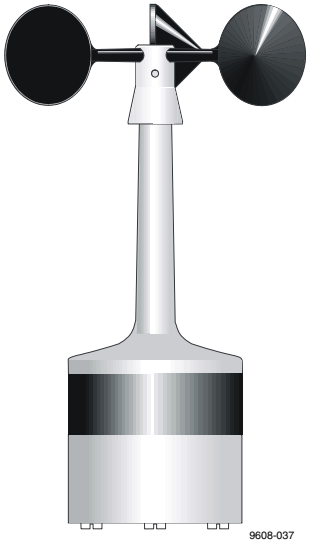
Quick Reference Guide

WAA252 Heated Anemometer

Description and Technical Data



- **Non-freezing all-weather sensor**
- **Lightweight cups with integral heaters**
- **Non-contact heating power transmission**
- **Low starting threshold**
- **Excellent linearity even at low wind speeds**
- **Fast response; distance constant only 2.7 m**

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DESCRIPTION

The WAA252 Heated Anemometer is an optimum choice, when a non-freezing gauge is required. It offers the linearity and sensitivity of a well-designed cup anemometer plus the advantage of heating carried out right where it is needed - in the cups. Foil heaters are inserted in each cup and in the cup wheel hub. For easy maintenance the cup assembly is removable, with a 2-pin connector for heating electricity.

The transmission of heating power to the WAA252's rotor is contactless, with no slip rings or brushes. This feature completely eliminates sparks and excessive friction or wear. Power to the heaters is supplied via a rotary transformer, with 26 kHz low-EMI sine wave.

An intelligent heating control circuitry is included, with integral sensors for both ambient and internal temperature. Therefore, there is no need for a separate temperature sensor in the system.

Power consumption, typically 72 watts, is very low considering the heating efficiency and the protection against freezing provided. Approximately 50 watts of the power is on the cup wheel, 12 watts on the shaft and bearings, and 10 watts on the body. Hence also the sensor body is kept free of ice, which is important for maintaining the gauge's aerodynamic performance.

A single 24 VDC (3.5 A) power supply is able to feed the whole device, including the transducer. The WAA252 can even deliver an isolated 12V excitation to a separate wind transmitter, if needed. Thus one power supply is enough for the whole sensor system.

Optionally it is possible to take the transducer power from an external device such as the WT521 or WAT12 wind transmitter. This guarantees an uninterrupted transducer supply, independent of the heating power. The opto-chopper type transducer consumes only some 10 mA from a 5... 15 V excitation.

The WAA252 can be mounted on Vaisala's regular WAC151 crossarm and its output interface is compatible with that of the regular WAA151 anemometer. Therefore, updating to a heated-cup system is easy - just a wiring alteration is needed in the crossarm's junction box.

Wind tunnel tests per ASTM method D5096-90 have been conducted on the WAA252 in order to define its aerodynamical behavior.

The WAA252's power inputs and signal outputs are well protected against line transients and interference. The device itself emits no unacceptable electro-magnetic noise to the signal cables or the atmosphere.

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TECHNICAL DATA

Sensor / Transducer type	Cupwheel anemometer / Opto-chopper
Measuring range	0.4 ... 75 m/s
Starting threshold	< 0.5 m/s [1]
Distance constant	2.7 m
Transducer output (for wind speeds 0 ... 75 m/s)	0 ... 750 Hz square wave
Characteristic transfer function (R = o/p pulse rate; Uf = wind speed)	Uf = 0.39 + 0.10 x R
Accuracy (within 0.4 ... 60 m/s)	
with characteristic transfer function	± 0.17 m/s [2]
with transfer function Uf = 0.1 × R	–0.3/+1.0 m/s [3]
Input power	24 VDC ± 10 %, 3.2 A max.
Typical power consumption (Uin = 24 VDC)	72 W below +2 °C (heating on) 1 W above +6 °C (heating off)
Optional xducer i/p power (Uxdr)	4.8 - 15.3VDC, 11mA typ.
Transducer output high level (with Iout < +5 mA)	> 11 V (or > Uxdr - 1.5V)
Transducer output low level (with Iout > –5 mA)	< 1.5 V
Output power for wind xmitters	13 ± 1 VDC, 75 mA max.
Electrical connections	MIL-C-26482 type 6-pin plug
Operating temperature	–55 ... +55 °C
Storage temperature	–60 ... +70 °C
Housing material	AlMgSi, gray & black anodized
Cup material	PC reinforced with glass fiber; black
Dimensions	264 (h) × 90 (Ø) mm; swept radius of cup wheel: 91 mm
Weight	800 g

1) Measured with cup wheel in position least favored by flow direction. Optimum position yields < 0.35 m/s starting threshold.
2) Standard Deviation
3) Typical error versus speed, when "simple transfer function" Uf = 0.1 × R is 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

Mounting and Locating

In mounting the WAA252 Heated Anemometer keep in mind the recommendations for locating the wind sensors. Following three cases are most typical:

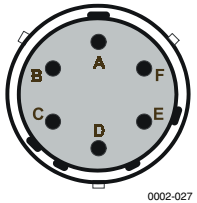
1. Preferred location is on the top of a mast, at a site with open terrain. The recommendation is to have at least 150 m open area in all directions. Minimum distance to visible obstacles is 10 times the height of the obstacle.
2. When the gauge is mounted beside the mast, the distance from the mast to the crossarm should be at least 3 times the diameter of the mast.
3. If mounted on the top of the building, the gauge should be installed on top of a mast at least 1.5 times as high as is the height or the largest width of the building, whichever is smaller.

NOTE Following the recommendations for locating the wind sensors is essential for receiving reliable wind data.

Electrical

The WAA252 operates from a single 25 VDC +10% power supply, at 3.2-ampere maximum current (@ 25 V). Most of the current is consumed by the heating, typically enabled only at ambient temperature below +5 °C. With heating off, only some 40 mA is consumed.

Table 1. WAA252 Connector



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A	F+	Optional power input for transducer section, 5...15VDC, 10mA typ.
B	SGND	Signal Ground (also GND for optional power i/p and o/p at A and F)
C	Fout	Signal Output, 0...750Hz square wave (for 0...75m/s), (HI>11V / LO<1V typ.)
D	HGND	Power Ground
E	HTG+	Power Input, 24VDC ±10%, 3.2 A max.
F	12Vout	Optional power output for external transmitter, 13VDC typ., 75 mA max.

The input power supply leads are connected to the terminals E(+) and D(-) of the I/O connector (presented in Table 1). The lead diameter should be such that no excessive power is wasted in the cable. Each 0.3 ohms in the cable will cause a 1-Volt extra drop in the operational voltage, which in turn will decrease the applicable heating power. For instance, if only 20 V instead of the recommended 24 V is remaining at the anemometer end of the cable, only 70% of the specified heating power is gained.

No separate power source is required for the WAA252's transducer section, since this is also fed by the heating supply, through a galvanically isolated voltage converter integral to the sensor electronics.

Optionally however, if an external, no-break power supply should be applied for the transducer section only, this can be connected to the terminals A(+) and B(-), with a voltage range from 5 to 15 VDC. The transducer section, consuming only about 10 mA, will manage even long power break periods with just a tiny battery, whereas the heating power requires a big battery pack. An option for saving power is to use pulsing in power supply. For further information on that contact Vaisala personnel.

The sensor signal output is taken from the terminals C(+) and B(-). The output is a square wave pulse frequency 0 to 750 Hz linearly corresponding to 0 to 75 m/s wind speed. Typically, o/p high level is 11…13 V and low level 0…1 V. However, with e.g. 5 V external power applied to the sensor section, the o/p high level, during the time the heating supply is unavailable, is only about 4 V.

The 12 V power output at the terminals F(+) and B(-) is for excitation of optional wind transmitters like Vaisala WAT12 or WT521, in case those have no other power source available.

NOTE SGND at terminal B and HGND at terminal D are galvanically isolated from each other.

WAC151 Wiring

The wiring diagram for the WA252 system to the WAC151 Sensor Crossarm is shown in the Figure 1. Two alterations must be done to the regular sensor cable wiring in this junction box. The altered wire connections are highlighted in the Figure 1.

The alterations are:

1. The thermostat switch in the junction box's regular wiring is useless in this application and hence its WHT and LGN colored wires are disconnected. Both of these wires are connected to the screw terminal #2.
2. The YEL colored wire is moved from the terminal #2 to the terminal #3.

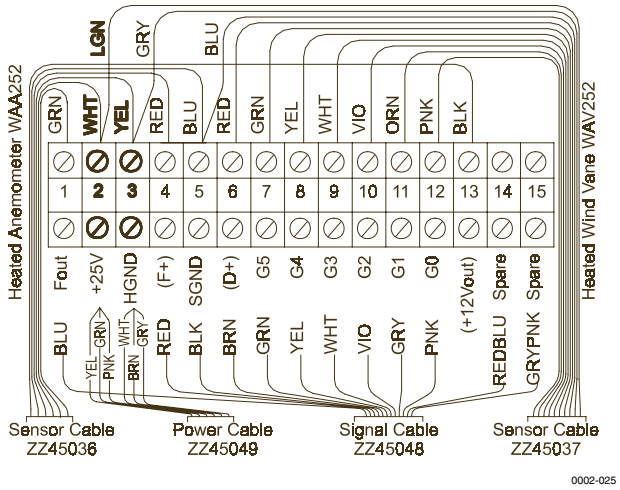

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Figure 1. WAC151 Standard Wiring for WAA252 and WAV252

The signal cable wiring (ZZ45048 or equivalent) is the same as with the regular sensors, except for the sensor power inputs F+ and D+ (terminals #4 and #6). Those inputs are not necessarily needed, since the sensor can take its excitation from the integral, isolated 12V power supply fed from the 25V heating power line. Optionally, however, as described in the Electrical section, a no-break power supply can be applied to those terminals, for example, when a WT521 or WAT12 Wind Transmitter is being used.

The power cable leads (ZZ45049 or equivalent) are applied to the terminals #2(+) and #3(-). In case the installation includes both the WAA252 and WAV252, the power line current exceeds 5 A. Hence a large wire dimension or several wires in parallel shall be used. Each 0.2 ohms in the power cable will cause a 1-volt extra drop in the input voltage, which in turn will decrease the available heating power.

NOTE The lead diameter should be such that no excessive power is wasted in the cable.