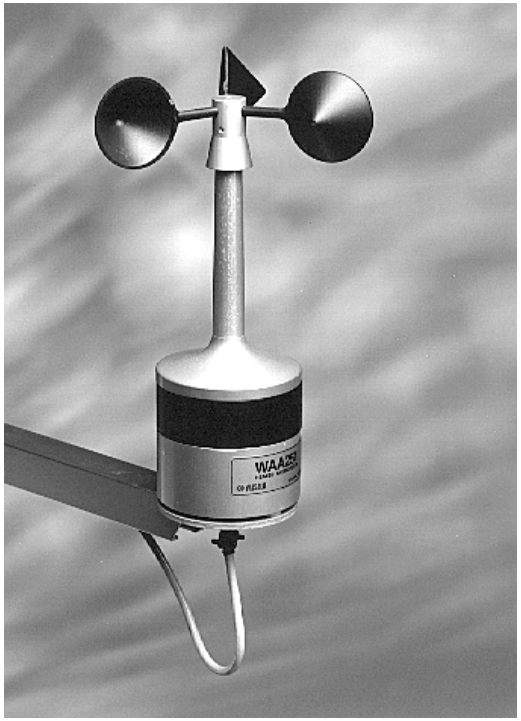
Quick Reference Guide

WAA251 Heated Anemometer



- **Non-freezing all weather sensor**
- **Lightweight cups with integral heaters**
- **Non-contact heating power transmission**
- **Low inertia and starting threshold**
- **Excellent linearity up to 75 m/s**
- **Distance constant 2.7 m**

VAISALA

DESCRIPTION

The WAA251 is an optoelectronic heated-cup anemometer with excellent performance even in extreme climatic conditions. High sensitivity and linearity are achieved by a unique non-contact heating power transmission. Foil heaters are inserted in each cup and in the cup wheel hub enabling low power consumption. The cup wheel is removable, with a 2-pin connector for heating electricity.

The transmission of heating power to the anemometer's rotor is contactless, with no slip rings nor brushes, hence eliminating sparks and excessive friction and wear. The cup heaters are supplied via a rotary transformer, with 26 kHz sine wave, providing low EMI.

A heating on/off switch circuit is included, controlled by an external NTC resistor sensing the ambient temperature. The circuit also controls power feed to the non-rotating heater in the anemometer's shaft tunnel.

Power consumption, typically 70 W, is very low considering the protection it gives against freezing. Approximately 49 W of the heating power is on the cup wheel, 12 W on the shaft and bearings, and 9 W on the body.

The WAA251 can be mounted to Vaisala's standard WAC151 Cross Arm with a regular 6-pin connector. Besides the standard cross arm the WAA251 also complies with the WAT12 and WAT15 Wind Transmitters.

A single 24 VDC (4 A) power supply feeds the device, including both the heater and the transducer. A recommended power supply is Vaisala's WHP25, designed for outdoor use and mountable to the sensor mast. The WAA251 even provides the operating and shaft heating voltages to a WAV151 Wind Vane mounted to the same cross arm. The wind transmitter WAT12 or WAT15 as well receives its operating power from the WAA251. Hence a single power supply is enough for the whole sensor/transmitter system.

WAA251's transducer has an optochopper and output interface similar to those of the WAA151. Hence, upgrading to a heated-cup system is easy; the only alteration needed is for the wiring in the WAC151 junction box, see Fig. 3. Notice that the NTC resistor shown in the figure is essential for the system temperature control.

The WAA251 is mounted to the southern end of the cross arm. Installation is safer with the cup wheel removed. Fit the 6-pin plug through the mounting flange of the cross arm, then carefully connect it to the sensor. Mount the sensor to the flange by twisting, and tighten the screws. Refer to Figure 1.

The WAA251 complies with the ASTM 5096-90 performance test (refer to technical data) and several MIL-test standards.

INSTALLATION

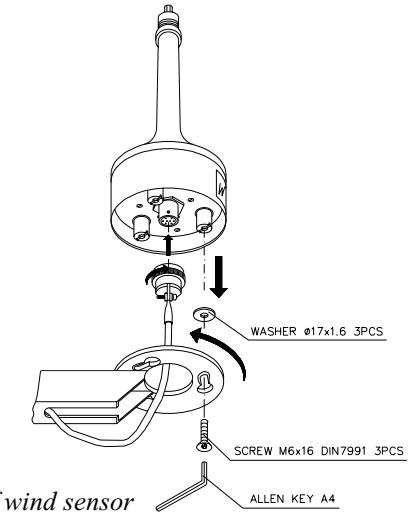


Figure 1. Mounting of wind sensor

A	+12 Vout (for vane and transmitter)
B	+24 Vout (for vane)
C	Fout (signal output)
D	GND (common ground)
E	+24 Vin (power input)
F	HCin (heating control / NTC)

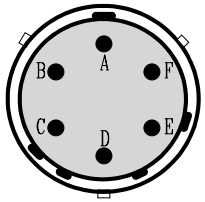


Figure 2. WAA251 connector

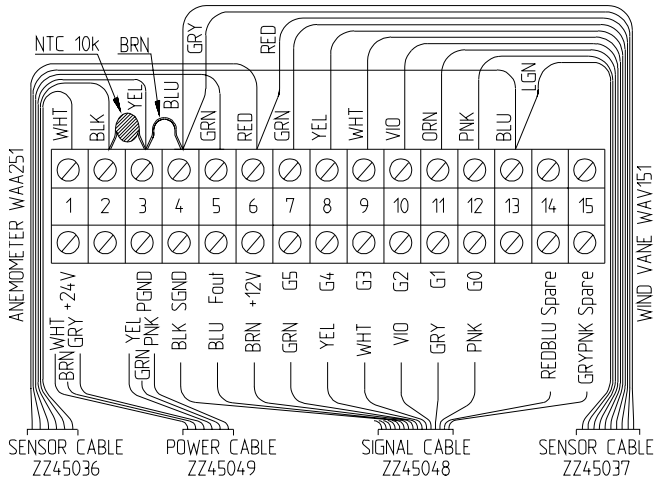


Figure 3. WAC151 Standard Wiring for WAA251 & WAV151

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TECHNICAL DATA

Sensor/Transducer type	Cup anemometer/ Opto-chopper
Measuring range	0.4 ... 75 m/s
Starting threshold	< 0.5 m/s [1]
Distance constant	2.7 m
Transducer output	0...750 Hz square wave (for 0...75 m/s)
Characteristic Transfer Function	$U_f = 0.2425 + 0.09793 \times R$ (U_f = wind speed; R = o/p pulse rate)
Accuracy (within 0.4 ... 60 m/s)	
with Characteristic Transfer Function	± 0.17 m/s [2]
with "simple transfer function" $U_f = 0.1 \times R$	–0.3/+1.0 m/s [3]
Transducer output level	High state > 11 V (with I_{out} < +5 mA) Low state < 1.5 V (with I_{out} > –5 mA)
Input power supply	24 VDC ± 10 %, max. 3.3 A (max. 3.9 A with WAV151 added)
Power consumption	70 W below +2 °C; 1 W above +5 °C (typical, with U_{in} = 24 VDC)
Heating control	Shaft heating on at < +5 °C (12 W) Cup heating on at < +2 °C (49 W)
Temperature sensing	With external 10 kohm NTC-resistor included in the cross arm j-box wiring
O/P power (for WAV151, WAT12 etc.)	13 VDC, 70 mA max. 24 VDC, 0.6 A (on at < +5 °C)
Electrical connections	MIL-C-26482 type 6-pin plug; 6-wire cable through cross arm tubing
Operating temperature	–55 ... +55 °C
Storage temperature	–60 ... +70 °C
Housing material	AlMgSi, grey/partially black anodized
Cup material	PC reinforced with glassfibre; black 15 W foil heater integral in each cup
Dimensions & Weight	270 (h) × 90 (Ø) mm; weight 860 g Swept radius of cupwheel: 91 mm

[1] Measured with cup wheel in position least favored by flow direction. Optimum position would yield < 0.35 m/s threshold.

[2] Standard Deviation

[3] Typical error vs. speed with the "simple transfer function" used :

RANGE m/s	0-5	5-10	10-15	15-20	20-24	24-29	29-34	34-39	39-44	44-48	48-58
ERROR m/s	-0.2	-0.1	0.0	+0.1	+0.2	+0.3	+0.4	+0.5	+0.6	+0.7	+0.85

Spare parts:	**Order number:**
Cup wheel assembly	WA35066
Set of bearings & gasket	16644WA

VAISALA

SFS CERTIFIED QUALITY SYSTEM ISO 9001

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MAINTENANCE AND REPAIR

Ball bearings must be checked once a year visually and by rotating the sensor shaft. To do this, remove the cup wheel. The shaft should spin smoothly and should not create any detectable noise.

Replacement should be done only by a trained technician, as follows:

1 Loosen and carefully remove the hexagon screw of the cup wheel, not bending the connector pins on top of the shaft.

2 Loosen the hex nut of the connector (with 22 mm tool).

3 Loosen the three screws at the bottom of the sensor body (with 7 mm tool).

4 Remove the body cover; handle carefully the O-rings.

5 Release the three wires from the screw terminals on the lower circuit board.

6 Loosen the three nuts at the bottom of the circuit board.

7 Remove the lower circuit board.

8 Loosen the spacer screws (with 6 mm tool); carefully, not bending.

9 Remove the upper circuit board.

10 Loosen the hexagon screw of the rotating transformer assembly and remove it.

11 Remove the retaining ring at the shaft tunnel (using narrow-pointed pliers).

12 Remove the upper bearing after pulling out the shaft.

13 Remove the retaining ring at the shaft (using narrow-pointed pliers).

14 Remove the lower bearing.

Be careful when handling the ball bearings!

Reverse work order for assembling the sensor.

NOTE for reassembly! At step 10, the rotating transformer is installed but its fixing screw is not fastened until the lower circuit board is installed and fixed (steps 7, 6). After that, to adjust the air gap between the transformer coils, first push the transformer (10) as far up as possible. **The ferrite coils are breakable, do NOT prise them with any hard tool.** Then place a screwdriver tip into the slot between part 10 and the shaft tube, and pry until the air gap underneath part 10 is 0.4 mm (0.016"). Finally, fasten the hexagon fixing screw. **Make sure the part 10 does not touch the transformer lower part at any rotary position of the shaft.**

The O-rings must be replaced by new ones before reassembling.

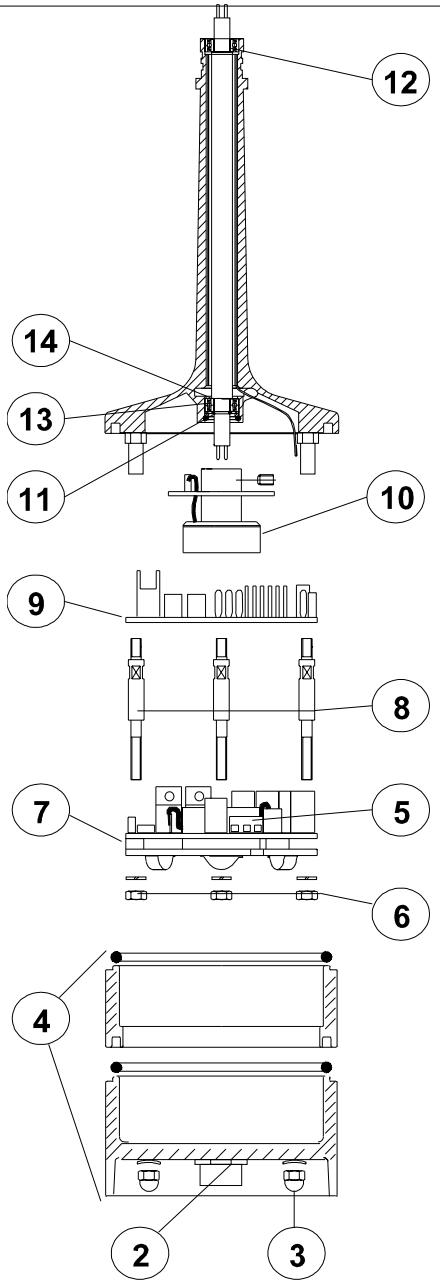

Figure 4. WAA251 assembly