取 A-0159-00

OEM Single axis electromagnetic speed sensor

AEM1-G

Operational Manual

For your safe use

1. Use after thoroughly reading this manual
2. Improper use can lead to accidents
3. Safely keep this manual in order not to lose it

JFE Advantech Co., Ltd.

Introduction

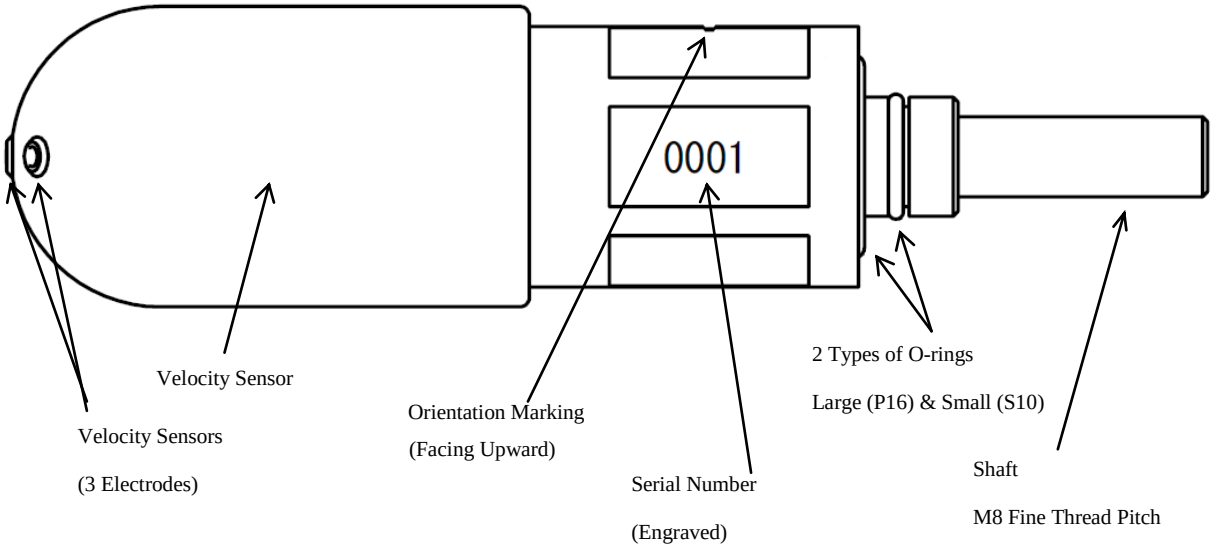
This electromagnetic speed sensor is for integration, which is formed with a single axis electromagnetic speed sensor and a circuit board.

- Power supply from external source
- Automatically export digital signal and analog voltage signal of velocity data by start supplying power.
- RS-232 has been adopted for communication with the instrument and the control system.

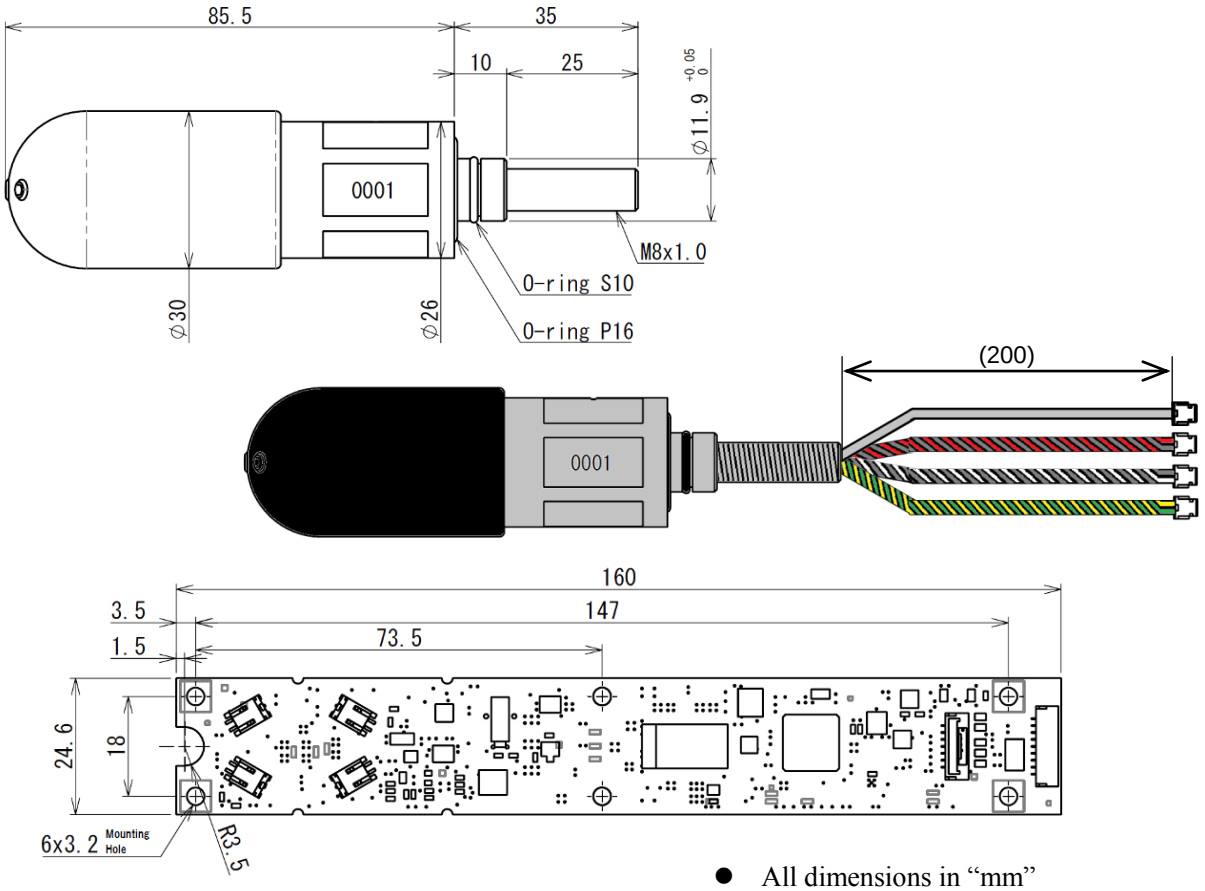
Contents

1 Part Names

1.1 Part and Section Names of the Sensor



1.2 Outer Dimensions

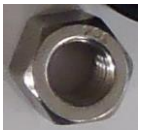


- All dimensions in “mm”

2 Packaged Items

2.1 Packaged Item List of AEM1-G Package ([1])

No.	Item Name	Appearance ([2])	QTY
1	Sensor Unit (w/ cable) ([3])		1
2	Circuit Board KP-1435○ ([3])		1
3	Connector Cable		1
4	Large-size O-ring (P16) ([4])		2
5	Small-size O-ring (S10) ([5])		1

No.	Item Name	Appearance	QTY
6	Hex Nut M8 Fine Thread Pitch 1.0		1
7	S Washer M8		1
8	Insulation Spacer ([6])		1
9	User's Manual (This booklet)		1
10	Inspection Report ([7])		1

Note ([1]): This packaged item list is for our standard package.
Items in your package may differ depending on your order.

Note ([2]): Appearances of the items may be different from the photos.

Note ([3]): The sensor unit and the circuit-board KP-1435○ to be used as a set.
There will be an alphabet in "○" indicating the number of revisions made.
We cannot guarantee its accuracy when used in different combinations other than the combination of them when shipped out from our factory.

Note ([4]): One of the O-rings is already attached to the sensor unit, which is "No. 1" in the list.
The other one is for the insulation spacer, which is "No. 8" in the list; however please use it as a spare if you do not use the insulation spacer.

Note ([5]): Already attached to the sensor unit, which is "No.1" in the list, when shipped out from our factory.

Note ([6]): Large-size O-ring (P16), which is "No. 4" on the list, has been pre-installed in the photo.
Please be sure to install O-rings before using.

Note ([7]): Velocity calibrations are carried out using standard cables, and are not to guarantee their accuracies using optional extension cable.

3 Safety Warnings

Danger	Indicates limited cases (including highly dangerous cases), which may cause death or serious injury to users, and have high degree of emergency (degree of imminence) when dangerous situations occur.
Warning	Indicates cases, which may cause death or serious injury to users.
Caution	Indicates cases, which may cause minor injury to users or material damage.

Please Be Sure to Read before Use

Caution

- Please be careful with burrs and protrusions from hurting yourself when handling the circuit-board KP-1435○.
- Please be careful with polarities when connecting.
- Please make sure to insulate analog out-put line if it would not be used, so the line would not contact circuit-boards or other internal parts.

4 Caution

4.1 Using the Instrument

(1) Please be careful with the instrument direction when integrating it.
Use while the orientation marking is facing up.

(2) Magnetic field formation of the velocity sensor influences its surroundings about three times the sensor's diameter away from the sensor. Please make sure that there are no obstacles any closer than 10 cm away from the velocity sensor.

(3) Please do not apply excessive impact to the sensor.

(4) Please do not touch the velocity sensor's electrodes with bare hands. If doing so, it may cause to damage the sensor by static electricity, or cause measurement error to become larger.
Please pay extra attention when handling the velocity sensors (electrodes) since they are very delicate.
Any impact may damage the sensor.

(5) As a countermeasure against static electricity, please use antistatic wristband or others as prevention when integrating the sensor.

(6) Please keep the circuit-board KP-1435○, connectors, or others dry.

4.2 Disposal

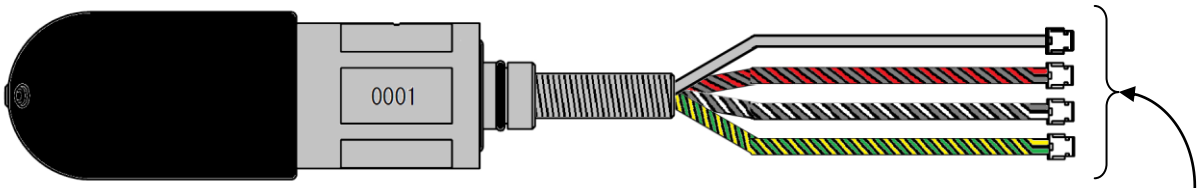
Ensure to act accordingly to the laws and the regulations when disposing the instrument.

5 Connection Outline

5.1 For RS-232 Communication

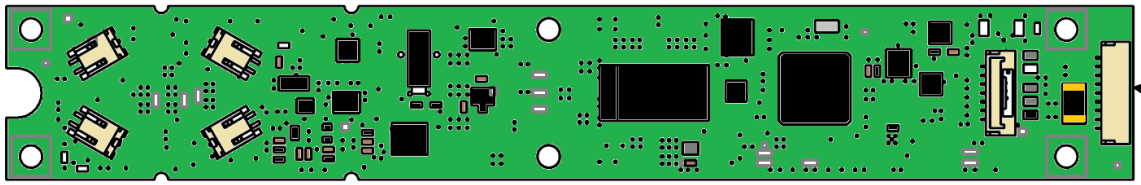
(1) Sensor ⇔ Circuit-Board KP-1435○ (Standard Package)

Sensor

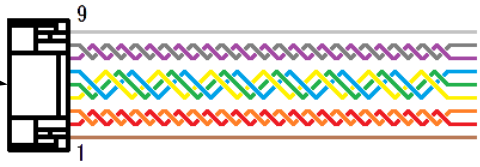


Circuit Board

KP-1435○



Cable for External Connection

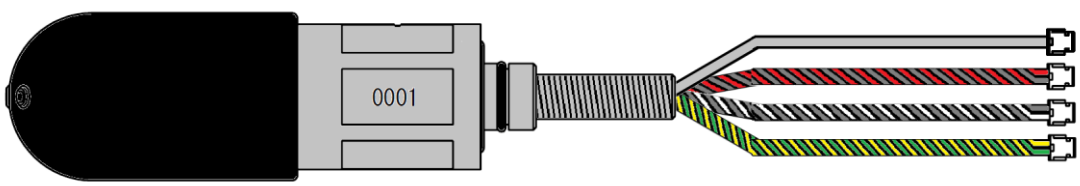


1. Brown : FG
2. Red : Power + 5 V (In-Put)
3. Orange : Power GND (In-Put)
4. Yellow : RS232 Tx (Out-Put)
5. Green : RS232 Rx (In-Put) *1
6. Blue : RS232 GND (Out-Put)
7. Violet : Analog Out-Put *1
8. Grey : Analog GND *1
9. White : *1

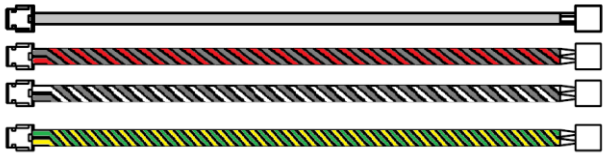
*1 : Not Used

(2) Sensor ⇔ Extension Cable (Optional) ⇔ Circuit Board KP-1435○

Sensor

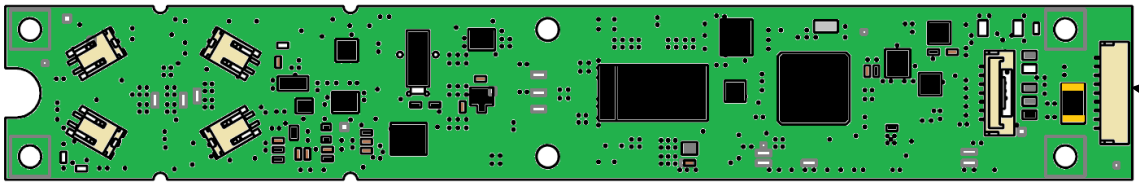


Extension Cable (Optional)

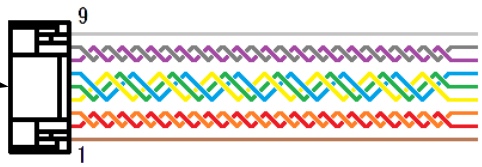


Circuit Board

KP-1435○



Cable for External Connection

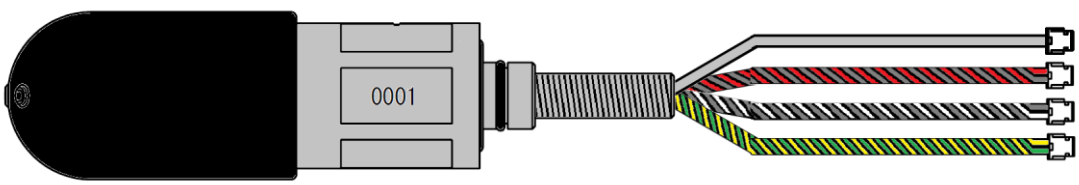


1. Brown	: FG
2. Red	: Power + 5 V (In-Put)
3. Orange	: Power GND (In-Put)
4. Yellow	: RS232 Tx (Out-Put)
5. Green	: RS232 Rx (In-Put) *1
6. Blue	: RS232 GND (Out-Put)
7. Violet	: Analog Out-Put *1
8. Grey	: Analog GND *1
9. White	: *1
*1	: Not Used

5.2 For Analog Out-Put

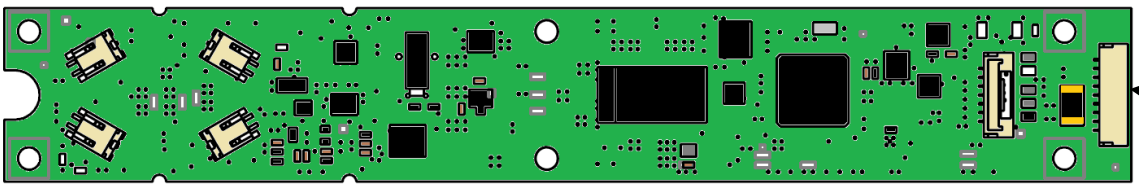
(1) Sensor ⇔ Circuit-Board KP-1435○ (Standard Package)

Sensor

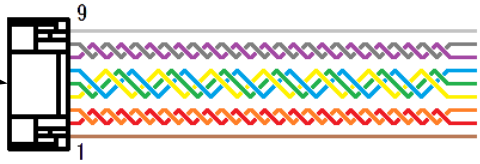


Circuit Board

KP-1435○



Cable for External Connection

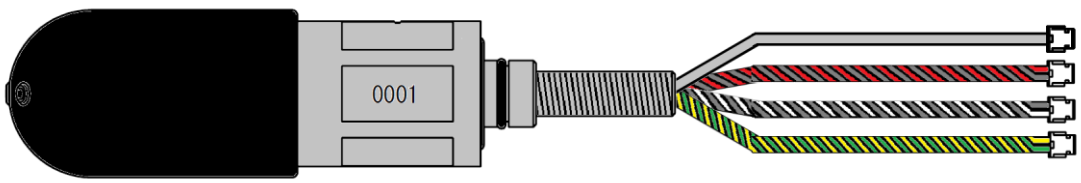


1. Brown : FG
2. Red : Power + 5 V (In-Put)
3. Orange : Power GND (In-Put)
4. Yellow : RS232 Tx (Out-Put) *1
5. Green : RS232 Rx (In-Put) *1
6. Blue : RS232 GND (Out-Put) *1
7. Violet : Analog Out-Put
8. Grey : Analog GND
9. White : *1

*1 : Not Used

(2) Sensor ⇔ Extension Cable (Optional) ⇔ Circuit-Board KP-1435○

Sensor

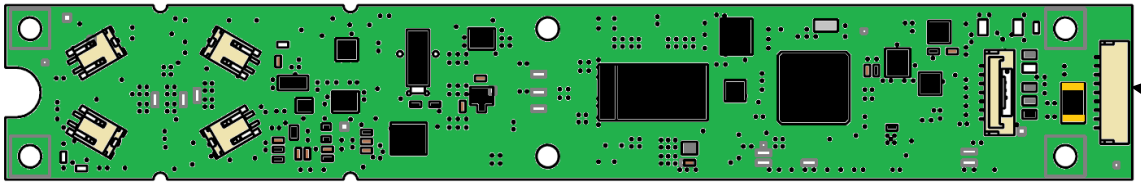


Extension Cable (Optional)

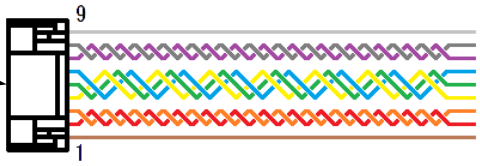
＊ Velocity accuracy would not be guaranteed if extension cable was used.

Circuit Board

KP-1435○



Cable for External Connection



1. Brown : FG
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7. Violet : Analog Out-Put
8. Grey : Analog GND
9. White : *1

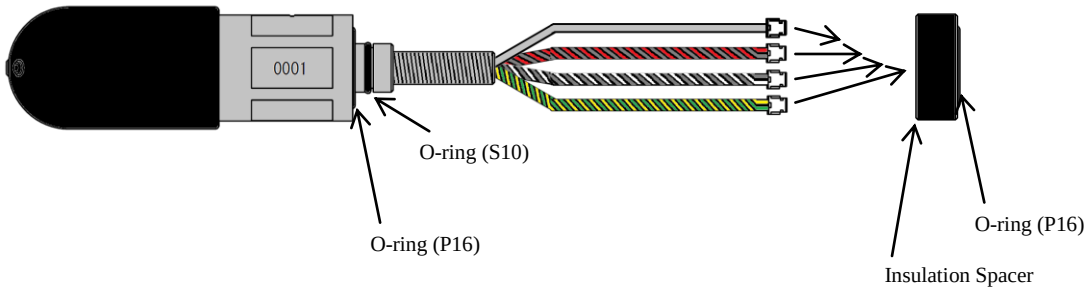
*1 : Not Used

6 How to Connect

Please see the followings for how to connect. Please use as integration reference.

(1) Attaching the Insulation Spacer

＊ Be sure to attach it in case your housing is not made of Titanium to prevent from galvanic corrosion.

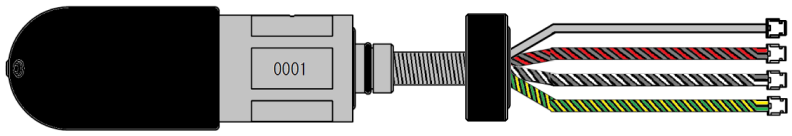


Confirm two (2)types of O-rings are attached to the sensor shaft.

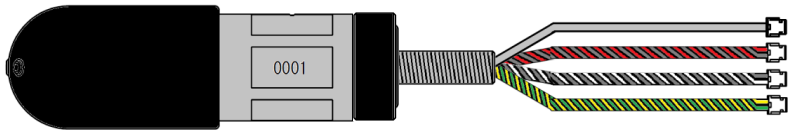
In case O-rings are not attached, attach them first.

Insert connectors through the insulation spacer hole one by one

while being careful of insulation spacer (or O-ring groove for insulation spacer) direction.



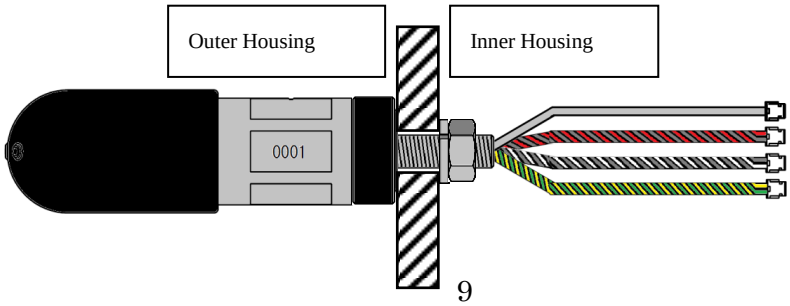
When all connectors are through, push the insulation spacer completely onto the shaft base.



(2) Attaching to your Housing

Insert connectors through your housing's mounting-hole one by one, and then make sure the sensor is completely pushed into the housing.

Use enclosed "S Washer (M8)" and "Nut (M8 Fine Thread / Pitch 1.0)" to fix its position.



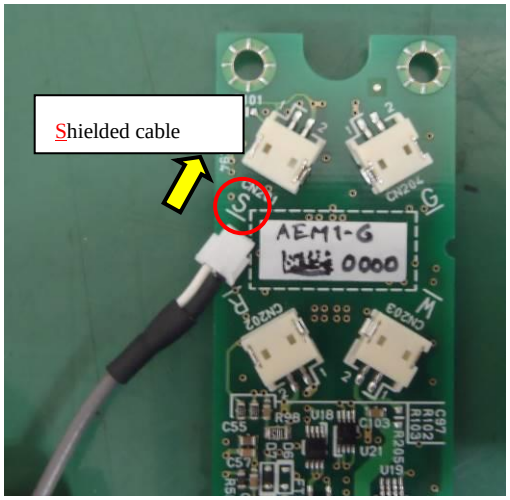
(3) Attaching the Circuit-Board KP-1435○

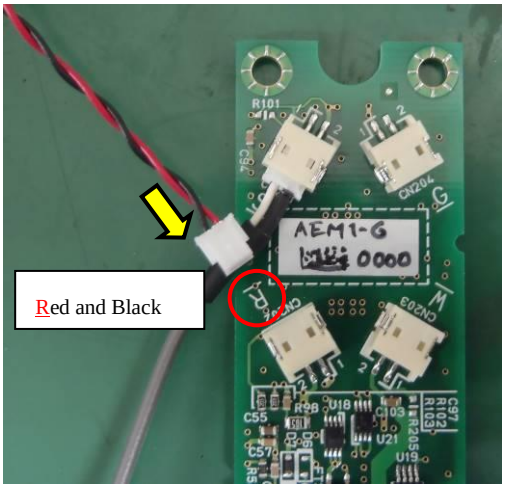
After attaching the circuit-board KP-1435○ in the housing, connect sensor connectors to CN201 ~ CN204 on the circuit-board KP-1435○.

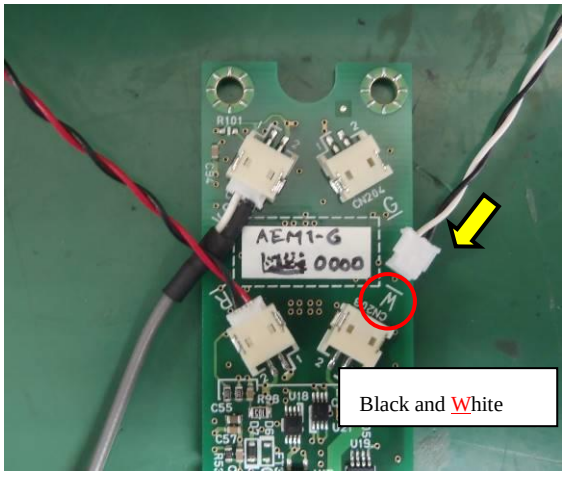
When you do so, please be careful with connectors' direction by referring to the photos below.

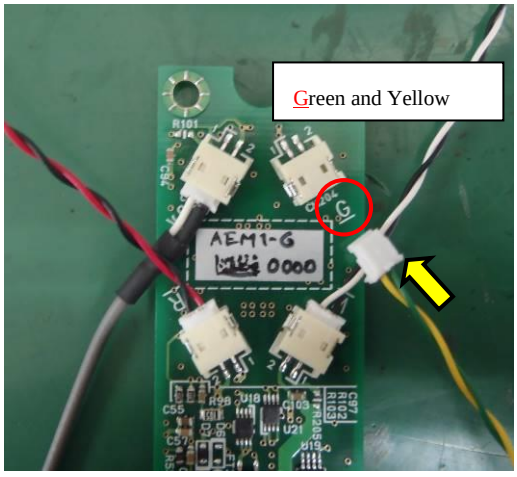
＊ Be sure to match cable types, colors, and silk-screen characters printed on the circuit-board KP-1435○.

＊ There is no particular order to connect.

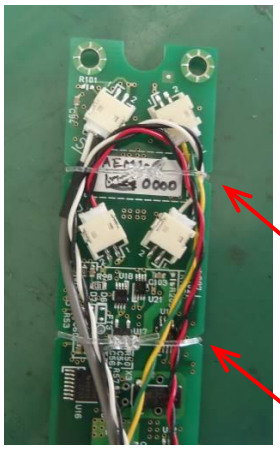








We recommend you to secure the cables as shown in the photo after connecting them.



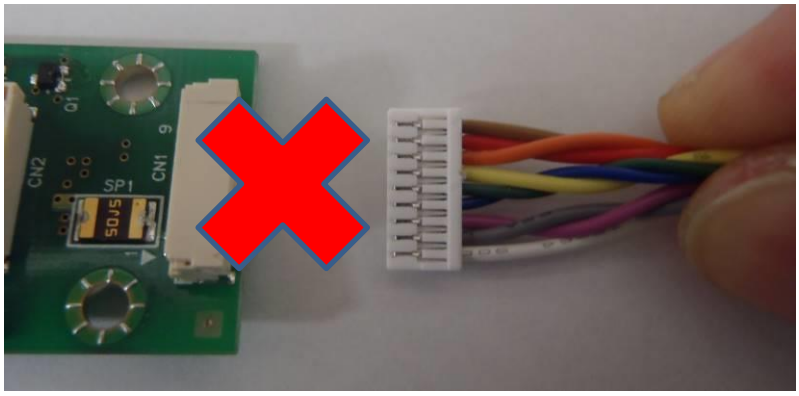
※ Please use tweezers or similar things to grab connector housings when pulling the cables out.
Pulling the cables out without grabbing the connector housings may pull only their pin-headers, and will not be able to repair if only pin-headers were pulled out.

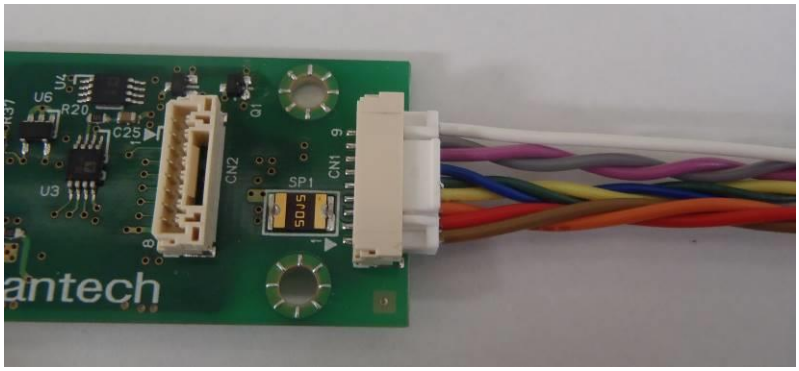
Groove for a zip-tie.

Groove for a zip-tie.

(4) Connecting External Connection Cable

Insert connector into CN1 on the circuit-board KP-1435○ while paying attention to its facing direction.





＊ Be sure to insert the connector completely until it locks.

Please refer to the section “5 Connection Outline” for connecting external connector cable.

7 Data Output Specifications

7.1 Communication Specifications

Item	Specification
Baud Rate	38400 (Fixed)
Character Length	8 bit (Fixed)
Stop Bit	1 (Fixed)
Parity	None (Fixed)
Interface	RS-232
Busy Control	None

Control Code

Control Characters	Code
<d1>	11h (DC1 of ASCII code)
<cr>	0Dh

- All character strings are in ASCII format.
- "CS" stands for "Control System".

7.2 AEM1-G Communication Command List

AEM1-G is specifically made for streaming mode only. It outputs data only every 0.1 second after powering up.

・AD values are A/D converted output values (integers between 0 ~ 65535) from the sensors in 16-bit.

CS ← Instrument <d1><d1>real, Velocity AD value, <cr>

Example) CS ← Instrument <d1><d1>real, 12345, <cr>

* Conversion constant and formula used for output data to velocity are in the inspection report.

7.3 AEM1-G Analog Out-Put Specifications

Item	Specification
Analog Voltage Out-Put	0.3 ～ 4.5 [V]

＊ Conversion constant and formula used for output voltage to velocity are in the inspection report.

8 Maintenance

8.1 Pre-Observation Cautions

Please conduct an operation check before your observation in case it was not used for a while. Please also confirm that there is no damage to the cable.

8.2 Post-Observations Maintenance

(1) Please completely dry the sensor unit after washing it with water before storing.

(2) Please wash with fresh water and wipe it gently with soft cloth in case you have to clean the velocity sensor electrodes.

(3) Please confirm there is no scratch on the velocity sensor electrodes. We recommend you to contact us for inspection in case finding any scratches.

8.3 Storing

(1) Please store the sensor unit after washing it with water and making sure it is completely dry.

(2) Please avoid storing in environment with high temperature and humidity level, or under direct sunlight.

8.4 Periodical Maintenance

We recommend for annual inspection and calibration for your safe and long term use, and also to keep its accuracy.

However, it is unable for us to maintain (or repair) while the sensor is integrated to another unit.

Please detach our sensor unit and send it back to us with the circuit-board KP-1435○.

9 Troubleshooting

No	Problem	Possible Solutions
1	Would not output data.	Please confirm that power is supplied properly, external output cable is connected properly, and the cable is not disconnected or broken. Please confirm the port number that it is connected to.
2	Would not output correct velocity value.	Please confirm that the sensor connectors are properly connected and also confirm not broken. Please confirm the direction of sensor integration. Please confirm that there are no obstacles close the sensor.
3	Zero-point of the velocity sensor has shifted.	Please confirm that the sensor electrodes are clean. If not, please clean it using neutral detergent. If this is not enough to clean, please gently wipe the velocity sensor electrodes using soft cloth with alcohol.
4	Zero-point of the velocity sensor is unstable.	After cleaning the sensor, prepare fresh water in non-magnetic container and dip the sensor in it over 24 hours. Please have the sensor inspected if this does not solve the problem.*

Note * When you contact us, please be sure to have Model, Serial Number, Observation Place, Mooring Environment, and other information ready.

10 Product Specifications

(1) Sensor Specifications

	Item	Model: AEM1-G
Sensor	Velocity	Electro Magnetic
Measurement Range	Velocity	0 ~ +500[cm/sec]
Resolution	Velocity	0.02[cm/sec]
Accuracy	Velocity ([1])	±0.5[cm/sec] or ±2%RD

(2) Data Save/Transfer Specifications

	Item	Model: AEM1-G
Data Transfer Spec.	Communication	RS-232
	A/D Converter	16 bit digital conversion
	Communication Frequency ([2])	0.1[sec] or faster
	Analog Out-Put	0.3 ~ 4.5[V]

(3) Power / Outer Form / Other Specifications

	Item	Model: AEM1-G
Power / Form / Other Specifications	Power	DC4.75 ~ 5.25[V]
	Current Consumption	While Measuring 85[mA]±10% (when using 50cm external cable used, DC5V supplied)
	Primal Material	Flange / Sensor Shaft: Grade 2 Titanium
	Measurements (Circuit Board KP-1435○)	Overall Length: 160[mm] Width: 24.6[mm] Height: 17.6[mm] (Maximum Height)
	Measurements (Sensor)	Overall Length: 85.5[mm] Diameter: 26[mm] (Flange Diameter) Diameter: 30[mm] (Sensor Head Diameter)
	Weight	Weight in Air: 167±8[g] (Total of the sensor and the circuit board KP-1435○)
	Pressure Resistance	1500[m] Depth Rated
	Sensor Cable Length	20cm (Standard) Extension Cable 50cm (Optional)
	External Cable Length	50cm (Standard) Maximum Cable Length 10m([3])

Note ([1]) Guaranteed accuracy range is 0 ~ +100[cm/sec].

Note ([2]) Communication frequency is an average value.

Note ([3]) Make sure the power voltage is in the voltage range at connector ends on circuit board-end in case using maximum cable length (10m) to avoid voltage drop.

11 Warranty

The warranty period shall be **one (1) year** from the date of shipment from our factory, and will be repaired or replaced against any malfunctions attributed to its design, manufacturing, or malfunction occurred with proper use within the warranty period.

However, this warranty will NOT be applied to the following cases.

(1) This warranty will not be applied to any accessories, consumables, packaging, scratches not relating to its function, grime, rust, and others.
(2) Damage caused when integrating, mooring, observing, or storing.
(3) Malfunction or damage caused by incorrect operation or carelessness.
(4) Malfunction or damage caused by unwarrantable repair or modification which was not performed by JFE Advantech Co., Ltd.
(5) Malfunction or damage caused by transporting, dropping, or applying impact after its purchase.
(6) Malfunction or damage caused by external factors such as fire, earthquake, flood, lightning, or any other natural disaster, including pollution, abnormal voltage, or others.
(7) Malfunction or damage caused by connecting to defective equipment.

This warranty will not be applied to any damage while integrating, mooring, or observing. Please insure your unit in case there might be a possibility of being damaged.

JFE Advantech Co., Ltd. will not be responsible for any damage, lost earnings caused by using this unit, or any claim from a third party.

取A-0159-00

JFE Advantech Co., Ltd.

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