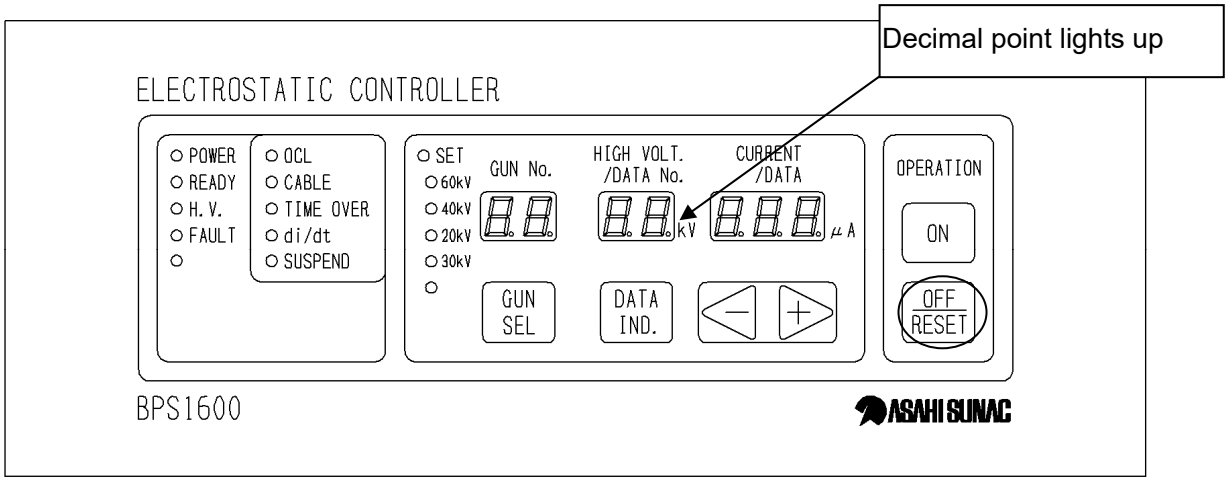
If it becomes necessary to change System Parameters, take the following steps.

(1) Input power source keeping [OFF/RESET] key be pushed. All Lamps of [SET], [60kV], [40kV],[20kV] and [30kV] will light up.

(2) After some time length, decimal point in [DATA No.] lights up to show the system moves to [Function Setting Mode]. You can enter in this Mode by pushing [OFF/REST] key for 3 seconds, too.

(3) Select Data No. by pushing [DATA IND.] and change data(System Parameters) by pushing [—] or [+] key.

(4) To secure the changed data, never forget to push all key Switches except [—] and [+], i.e., [GUN SEL], [DATA IND.], [ON] and [OFF/RESET]



Key Switch	Status	Contents
GUN SEL	Effective	Select Data No. of System Parameter for which set value is to be changed. (-1)
DATA IND.	Effective	Select Data No. of System Parameter for which set value is to be changed. (+1)
— +	Effective*	Increase and decrease figures.(*Only when Data Lock is released)
ON	Ineffective	-
OFF/RESET	Effective	Moves to Operation Off Mode if pushed for over 3 seconds.

Data No.	Name	Min.	Max.	Initial Value	Relating Error	Remarks
1	Plural Guns Specification	0	1	1	-	0: 1 gun 1: Plural Guns
2	Gun Type	0	4	0	-	0: for -20kV 1: for -40kV 2:for -60kV At setting by each Gun: 0 *Don't select 3 4:for -30kV
3	Numbers of Gun	1	25	5	-	1 to 25
4	Prefer Outside	0	1	1	-	0: Panel is preferred. 1: Outside is preferred. Selecting method at 1 gun specifications
5	Transmission Error Detection Interval	0.01	2.50	0.01	CABLE	0.01 to 2.50sec.
6	Times of continuous Transmission Error Detection	1	10	5	CABLE	1 to 10 times
7	Transmission Error,min current	0.01	9.99	0.04	CABLE	0.01 to 9.99A
8	Transmission Error, max current	0.01	9.99	3.00	CABLE	0.01 to 9.99A
9	Return Current Err. Detect.Int.	0.1	9.9	0.1	CABLE	0.1 to 9.9 sec
10	Ret'n Current Err. Detect. Times	1	99	30	CABLE	1 to 99 times
11	Ret'n Curr. Error, min Curr.	0.25	40.0	1.00	CABLE	0.25 to 40.0μA
12	Air Leak Detect. Time Length	1	240	120	TIME OVER	1 to 240 sec
13	Constant current	25	80	80		25 to 80μA
14	Cont.OCL Detect. Times	1	20	1	OCL	1 to 20 times
15	OCL Detect. Value	30	160	160	OCL	30 to 160μA
16	OCL Dull Time Length	0.0	2.0	0.5	OCL	0.0 to 2.0 sec
17	OCL Dull Degree	1.0	5.0	2.0	OCL	1.0 to 5.0 times
18	di/dt Buffer	1	8	4	di/dt	1 to 8
19	di/dt Weighted Average	10	255	50	di/dt	10 to 255
20	Cont. di/dt Detect. Times	1	2	1	di/dt	1 to 2 times
21	di/dt Detect Interval	2	7	5	di/dt	32msec(5 shifts)
22	di/dt Dull Time Length	0.0	2.0	1.0	di/dt	0.0 to 2.0 sec
23	di/dt Dull Degree	1.0	5.0	2.0	OCL	1.0 to 5.0 times
24*	OCL Yes/No / Error Output	0	3	1	OCL	*Refer to Art. "Setting for Solution at Error Occurrence".
25*	di/dt Yes/No / Error Output	0	3	0	di/dt	
26*	Transm. Err. Yes/No/Err. Output	0	3	2	CABLE	
27*	Ret'n Err. Yes/No / Err. Output	0	3	0	CABLE	
28*	Time Over Yes/No / Err. Output	0	3	2	TIME OVER	
29*	Const. Current Time Over Yes/No / Err. Output	0	3	0	Const. Current TIME OVER	
30	Err. Relay Output Delay	0.0	5.0	0.0		to 5.0 sec (In case Solution at Error is set at "1")
31	Const. Current Time Over Detecting Time	1	60	10	Const. Current TIME OVER	
32	Current Err. (Spray OFF)	0	3	0	CABLE	*Refer to Art. "Setting for Solution at Error Occurrence."

33	H.V. Setting during Operation	0	1	0		0: Not allowed 1: Allowed
34	Main Monitorings	0	4	0		Output Voltage and 0: Returning Current (Weighted Average) 1: Returning Current 2: Transmitted current 3:TimeOver 4:di/dt
35	Correction value of Transmission Error, max current	1	10	6		1 to 0.1 (100 to 10 %)
36	Recipe Preservation Yes/No	0	1	0		0: Effective 1:Ineffective (In case of one gun)
37	Recipe Number	1	25	1		1 to 25
38	—	—	—	—		
39	Final Error Code	—	—	—		Only Error set to 'Operation OFF'. 1: H.V. Over-current 2:Varying value Error of H.V. current 4:Min. limit Error of transmitting current 8: Max. limit Error of transmitting current 16: Min limit Error of returning current 32: Varying value Error of H.V. current（Peek Mode） 64: Air leak Error 128: Constant Current Time Over Error It is initialized in power OFF.
40	Returning Current Max. value	0	255	—		It is initialized in power OFF or pushing [—] or [+] key
41	di/dt Max. value	0	255	—		
42	di/dt Max. value（Peek Mode）	0	255	—		
43	Transmitted current Max. value	0.00	9.96	—		
44	TimeOver Max. value	0	255	—		
45	Const. Current Time Over Max. Value	0	255	—		

As to various errors, you can preset Error Detection or none and system's action at occurrence of error.

Setting for action at Error Occur-ence	Action	Indication	High Voltage	Error Relay	Operation
0	No Detection of error	No	—	—	—
1	Stop high voltage. Error output. (Reset by releasing trigger.)	Yes	OFF	ON(Delay output)	—
2	Stop high voltage. Error output Stop operation(Reset by pushing [RESET] switch	Yes	OFF	ON	OFF
3	Stop high voltage. Error output (Reset by pushing [RESET] switch)	Yes	OFF	ON	—

Name	Range of Setting	Initial Value	Remarks
Output Voltage	3 to 20kV	30	For –20kV, Output voltage at non-load
	6 to 40kV		For –40kV, Output voltage at non-load
	10 to 60kV		For –60kV, output voltage at non-load
	5 to 30kV		For –30kV, output voltage at non-load
OCL	30 to 160μA	80	Max. limit of over-current
di/dt	0 to 40μA	30	Max. limit of varying value
Gun type	0 or 2	4	0: -20kV 1: -40kV 2:-60kV 4:-30kV (In case of plural guns)
Constant current	25 to 80	80	Value of constant current
—		—	Not used.
H. V. generating	0 or 1	0	0: Effective 1:Ineffective(In case of plural guns)

[Set Values]

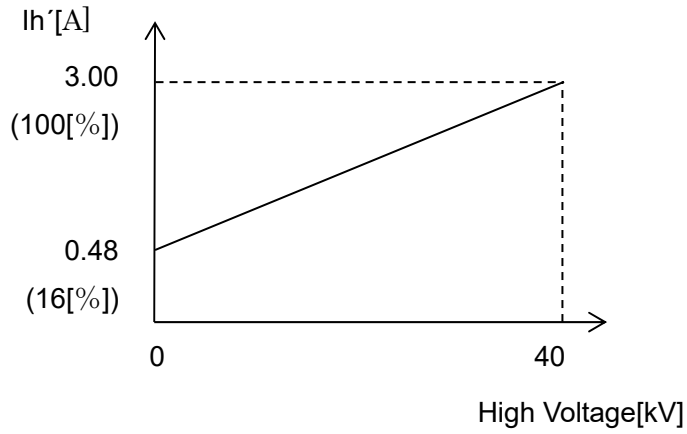
Data No. / Gun No	— Output Voltage	— OCL (μA)	3 di/dt (μA)	4 Gun type	5 Constant current(μA)	6 —	7 H.V. generating 0: Yes 1:No
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

6.7 How to set Max. Limit Error of Transmitting Current

Transmission Error, max current " Ih' " corresponding to Output voltage is calculated by using the Data No.8 "Transmission Error, max current" and the Data No.35 "Correction value of Transmission Error, max current" in Function Setting Mode.

Correction Value :k	[%]
1	100 (1)
2	50 (1/2)
3	33 (1/3)
4	25 (1/4)
5	20 (1/5)
6	16 (1/6)
7	14 (1/7)
8	12 (1/8)
9	11 (1/9)
10	10 (1/10)

← Initial Value



6.8 Outside Output of Error and How to reset Error

Errors	Lamp (on and off)	Relays			How to reset Error
		POWER	H. V.	ERROR	
H.V. Over-current	OCL	—	OFF	ON (Delay)	Release Gun trigger.
Varying value Error of H.V. current	di/dt	OFF	OFF	ON	Push [OFF/RESET] Push [OFF]
Max/min limit Error of transmitting current	CABLE	OFF	OFF	ON	Push [OFF/RESET] Push [OFF]
Max/min limit Error of returning current	OCL• CABLE	OFF	OFF	ON	Push [OFF/RESET] Push [OFF]
Air leak Error	TIME OVER	OFF	OFF	ON	Push [OFF/RESET] Push [OFF]
Const. Current Time Over	OCL ・TIME OVER	OFF	OFF	ON	Push [OFF/RESET] Push [OFF]
Current Error (Spray OFF)	OCL・ CABLE	OFF	OFF	ON	Push[OFF/RESET] Push[OFF]
H.V. Suspending	SUSPEND	—	OFF	—	Make contact for Suspend off.

6.9 How to make Outside Operating Switches be effective

When Outside Operation Switch is set at Effective, Operation On/Off can be controlled by outside switch, but in this case, Operation Switch on Front Panel becomes ineffective. However, the [OFF/Reset] Switch on the Panel remains effective.

10. Following to the steps for Function Setting, set No.4 [Prefer Outside] of Function Setting to “1”.

(2) Short circuit [(13) OPE.ON] to [(30) INCOM] on Input/Output Terminal Block.

(3) Confirm that the [READY] Lamp lights up.

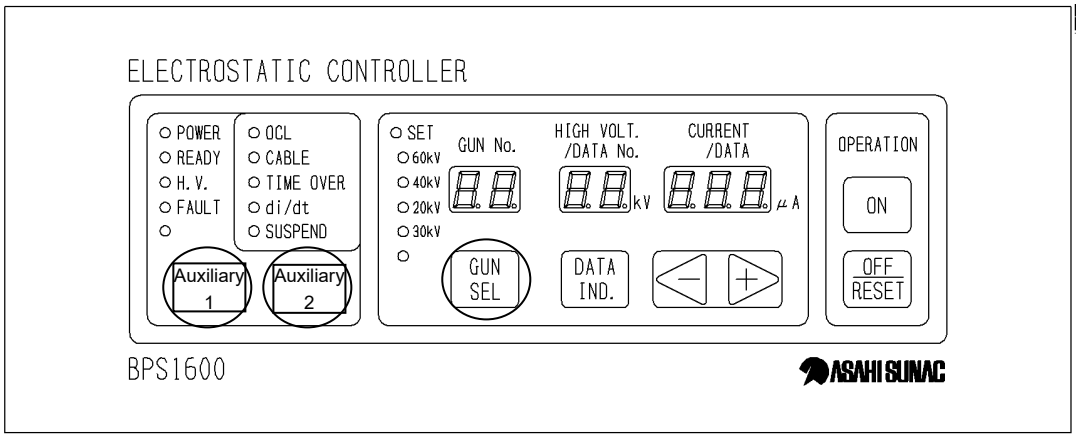
(4) Short circuit [(31) OPE. OFF] to [(30) INCOM] on Input/Output Terminal Block.

(5) Confirm that the [READY] Lamp is off.

(6) Confirm that the [READY] Lamp does not light up even if Operation ON Switch on Front Panel is pushed.

(7) Now, the setting is over.

6.10 How to clear all setting



When it is desired to make all condition settings by each Gun or values of System Parameter return to their initial values, clear entirely taking the following steps.

10. In the state of Power ON, keeping the keys [Auxiliary 1] and [Auxiliary 2] be pushed, push [GUN SEL] key.

(2) [POWER] Lamp will twinkle to show “All Clear” is being prepared.

(3) Shut off power once, then switch on again.

(4) [di], [Er] and [4.01](Data Error Version 4.01) are indicated, while the system is initialized.

6.11 How to set ‘Constant Current Time Over Error

The state is judged as abnormal during keeping ‘constant current state’* for a definite period of time. Then, high voltage output is stopped and error signal is output.

*Constant current state: high voltage output is reduced while output current exceeds the preset value of ‘constant current’.

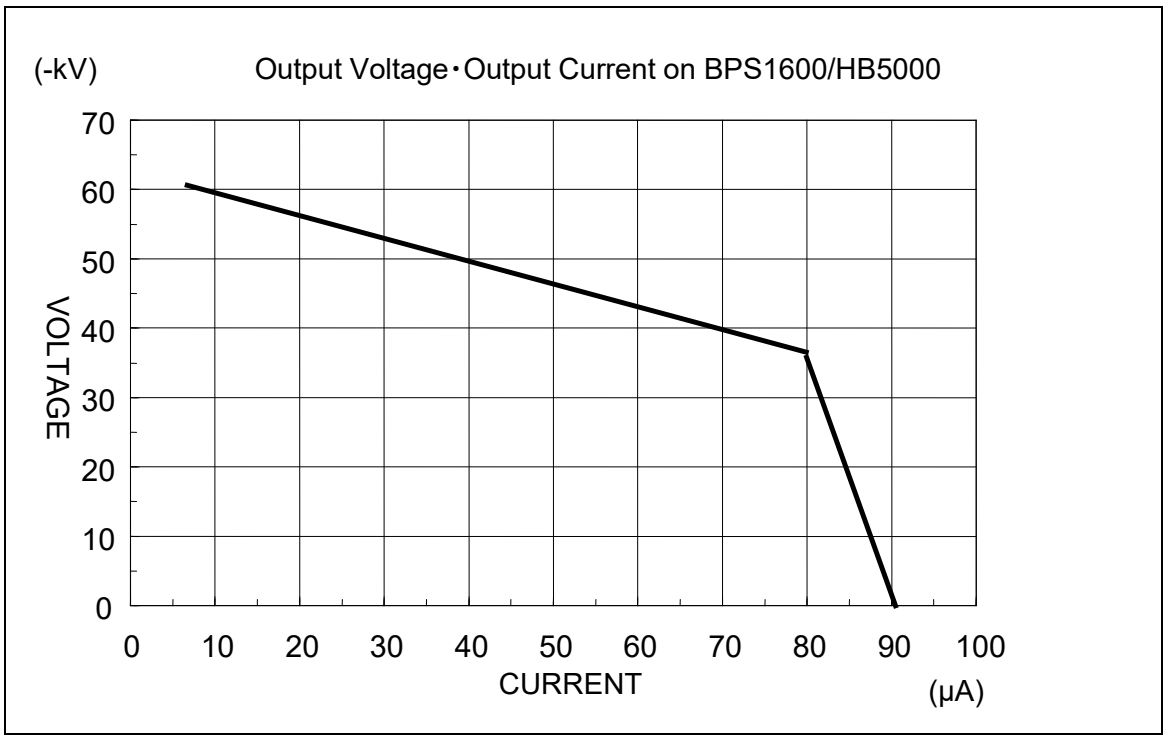
“Constant Current Time Over Error”' can be set by using the data No. 29 “Constant Current Time Over Error” and No. 31 “Constant Current Time Over Detecting Time”.

the lamp of [FAULT] lights up and the lamps of [OCL] and [TIME OVER] light up intermittently, detecting the abnormal state,.

*Setting of constant current: Use the following settings according to ‘Plural Guns Specification (function Setting Data No. 1)’.

Plural Guns Specification (Function Setting Data No. 1)	Constant Current
0: 1 gun	Constant Current (Function Setting Data : No. 13)
1: Plural Guns	Constant Current (Function Setting Data by each gun: No. 1)

7 Output voltage output current characteristics



8 Maintenance Log

Maintenance/repair should not be performed by the end-user. Maintenance/repair is provided by Asahi Sunic or agency and contact information.

In the long run, you will find that such a log is very valuable in keeping your equipment in a consistently good operating condition.

Equipment name			BPS1600		Date of acquisition: YYYY/MM/DD	
Date of service			Portion worked on	Description	Results	Who serviced
						Agency / Asahi Sunac
						Agency / Asahi Sunac
						Agency / Asahi Sunac
						Agency / Asahi Sunac
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						Agency / Asahi Sunac

9 Warranty

ASAHI SUNAC CORPORATION (the “Company”) shall provide the original purchaser (the “Purchaser”) with warranty service for a period of one (1) year from the date of purchase of the product, as follows:

- Should you find defects in design or workmanship with regard to parts, ship them back to the Company, with freight prepaid. The Company shall repair or replace the parts free of charge and reimburse the freight charges, provided that, as a result of an inspection and investigation of the parts conducted by the Company, the defects are deemed to be to attributable to the factors within the Company’s responsibility.

- In the following cases, free after-sales service is not provided.

  1. Failure resulting from an inappropriate method of installing this equipment.
  2. Failure resulting from a use method not conforming to this instruction manual or mishandling.
  3. Failure resulting from insufficient maintenance management of this equipment and incorrect handling such as non-conformance to the procedures specified in this instruction manual.
  4. Failure resulting from unauthorized alteration or structure change of this equipment without the Company’s consent.
  5. Failure due to force majeure such as earthquake, disaster, flood disaster or lightening.
  6. Warranty for consumables worn or deteriorated even in the case where this equipment is used correctly.
  7. Repair after the machine has been used outside Japan, and shipping cost.
  8. In addition to the above, failure due to circumstances beyond our control.

- As for items such as parts purchased by the Company from another manufacturer, the warranty of that manufacturer shall apply.

- As for any parts deemed to be defective, the Company shall not be held liable for any expenses beyond the provision of repair or replacement parts free of charge.

- The Company shall not be held liable for any damage to the Purchaser caused by factors not attributable to the Company, such as misuse of product, etc.

10 Revision Record

Revision level	Date	Content of revision	Program version
First edition	December 24, 2004	-	Ver1.00
2nd edition	June 29, 2005	Change CPU board and Program	Ver2.00
3rd edition	March 5, 2007	Change Key sheet and Program	Ver3.00
4th edition	March 25, 2010	Change Key sheet and Program	Ver3.03
5th edition	July 23, 2015	Change CPU board and Program	Ver4.00
6th edition	September 7, 2015	Change Terminal No.	Ver4.00
7th edition	November 9, 2015	Change Program	Ver4.01
8th edition	January 25, 2016	Change Pictures	Ver4.01
9th edition	June 19, 2018	Change Back panel and Program.	Ver5.01
10th edition	November 13, 2018	Change system parameter and program.	Ver5.02
11th edition	February 3, 2020	Add ATEX related matters	Ver5.02
12th edition	April 1, 2022	Change rating plate and program	Ver5.03

● When a transfer of title of this equipment takes place, please see to it that this Instruction Manual is handed over to the new owner.

● This equipment is manufactured in compliance with the Laws and Regulations of Japan.
In the rare eventuality of this equipment being used outside Japan, compliance with the safety standards of the relevant countries is of course mandatory.

12th Edition : April 1, 2022

ASAHI SUNAC

Leading Manufacturer of Coating FA Systems and Equipment
ASAHI SUNAC CORPORATION
Head office & Factory: 5050 Asahimae-cho, Owariasahi, Aichi 488-8688 Japan
TEL 81-561-53-0717 FAX 81-561-54-8847
e-mail: ctrd01@sunac.co.jp