KOGANEI

X904366

Ver.1.0

Electrostatic Potential Sensor

DTY-EPS01

Instruction Manual

Thank you for purchasing a Koganei electrostatic potential sensor.
Please read this instruction manual carefully before using the device, so that you can use it safely and correctly. In addition, keep this manual in a safe place.
Always follow the safety precautions and instructions in this manual. If necessary safety measures are neglected or incorrectly applied, it could do more than just damage or break the product; it could also lead to an accident or injury to the user (installer, operator, adjuster, or inspector).

⚠ WARNING

This product was designed and manufactured for use in general industrial machinery.
Do not use the product for the purposes listed below:
1. Medical equipment related to maintenance or management of human lives or bodies
2. Machines or equipment designed for the purpose of moving or transporting people
3. Critical safety components in mechanical devices
This product has not been standardized or designed for purposes that require high levels of safety. Using the product in any of the ways described above creates the risk of loss of human life.

⚠ CAUTION

The product is an industrial sensor. It is not a meter for measuring absolute electric potential. Its measurement accuracy is not 100% guaranteed.
Always apply a ground. Not doing so can lead to malfunctions or degraded measurement accuracy.
When the product can no longer be used or is no longer necessary, dispose of it appropriately as industrial waste.
Install a circuit breaker or a switch that workers can use to quickly cut off the power and label it appropriately.
Do the wiring correctly. Incorrect or inappropriate wiring, can lead to malfunctions.
For the DC power source, use a power source that has a 24 VDC output voltage with double or reinforced insulation between the input and output. For the power supply, use DC24V/4A (100W) or below. Wiring should be within 30m on the EN standard.
Shaking or vibrations can lead to degraded measurement accuracy. Install it in a location that is not subject to shaking or vibrations.
Note that anything near the sensor or between the sensor and the object being measured that disrupts the magnetic field (such as relays, solenoids, metal scraps, ionizers, etc.) affects the measured values.
Note that there is an inrush current when the power is turned on.
Pulling forcefully on the cables damages them. Do not subject cables to stress, such as pulling or bending them excessively. The minimum bending radius is 40 mm.
Analog output may fluctuate during communications. Do not use analog output for communications.
Do not use the product outdoors (in direct sunlight or extreme heat). Do not use the product in locations that are very humid, dusty, dirty, or exposed to corrosive or flammable gases.

※For any other items of danger, warning, or caution, please refer to the “Safety Precautions” in the Catalog for the “Static Electricity Removing Unit; IONIZER” .
(Be sure to refer to the Latest Version of the Catalog.)

1 Product description

Confirm that nothing is missing from the package. If anything is missing, contact your retailer (agent) or our nearest sales office.

Potential sensor 1
L bracket for mounting 1
Mounting screws (M3 x 0.5, 18 mm long) .... 2, with 2 washers

2 Overview

1. This product can remotely measure the electric potential (voltage) on an object that has a static electric charge.
2. The electric potential that is displayed as the measured value is based on the electric potential of the ground (FG/earth).
3. The product is intended to be installed in a fixed position at a specified distance from the objects being measured so as to provide reliable measurements.
4. Analog output type: Analog is output (1 - 5 V, zero-point 3 V) according to the size of the electric charge. Switch output type: Outputs a judgment signal if the value goes over or under a preset voltage (threshold).
5. Communications can be set up in various formats. The various set values are saved in the non-volatile memory. A cable specifically for communications can be used to communicate with external devices, such as a programmable controller. Settings can also be done via USB from your computer by using a USB-RS485 converter.

3 Specifications

Item \ Models	Analog output type DTY-EPS01-EA	Switch output type DTY-EPS01-ES
Power [V]	24 VDC ±10%	
Consumption current [mA]	Max 50	
Indicator light	Power LED (green): lit when power is on	
	Measurement mode display LED (blue): not lit in standard mode; lit in high voltage mode; flashes in ion balance mode	
	Abnormal display LED (red): lit when over range or sensor abnormality occurs	
	-	Switch display LED (yellow): lit during switch output
Analog output Note 1)	1 to 5 V analog output1 (Zero-point 3 V, full scale 4 V) (Output impedance approximately 100 Ω)	-
Output	Alarm output1 (NPN open collector output) (24 VDC ±10%/max 50 mA) (Internal voltage drop max 0.3 V @ 5 mA/max 1.0 V @ 50 mA)	Judgement output2 Alarm output1 (NPN open collector output) (24 VDC ±10%/max 50 mA) (Internal voltage drop max 0.3 V @ 5 mA/max 1.0 V @ 50 mA)
Input	Zero calibration input1 (Shared 24 VDC input voltage power source, input current 4.8 mA @ 24 VDC, input impedance 4.7 kΩ) * Zero calibration is within ±200 V (High voltage mode is within ±2000 V)	
Measurement distance [mm]	6 to 100	
Measured range [mm]	φ20 to φ400	
Accuracy	±5%F.S.	
Data output cycle [ms]	10 Smoothing: 50, 100, 200, 500, 1000 (by setting)	
Measurement mode	Ion balance mode/Standard mode/High voltage mode	
Switch settings	1 (Switch measurement modes/Zero calibration)	
Communications I/F	Set according to RS485 communications	
Temperature characteristics	+0.5% F.S./°C or below (0 to 40°C, standard of 25°C)	
Operating environment	0 to 40°C/less than 65% (non-condensation, non-freezing)	
Storage environment	-20 to 60°C (non-condensation, non-freezing)	
Installation environment	Installation category I, pollution degree 2 (EN61010-1)	
High level	Less than 2000 m	
Case material	Conductive ABS resin	
External dimensions [mm]	55 (W) × 25 (H) × 10.5 (D)	
Mass [g]	13 (cable not included)	
Attachments/accessories	1 L bracket (2 mounting screws, 2 washers)	
	Attached according to selection 1 power and signal cable (blank: none, -3L: 3 m cable, -10L: 10 m cable) 1 communications cable (blank: none, -1RLN: 1 m cable, -3RLN: 3 m cable, -10RLN: 10 m cable)	

Note 1) If the electric charge goes over in the positive direction of the measured range, 5.2 V is output. If it goes over in the negative direction, 0.7 V is output. Do not short circuit the analog output.
Remark: If no measurement conditions are specified, the temperature range is 25 °C.

■ Measurement distance and measured voltage range

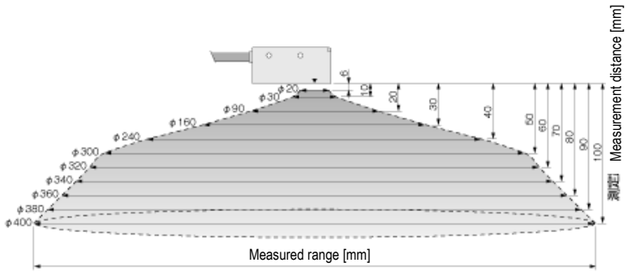
The measurement range and resolution vary depending on the measurement mode. Set the measurement distance according to the amount of charge on the objects being measured.

Measurement distance [mm]	Standard mode		High voltage mode	
	Range [V]	Resolution [V]	Range [kV]	Resolution [V]
6 to 15	±1000	1	±10.00	10
16 to 50	±2000	1	±20.00	10
51 to 100	±2000	2	±20.00	20

*The ion balance mode has a range of ±1000 V and resolution of 1 V.
*Resolution is when measuring an object that exceeds the measurement range. If the object being measured is smaller than the measurement range, the workpiece size can be set to compensate the amount of static charge that is output, but the resolution will degrade.
Also, the resolution degrades at ±50V or below. (High voltage mode: ±500V or below)

■ Measurement distance and measured range

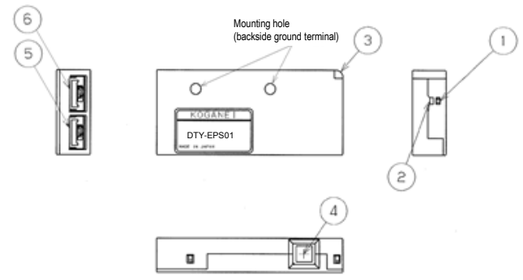
Measurement distance [mm]	Measured range φ [mm]
6	20
10	30
15	60
20	90
30	160
40	240
50	300
60	320
70	340
80	360
90	400
100	375



4 From preparations to measurements

	Procedure		Reference sections
Preparations	Names/ functions	Confirm the names and functions of the parts of the potential sensor.	4-1. Exterior view and names of parts
	Installation	Install the potential sensor.	4-2. Installation
	Connections	Connect the power, external devices (PLC, etc.), computer, and external devices (communications unit).	4-3. Connections ■ Connecting the power/connecting external devices ■ Connecting to communication devices
	↓		
	Power on	Supply 24 VDC.	-
	↓		
Settings	Settings	Set the parameters according to the usage conditions of the potential sensor.	4-4. Settings ■ How to set parameters ■ Required parameters that must be set ■ Parameters that are set if necessary
	↓		
	Zero calibration	Use the potential sensor to measure the conductor to which the ground is connected and calibrate for zero.	4-5 Measuring ■ Zero calibration
	↓		
Measurement	Start measurements	You can judge and confirm the amount of electric charge on external devices.	4-5 Measuring ■ Measurements

4-1 Exterior view and names of parts



	Parts	Description
①	Switch measurement modes/ Zero calibration switch	Press and hold for five seconds: Switch measurement modes Press and hold for less than five seconds: Executes zero calibration
②	Measurement mode LED (blue)	In standard mode: off In high voltage mode: on Ion balance mode: flashing
③	Display LEDs (green, red, yellow)	Normal: Green LED lights Measured value over the range: Red LED lights Error detected: Green LED goes out, red LED lights or flashing Measurement output is on: Yellow LED lights *Only for switch output types
④	Position to measure static charge potential	Point it at the position on the target object to measure the static charge potential
⑤	Communications connector (CON2)	Connect a communications cable or a USB-RS485 converter cable.
⑥	Power and signal connector (CON1)	Connect the power and signal cable

■ LED display depends on conditions

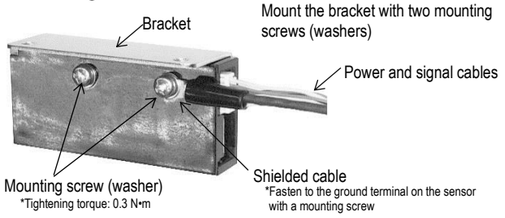
State	Name				Description
	Red	Green	Blue	Yellow	
Non-electrified (power off)	○	○	○	○	-
Electrified (power on)	○	◎→●	○	○	After turning on the power, the green LED flashes for 2 seconds, and then stays lit.
Zero calibration complete	○	●	○	◎→○	When zero calibration is complete, the yellow LED flashes for 2 seconds, and then goes out.
When switch output is on	○	●	○	●	While switch output is on, the yellow LED is lit. It goes out when off.
In standard mode	○	◎→●	○	○	In standard mode, the blue LED goes out.
In high voltage mode	○	◎→●	●	○	In high voltage mode, the blue LED lights.
In ion balance mode	○	◎→●	◎	○	In ion balance mode, the blue LED flashes.
When the measurement value is over range	●	●	○	○	When the measurement value of the target goes over range, the red LED lights.
I/O output abnormality (overcurrent) detection	●	○	○	○	Load on I/O output short circuits and causes an overcurrent.
Memory abnormality detection	◎	○	○	○	Data acquired from the internal memory is abnormal.
Sensor abnormality detection	◎	○	○	○	Sensor is abnormal.

●: Lit ○: Unlit ◎: Flashing

4-2 Installation

1. Install the surface of the measuring part of the potential sensor so it is parallel to the surface to be measured on the object from which to remove the static charge.
2. If the installation location is subject to vibrations, it may affect the accuracy of the measurements. Install the sensor where there are no vibrations.
3. Use a strong frame on which to install the sensor. If it is not strong, it may affect the accuracy of the measurements. Also, be sure to use screws to mount the sensor.
4. Be careful to not overtighten the mounting screws when mounting the potential sensor on the mounting bracket. Doing so could damage or break the product.
   (Recommended tightening torque for the mounting screws: 0.3 N•m)
5. The measured electric potential is related to the proximity of and distance to the objects from which to remove the charge. Install it so the distance is as accurate as possible.
6. Always ground the potential sensor, because it has an effect on the accuracy of measurements. The cable or the mounting holes in the potential sensor are the ground.
7. If it is not possible to avoid some voltage in the installation location, use appropriate insulation. If you do not use insulation, it will affect not only the measured values, but it may also create a ground or short circuit.
8. The potential sensor measures the strength of the electric field, and then calculates the voltage value. Therefore, note that anything near the sensor or between the sensor and the object from which a charge is being removed that disrupts the magnetic field (such as relays, solenoids, metal scraps, etc.) affects the measured values.
9. Regarding use of ionizers
   The measurements will not be consistent if the sensor is installed near an ionizer. Install the sensor so it is as far away as possible from the ionizer. Installing the potential sensor directly between the ionizer and the object from which the charge is being removed may have an effect on the accuracy of measurements.

■ Installing brackets



4-3 Connections

■ Connecting the power/connecting external devices

Connect power and signal cables to the power and signal connectors.
Refer to the cable and wiring table to connect the power and external devices. Do not reverse the connections for the +24 V and 0 V power sources. Doing so could damage the equipment.
Use the mounting screws to fasten the shielded signal and power cables to the potential sensor. Always ground the shielded cable on the loose-wire side.
The power ground 0 V and shielded cable are connected inside.

Cable signal table: Analog output type

Number	Parts	Input/output	Cable color	Description
1	0 V Note)	-	Blue	Power source ground
2	+24 V	-	Brown	24 VDC power
3	Z.C	Input	Orange	Zero calibration input
4	ALM	Output	Purple	Alarm output
5	AG Note)	-	White	Analog ground
6	SA	Output	Black	Analog output (1 - 5 V)

Note) The 0 V (power ground), AG (analog ground), and ground terminal are connected inside.

Cable signal table: Switch output type

Number	Parts	Input/output	Cable color	Description
1	0 V	-	Blue	Power source ground
2	+24 V	-	Brown	24 VDC power
3	Z.C	Input	Orange	Zero calibration input
4	ALM	Output	Purple	Alarm output
5	CP1	Output	White	Judgment output 1
6	CP2	Output	Black	Judgment output 2

Note) The 0 V (power ground) and ground terminal are connected inside.

■ Connection with communication devices

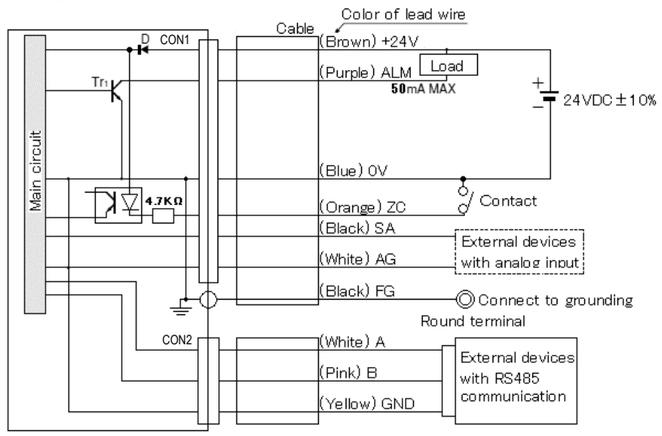
Connect a communications cable or a USB-RS485 converter to the communications connector.
It is possible to do various settings and acquire information from inside the potential sensor.
You can use the communications cable if you set up the 485 communications unit for external control devices.
You can use a USB-RS485 converter if you set up USB from your computer.
Remove the dummy connector that has been inserted into communications connector (CON2) to use it.
(Insert the dummy connector if you are not using communications. It prevents foreign objects from getting in.)
Before connecting the communications cable for the first time, confirm that the green LED on the sensor is lit as normal. If you connect cables or a USB-RS485 converter while the sensor's power is connected in reverse, it may damage the thing that is being connected.

Shared communications cable signal table: Analog output/switch output type

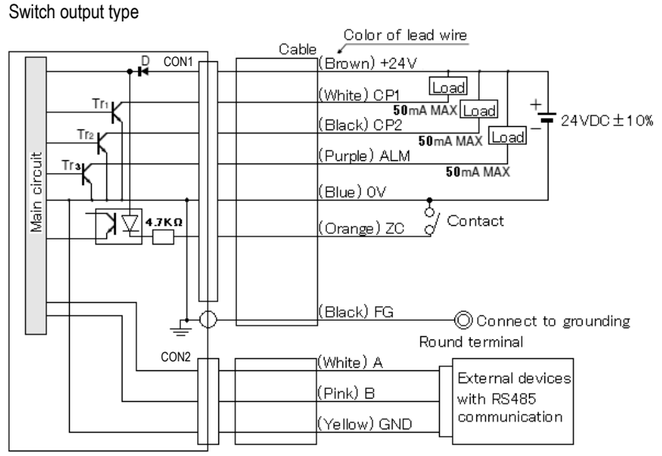
Number	Parts	Input/output	Cable color	Description
1	A	Input/output	White	485 communication data
2	B	Input/output	Pink	485 communication data
3	GND	-	Yellow	Ground
4	N.C.	-	-	Unconnected
5	(GND)	-	-	Unconnected

■ Input/output circuit

Analog output type



Switch output type



4-4 Settings

Except for some settings, this product is set up via communications operations.
You can easily do the settings from a computer (support software) or a communications unit.
The setting conditions are written and stored to a non-volatile memory. Note that the non-volatile memory has a limited service life of 100,000 guaranteed writes.

■ How to set parameters

Use a computer (support software) or a 485 communications unit to set the various parameters.
If you use a computer (support software), you can use a USB-RS485 converter, and the settings can be done with the support software.
Refer to the instruction manual for the support software regarding how to operate the support software.
If you are using a communication unit, such as the RS485, use the parameter write command to set the parameters.
After writing the parameters, check the readout data.

- Parameter write command
  @WP, operand 1 (parameter number), operand 2 (data)
- Parameter readout command
  @RP, operand 1 (parameter number)
- Communications settings

Item		Specifications
Communications standard		RS-485 (2 lead wire type)
Transmission speed		115200 bps
Transmission format		Half duplex
Data format	Start bit	'@' (=0x40)
	Delimiter code	',' (=0x2C)
	Completion code	CR (=0x0D)
	Data bit	8bit
	Stop bit	1bit
	Parity	Odd numbers
	Checksum	None
Number of transmitters		1 unit
Termination resistance		Built in

- Content of communications response

Reply	Specifications
OK	Normal. If there is data, delimit it with commas.
ER	Error generated. Content of error display delimited by commas.

■ Command list

Command	Operand 1	Operand 2	Description
RC	-	-	Reads the voltage
WP	Parameter number	Data	Writes parameters
RP	Parameter number	-	Reads parameters
REALL	-	-	Batch read of error history Reads the last 10
ZERO	-	-	Executes zero calibration
IPRM	-	-	Parameter initialization
IERR	-	-	Initialize error history
JM	Judgment mode	** (There may be 3 operands, depending on judgment mode)	Switches from detailed to simple judgment 0: Detailed judgment 1: Simple judgment Note) Operands after 2 vary depending on the judgment mode.
MM	Measurement mode	-	Switch measurement mode 0: Standard mode 1: High voltage mode 2: Ion balance mode
TIME	Output cycle	-	Set data output cycle 0: 10 ms, 1: 50 ms 2: 100 ms, 3: 200 ms 4: 500 ms, 5: 1000 ms
VERSION	-	-	Read version information

■ Explanation of JM commands

Command Operand 1	Operand 2	Operand 3	Description
JM,0	CP1 mode	CP2 mode	Set detailed judgment 0: Hi mode 1: Low mode 2: Inside mode 3: Outside mode 4: Off mode
JM,1	Judgment mode	-	Set simple judgment 0: Easy.High.Low mode 1: Easy.Inside mode 2: Easy.Outside mode

■ Description of contents received via RC command

Response data range	Description
-20000 to 20000	Charge voltage (V)
30000	+ over range
-30000	- over range

■ Description of required parameters and settings that must be set

① Measurement distance (WP command: parameter number 91)
Set the distance from the potential sensor to the object being measured.
The initial value is 50 mm.
Set it within a 6 mm to 100 mm range.
Can be set in 1 mm units.
If you are using ion balance mode, you do not need to input a measurement distance.

Note: If you are doing high voltage measurements, set the measurement distance according to the following guidelines.

Measurement distance	Measured voltage
6 to 15 mm	**Distance (mm) x 1.0 kV**
16 to 100 mm	**Distance (mm) x 0.5 kV**

② Workpiece size (WP command: parameter number 90)
Set the diameter of the diagonal dimension of the object being measured.
Initial value is φ300 mm.
Set it within a φ20mm to φ400 mm range.
Can be set in φ1 mm units.

③ Measurement mode (MM command)
Amount of charge on object being measured and measurement mode according to object being measured: Set standard mode/high voltage mode/ion balance mode.
Initial value is standard mode.

*Switch measurement modes on the potential sensor/can also be changed with the zero calibration switch.
Press and hold for 5 seconds to change modes in order from Standard mode → High voltage mode → Ion balance mode → Standard mode.

④ Judgment mode (JM command)/
Judgment threshold (WP command: Parameter 16 to 19)/
Hysteresis (WP command: Parameter 20 to 23)

Only switch type settings can be done.
Set the threshold of the amount of charge to judge as judgment output 1 (CP1) and judgment output 2 (CP2).
The judgment mode also has detailed judgment and simple judgment.
Simple judgment can judge measured potential with the least amount of settings.

■ Detailed judgment

Note) Set the setting conditions of the judgment threshold so they are as shown below.

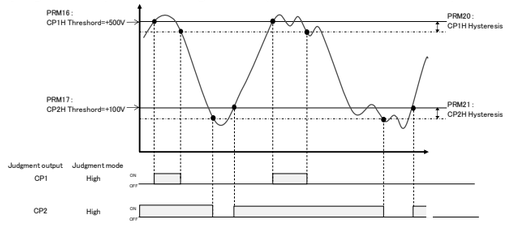
- (CP1H threshold - CP1H hysteresis) > (CP1L threshold + CP1L hysteresis)
- (CP2H threshold - CP2H hysteresis) > (CP2L threshold + CP2L hysteresis)

Note that an error will occur if the setting conditions are not met.

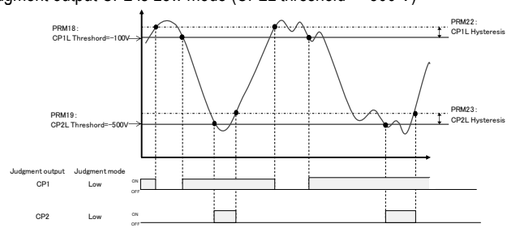
<High/Low modes>

- If the measured potential exceeds threshold H or threshold L, output turns on.
- The output judgment can output a maximum of two positions (CP1/CP2).
- You can set hysteretic values for the thresholds.

Setting example)
Given judgment output CP1 is High mode (CP1H threshold = +500 V) and judgment output CP2 is High mode (CP2H threshold = +100 V)



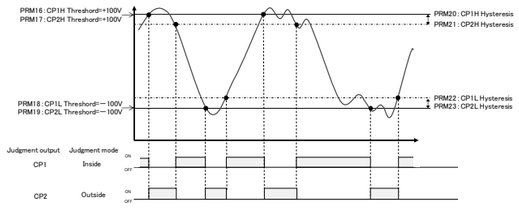
Setting example)
Given judgment output CP1 is Low mode (CP1L threshold = -100 V) and judgment output CP2 is Low mode (CP2L threshold = -500 V)



<Inside/Outside mode>

- Output is on while the measured potential is within (Inside mode) threshold H and threshold L or when it is outside (Outside mode).
- The output judgment can output a maximum of two positions (CP1/CP2).
- You can set hysteretic values for the thresholds.

Setting example)
Given judgment output CP1 is Inside mode (CP1H threshold = +100 V and CP1L threshold = - 100 V) and judgment output CP2 is Outside mode (CP2H threshold = +100 V and CP2L threshold = - 100 V)

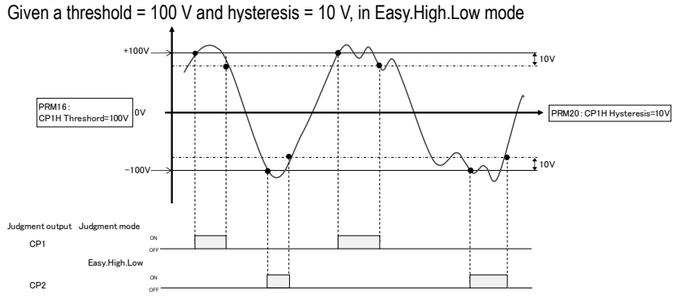


■ Simple judgment

<Easy.High.Low mode>

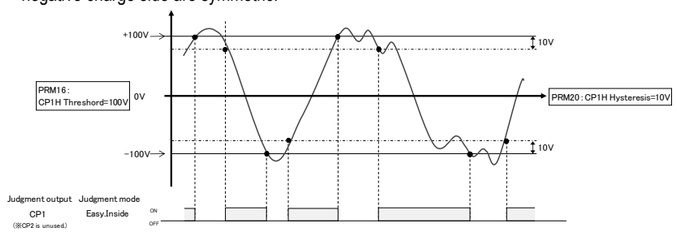
- Judgment output CP1 is automatically set to High mode and CP2 to Low mode.
- You can set just one threshold, using a base of 0 V, so the positive charge side and the negative charge side are symmetric.

Setting example)
Given a threshold = 100 V and hysteresis = 10 V, in Easy.High.Low mode



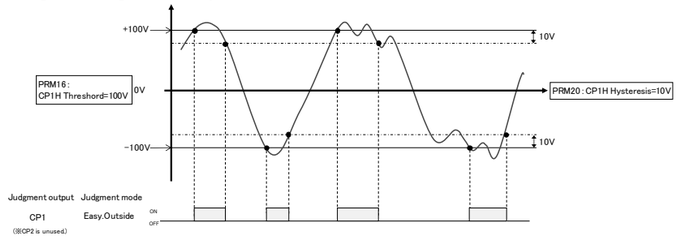
<Easy.Inside mode>

- Judgment output CP1 is automatically set to Inside mode. Judgment output CP2 is in Off mode and is not output.
- You can set just one threshold, using a base of 0 V, so the positive charge side and the negative charge side are symmetric.



<Easy.Outside mode>

- Judgment output CP1 is automatically set to Outside mode. Judgment output CP2 is in Off mode and is not output.
- You can set just one threshold, using a base of 0 V, so the positive charge side and the negative charge side are symmetric.

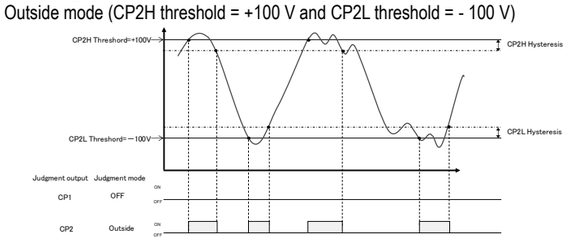


■ Stop judgment

<Off mode>

- If you do not want to output judgment, set Off mode and it will not be output. You can set this individually for CP1 and CP2.

Setting example)
Given judgment output CP1 is Off mode and judgment output CP2 is Outside mode (CP2H threshold = +100 V and CP2L threshold = - 100 V)



■ Parameters that are set if necessary

① Smoothing of data output (TIME command)
Select a data output cycle from 10 ms (no smoothing), 50 ms, 100 ms, 200 ms, 500 ms, and 1000 ms.
Initial value: 100 ms
When Ion balance mode is selected, the data output cycle is 100 ms.

*Judgment for data for the judgment output of the switch output type is also done according to the data output cycle set.
*Reading the amount of charge via communications outputs the data that has been set by smoothing of the data output.

■ List of parameters

Number	Initial value	Input range			Unit	Description
16	100	-20000	to	20000	V	CP1H threshold
17	100	-20000	to	20000	V	CP2H threshold
18	-100	-20000	to	20000	V	CP1L threshold
19	-100	-20000	to	20000	V	CP2L threshold
20	50	0	to	20000	V	CP1H hysteresis
21	50	0	to	20000	V	CP2H hysteresis
22	50	0	to	20000	V	CP1L hysteresis
23	50	0	to	20000	V	CP2L hysteresis
90	300	20	to	400	mm	Workpiece size
91	50	6	to	100	mm	Measurement distance

4-5 Measuring

If consistent measurements are needed, we recommend waiting 10 minutes or more after turning on the power before using the sensor.
The measured values may fluctuate slightly immediately after the power is turned on because the circuits have not stabilized.
After turning on the power, measurement starts after the green LED has flashed for 2 seconds. Furthermore, judgment output is after the data output cycle has elapsed.

■ Zero calibration (ZERO command)

Zero calibration is a function that compensates the standard electric potential so the measured value is 0 V.
Point the sensor at an empty space, away from the metal plate to which the ground is attached, where there are no charged objects.

Z.C. signal: Turn on the zero calibration (close the contact).
The yellow LED flashes for 2 seconds. After that, it goes out.

Zero calibration can also be done with the switch on the potential sensor.
Press the measurement range switch/zero calibration switch on the side of the potential sensor.
The yellow LED flashes for 2 seconds. After that, it goes out.

Note: Do not push and hold for 5 seconds during zero calibration.
If you press and hold it for more than 5 seconds, the measurement range will change.
If it happens to change, press and hold the switch for more than 5 seconds again to change it back.
Note: The zero calibration execution range must be within ±200V.
(High voltage mode must be within the range of ± 2000V.)
If operated when charge is over 201V, this will cause an error.

■ Measurement methods according to measurement modes (MM command)

<Standard mode/High voltage mode>
Set the sensor in the same position as the measurement distance that was set for the distance from the product to the object to be measured.
Set the position accurately because the measured values change depending on the measurement distance.

- When using switch output type, the judgment output from CP1/CP2 is according to the judgment mode/judgment threshold that has already been set.

- When using an analog output type, analog is output according to the size of the electric charge.

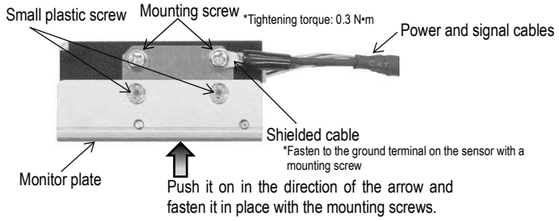
Standard mode

Amount of charge [V]		Analog output voltage [V]
Measurement distance 6 to 15 mm	Measurement distance 16 to 100 mm	
+1000	+2000	5.000
+750	+1500	4.500
+500	+1000	4.000
+250	+500	3.500
+50	+100	3.100
0	0	3.000
-50	-100	2.900
-250	-500	2.500
-500	-1000	2.000
-750	-1500	1.500
-1000	-2000	1.000

High voltage mode

Amount of charge [kV]		Analog output voltage [V]
Measurement distance 6 to 15 mm	Measurement distance 16 to 100 mm	
+10.00	+20.00	5.000
+7.50	+15.00	4.500
+5.00	+10.00	4.000
+2.50	+5.00	3.500
+0.50	+1.00	3.100
0.00	0.00	3.000
-0.50	-1.00	2.900
-2.50	-5.00	2.500
-5.00	-10.00	2.000
-7.50	-15.00	1.500
-10.00	-20.00	1.000

<Ion balance mode>
To do measurements in the ion balance mode, you need to attach a monitor plate, which is sold separately.
You will be able to measure the charge on people and the charge removal and ion balancing with an ionizer.
The mounting method is shown in the diagram below.



Use the following procedures to do measurements.
① Turn on the power to the product.
② Set the measurement mode to Ion balance mode.
③ Attach a ground to the monitor plate, and then, after releasing the electrification charge, calibrate zero on the potential sensor. Do this operation each time you do a measurement.
④ Undo the ground connection and start measurements.

(a) Measuring ion balance
- When using switch output type, the judgment output from CP1/CP2 is according to the judgment mode/judgment threshold that has already been set.

- When using an analog output type, analog is output according to the ion balance.

If you put the sensor in an arbitrary position for measurements, it reads the voltage of the positive ion and negative ion balance from that position.
The measurement range is ±1000 V.

Analog output as per the ion balance

Amount of potential [V]	Analog output voltage [V]
+1000	5.000
+750	4.500
+500	4.000
+250	3.500
+50	3.100
0	3.000
-50	2.900
-250	2.500
-500	2.000
-750	1.500
-1000	1.000

(b) Measuring the effect of removing a charge by the ionizer
Put a plastic object that has become charged due to friction in contact with the monitor plate, thus charging the monitor plate. You can measure the effect of the ionizer's charge removal by monitoring the decay of the potential on the plate that has been placed in the charge removal area of the ionizer.

(c) Measuring the charge on a human
If you touch the monitor plate with your hand, the sensor can read the charge potential of your body.

Precautions
Do not touch the plastic screws on the monitor plate. If they happen to become loose, tighten them to the following torques.
Small plastic screws = 0.12 N•m
The values measured with the standard charged plate monitor may differ from the values measured with the actual monitor plate because there are differences in the volume and size of the plates.
When you are charging the monitor plate by touching a piece of plastic that has been charged through friction, it may be difficult to charge the plate due to the material and shape of the plastic object. Also, the polarity changes depending on the material of the plastic object.

5. Maintenance mode
1. If the detector needs to be cleaned, point the detector downwards and use an air blower at lower than 0.1 MPa, and from a distance of over 100 mm to clean it.
2. Do not allow dust to collect in the environment around the detector.
Do not touch the detector.
Make sure the case surface does not get stained by sebum, oil, particles, or dust.
It is necessary to clean when stained.
3. Tiny electronic parts are used in the device and in the sensor. When handling the product, take care to avoid dropping it, allowing it to come into contact with other objects, or otherwise subjecting it to excessive impact. Even if the exterior of the product appears undamaged, damage to internal components can cause abnormal operation.

6. Troubleshooting
■ When problems occur
If you are going to contact Koganei about the conditions of your problems, please prepare the following items in as much detail as possible.

Item	Description (example)
What	Potential sensor model Other
When	Time of purchase (serial number) Period used, conditions of use When power was turned on and one hour after power was turned on
Under what conditions	While operating While doing settings
What happened	Does not operate Alarm occurs
Frequency	Always occurs Occurs once an hour Does not recur

■ When alarms occur and their countermeasures
An alarm is determined to have occurred if the ALM signal output of the input/output is on.
When an alarm occurs, the red LED will light or flash.
If an alarm occurs, turn off the power, remove the cause of the alarm, and then restart the power.

■ List of alarms

Alarm messages	Description	Likely causes	Countermeasure
Sensor error	Error occurred at the sensor	Sensor is damaged	Turn off the power, and then turn it on again. If this does not solve the problem, contact Koganei.
Memory errors	The data in the sensor has been damaged.	The power was turned off while data was being written.	Turn off the power, and then turn it on again. If this does not solve the problem, use the support software to do an initialization. If the problem still remains unsolved, contact Koganei.
I/O output error (overcurrent)	The I/O output had an overcurrent	The load connected to the I/O output had a short circuit	Turn off the power, and check the load. After removing the cause of the alarm, turn the power on again.

■ List of error codes

Error codes	Description	Likely causes	Countermeasure
10	Memory errors	■ Refer to list of alarms	
11	Sensor error		
30	I/O output error		
40	Typo	Command is incorrect	Check the commands.
41	Data error	Outside the input range	Check the input range.
42	Parameter is write protected	Outside the parameter input range	Check the parameter number.
43	Threshold error	Discrepancy in the threshold input data	Check the threshold input range and conditions.
44	Over range of zero calibration	Out of zero calibration range	Execute zero calibration within range (±200V)
50	Parity error	• Communications settings are incorrect • Connected to sensor while applying power during communications via support software • Effect caused by noise	Check the communication settings. Connect before applying power.
51	Framing error		

* For other details about specifications and precautions, see the catalog.
* For inquiries about the product, contact the Koganei overseas department at the number below.

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