Instruction Manual

Measuring & Monitoring System

Controller EVM-302 / EVM-308
Sensor SM-10 / SM-30

- ● English
- ☐ Korean
- ☐ Japanese
- ☐ Chinese (Simplified)
- ☐ Chinese (Traditional)

EVM-302
SM-10
SM-30
EVM-308
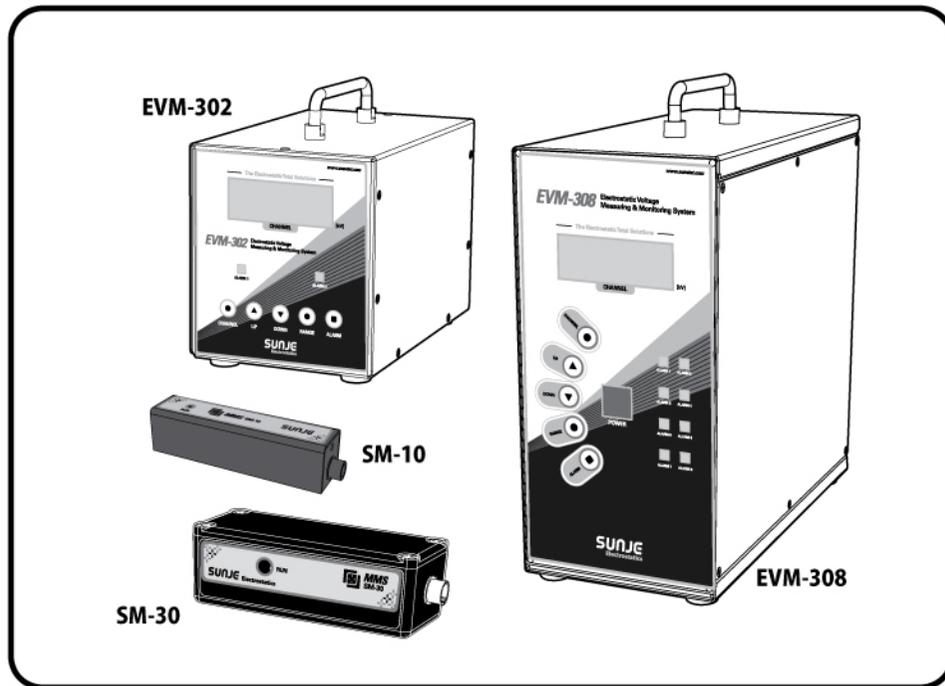
SUNJE
Electrostatics

INDEX

1. Please read before using

■ This product is designed and manufactured for industrial usage.

■ We recommend that only experienced persons such as a system designer or person in charge must operate our products. Please read the manual carefully before installation.

■ Please do not discard your instruction manual, place it in handy, you might need it in the future.

■ We cannot be responsible for improper installation or service, or if the product is not used properly. We only provide replacement or refund for defective products.

1.1 The matters of safety

⚠ WARNING If you do not obey these notices, you may be involved in a serious accident.

⚠ CAUTION If you do not follow these notices, you may have a serious injury or a loss of property.

⚠ ATTENTION If you do not follow these notices, you may have an injury or a loss of property.

1.2 Please read before using

⚠ WARNING
■ Do not use the products at the place where dangerous material such as inflammable or ignitable material exists.
   These products are not the products of anti-explosive type.

■ Secure the products firmly when you want to secure them.
   There is a possibility of accident due to fall-over or malfunction, etc.

■ Do not let the water touch the products. It may cause electric shock or fire due to malfunction.

■ When you check or maintain the products, make it sure you turn off the power.
   There is a possibility of electric shock.

■ Never modify the products. An accident can happen due to malfunction.

⚠ CAUTION
■ Do not use the product for the purpose outside of the range of the product use.
   If the product is used for the purpose outside of the range of the use, it can result in the trouble or the shortened service life. Or an unexpected problem may occur.

■ In the event the power line or communication line of the product has been damaged, replace it immediately. It can cause malfunction due to electric leakage or defective communication.

■ Connect wires referring to the product manual.
   Wrong connection can cause failures.

■ After the wires are connected, check whether cables are connected correctly before power is applied.
   If cables are not connected correctly, it may cause failure of the product.

■ Take precautions as cables of the adaptor, the power line and communication line of each product may disconnect.

⚠ ATTENTION
■ Secure working space when you install the product. If working space is not secured, the checking or maintenance of the product is made impossible leading to failure of the product.

■ When you dispose the product, dispose it appropriately as industrial waste.

2. Overview and Major Features

EVM series can easily monitor the voltage of static electricity at places where static electricity is generated such as manufacturing processes of LCD, PDP, OLED and semi-conductor, or parts assembly processes, printing processes, film processes, etc.

.

RS-232/485 — Provides the optimized display screen. Communication with PC through RS-232/RS-485 is possible.

OUTPUT — In the event the voltage of static electricity is generated which is higher that the value set for alarming, contact output is possible.

SM-10 — SM-10 is a short-range sensor. (Range: 10~100mm)

SM-30 — SM-30 is a long-range sensor. (Range: 100~700mm)

Can check the measured voltage real-time.

Can store and output all the information input in PC.

NON-CONTACT — The sensor that detects the static electricity has the compact structure and is non-contact type, so it is easy to install it.

EMS — It is possible to configure RS-485 network to construct the EMS (Electrostatic Monitoring System) that can monitor up to 1,024 static electricity. **(Option)**

3. Nomenclatures of Parts

3.1. Sensor

⚠ Caution

• **Take precautions because it is very sensitive to shock.**

1) SM-10

SM-10 is a short-range sensor (Range: 10~100mm)
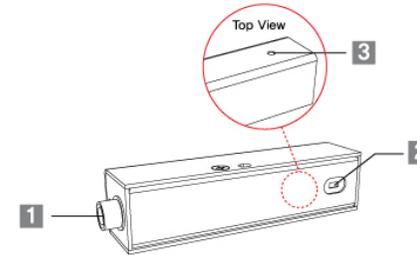
1. Controller Connector
   The connector that connects SM-10 to EVM-302/308.

2. Constant Voltage Sensing Part
   The part that measures the electrostatic voltage of the electrified body.

3. Run LED
   This indicating LED is on when the product works properly.

2) SM-30

SM-30 is a long-range sensor (Range: 100~700mm)
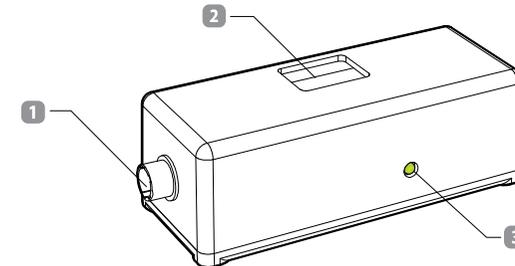
1. Controller Connector
   The connector that connects SM-30 to EVM-302/308.

2. Constant Voltage Sensing Part
   The part that measures the electrostatic voltage of the electrified body.

3. Run LED
This indicating LED is on when the product works properly.

3.2 EVM-302

Up to 2 units of sensors can be installed.
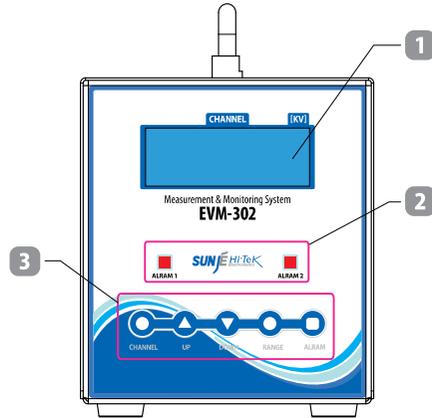
■ Front View

1. LCD Display

   LCD display of EVM-308.

   Display each sensor's setting and measuring mode.

2. Alarm LED

   This is lighted on when voltages higher than the set alarm voltage are detected and lighted off when voltages

   lower than the set alarm voltage are detected. In other word, LED is turned on when alarm occur, and turned

   off   when detected voltage is lower than alarm voltage.

3. Button

   • <CHANNEL> Button

   Select the channel of the sensor to be checked.

   • <UP> / <DOWN> Button

   It is for in the System Setting, Alarm Setting, Range Mode, select channel and distance.

   • <RANGE> Button (SM-10 Only)

   When release, adjust distance between charged object and sensor.

   Range Function only works when entered in wideband MODE, therefore if you use high precision MODE

   instead, you cannot use Range function at the same time. For more information, look at the page 16 (5.3

   Range Setting)

   • <ALARM> Button

   assign the alarm display value for the channel to be measured. When "Alarm" warn by measured data, front

   LED turned on. For more information, look at the page 15 (5.2 Alarm Setting)

■ Rear View

1. Sensor Connector (CH1~CH2)

   • Zero and Gain controller: Adjust each sensor for measuring voltage accuracy.

   If user adjusts it arbitrarily, we do not guarantee accuracy of measured voltage.

   • CH1~CH2 Connector: Please connect it to each sensor which is right fair.

   - Please connect numbered sensor to the connector which is numbered as same.

   - When user connect sensor to the different numbered connector, we do not guarantee accuracy of

   measured voltage.

2. RS-485 Communication Port

   This port is meant to use RS-485 communication function.

3. Communication Select Switch

   This switch is for selecting communication method.

4. RS-232 Communication Port

   This port is meant to use RS-232 communication function.

5. Alarm Output

   When alarm occur this electrical contacts will work.

   For more information, look at the page 15 (5.2 Alarm Setting)

6. Firm

   Firmware upgrade port. It is not for user. Do not use arbitrarily.

7. Ground

   Please use supported ground cable(s) for your ground application. Be sure to make the product grounded

   in order to prevent the electric shock, product performance deterioration or fire.

8. Power Input Connector

   It's a socket that enables to connect power supply of the product.
   - AC100 ~ 240V, 50/60Hz
   - Fuse : 250V, 1A

3.3 EVM-308

Up to 8 units of sensors can be installed.
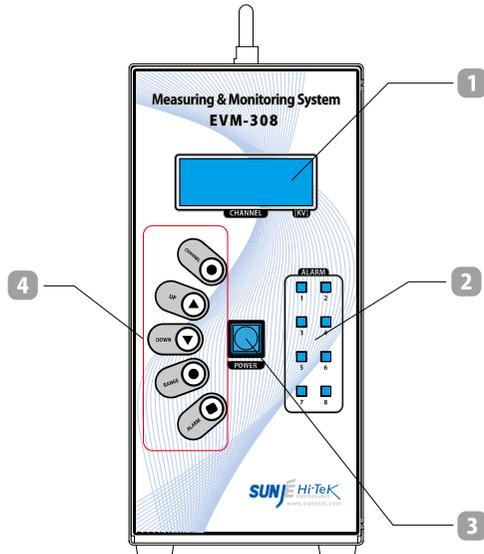
■ **Front View**

1. LCD Display
   LCD display of EVM-308.
   Display each sensor's setting and measuring mode.

2. Alarm LED
   This is lighted on when voltages higher than the set alarm voltage are detected and lighted off when voltages lower than the set alarm voltage are detected. In other word, LED is turned on when alarm occur, and turned off when detected voltage is lower than alarm voltage.

3. Power Button
   When pressing <POWER> button, it will start. If you want to stop its operation, press <POWER> button for 3 second.

4. Button
   • <CHANNEL> Button
   Select the channel of the sensor to be checked.

   • <UP> / <DOWN> Button
   It is for in the System Setting, Alarm Setting, Range Mode, select channel and distance.

   • <RANGE> Button (SM-10 Only)
   When release, adjust distance between charged object and sensor.
   Range Function only works when entered in wideband MODE, therefore if you use high precision MODE instead, you cannot use Range function at the same time. For more information, look at the page 16 .(5.3 Range Setting)

   • <ALARM> Button
   assign the alarm display value for the channel to be measured. When "Alarm" warn by measured data, front LED turned on. For more information, look at the page 15.(5.2 Alarm Setting)

■ **Rear View**

1. Sensor Connector (CH1~CH8)
   • Zero and Gain controller: Adjust each sensor for measuring voltage accuracy.
   If user adjusts it arbitrarily, we do not guarantee accuracy of measured voltage.

   • CH1~CH8 Connector: Please connect it to each sensor which is right fair.
   - Please connect numbered sensor to the connector which is numbered as same.
   - When user connect sensor to the different numbered connector, we do not guarantee accuracy of measured voltage.

2. RS-485 Communication Port
   This port is meant to use RS-485 communication function.

3. Communication Select Switch
   This switch is for selecting communication method.

4. RS-232 Communication Port
   This port is meant to use RS-232 communication function.

5. Alarm Output
   When alarm occur this electrical contacts will work.
   For more information, look at the page 15 (5.2 Alarm Setting)

6. Firm
   Firmware upgrade port. It is not for user. Do not use arbitrarily.

7. Ground
   Please use supported ground cable(s) for your ground application. Be sure to make the product grounded in order to prevent the electric shock, product performance deterioration or fire.

8. Power Input Connector
   It's a socket that enables to connect power supply of the product.
   - AC100 ~ 240V 50/60Hz
   - Fuse: 250V, 1A

4. Installation

4.1 Sensor installation

The installing distance of Constant Voltage measuring sensor should be considered both measuring surface and voltage level.

Sensor Location

Cable Length 20M

• Install Length
  SM-10 : 10~100[mm]
  SM-30 : 100~700[mm]
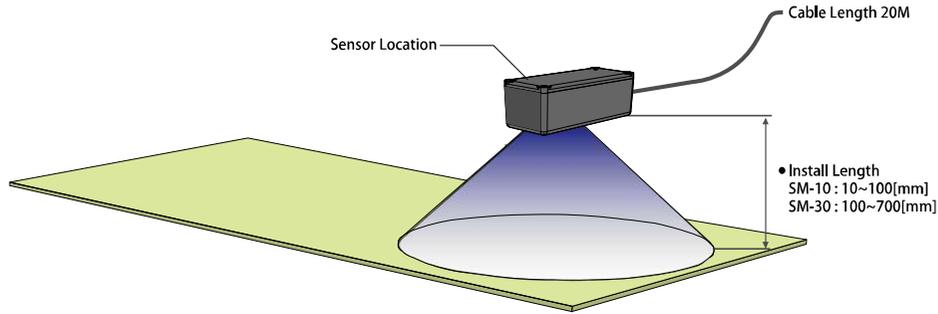
> ⚠ **Caution**
>
> • **The most important thing about installing the sensor is that the sensor should be installed to be level with the electrified body.**
> • **Please be aware of any objects between a target object and sensor.**
> • **A targeted surface should be larger than measuring surface of the sensor.**

1) The measurement range depending on the set-up distance of the sensor is as the following figure.

10mm : Ø50
50mm : Ø100
100mm : Ø200

<SM-10>

100mm : Ø200
400mm : Ø800
700mm : Ø1400

<SM-30>
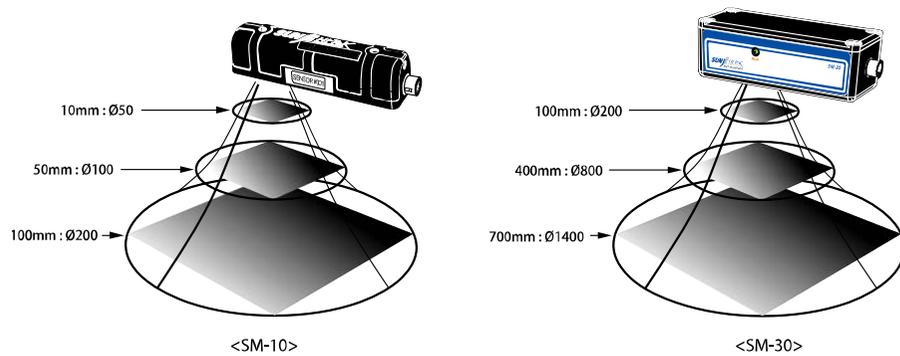
2) The voltage measured depending on the set-up distance of the sensor is as the following table.

Model	Mode	Setting distance [mm]	Measure Voltage [kV]
SM-10	Wide Range Mode	10	0～±5
		20	0～±10
		30	0～±15
		40	0～±20
		50	0～±25
		60	0～±30
		70	0～±32.5
		80	0～±35
		90	0～±37.5
		100	0～±40
	Precision Mode	10～100	0～±5
SM-30	Wide Range Mode	100	0～±20
		150	0～±20
		200	0～±25
		250	0～±25
		300	0～±30
		350	0～±35
		400	0～±35
		450	0～±40
		500	0～±45
		550	0～±45
		600	0～±50
		650	0～±55
		700	0～±60
	Precision Mode	100～700	0～±20

※ Error on the voltage measured is F.S. 5[%].

4.2 How to install Controller

a. How to connect sensor

: Using supported cable, connect the sensor and controller together.
For more information, look at the page 11 (4.1 Sensor installation)

b. Ground connection

: Earth ground it with a supported ground cable.

c. How to connect power cable

: Connect a power cable to main device. Input power supply is 100V~240V, 50/60Hz.

d. How to connect communication cable(Option)

: Plug to proper communication port that meets either RS-232 or RS-485 standards.
(RS-232 & RS-485 cannot be used at once)

e. How to set the communication method (Option)

: You can find the Communication Select Switch at the back of the device and set the proper
communication method according to your requirement.

f. Power Supply ON

: Press Power Switch to ON at the back of device. If your sensor is connected successfully, measured
voltage value will be displayed on the screen.

3) Image of EVM-308 connection

※ SM-10 and SM-30 are compatible with EVM-302/308.

2) Image of EVM-302 connection
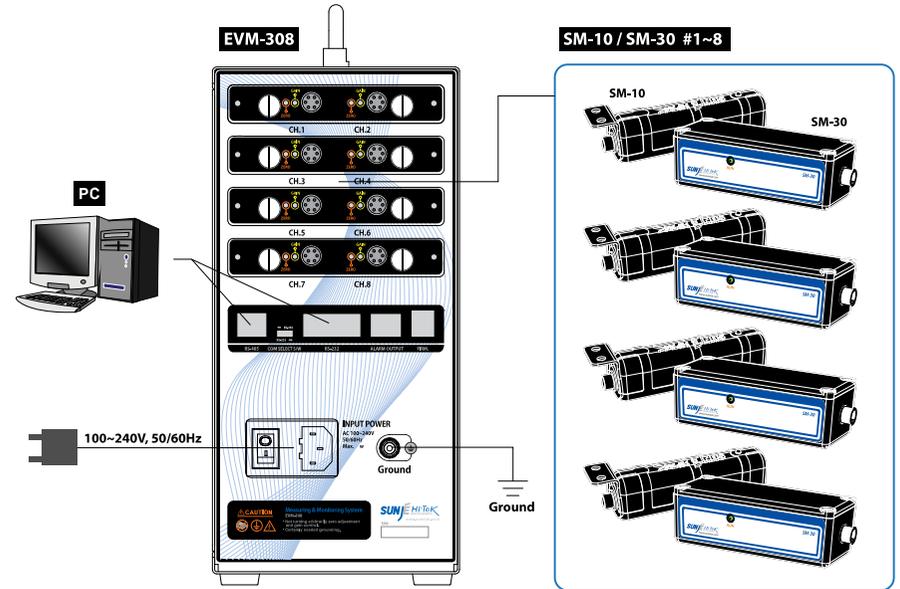
※ SM-10 and SM-30 are compatible with EVM-302/308.

5. Set-up

5.1 Channel Set-up

The channel information of sensor can be checked.

1) Individual Channel Information Checking

In the individual channel information window, you can see the detailed information.

Press <CHANNEL> button to check the detailed information.

```
①  CHANNEL  :  XX  [SM-XX]  ⑤
②  VOLTAGE  :  +X.XX     [kV]
③  MAXIMUM  :  +X.XX     [kV]
④  ALARM    :  ±X.XX     [kV]
```
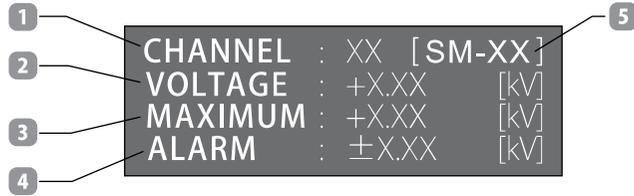
1. CHANNEL: Channel number of each sensor will be appeared.

2. VOLTAGE : Current measuring value will be appeared.

3. MAXIMUM : Max. measuring value will be appeared.

4. ALARM : Currently selected Channel's Alarm set-value will be appeared.

5. SENSOR MODEL : Selected channel model will be appeared.

2) All Channel Information Checking (EVM-308 Only)

When checking individual channel information, you can see the whole channel's information if you press

<POWER> button once. If you want to go back to previous stage, press <POWER> button one more time.

```
[ 1 ]  +X.X   [ 2 ]   +X.X
[ 3 ]  - X.X  [ 4 ]   - X.X
[ 5 ]  - X.X  [ 6 ]   - X.X
[ 7 ]  +X.X   [ 8 ]   +X.X
  ①       ②
```
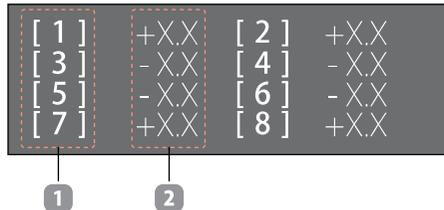
1. CHANNEL NO : Channel number of each sensor will be appeared. (1~8)

2. VOLTAGE : Current measuring value will be appeared.

5.2 Address Set-Up

Connection to a group of up to 16 EVM-302/308 to RS-485 communications, you must set a specific

number(Address) in order to use the whole channel calls. Refer to the figure below.

a. The front of the <CHANNEL> button while the product is in operation, press and hold for about 5 seconds.

```
ADDRESS SETTING
————————————————————
SELECT : 01
[Disable]
```

〈Address Setting Mode〉

b. Press the <UP / DOWN> button to select the Address value to be specified.

```
ADDRESS SETTING
————————————————————
SELECT : 01
[Disable]
```
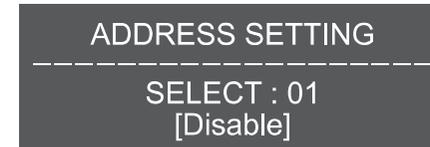
* SELECT 00~01 : 00: EVM-102/105, Address is not used.

01: EVM-302/308, Address is not used.

```
ADDRESS SETTING
————————————————————
SELECT : A1
[Enable]
```
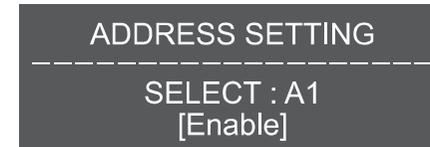
* SELECT A1~A9, AA~AG : Use the address.

c. When you select the Address value and press the <RANGE> Button, Setup is complete.

And then returns to original screen.

```
CHANNEL  :  XX  [SM-XX]
VOLTAGE  :  +X.XX    [kV]
MAXIMUM  :  +X.XX    [kV]
ALARM    :  ±X.XX    [kV]
```

5.3 Alarm Set-up

1) How to Set up Alarm

a. Press <ALARM> button in the front of device when running.

b. Press <CHANNEL> button and select the one you want for setting Alarm.

c. Press <UP/DOWN> button to set Alarm value.

• Setting range [Setting unit: 0.1 kV]

SM-10	Precision Mode	±0.1kV ~ ±5.0kV
	Wide Range Mode	±0.1kV ~ ±40.0kV
SM-30	Precision Mode	±0.1kV ~ ±20.0kV
	Wide Range Mode	±0.1kV ~ ±60.0kV

```
ALARM SETTING
——————————————————
CH[ 1 ]  :  ±1.50   [kV]
```

<Alarm Setting Mode>

d. Once set-up is done, press <ALARM> button again to store the data. Then, you will be exited from the Alarm Mode.

e. If constant voltage exceeds the level that we expect, the alarm LED will be in red.

2) ALARM OUTPUT

When alarm occur this electrical contacts will work.

• Source Rating : DC 24V 0.3A [AT resistor load]

No.	Descriptions
①	Common
②	Normal Closed
③	Normal Open

〈Nomal〉
① ② ③

〈Alarm〉
① ② ③
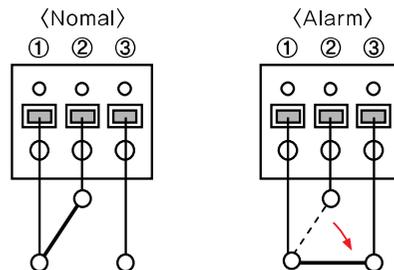
5.4 Range Set-up

⚠ Precision Mode / Wide Range Mode

You cannot use high precision mode and wideband mode at the same time. You should check whether the device is set to either high precision or wideband mode, and use them correctly correspnd to your specification.

• **Precision Mode**

This mode enables precise measurement.

Before we release the item, the range of sensor is fixed to high precision.

※ Originally, normal set-up distance is @ 100mm, but with your request, we can re-set our sensor for you before packing the shipment. (SM-10 : 10~100mm / SM-30 : 100~700mm)

※ If you need to rearrange the installing distance, the sensor needs to be re-calibrated properly. Any further assistant, please contact us immediately.

• **Wide Range Mode**

This mode enables to use Range function.

The distance of the sensor can be changed upon your request.

- SM-10 : 10~100mm(10 Step) / SM-30 : 100~700mm(13 Step)

※ If the set-up range value from the controller varies from the actual distance of installation, the accuracy of sensor will be unstable.

1) Precision Mode

Range Function only works when entered in wideband MODE, therefore if you use high precision MODE instead, you cannot use Range function at the same time.

```
CURRENT
RANGE MODE
——————————————————
NOT USED
```

<If pressing a Range Button in high precision mode, it will be displayed in the panel>

2) Wide Range Mode

a. Press <RANGE> range button when the sensor normally operates.

b. Press <CHANNEL> button to select the proper sensor that needs relocation of the installing distance.

c. Press <UP/DOWN> button to set the proper distance of the sensor.

• SM-10 Set-up range : 10mm ~ 100mm [increasing by 10mm]

• SM-30 Set-up range : 100mm ~ 700mm [increasing by 50mm]

d. After settings, press <RANGE> button again to store the data and exit the Range mode.

e. Please check whether the range set-up value is identical to actual distance value.

f. If the range set-up value is not same as the actual distance value, please correct them to match identically.

```
SENSOR DISTANCE SET.
——————————————————
CH [ 1 ] -  050 [mm]
```

<Range Setting Mode>

■ The actual installation distance of the constant voltage measuring sensor according to the Range setting value of controller.

Model	EVM-302/308 Range Set-up Value [mm]	SM-10/30 actual installation distance [mm]	Measuring voltage [kV]
SM-10	010	10	0～±5
	020	20	0～±10
	030	30	0～±15
	040	40	0～±20
	050	50	0～±25
	060	60	0～±30
	070	70	0～±32.5
	080	80	0～±35
	090	90	0～±37.5
	100	100	0～±40
SM-30	100	100	0～±20
	150	150	0～±20
	200	200	0～±25
	250	250	0～±25
	300	300	0～±30
	350	350	0～±35
	400	400	0～±35
	450	450	0～±40
	500	500	0～±45
	550	550	0～±45
	600	600	0～±50
	650	650	0～±55
	700	700	0～±60

5.5 Communication function set-up

If using communication function, it is easy to monitor constant voltage level at your PC.

※ In use of communication function, it will not work even though you press the button(s) in the front of device.

```
= = = = = = = = = = = = = = = = = =
C O N N E C T I O N   T O   P C
= = = = = = = = = = = = = = = = = =
w w w . s u n s t a t . c o m
```

<In use of communication function, it will be displayed in the panel>

1) Example of how to select communication mohod

COM SELECT S/W

EVM-320/308 support RS-485 and RS-232 communication. Please select switch which is want to use. (RS-485 & RS-232) But, communication on both way is not available. Ex) When select switch is tuned for RS-485, RS-232 communication is not available.)

2) RS-232 Communication Port

• Pin

Pin 2: TX
Pin 3: RX
Pin 5: GND

• Communication Spec.

Baud: 9600
Parity Bit: None
Data Bit: 8
Stop Bit: 1

■ RS-232 Port Connector Specification

No	Descriptions	Picture
1	Not Used	
2	TX	
3	RX	
4	Not Used	
5	GND	
6	Not Used	
7		
8		
9		

3) RS-485 Communication Port

• Pin

Pin 5: TRX+

Pin 6: TRX−

• Communication Spec.

Baud: 9600

Parity Bit: None

Data Bit: 8

Stop Bit: 1

■ RS-485 Port Connector Specification

No	COLOR	Descriptions	Picture
1	Orange / White	Not Used	
2	Orange		
3	Green / White		
4	Blue		
5	Blue / White	RS-485 TRX+	
6	Green	RS-485 TRX-	
7	Brown / White	Not Used	
8	Brown		

4) RS-232/RS-485 Communication Protocol

Transmit Data

Whole channel call

1. If the Address is 01

BYTE	0	1	2	3	4	5
ASCII	#	0	1	8	4	Cr

Calculated value of SUM2

2. If the Address is A1~AG

BYTE	0	1	2	3	4	5
ASCII	#	A	A	SUM2	Cr	

Address : A1~A9, AA~AG (Total 16)

Individual channel call

BYTE	0	1	2	3	4	5	6	7	8	9	10	11

*Stops displaying measured values on the LCD automatically when you start to communication.

*Each transfer to request cycle

Receive Data

Whole channel response

1. If the Address is 01

	Channel #1								Channel #2						Channel #3							Channel #4						
BYTE	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
ASCII	>	+	0	0	.	0	0	0	+	0	0	.	0	0	0	+	0	0	.	0	0	0	+	0	0	.	0	0	0

	Channel #5							Channel #6							Channel #7							Channel #8								
BYTE	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
ASCII	+	0	0	.	0	0	0	+	0	0	.	0	0	0	+	0	0	.	0	0	0	+	0	0	.	0	0	0	h	h	CR

2. If the Address is A1~AG

Address			Channel #1								Channel #2						Channel #3							Channel #4						
BYTE	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ASCII	>	A	A	+	0	0	.	0	0	0	+	0	0	.	0	0	0	+	0	0	.	0	0	0	+	0	0	.	0	0	0

	Channel #5							Channel #6							Channel #7							Channel #8								
BYTE	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
ASCII	+	0	0	.	0	0	0	+	0	0	.	0	0	0	+	0	0	.	0	0	0	+	0	0	.	0	0	0	h	h	CR

Individual channel response

BYTE	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ASCII	$	R	,	A	D	,	CH	*	N/P	,	0	0	.	0	0	*	SUM1	CR	LF
											0	0	.	0					

CH : Channel (1~8)
N/P : Negative(−) / Positive(+)
SUM1 : Checksum
SUM2 : Checksum

■ Example of checksum calculation

<SUM1>

```
char pPacket[] = "C,DR,1";
unsigned char cChecksum = 0;
int i, nSize = 0;

while(pPacket[nSize] !='₩0')
    nSize++;

for(i = 0 ; i < nSize ; i++)
{
    if(i == 0)
        cChecksum = pPacket[i];
    else
        cChecksum ^= pPacket[i];
}
printf("Request message : $C,DR,1*%02X",cChecksum);
// Transfer character string by "ASCII" code
```

<SUM2>

```
char pPacket[] = "#01";
unsigned char cChecksum = 0;
int i, nSize = 0;

while(pPacket[nSize] !='₩0')
    nSize++;

for(i = 0 ; i < nSize ; i++)
    cChecksum += pPacket[i];

printf("Request message : #01%02X",cChecksum);
// Transfer character string by "ASCII" code
```

5) CC-Link(Option)

• EVM-302/308 Communication Set

Baud: 9600

Parity Bit: None

Data Bit: 8

Stop Bit: 1

(1) AJ65BT-R2N(Intelligent Device) Communication Setting
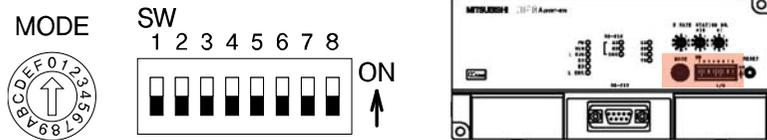
a. Mode : 1 (On-line mode)

Mode setting switch	Set the module's operation state. (Default setting: 0)		
	No.	Name	Setting details
	0	On-line mode (using transmission/reception buffer)	Mode for on-line communication. Set when using the transmission/reception buffer.
	1	On-line mode (using buffer memory automatic update function)	Mode for on-line communication. Set when using the buffer memory automatic update function.
	2	Not used	Setting error ("RUN" LED turns OFF.)
	3	Not used	Setting error ("RUN" LED turns OFF.)
	4	Use not possible	–
	5	Not used	Setting error ("RUN" LED turns OFF.)
	6	Not used	Setting error ("RUN" LED turns OFF.)
	7	Not used	Setting error ("RUN" LED turns OFF.)
	8	Not used	Setting error ("RUN" LED turns OFF.)
	9	Not used	Setting error ("RUN" LED turns OFF.)
	A	Not used	Setting error ("RUN" LED turns OFF.)
	B	Not used	Setting error ("RUN" LED turns OFF.)
	C	Not used	Setting error ("RUN" LED turns OFF.)
	D	Hardware test mode	Mode for confirming that module runs independently.
	E	Not used	Setting error ("RUN" LED turns OFF.)
	F	Not used	Setting error ("RUN" LED turns OFF.)

b. SW : 1 0 1 0 1 0 0 0 (1 : On, 0 : Off)

RS-232-C transmission specifications setting switch	Set the RS-232-C transmission specifications.							
	No.	Setting details	Setting switch state					Default setting
			ON			OFF		
			SW	1	2	3		
	SW1 to 3	Transmission speed		0	0	0	300bps	OFF
				1	0	0	600bps	
				0	1	0	1200bps	
				1	1	0	2400bps	
				0	0	1	4800bps	
				1	0	1	9600bps	
				0	1	1	19200bps	
			0:OFF 1:ON					
	SW4		Not used					
	SW5	Data bit length	8			7		ON
	SW6	Parity bit	Yes			No		OFF
	SW7		Even			Odd		
	SW8	Stop bit length	2			1		

(2) How to connect Communication Cable

a. EVM-302/308

① COM SELECT S/W : RS-232

② Pin Map : TXD 2, RXD 3, GND 5

b. AJ65BT-R2N

① Pin Map : RD 2, SD 3, SG 5, ER 4 ↔ DR 6, CD 1 ↔ RS 7 ↔ CS 8

AJ65BT-R2N		Cable connection	EVM-302/308	
Pin	Signal		Signal	Pin
1	CD		DCD	1
2	RD		TXD	2
3	SD		RXD	3
4	ER		DTR	4
5	SG		GND	5
6	DR		DSR	6
7	RS		RTS	7
8	CS		CTS	8
9	-		RI	9

6) Wireless communication (Bluetooth_Option)

(1) Bluetooth structure diagram
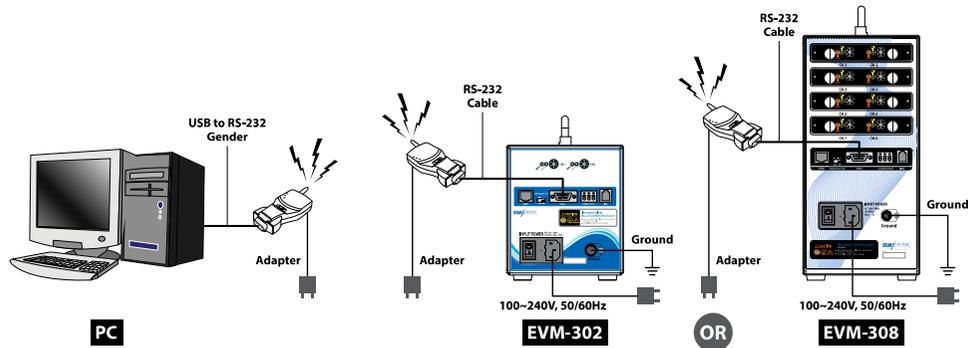
(2) Operating Process

  a. PC, EVM Power supply(operation waiting)

  b. Connect to bluetooth(Active module) to RS-232 of PC and supply power(check port necessary)

    Use Gender if there is no RS-232 port.

  c. Connect communication cable and wireless communication todule(Active Mode) to RS-232 port of

    EVM and supply power.

  ※ Once power is supplied to two communication modules, it is linked automatically.

    (Link LED color change : RED[Offline] → GREEN[Online])

  d. Start communication after selecting confirmed port in number b.
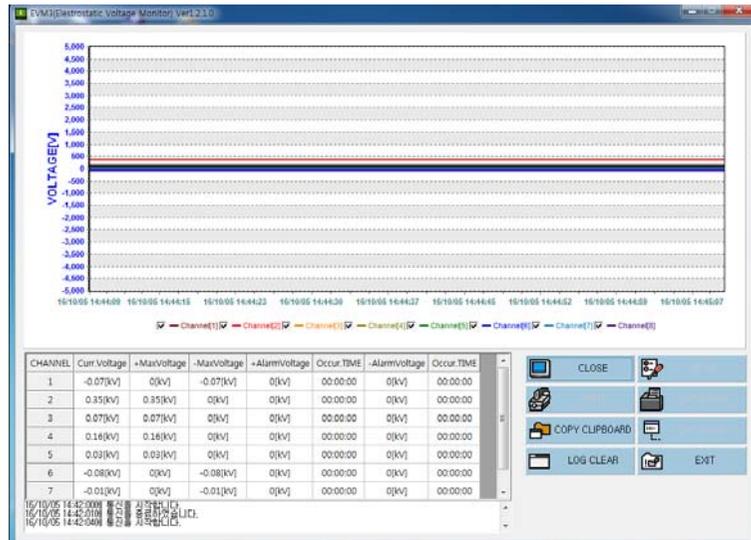
< EVM bundle S/W : Start collecting electrostatic voltage data >

(3) Basic componants

Bluetooth Module 2ea   **Adapter 2ea**

RS-232 Communication Cable 1ea   **S/W CD 1ea**
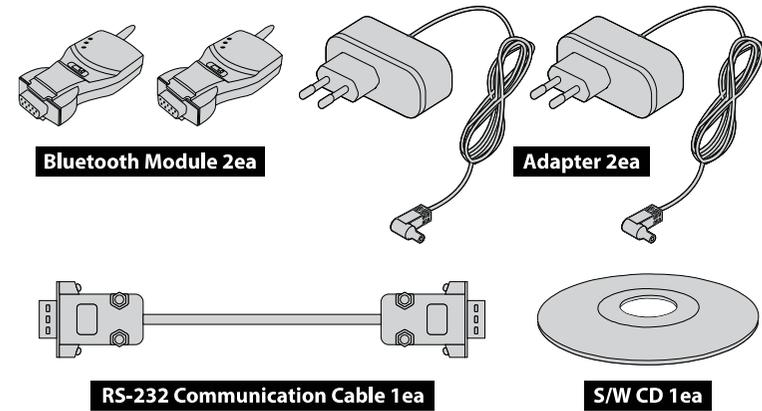
(4) Bluetooth Module Specifications

Mode	Point to Point (1:1)
Speed	Max. 115.2Kbps
distance	**Max. 100m Patch if using Antenna 1000m(open area)**
RF spec	Bluetooth Specification Version 2.0+EDR
Bandwidth	2.402-2.408GHz
RF type	Hopping Frequency
Available Channels	79 channels
Modulation	GFSK
Connector	One RS-232 Port (DB-9 Female)
Connector	RTS/CTS, DTR/DSR/DCD
Dimension	75(W) x 37(D) x 19(H) mm
Weight	33g
LED	Tx, Rx, Link
Power	· 5-12V DC power supply type · Internal USB connector. (PC USB port available) · External power supply with DB-9 pin connector. (When using serial port which can supply current)
Antenna	Stub : 1dBi Dipole : 3dBi or 5dBi(optional) Patch : 9dBi(optional)
Current	Max. 80mA (5V DC)
Temperature	-20 ~ 70℃

(5) RS-232 Communication Cable connection

a. EVM-302/308

- COM SELECT S/W : **RS-232**

- Pin Map : **TXD 2, RXD 3, GND 5**

b. Bluetooth Module

- Pin Map : **RXD 2, TXD 3, GND 5**

Bluetooth Module (Male)		Cable connection	EVM-302/308 (Male)	
Pin	Signal		Signal	Pin
1	-		DCD	1
2	RXD		TXD	2
3	TXD		RXD	3
4	-		DTR	4
5	GND		GND	5
6	-		DSR	6
7	-		RTS	7
8	-		CTS	8
9	-		RI	9

6. EVM(Electrostatic Voltage Monitor) Software

Use a supported EVM software and installl at your PC. This software is for monitoring constant voltage problem in your system in real time. EVM is a real time monitoring device(incl. software) that can be connected from minimum 2 units (EVM-302) to maximum 8 units (EVM-308).

6.1 Main View
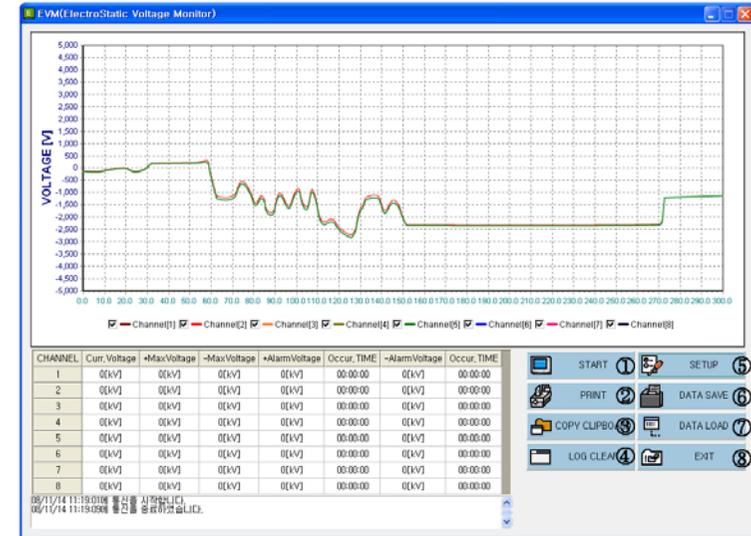
Main screen of EVM software

① START/CLOSE : EVM displays data that is measurement the electrostatic voltage as the list and graph. Next to stage, that begins to save the data. If user pushes the button of start, EVM begins to communicate with PC and the controller doesn't handle at will. And the path of automatic save data is the path of Setup(Save\YYMMDD\HHMMSS_CHANNEL.csv).
   The path of Setup : C:\Program Files\SUNJE\EVM, YYMMDD : the date, HHMMSS : the time, CHANNEL : the number of connection between SM-10 and EVM

② PRINT : prints the measurement graph displayed on the program window.

③ COPY CLIPBOARD : saves the measurement graph displayed on the program window to the clipboard as an image file (this is used through "Paste" in the connection program).

④ LOG CLEAR : The Button for deleting Log In/Off Records on message window.

⑤ SET UP : used to change the setting of the program

⑥ DATA SAVE : The Button for saving the data to the path and the folder you want.

⑦ DATA LOAD : retrieves saved data.

⑧ EXIT : closes the program and stops measurement.

※ **Left-click on the data graph displayed on the main screen and drag it from the left top to the right bottom to enlarge the graph or drag from the right bottom to the left top to reduce.**
   After it is enlarged, keep the right button of the mouse clicked and drag the graph to move it.

6.2 Setup View
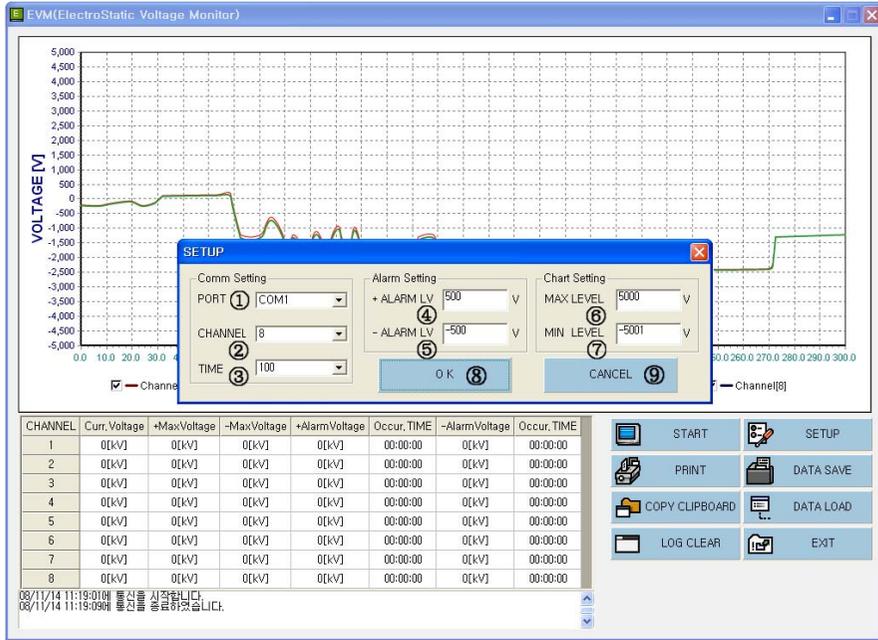
Setup Execution Screen

① PORT: Serial Communication Port Setting.

② CHANNEL : Sensor Quantity Setting.

   * Do not click more than the number of connected sensors.

③ TIME : sets time at which data is received from the controller (minimum 100[m/s]).

④ + ALARM LV : + ALARM LEVEL Setting.

⑤ - ALARM LV : - ALARM LEVEL

⑥ MAX LEVEL : the Graph Maximum Level Setting for Plus Side.

⑦ MIN LEVEL : the Graph Maximum Level Setting for Minus Side.

⑧ OK : the new setting will take effect.

⑨ CANCEL : The new setting will not take effect.

6.3 Data Save View
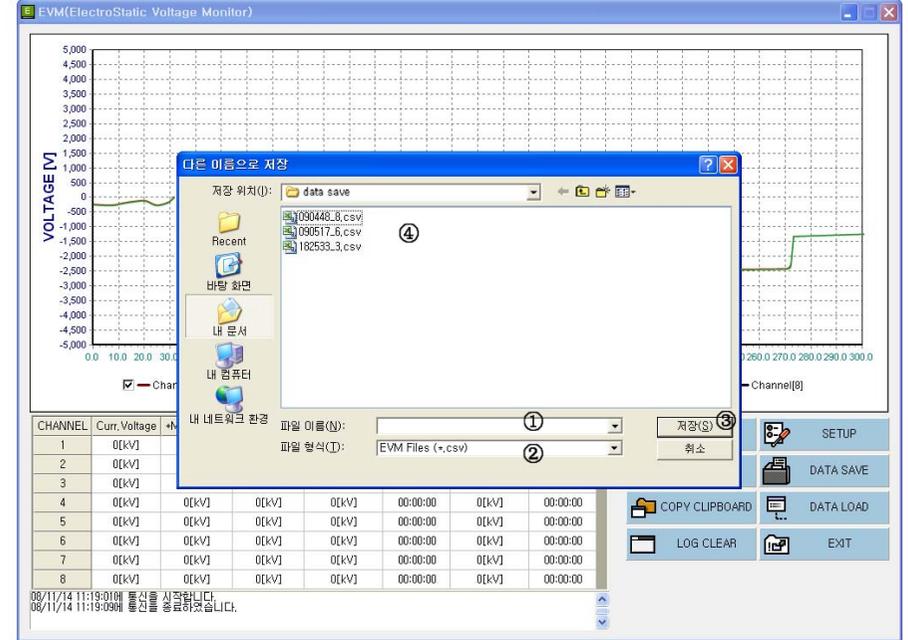
Screen that saves and loads the measured data

① File name (N): write the name of the file of the measured data to be saved.

② File type (T): this is the file type used in the EVM measurement program, so if this is changed at user's will, then data load is impossible.

③ Save (S): after a file name is set, the file is saved in the PC.

④ Displays saved files, sets the save route and loads the saved data.

6.4 Data Load View
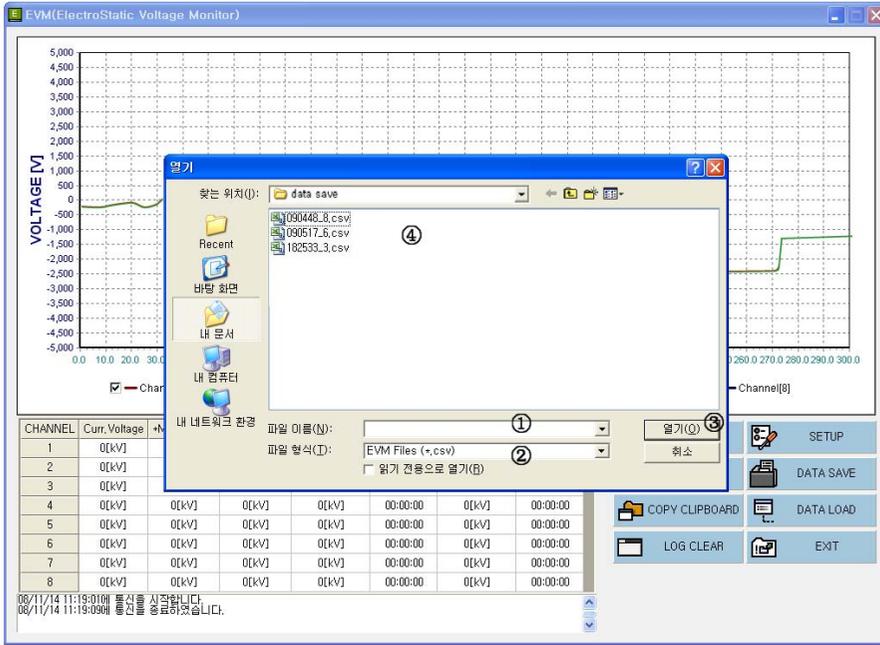
Screen that saves and loads the measured data

① File name (N): write the name of the file of the measured data to be saved.

② File Format(T) : *.csv File, Do not modify.

③ Open(O) : the button for showing on the graph the selected file.

④ File Directory List.

6.5 Print View
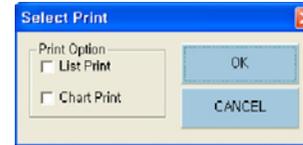
< Fig.1> Select Print
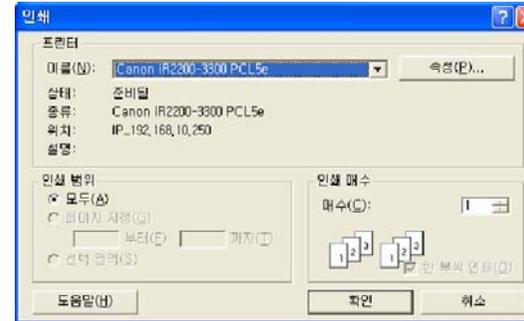
< Fig.2> List Print
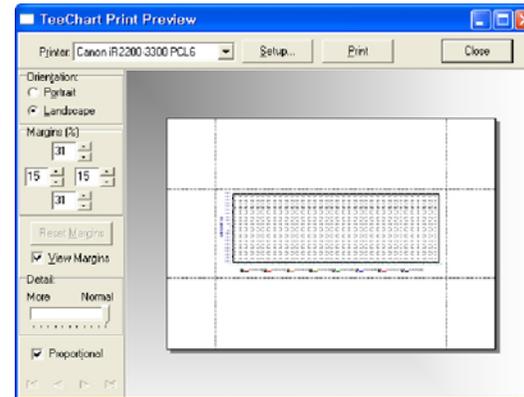
< Fig.3> Graph Print

a. **Select one to print between list and chart. <Fig. 1>**

b. **b: List Print : Measurement List Printing. <Fig. 2> List Print**

c. Graph Print : Graph Printing. **<Fig. 3> Graph Print**

   ■ In case of Graph printing, it can print the selected graph in the preview

   ■ Paper Selection for printing

   ■ Printing Page Setting

6.6 Copy to Clipboard & Log Clear
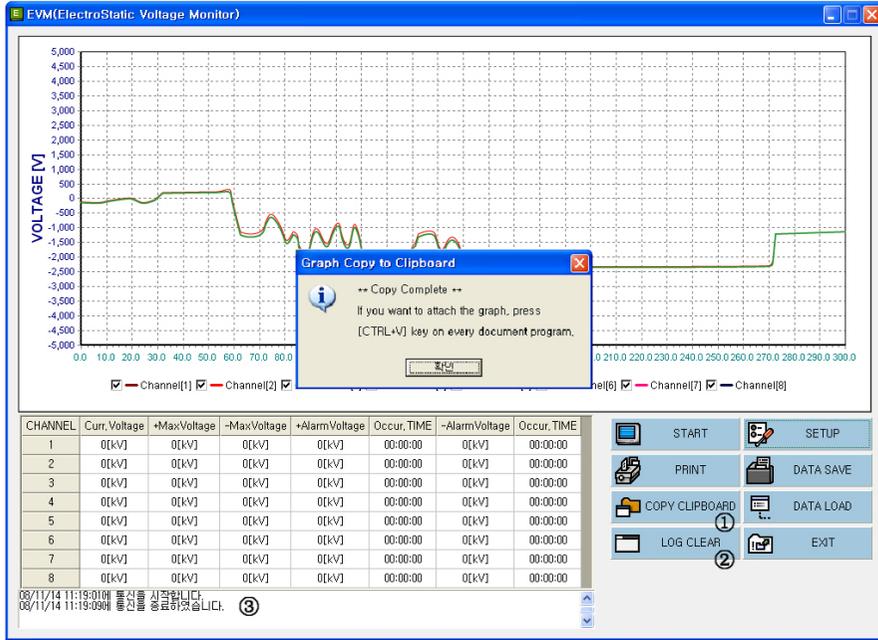
Displays the changes of measured data in the graph and copies this graph.

① Copy to Clipboard: saves the graph in the clipboard as the image in the Windows environment.

   Used by using "Paste" function to other applications.
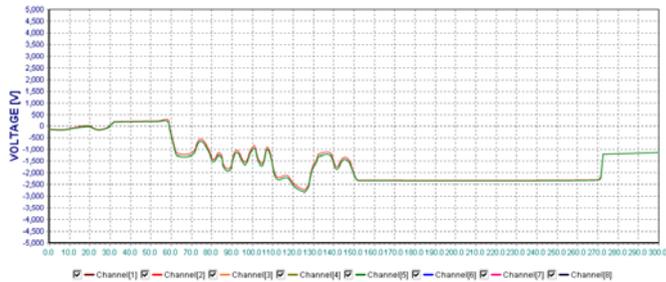
※ The graph copied to the clipboard is saved like the image above.

② LOG CLEAR : The Button for deleting Log In/Off Records on message window

7. EMS(Electrostatic Monitoring System) Software

EVM Series is electrostatic measurement equipment that can be connected to PC via networking and it collects data and analyze. This is suitable where FPD (AMOLED, LCD, PDP), semiconductor process, component assembly process, printing, or film process need to eliminate electrostatics. It checks the status in real-time, therefore, it is easy to find and fix the problem right away. Then, a constant voltage of all static problems from the origination points and useful information can be managed easily.

7.1 Configuration

1) System
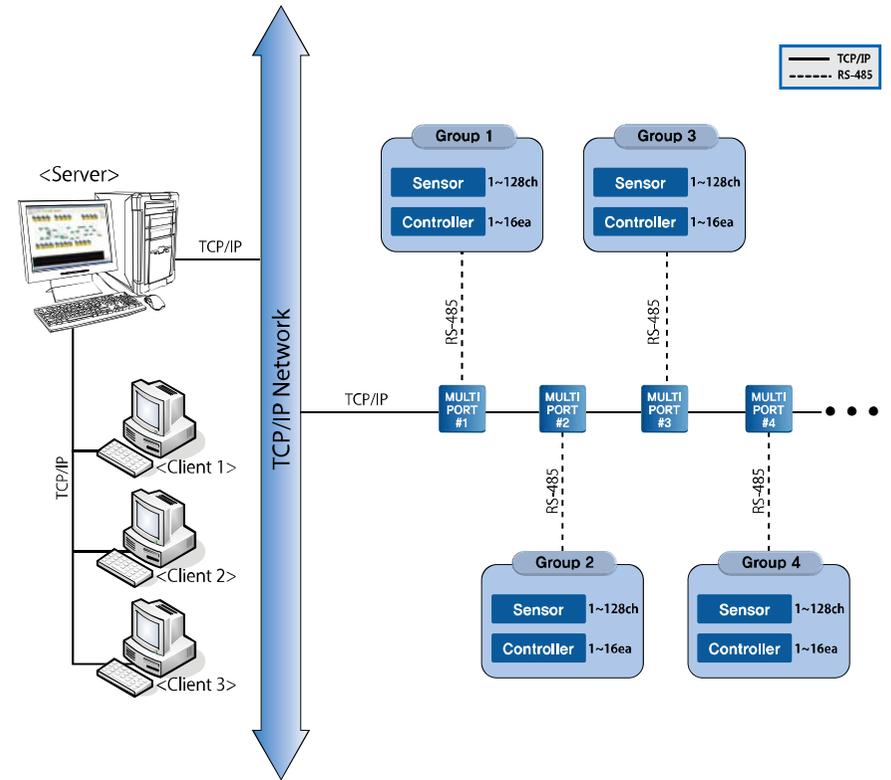
Figure 1 Diagram of System

2) Specification

• Up to 8 units of controllers and 128 units of sensors can be connected to one unit of machine.

• Electrostatic voltage for each sensor is measured and recorded at the interval of 0.2 seconds.

7.2 Installation

You just find the EMSInstall.exe in the installation folder provided in the form of CD or compressed file and run it, and then the installation is completed without other setting. Or you can decompress the compressed file directly in C:\.

After the installation is completed, when you check the hard disk drive C:\ in My Computer, you will see the following folder.

** If you install in places other than C:\, then the program will not operate. **
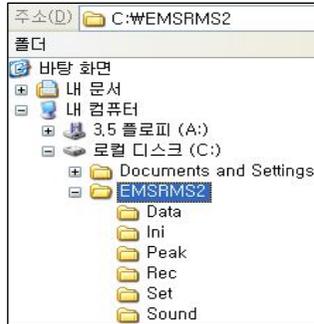
Figure 2 Installation Folder

There are background files and setting files just below the folder. If you erase these files, then the program will not operate.

Name of Subfolder	Descriptions
Data	File of database which records abnormal conditions (EMS.mdb)
Exe	Execution file and DLL
Rec	Value measured at the time of peak. Value measured by sensor real-time at the interval of 0.2 seconds.

■ Data size of values real-time measured by sensors are large, so they are deleted automatically whose period elapsed according to the settings.

7.3 Execution and Exit

1) Execution file

You just run C:\EMS\Exe\EMSRMSd.exe. It is more convenient if you create the shortcut to it on the desktop or register it in the Start program. If you run it, the name of the pertinent worksite appears on the window.

Figure 3 Example of Program Names by Worksites

2) Prevention of Multiple Executions

You should run the electrostatic voltage monitoring software only once in one computer.

If you execute it redundantly, the following warning will appear on the screen.
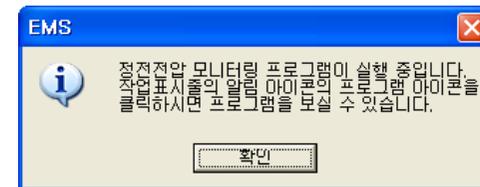
Figure 4 Warning window of multiple execution

3) Tray Icon

In order to ensure that the data of measured record is saved correctly, the electrostatic voltage monitoring software is functioning in the form of the tray icon even though it is invisible on the screen. If the warning window of multiple executions appears, check the tray icon. If you want to see the screen, double-click on the tray icon, or right-click and select 'Open' in the menu.

Figure 5 Tray Icon

4) Exit

If you exit the electrostatic voltage monitoring software by using the file menu or system button, then it hides itself behind the tray icon. To force to exit it, right-click on the tray icon and select 'Exit' in the menu.
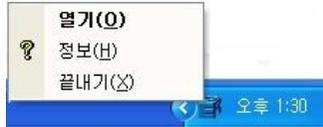
Figure 6 Menu of the tray icon

When you force to exit, if you select the "Save the measurement record data function" (see the "System Setting" section), the following warning window will appear on the screen. Press "Confirm" to exit or press "Cancel" to continue the running.
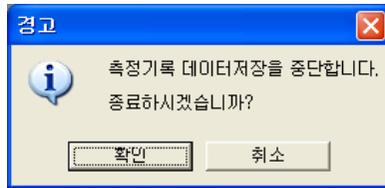
Figure 7 Exit Confirmation Window

7.4 Use

1) Basic Operation
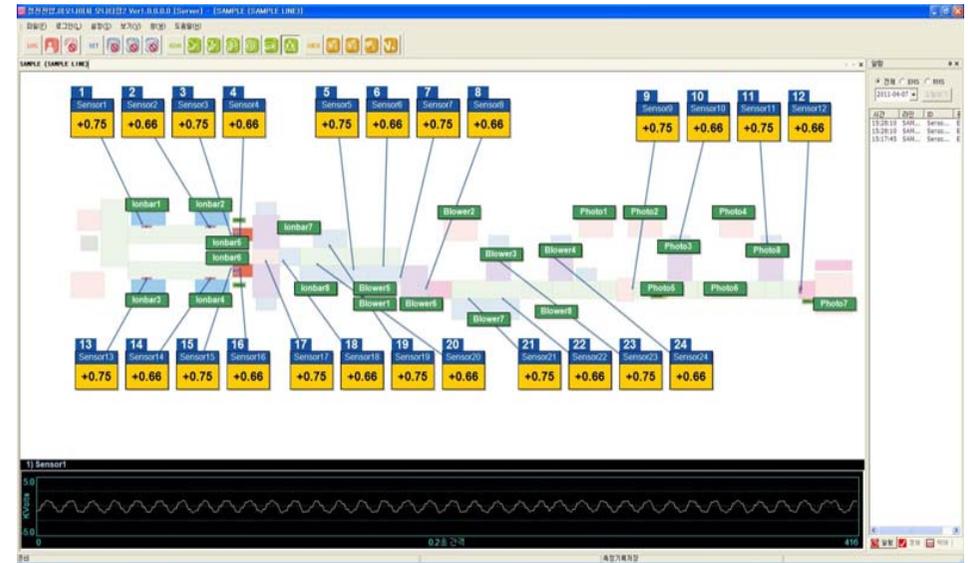
Figure 8.   Entire Display

Displays on the screen divided by lines/machines. From the top, machines are assigned in the order of Machine 1, Machine 2 and Machine 3.

If you want to see the enlarged image of the machine, double-click on the subject part of the pertinent window or the blank space of the screen, or press the magnifying glass button in the tool box. To change the screen, select the pertinent window in the window selection tab.

To reduce the image of the machine, double-click on the blank space of the screen, or press the magnifying glass button in the tool box like in the case of enlargement.

2) Verification of Measured Values

L51_1_12
+0.90

The ID and the current measured value appear in the sensor icon. According to the setting, the grayed-out graph of the measured values is displayed on the background for 6 seconds.

L51_1_12
+0.10
+6.86

If the measured value of the electrostatic voltage exceeds the set range, the most recent exceeding value blinkers and appears at the bottom.

L51_1_12
+0.73

You can choose to display or not to display the measured value graph by pressing [icon] button in the tool box and alternating the view/hide functions. If the button is in the pressed state, it shows that the graph view was set. The default is set to hide.

L51_1_12
-0.52
+6.86

3) Confirmation of the abnormal condition

In the event the abnormal condition happens, the pertinent sensor icon blinkers. If the user presses the confirmation [icon] button, then the blinking stops. After that, it is registered in the abnormal condition records window.

You can check the time the abnormal condition happened in the abnormal condition records window.

4) Release of the abnormal condition

After confirming the abnormal condition that appeared on the screen and taking appropriate actions, press the abnormal condition release [icon] button. It will release the entire abnormal condition and initialize the normal condition. You can check afterwards as all the records remain in the abnormal condition records window. However, you can release only after you confirm the abnormal condition.

5) View of the abnormal condition records by sensors

Left-double-click on the pertinent sensor's icon or the pertinent ID in the abnormal condition records window to check the abnormal condition records list and the graph of the day.

Select the start date and the end date at the top left of the screen and press the "Search" button to view all the abnormal condition records for the period.

Figure 9 Alarm List Window

① Basic information : Sensor ID, Channel number, Product name, serial number, and etc.

② Status information : Correction value or alarm value set-up.

③ Search : Stored alarm history in bada base.

④ Save : Additional data will be stored.

6) View of Sensor Installation Location

Pressing the sensor installation location view [icon] button in the tool box switches the "View/Hide" of the sensor installation location.

The default is set to "Hide". The numbers appearing next to the sensor icons are the installation order of the sensors by lines.
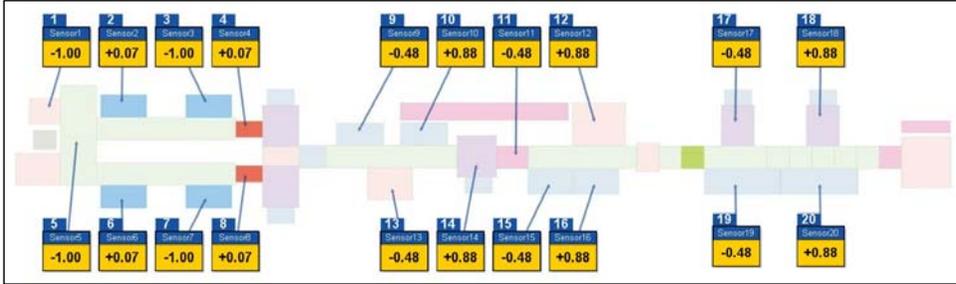
Figure 10 View of Sensors

7) View of Controllers

Select the "Controller view" to check the information on the connection of sensors and controllers and communications. In the tool box, press the [icon] "Controller view" button to change "View/Hide of the controller". The default is set to "Hide".

.
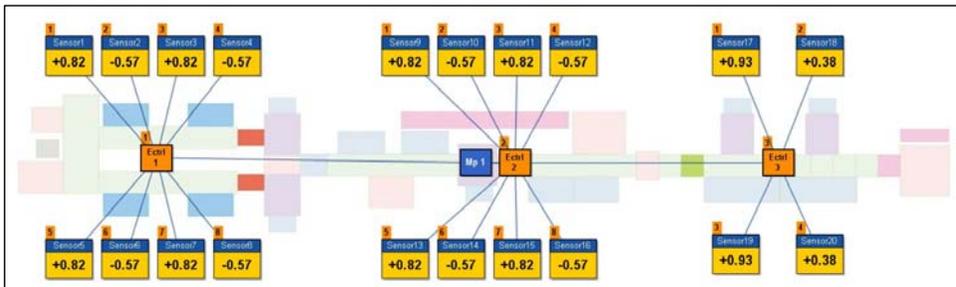
Figure 11 View of Controllers

You can select to view all or each of EMS/RMS.

If you want to change the contents of view, press the button to release it and select again.

8) View of Real-time Measurement Graph

Enlarge the relevant work area to view the electrostatic voltage real-time measurement graph at the bottom of the window. You can check the ID of the current sensor at the top left of the graph. Select the desired sensor icon by using the left button of the mouse to change the graph.

Figure 12 Enlarged Display

9) View of Abbreviated Words

Press the abbreviated words descriptions tab at the right bottom of the screen to view descriptions of the abbreviated words that appear on the screen. For editing the contents, see the "System Setting" section.

10) View of Measurement Records

If you press the measurement records view [icon] button in the tool box, the window of the real-time measurement records graph of the pertinent sensor appears.

Select the date and up to 4 sensor IDs buttons and press the "Graph View" button to view the real-time measurement records graph.

You can enlarge, reduce or move the enlarged image, and the size of the graph is adjusted automatically according to the maximum and minimum values of the relevant area.

Figure 13 Measurement Records View Window

The arrow buttons change the graph forward or backward according to the unit of set time interval (1 minute ~ 10 minutes). The button of two arrows means the unit of one hour. You can save the graph in Excel file or JPG file.

11) Use of Alarm Sound

Pressing the alarm sound use button in the tool box switches the use/stop of the alarm sound. The default is set to the stop.

To change the sound of the alarm, overwrite the C:\EMS\Alarmp.mp3 with other sound sources (however, only mp3 is supported and it can not be overwritten with other file formats).

12) System Setting

Everyone can use the basic setting functions, however, regarding the functions related to the file and system settings, only the manager should log in to use them. Before the log-in, the tool box looks like the following.

Buttons [icon] with the stop sign are functions that can be used after the log-in.

a. Login by manager

Pressing the login button [icon] in the toolbox opens the window asking the password.

Entering the relevant password switches to the login state and then pressing the login button switches to logout.

Figure 14 Manager Login

b. Change of password

Pressing the password change button in the toolbox opens the password change window. Enter a new password two times. If those two passwords match each other, then the password changes to the new one. Please take care not to forget the changed password.

Figure 15 Change of Password

c. Record Save Period

The electrostatic voltage monitoring software saves on real-time all the measurement data and failure occurrence data, and allows the user to reference these in the database. In certain circumstances, the capacity of daily data may be more than 1GB. So, the user is allowed to set the record save period so that the data whose period elapsed may be deleted automatically. Deleted data can not be restored.

The default is set to 10 days. Select the record save [icon] period button in the tool box to change it.

Figure 16 Measurement Record File Management

7.5 File Setting

Some times, it is necessary to change the sensor or controller settings.

It is necessary to set files when the peak values of sensors are changed or deleted, or when controllers are added or deleted or sensors are added, or worksite names are changed, or when the locations of sensors or controllers on the screen are changed, or installation locations of them are changed.

First, select the setting change button [icon] in the tool box when setting files.

Pressing the button displays the "setting change/setting release". And windows for each line/machine are separate conditions. For example, if you designate the setting change in the Line 5, Machine 1 window and then if you switch to the Line 5, Machine 2 window and want to do setting, then you should select the setting change button, again.

For the sake of stability during file setting change, the communication between the relevant line/machine and sensors are discontinued so that the rest of lines/machines may be ensured to be monitored continuously.

Selecting the file setting change opens the confirmation window on the screen.
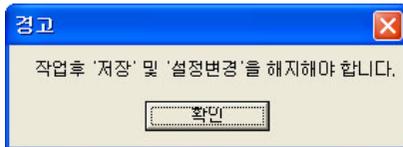
Figure 17 Setting Change Confirmation

When communication with sensors are discontinued securely to prepare for the setting change, there may be some time delay depending on the conditions of the relevant area. Please wait for some time to check the setting change confirmation window of Figure 18 and proceed to the setting change.

■ After the operation, if you do not press the Save button in the tool box, the currently set contents do not apply when the program is restarted. And after the operation, press the setting change button again to release the setting for the monitoring function to operate. Please pay attention to these. **

7.6 Utilization of Record File

1) View of Alarm Record

Pressing the Total Alarm Record [icon] button in the menu or toolbar opens the following window.
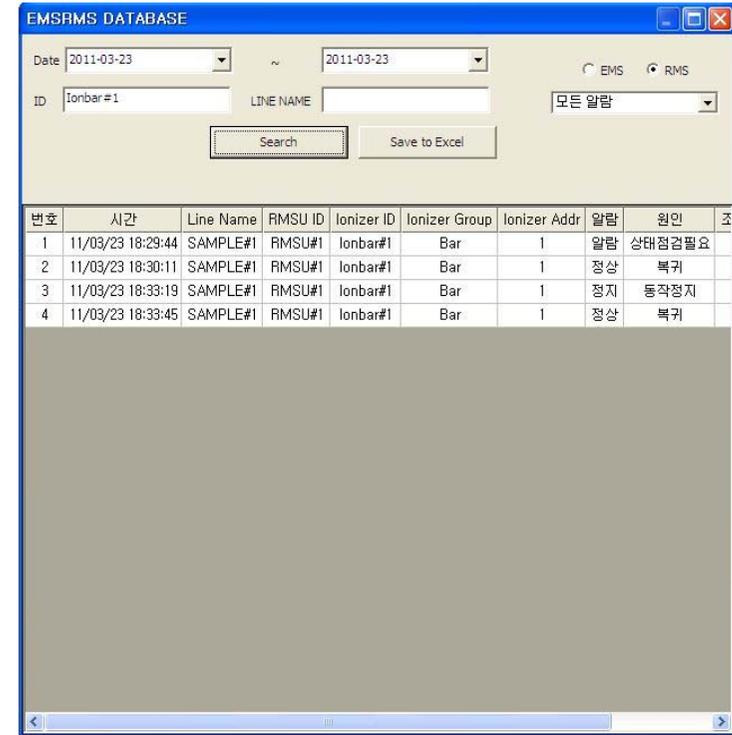
Figure 18 Total Alarm View Window

Displays EMS/RMS alarm separately. Displayed contents can not be modified.

Pressing the search button without entering the search conditions displays abnormal RMS states which happened on the day.

It is possible to search by entering the ID only. To view the exact data, you should enter both the ID and worksite name.　It is recommended that you enter only the ID and after the search you confirm the relevant line number and input in the worksite field to search again.

2) View of Measurement Records
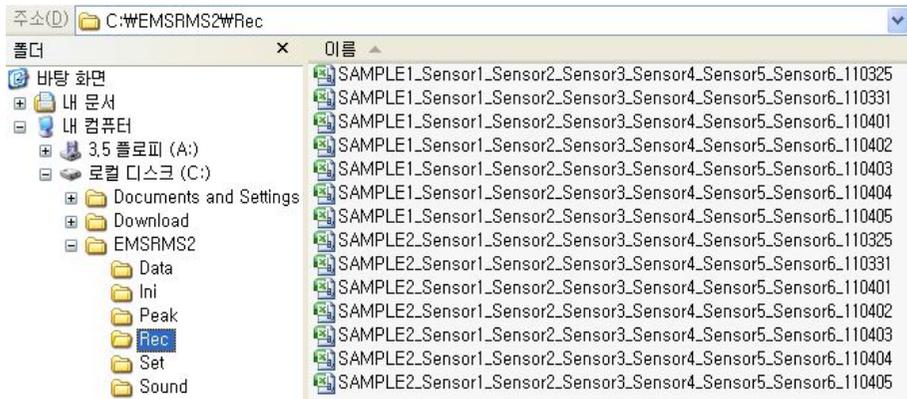
All the measurement records and peak happening records are saved in the C:\EMS\Rec.

This can be used after you convert it to the Excel file by using the individual conditions in the individual view window. To view the entire records unprocessed, you can use files in the folder directly.

File names are assigned according to the following rules.

For measurement records, the names of files are assigned in the format of "Name of worksite_Sensor 1_Sensor 2 …Measurement date.csv"

Ex) "ODF1_Cooler#1_Cooler#2_061022.csv" ▶ The record of the worksite of ODF1 on the date of 2006-10-22

For peak happening records, the names of files are assigned in the format of "Name of worksite_Sensor name_Happening date.csv"

Ex) "ODF1_Cooler#1_061022131200.csv" ▶ The peak of Cooler#1 at the worksite of ODF1 happened on the date of 2006-10-22 at 13:12:00

All the records related to ionizers are in the database file so they can not be used separately.

⚠ Caution

• When you set sensors or ionizer ID, problems can occur if you select characters which can not be used in file names such as /, \ .

8. Specifications

8.1 SM-10

Category	Descriptions	Remarks
Model	SM-10	
Weight	60g	
Operation Circumstance	0℃ ~ +50℃(32°F ~ 122°F), 35% ~ 85% RH, Non-Condensing	
Dimensions	See the accompanying drawing paper	
Warranty	1 Year	

8.2 SM-30

Category	Descriptions	Remarks
Model	SM-30	
Weight	150g	
Operation Circumstance	0℃ ~ +50℃(32°F ~ 122°F), 35% ~ 85% RH, Non-Condensing	
Dimensions	See the accompanying drawing paper	
Warranty	1 Year	

8.3 EVM-302

Category		Descriptions	Remarks
Model		EVM-302	
Controller	Input Power	AC100V~240V, 50/60Hz	
	Power Consumption	15W	
	Current Consumption	68mA	AC 220V
	Measuring Range — SM-10	Precision Mode : 0V ~ ±5.0kV Wide Range Mode : 0V ~ ±40kV	
	Measuring Range — SM-30	Precision Mode : 0V ~ ±20.0kV Wide Range Mode : 0V ~ ±60kV	
	Installation Distance for Sensor — SM-10	Precision Mode : 10~100mm Wide Range Mode : 3~100mm	
	Installation Distance for Sensor — SM-30	100~700mm	
	Weight	2.48kg	
	Operation Circumstance	0℃ ~ +50℃(32°F~122°F), 35% ~ 85% RH, Non-Condensing	
	Output Signal	Alarm Output	
		RS-232/RS-485 Communication(For EVM/EMS)	
	Accuracy	±5%(F.S)	
	Dimensions	See the accompanying drawing paper	
Accessories	Sensor	1~2ea	Option
	Sensor Cable	According Sensor's Quantity	
	Warranty	1 Year	

8.4 EVM-308

Category		Descriptions	Remarks
Model		EVM-308	
Controller	Input Power	AC100V~240V, 50/60Hz	
	Power Consumption	40W	
	Current Consumption	181mA	AC 220V
	Measuring Range — SM-10	Precision Mode : 0V ~ ±5.0kV Wide Range Mode : 0V ~ ±40kV	
	Measuring Range — SM-30	Precision Mode : 0V ~ ±20.0kV Wide Range Mode : 0V ~ ±60kV	
	Installation Distance for Sensor — SM-10	Precision Mode : 10~100mm Wide Range Mode : 3~100mm	
	Installation Distance for Sensor — SM-30	100~700mm	
	Weight	5.5kg	
	Operation Circumstance	0℃ ~ +50℃(32℉~122℉), 35% ~ 85% RH, Non-Condensing	
	Output Signal	Alarm Output	
	Output Signal	RS-232/RS-485 Communication(For EMS)	
	Accuracy	±5%(F.S)	
	Dimensions	See the accompanying drawing paper	
Accessories	Sensor	1~8ea	Option
	Sensor Cable	According Sensor's Quantity	
	Warranty	1 Year	

※ The appearance and specification of the product may be changed without prior notice for the Improvement of the product.

9. Compositions

9.1 SM-10
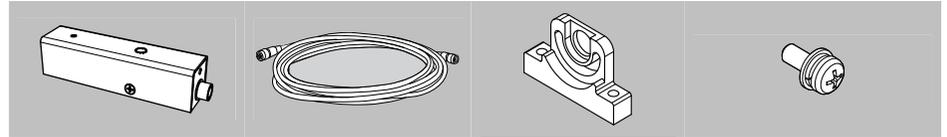
Body
SM-10
1ea

Connect Cable
SCC-SM-1-001
20m / 1ea

Side Bracket
SBR-SM-1-002
1ea

Fixing Bolt
SFB-SM-1-001
M4 x 10L Sems Screw, 1ea
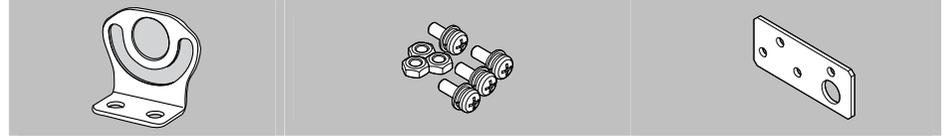
Side Bracket (Option)
SBR-SM-1-001
1ea

Fixing Bolt (Option)
SFB-SM-1-001
M4 x 12L Sems Screw, 3ea
M4 x 10L Sems Screw, 1ea
M4 Nut, 3ea

Installation Bracket (Option)
SBR-SM-2-001
1ea

9.2 SM-30
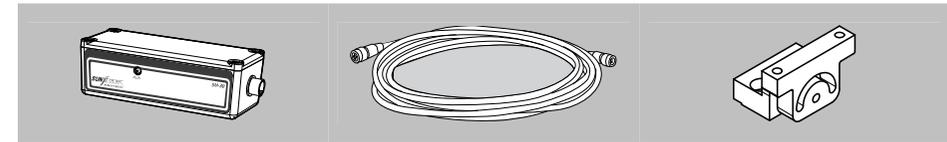
Body
SM-30
1ea

Connect Cable
SCC-SM-1-001
20m / 1ea

Installation Bracket
SBR-SM-3-002
1ea

9.3 EVM-302
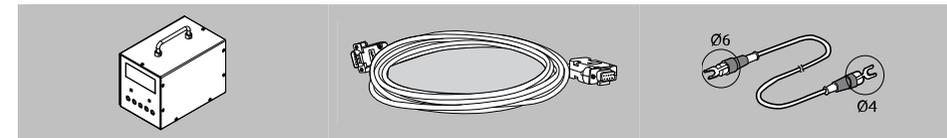
Body
EVM-302
1ea

**RS-232
Communication Cable**
SCC-VM-1-001
5m / 1ea

Ground Cable
SGC-MT-4-001
1m / Ø6-Ø4[mm] / 1ea

EVM Program CD
1ea

Power Cable
SPC-MT-1-001　AC 100V, 50/60Hz, 1.8m, 1ea　or
SPC-MT-2-001　AC 220V, 50/60Hz, 1.8m, 1ea

9.4 EVM-308
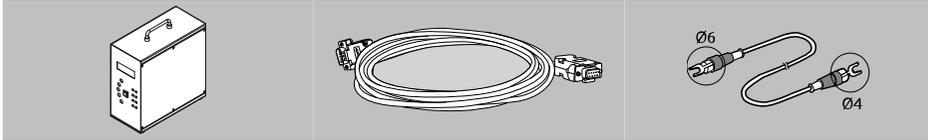
Body **EVM-308** 1ea	RS-232 **Communication Cable** SCC-VM-1-001 5m / 1ea	Ground Cable SGC-MT-4-001 1m / Ø6-Ø4[mm] / 1ea

EVM Program CD 1ea	Power Cable SPC-MT-1-001 AC 100V, 50/60Hz, 1.8m, 1ea or SPC-MT-2-001 AC 220V, 50/60Hz, 1.8m, 1ea

9.5 CC-Link (Option)
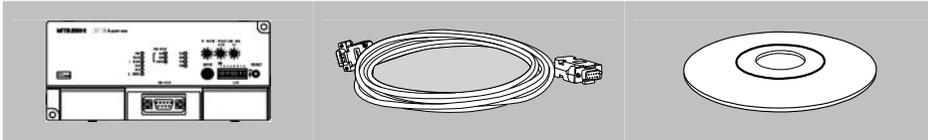
Intelligent Device AJ65BT-R2N 1ea	CC-Link Cable SCC-VM-2-001 5m / 1ea	CC-Link Demo S/W 1ea

9.6 Wireless communication (Option)
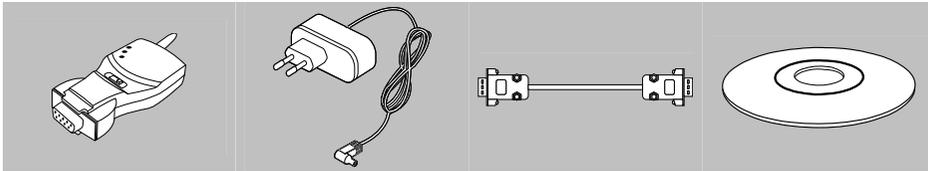
Bluetooth Module SBM-VM-001 2ea	Adapter SAD-VM-1-001 2ea	RS-232 **Communication Cable** SCC-VM-1-002 0.2m / 1ea	Bluetooth S/W 1ea

10. Drawings

10.1 SM-10

SM-10

10.2 SM-30

SM-30

10.3 EVM-302

TOP

FRONT   SIDE   REAR

10.4 EVM-308

TOP

FRONT   SIDE   REAR
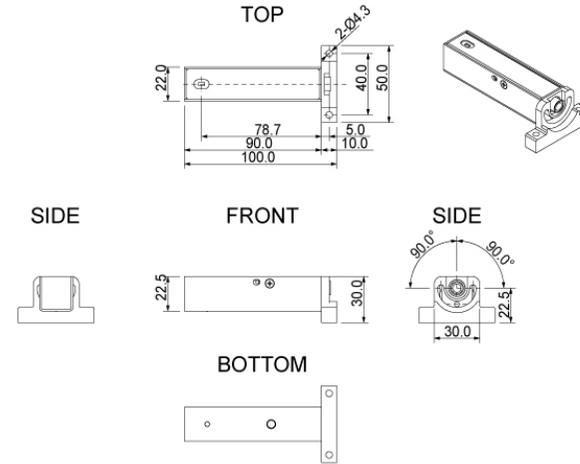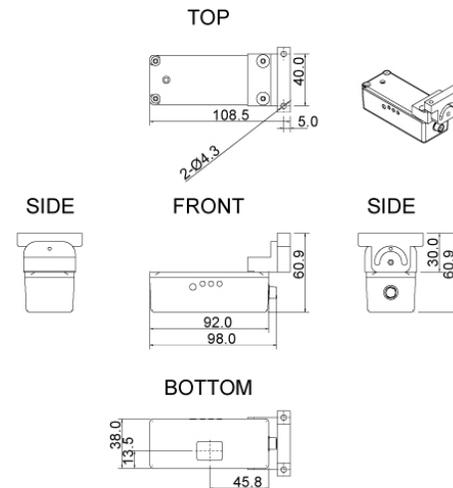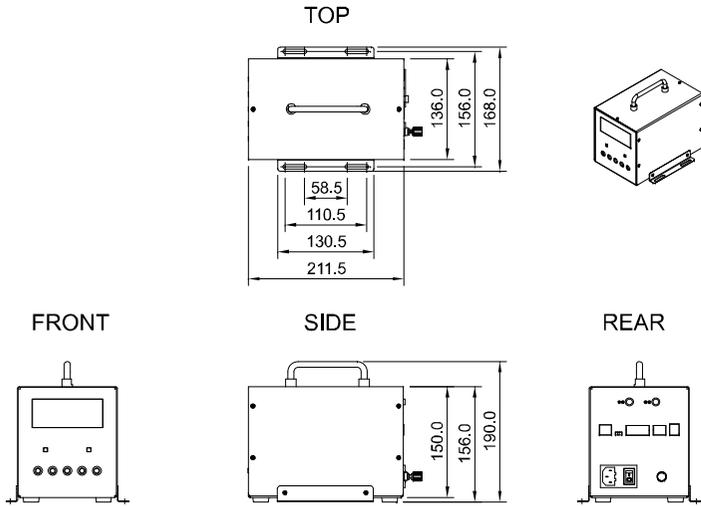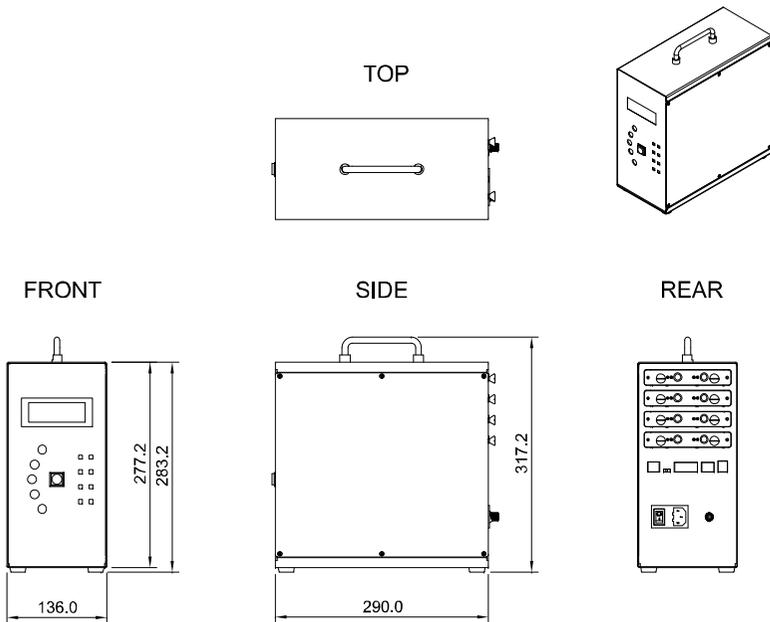
11. Warranty

11.1 Warranty Period

The warranty period of the product is for one year after the purchase of the product.

11.2 Warranty Scope

In case failure due to the problem of the product occurs during the above warranty period, after-sales service is provided free of charge. However, failures due to the following conditions are excluded from the scope of warranty.

■ Failures due to inappropriate conditions, environments, handling, and usage not conforming to the descriptions in the user's manual and the specifications attached separately.
■ Failures not due to our product's defects but due to the designs of customer's equipment or software.
■ Failures due to modification or change by user's own will.
■ Failures that are determined to have been prevented if consumables described in the user's manual, etc. had been maintained or replaced correctly.
■ Failures due to external causes including disasters such as fire, earthquake and flood, and abnormal voltage.

The scope of warranty is valid within warranty period. We are not responsible for the secondary damage (equipment breakdown, opportunity loss, profit loss, etc.) due to our product's failure.

11.3 Application scope of product

This product has been designed and manufactured as a product for general industrial use. Therefore, this product can not be used for the purpose related to atomic power generation, aviation, railway and medical equipment that have great influence on human life or properties. However, customers can apply our products to the above mentioned purposes after they fully understand the specifications of the product through consultation with us.

12. Contact Information

12.1 Contact Address for A/S

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