Quick Reference Guide

WAA151 Anemometer

- **Optoelectronic sensor**
- **Low inertia and starting threshold**
- **Excellent linearity up to 75 m/s**
- **Shaft heating for cold environment**

VAISALA

DESCRIPTION

The WAA151 is an opto-electronic, fast-response, low-threshold anemometer. In the cup wheel it has three light-weight conical cups providing excellent linearity over the entire operating range, up to 75 m/s. Rotated by the wind, a chopper disc attached to the cup wheel's shaft cuts an infrared light beam 14 times per revolution, generating a pulse train output from a phototransistor.

The output pulse rate can be regarded directly proportional to wind speed (e.g., 246 Hz = 24.6 m/s). For best available accuracy, however, the characteristic transfer function should be used (see technical data), for compensating for starting inertia and slight overspeeding.

A heating element in the shaft tunnel keeps bearings above the freezing level in cold climates. Nominally it provides 10 W of heating power. It is recommended to use a thermostat switch in the sensor cross arm for switching the heating power on below +4 °C.

The WAA151 complies with the following performance and environmental test standards:

- Wind tunnel tests per ASTM standard method D 5096-90 (for starting threshold, distance constant, transfer function; refer to technical data)
- Exploratory vibration test per MIL-STD-167-1
- Humidity test per MIL-STD-810E, Method 507.3
- Salt fog test per MIL-STD-810E, Method 509.3

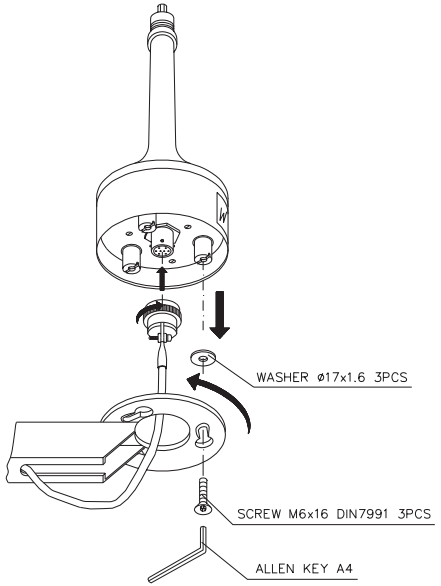

Figure 1. Mounting of wind sensor

INSTALLATION

The WAA151 is mounted at the southern end of the WAC151 Cross Arm. The installation is safer with the cup assembly removed. Fit the 6-pin cable plug through the mounting flange at the end of the cross arm, then connect it to the sensor. Mount the sensor to the flange by twisting, and tighten the screws. Finally, mount the cup assembly and tighten its screw.

A F+ (power input 9.5 ... 15.5 V)
B GND (common ground)
C Fout (signal output)
D HTNG } 20 VDC/AC
E HTNG }

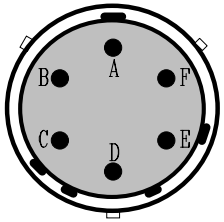

Figure 2. WAA151 connector

Usually the WAA151 is used in conjunction with the WAV151 Wind Vane. Figure 3 shows the standard wiring in the WAC151 Cross Arm's junction box, when the WAA151 and the WAV151 are used. The thermostat switch in the upper left corner is standardly included for temperature control of shaft heating power.

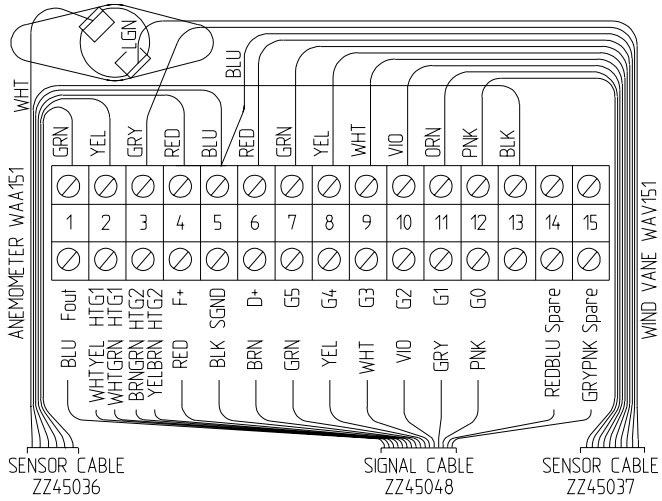

Figure 3. WAC151 Standard Wiring for WAA151 and WAV151

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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	2.0 m
Transducer output	
0...75 m/s	0 ... 750 Hz square wave
Characteristic Transfer Function	$U_f = 0.4054 + 0.09853 \times R$
(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" $U_f = 0.1 \times R$	± 0.5 m/s [3]
Transducer output level	
(I_{out} < +5 mA)	High state > U_{in} –1.5 V
(I_{out} > –5 mA)	Low state < 2.0 V
Settling time after power turn-on	< 30 µs
Operating power supply	9.5 ... 15.5 VDC, 20 mA typical
Heating power supply	20 VDC or VAC, 500 mA typical
Electrical connections	MIL-C-26482 type; 6-wire cable
Operating temperature	–50 ... +55 °C (with shaft heating)
Storage temperature	–60 ... +70 °C
Material	
Housing	AlMgSi, grey anodized
Cups	PA, reinforced w. carbon fibre
Dimensions & Weight	240 (h) × 90 (Ø) mm; 570 g
	Swept radius of cup wheel: 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:

0-3	3-10	10-17	17-24	24-31	31-37	37-44	44-51	51-58	58-65 m/s
-0.4	-0.3	-0.2	-0.1	0.0	+0.1	+0.2	+0.3	+0.4	+0.5 m/s

Spare parts:	**Order number:**
Cup assembly	7150WA
Set of bearings & gasket	16644WA

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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. To ensure proper operation, the shaft should spin smoothly and it should not create any detectable noise.

To replace the ball bearings:

1 Remove the cup wheel assembly.

2 Loosen the hex nut of the connector (with 22 mm tool). **Caution: Bending may break the connector pins!**

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

4 Remove the lower body assembly by pulling it straight outwards.

5 Loosen the spacer screws and the heating element outlet.

6 Remove the printed circuit board. Do not twist nor bend the connector; bending may break pins.

7 Loosen the fixing screw of the chopper disc and remove the disc.

8 Remove the retaining ring (using narrow-pointed pliers).

9 Remove the spacer ring.

10 Remove the external retaining ring at the top of the shaft (using narrow-pointed pliers).

11 Remove the lower bearing.

12 Push out the shaft through the upper body.

13 Remove the top bearing.

Be careful when handling the ball bearings!

Reverse work order for assembling the sensor.

When placing the lower body assembly, make sure that the O-ring is correctly positioned between the upper and lower bodies. It is recommended to replace the O-ring by a new one before re-assembly.

The heating resistance element cannot be removed without special tools. It is recommended that replacing of the heating element is carried out by the manufacturer.

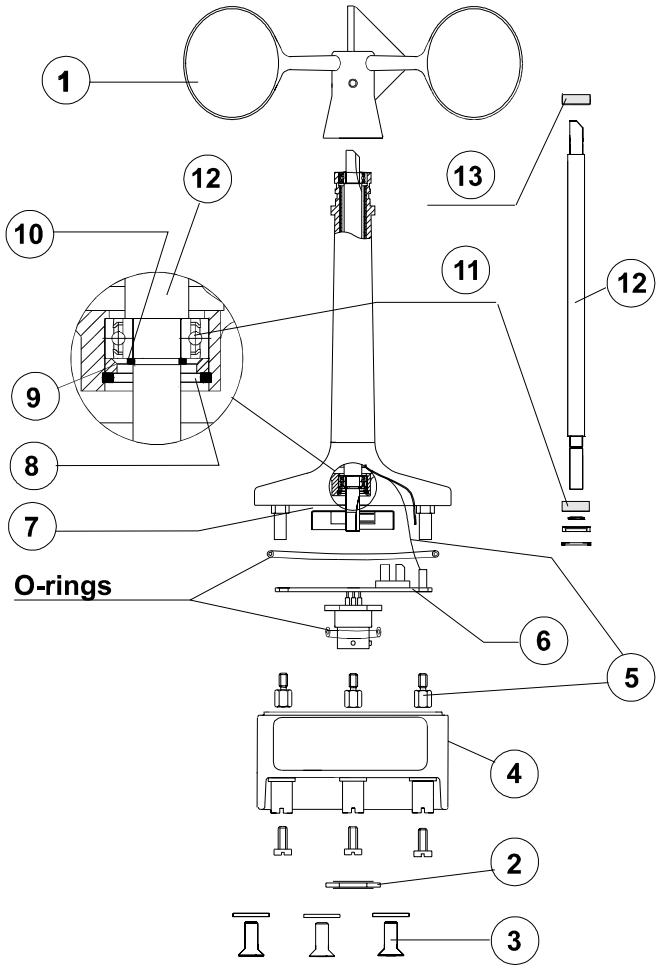

Figure 4. WAA151 assembly