Instruction Manual
No. 7790-00 Wind Speed and Direction Indicator
(Scale range: 2 to 70 m/s, 16 cardinal points)

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EW-J15004

Description

This is an instrument for measuring and monitoring instantaneous speed and direction of the wind by connecting the sensor and the indicator with a cable. Install the wind speed and direction sensor on top to a steel pole for observation.

Standard Components

1) Airplane type wind speed and direction sensor 1 pc.
2) Indicator for wind speed and direction 1 pc.
3) Accessories 1 set
   : 2 pcs. of Fuse (Ø6 x 30 1A), 20m cable, 2m of power cord, test result

Specifications

1. Sensor

1)	Transducer		
	Wind Speed	:	Propeller (AC generator)
	Wind direction	:	Counterbalanced Tail-AC Synchro-motor (in use of 220VAC)
2)	Starting speed	:	less than 2 m/s
3)	Withstand speed	:	108 m/s
4)	Wind speed Output	:	45VAC ±1V (no load) at 60 m/s Output Impedance: About 600ohm
5)	Operating ambient	:	-20 to 50℃ (no freeze at axial section)

2. Indicator

1)	Wind speed indicator		
	a. Type	:	Rectifying Voltmeter
	b. Dimensions	:	120 mm ×110 mm
	c. Scale	:	2 to 70 m/s Min. Scale: 1 m/s
2)	Wind direction indicator		
	a. Type	:	AC Synchro-motor, 360° Indication
	b. Dimensions	:	120 mm ×110 mm
	c. Scale	:	N, NE, E, SE, S, SW, W, NW, 16 cardinal points
Power requirements		:	220VAC ±10%
Electric power consumption		:	30VA (sensor + indicator)
Operating ambient		:	-10 to 50℃ for temperature, 40 to 85% for R. humidity

3. Accuracy

Wind speed	:	Within ±0.5 m/s less than 10m/s Within ±5% of the indicated value at more than 10 m/s
Wind direction	:	Within ±5°

Measuring Principles

1. Sensor

1) **Wind speed**
   A wind speed sensor generates alternating current which is proportional to wind speed and output.

2) **Wind direction**
   The turning angle of the counterbalanced tail is relayed to the axis of synchro-motor inside the sensor and converted to electrical signals. The signals are sent to the receiver

2. Indicator

1) Wind speed
This alternating current is divided at the resistance circuit and activates a moving coil type voltmeter to indicate instantaneous wind speed.

2) Wind direction
An indication pointer is attached to the pivot of the synchro-motor and direction on the meter. The movement of the motor axis synchronizes with the one inside the sensor.

Installation

1. Installing propeller of the sensor (See No. 11)

Improper installation could cause the propeller to fall. Be sure to fasten the screws tightly.

2. Installing the Sensor Unit

1) Install the sensor unit in a place where there is no vibration or corrosive gas. Locations exposed to vibrations, corrosive gas or sea-water splashes will shorten the life-span of the unit. In addition, strong vibrations could cause a breakdown. If unavoidable, install the unit in a location with a least vibration and use anti vibration rubber for reinforcement.

2) A lightning rod is attached to minimize the danger of lightning damage. However, note that this may not always protect the unit from lightning.

3) Select a level and open area to set up a pole 10m above the ground. Put a distance between the location and any obstructions at least 10 times the height of the obstructions. If you have trouble finding such an area, select a place as close to the conditions as possible.

4) When installing on a rooftop, choose a location as close to the center of the rooftop as possible to avoid strong influences of winds and install the unit at least 3m high. Even if you construct and install the sensor in this way there are cases in which due to excessive wind directional changes, the tail just rotates around in circles making you impossible to take measurements. So use a flag or the sort to check the wind in advance, and then decide on the height and location.

5) On the very top of the pole, install a flange with bolt holes matching the sensor's flange. It is convenient to use the flange that can fix the sensor on the pole directing any desired directions

6) There are the direction marks 'N' and 'S' on the sensor's flange. Face 'N' towards north and 'S' towards south and affix with 10mm (3/8'') brass or SUS bolt nuts.

3. Cable between Sensor and Indicator

1) Cable of 7 wires of at least 0.75 mm^2 is usable for maximum 2 km in length for one-indicator, 1 km for two-indicators.

2) If induction by radio waves occurs, use shielded cable and earth end of the shield (E3).

3) Set the units and the cable away from powerful transmitting antennas as well as high-voltage and large-current circuits.

4) Cable may be affected by lightning as the distance is extended, so cable should ideally be placed underground. Units have a small-capacity lightning arrester, but in areas subjected to frequent lightning, may require a separate lightning arrester on the input line.

4. Wiring the Sensor Unit

1) Connect cable according to the wiring drawing.
2) Open the lid of the terminal box at the lower part of the sensor unit.
3) Lead a line through the ground (cable penetration piece) into the terminal box.
4) After connection, secure the clamp screw by turning it clockwise. This tightened screw clamps the cable by compression of the rubber packing to seal the space against rain water. If a thin cable leaves spaces, pack the spaces with putty or similar material to keep out water.

5. Installing the Indicator

Select an installation location for this unit that satisfies the following conditions.

1) A place with less vibration, corrosive gas, dust, salt, and etc.
2) A place not exposed to direct sunlight or high temperature (desirable at -10 to +50℃)
3) A place with the humidity of 40 to 85%RH. No condensation.
4) A place not affected by magnetic fields

6. Wiring the Indicator

Wire cable to the terminals on the inside of this unit, referring to the wiring drawing attached at the end of this manual.

7. Starting Operation

1) Check that the cable is connected correctly.
2) Turn on the power switch and wind speed switch.

Maintenance

The sensor can be used for a long period of time without being oiled or greased, but please check the followings at least once a year.

1. The Sensor Unit

1) When the wind is calm (less than 2 m/s), check if the movement of propeller and tail is smooth or not. When there is no wind, manually rotate the propeller and tail by hand and observe until they stop. If the movement is still not smooth, the moving parts need to be oiled or the ball-bearing replaced. Please contact us or distributor for repair.

2) To keep accuracy effectively conduct accuracy test every 4 to 5 years. Or in some cases send out for an over-haul.

2. Indicator

1) A small lightning arrester is built-in to protect against troubles due to lightning, but it may not work in case of a large surge voltage. Check the movement of the pointers of indicator after lightning.

2) To detect such a failure early, it is useful to remember how to physically measure wind speed by comparing wind pressure on your body with indicated values and speed of the propeller at usual low wind speed.

3) This indicator should be inspected every 4 to 5 years as well as the sensor unit.

Trouble shooting

1. Indicator

A. Wind speed section

1. When the propeller is rotating but pointer in the indicator does not move.

1) Apply a tester to the input terminal No. 1 and No. 2 in the indicator. Set the tester range at 10 to 50VAC.

   a. If there is no voltage, the problem is poor connection with cable or troubles in the generator.

   b. Check for deterioration of rectifier, condenser or resister in the indicator.

   c. Caused by lightning, deterioration of surge absorber often occurs.
   Remove ERZV10D101. If the pointer begins to move, this part may be deteriorated.

2. The reading shown by the indicator is lower than the actual wind speed.

1) One or two bridges of the rectifier in the indicator have failed. (often caused by lightning).

2) A cable is not connected properly.
   a. Re-tighten the screws on the terminal block.
   b. Measure the line resistance between the transmitting and receiving unit.

3) Deterioration of surge absorber - Perform the procedures, a) to c) in 1-1).

4) Drop of output voltage due to deteriorated generator within the sensor unit

Correct Value (no load)			
Wind speed (m/s)	Rotation of propeller (r.p.m.)	Output	
		VAC	Hz
2	88	1.3	2.9
5	235	3.4	7.8
10	494	7.2	16.5

B. Wind Direction Section

Cautions

Risk of electrical shock

90 to 100VAC charges in the wind direction circuit.
Be careful when you check the circuit.

1. The tail is moving, but pointer of the indicator does not move.

1) Check that the power is ON. Check the fuse and the power cable.

2) Any two lines among sensor terminal No. 3, 4 or 5 are not properly connected.

Risk of electrical shock 90VAC charges

3) The synchro-motor secondly portion is three-phase winding wires. Two wires are broken among them.

2. The pointer suddenly moves with wide scale at certain point.

1) Check the terminal 3, 4 and 5 of the cable between sensor and indicator. One of them is not properly connected.

2) A winding wire of synchro-motor secondly portion of the sensor unit or indicator is broken. Check for connections in the sensor unit and the indicator with a tester with the power turned off.

3. When turning on and off the power switch, the pointer turns 180° off.

1) Check terminal No. 6 and 7 on the cable terminals between the sensor unit and the indicator, and their lines.

Risk of electrical shock 100VAC charges in the synchro-motor

2) Broken first winding wire of synchro-motor of the sensor unit or the indicator. Check for connections in the transmitting unit and indicator with a tester after disconnecting the cables.

4. When the power is turned on for the first time after installation or after reconnecting the cables, the pointer of indicator turns in the opposite direction to the tail of the sensor unit or turns 180° off.

1) If two of terminals 3, 4 or 5 (at the second winding of synchro-motor) are transposed, the pointer will reverse.

2) If the position of terminal 6 is exchanged with terminal 7 (at the first winding of the synchro-motor) (6 and 7 are reversed accidentally), the indication shifts 180° to the direction shown by the sensor unit.

Sensor Section

Caution

Risk of electrical shock

Be careful when you check the sensor section, especially the terminal since it is charged with 100VAC (Terminal No. 3, 4, 5: max 90VAC Terminal No. 6, 7: approx. 100VAC)

A. Wind speed section

1. The propeller is revolving, but there is no input AC voltage shown on the indicator.

1) Check that the cables are correctly connected. If there are no faults, check the sensor unit.

2) Open the lid of sensor terminal box and check terminal No. 1 and No. 2 with a tester.

a. Set the tester range to 10 to 50VAC. If you rotate the propeller and there is voltage, it is OK. If not, the problem is with the generator's wiring or with bad slip ring connection. With the slip rings, by rotating the tail and measuring output you can find the trouble spot. To check the wind speed output, use a tachometer on the propeller pivot. Correct rpm and output are as follows.

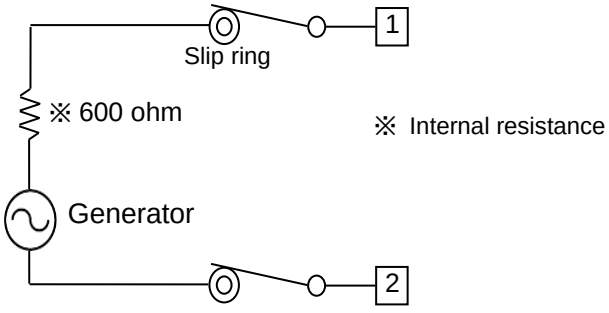
Wind Speed	RPM	Output
at 5 m/s	235 rpm	approx. 3.4VAC
at 10 m/s	494 rpm	approx. 7.2VAC
at 30 m/s	1518 rpm	approx. 22.2VAC
at 60 m/s	3081 rpm	approx. 45.0 ±1VAC

b. When checking the generator coil, make tester range resistance x 1. Take off cable on terminal No. 1 and No. 2, stop the rotation on the propeller and measure the resistance between terminals. Resistance value is about 600ohm.

2. When the wind becomes weak, the propeller stops rotating suddenly.

1) The propeller pivot ball-bearing is abrasion or is rusted.

Wind speed circuits inside the sensor



B. Wind Direction Section

1. Check the following procedures for malfunction of the synchro-motor inside the sensor.

   1) After turning off power of the indicator, take off the wires connected to the sensor terminals No. 3, 4, 5 and 6.

   2) Check the resistance value between terminals with a tester. Switch tester range to resistance range.

      * Synchro-motor secondary portion

Terminal	No. 3 and 4	about 260ohm
	No. 3 and 5	about 260ohm
	No. 4 and 5	about 260ohm

      * Synchro-motor primary portion

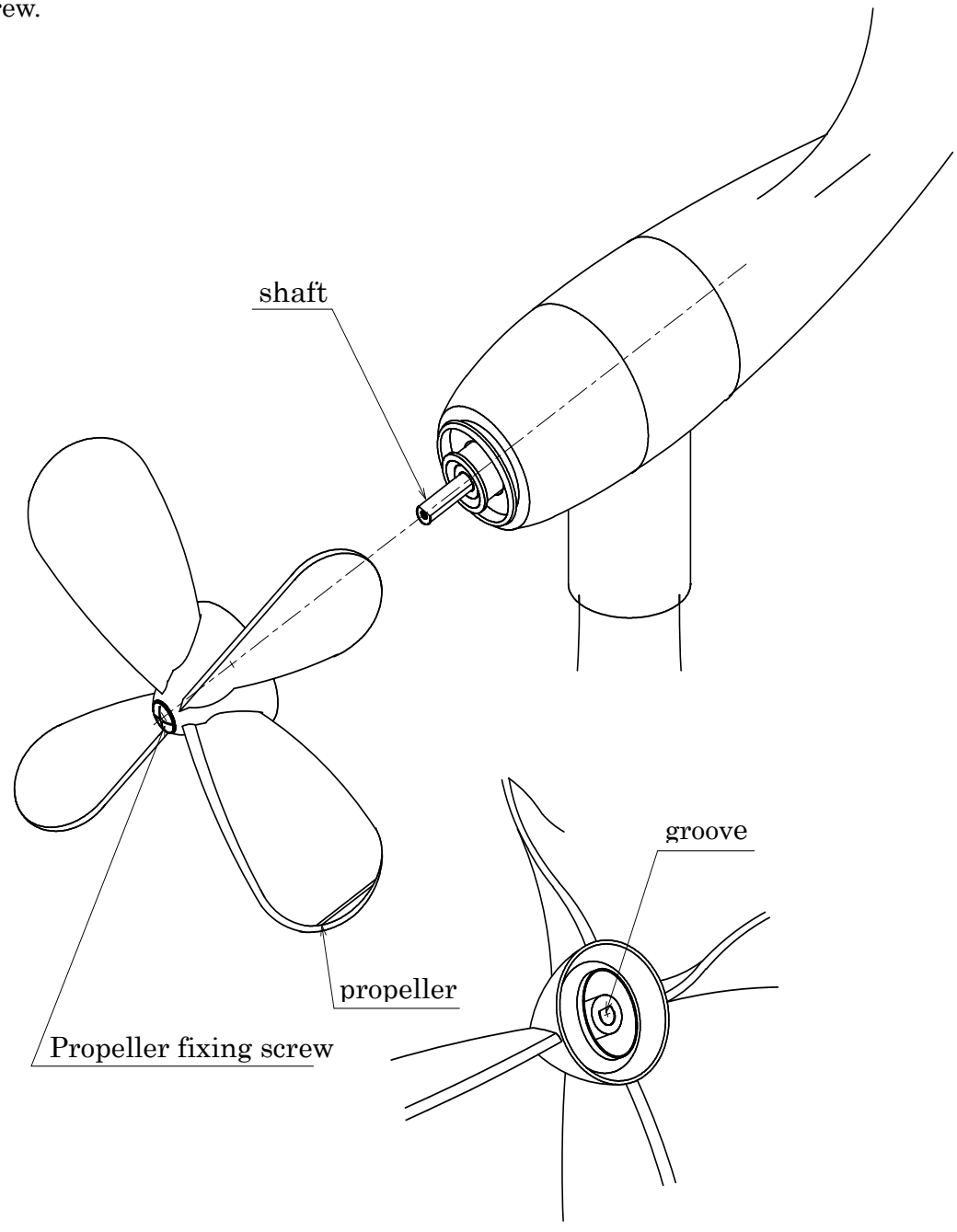
Terminal	No. 6 and 7	about 150ohm

      Normal if resistance values between terminals are near the values given above.

2. When the tail's movement is dull and slow.
   The ball-bearing is worn off or rusted. Refer to the maintenance section.

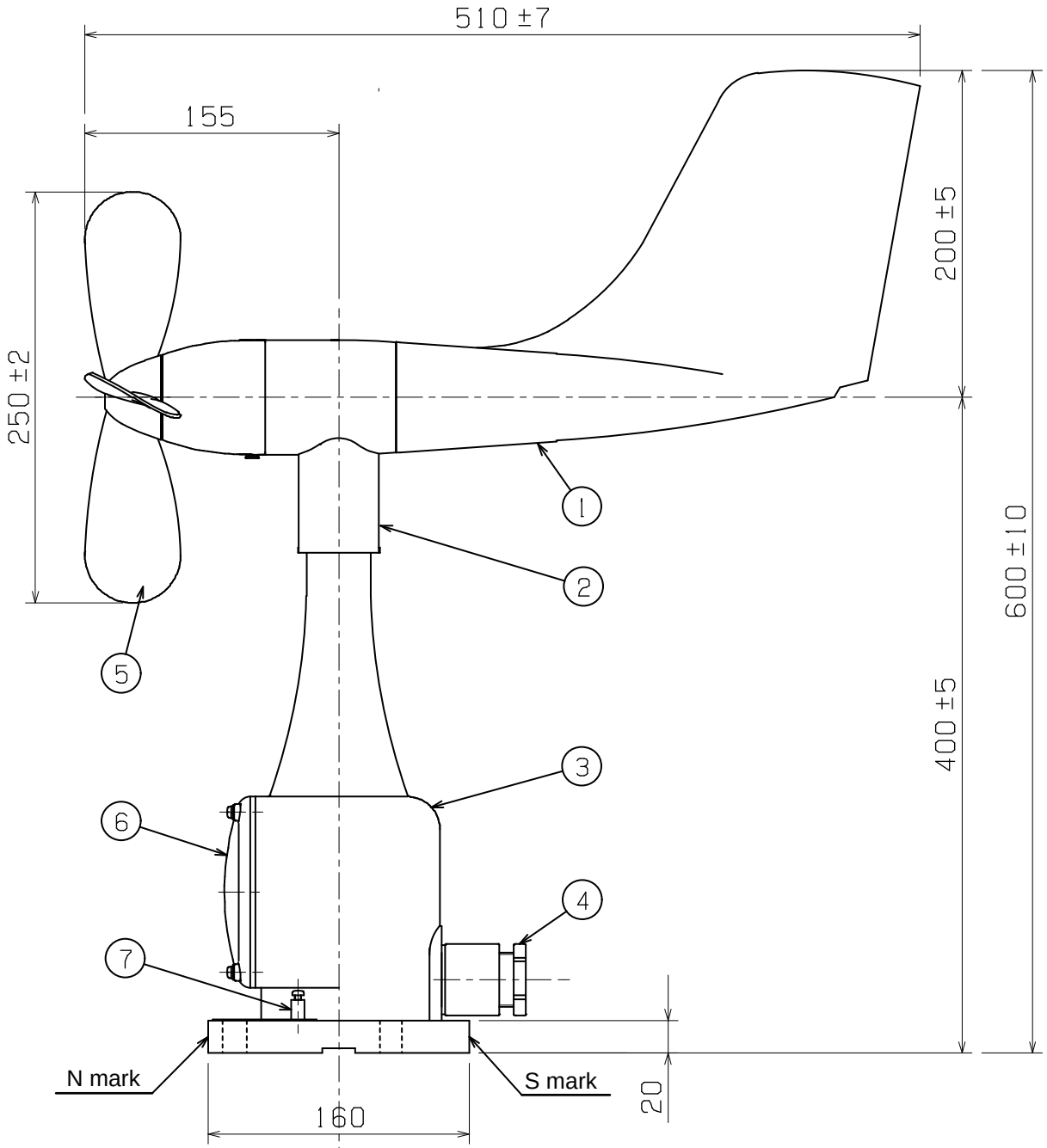
How to install the propeller of Wind & direction Sensor

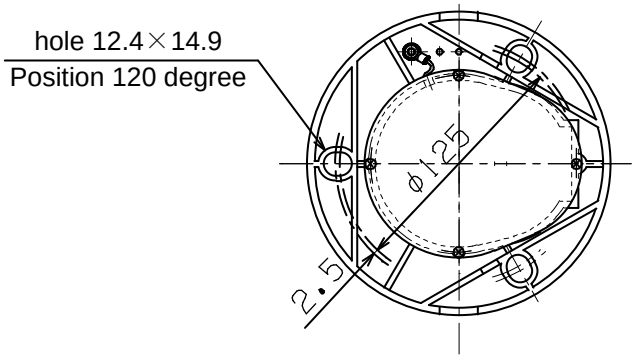
1) Put the each flat surface of the axis and the axis hole of propeller together and fix the propeller with the shaft.
2) Secure the propeller fixing screw into the shaft after fully turning lock screws.
   Tightening torque: 14kg·cm to18kg·cm.
3) In order to avoid falling the propeller while rotating, be sure to secure with fixing screws and fasten the lock screw. (rotate it by an angle of about 30° after spring washer was stringed)
4) Recommend to use a driver whose grip is 24mm dia. or more to securely fasten the screw.



Rear view of propeller

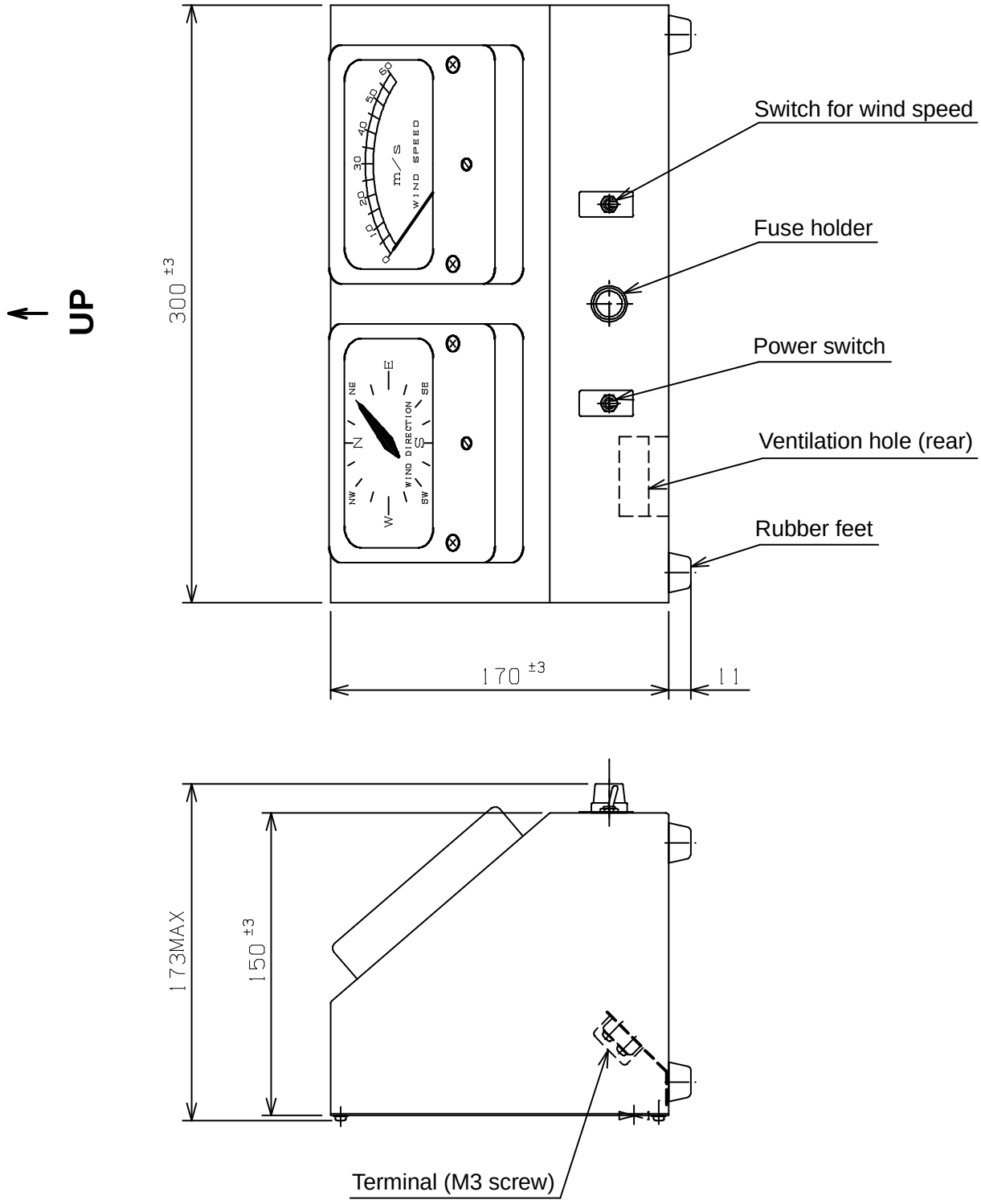
F No. MO-001A



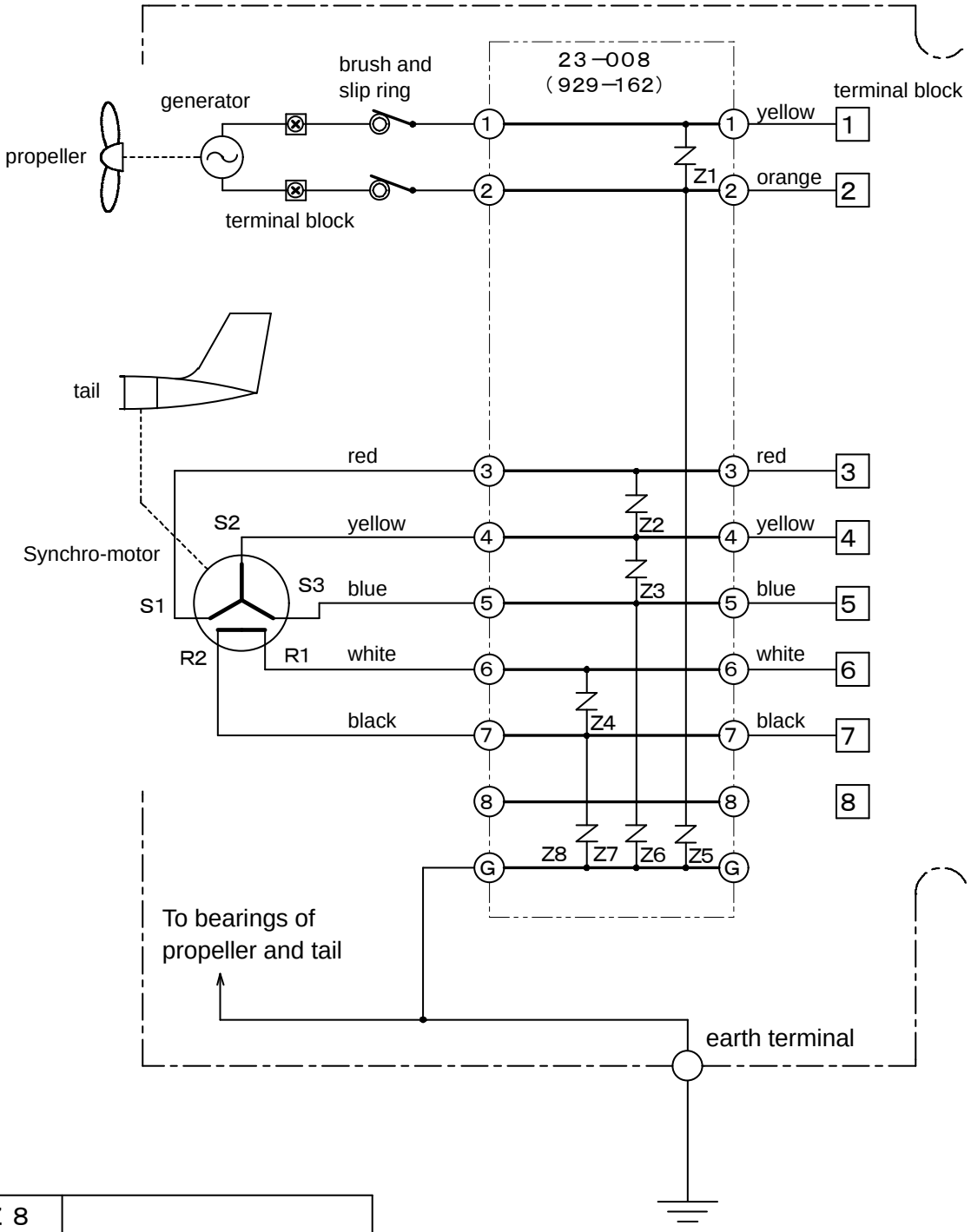


No	Name	Materials
7	Terminal for earth	BS Nickel plating
6	Lid of terminal box	Polycarbonate resin
5	Propeller	Polycarbonate resin
4	Grand #25	PBT resin
3	Stand	Polycarbonate resin
2	Body	Polycarbonate resin
1	Tail	Glass + polyester resin

COLOR	MASS	CHIFE	CHECK	DRAWN	WIND SPEED AND DIRECTION SENSOR
8YR7.3/1.3					7790-00
DATE	SCALE	REG.NO.		DWG.NO.	800-078
98.03.04	1/4				

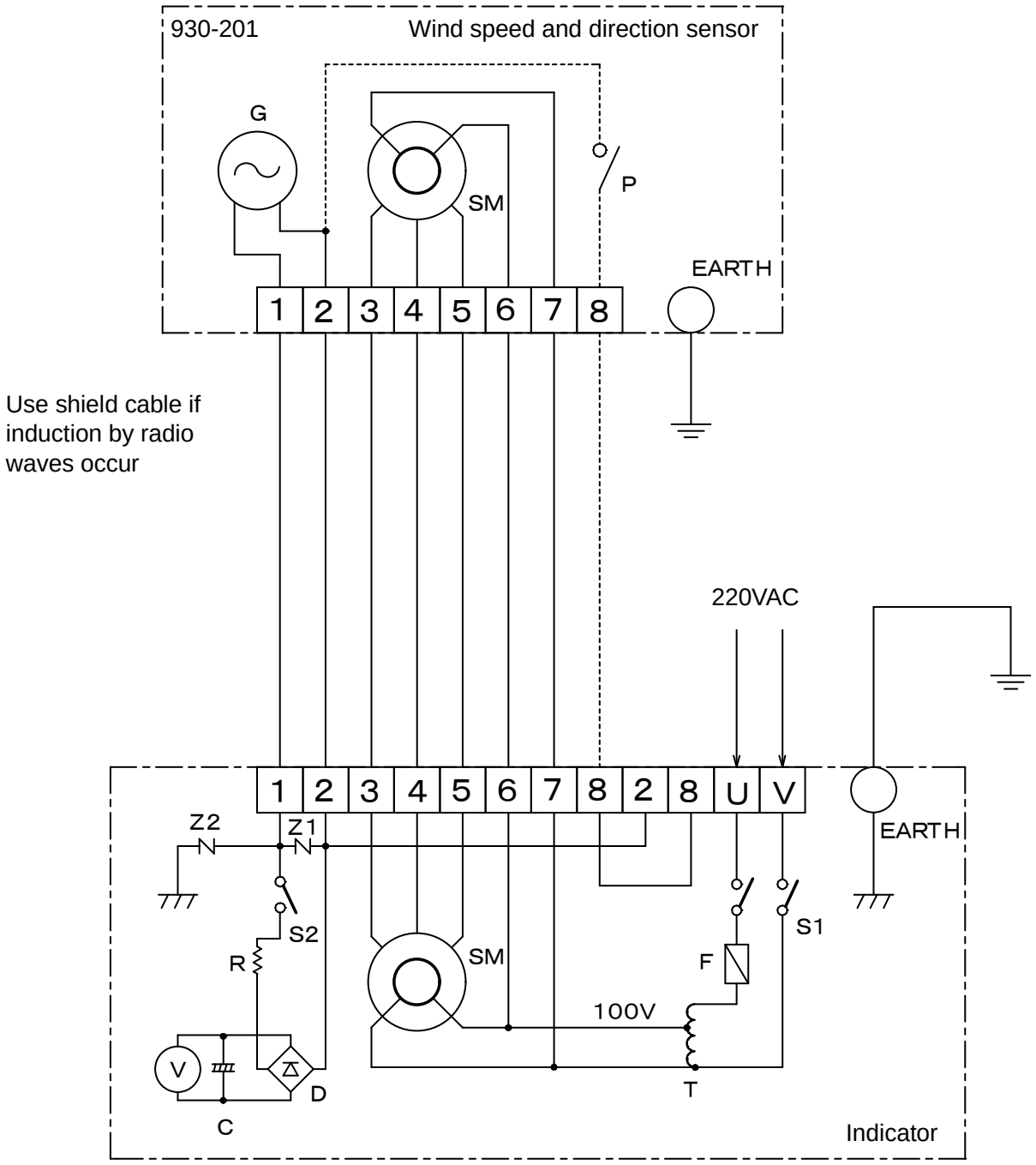


COLOR	WEIGHT	CHIFE	CHECK	DRAWN	Indicator
DATE	SCALE	REG.NO.		DWG.NO.	810-280
2014.8.8	1/3				



Z 8	
Z 7	E R Z V 1 0 D 6 8 1
Z 6	E R Z V 1 0 D 6 8 1
Z 5	E R Z V 1 0 D 6 8 1
Z 4	E R Z V 1 0 D 4 7 1
Z 3	E R Z V 1 0 D 2 2 1
Z 2	E R Z V 1 0 D 2 2 1
Z 1	E R Z V 1 0 D 2 2 1
Mark	Surge absorber

COLOR	MASS	CHI FE	CHECK	DRAWN	WIND SPEED AND DIRECTION SENSOR
					W611
DATE	SCALE	REG. NO.		DWG. NO.	930-097
2012. 10. 22					



Mark	Name / Remarks
T	Transformer (AD21R-050A)
Z1, Z2	Surge absorber (100 VAC use)
S2	Switch for Wind speed
S1	Power Switch
F	Fuse 1A
V	Voltmeter for Wind speed indicator
SM	Synchro-motor for wind direction
G	AC generator for Wind Speed

COLOR	WEIGHT	CHIFE	CHECK	DRAWN	**Wind Speed and Direction Indicator**
DATE	SCALE	REG.NO.		DWG.NO.	960—065
1998.10.12					