Lichen Automation

Ultrasonic Wind Speed and Direction Sensor Manual

DC-21

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DC-21 型超声波风速风向传感器说明书

DC-21 ultrasonic wind speed and direction sensor manual

一、产品简介：

Product introduction

DC-21 型超声波风速风向仪是一款全数字化信号检测，高精度，其内部自带的加热装置可以在严冬下保证仪器正常工作可应用在气象监测站点、建筑控制、公路、隧道、环境监测站点、港口码头、环境监测车、小型飞机场和直升机停机坪、钻井平台点等。

The DC-21 ultrasonic anemometer is a full digital signal detection device with high precision. Its internal heating device can ensure the normal operation of the instrument in severe winter. It can be applied in meteorological monitoring stations, building control, roads, tunnels, environmental monitoring stations, ports and wharves, environmental monitoring vehicles, small airports, helipads, drilling platforms, etc.

二、工作原理：

Working Principle

利用超声波时差法来实现风速风向的测量。由于声音在空气中的传播速度会和风向上的气流速度叠加。假如超声波的传播方向与风向相同，那么它的速度会加快；反之，若超声波的传播方向与风向相反，那么它的速度会变慢。所以，在固定的检测条件下，超声波在空气中传播的速度可以和风速函数对应。 通过计算即可得到精确的风速和风向。由于声波在空气中传播时，它的速度受温度的影响很大；风速传感器检测两个通道上的两个相反方向，因此温度对声波速度产生的影响可以忽略不计。

The measurement of wind speed and direction is achieved using the ultrasonic time difference method. Since the propagation speed of sound in air superimposes with the airflow velocity along the wind direction, if the ultrasonic wave propagates in the same direction as the wind, its speed increases; conversely, if it propagates against the wind direction, its speed decreases. Therefore, under fixed detection conditions, the propagation speed of ultrasonic waves in air can correspond to a function of wind speed. By calculation, precise wind speed and direction can be obtained. As the propagation speed of sound waves in air is significantly affected by temperature, the wind speed sensor detects two opposite directions on two channels, thus the impact of temperature on sound wave speed can be negligible

三、产品特点：

Working Principle

1.进口探头，数据更稳定，无需校准。

2.进口防紫外线，抗老化材质，非金属，更绝缘，抗盐雾。

3.电子罗盘，永远不迷失方向，适合移动监测。

4.加热功能融冰融雪，无惧严寒冰雪。
5.超国家标准 IP68 防水等级，内置防水涂层无漏水点。
6.特殊屏蔽材料，抗干扰，适用于各种恶劣环境。
7.支持远程系统升级，误差修正，让数据时间精准可靠。
1. Imported probes provide more stable data and do not require calibration.
2. Imported anti ultraviolet, anti-aging materials, non-metallic, more insulating, salt fog resistant.
3. Electronic compass, never lose direction, suitable for mobile monitoring.
4. Heating function melts ice and snow, fearless of severe cold and ice.
5. Exceeding the national standard IP68 waterproof rating, with built-in waterproof coating and no leakage points.
6. Special shielding material, anti-interference, suitable for various harsh environments.
7. Support remote system upgrades, error correction, and ensure accurate and reliable data timing.

四、应用领域：
Application areas

产品可应用于气象，风能，光伏，新能源，海洋，科研，输电线路，高校，环保，农业，公路等领域。

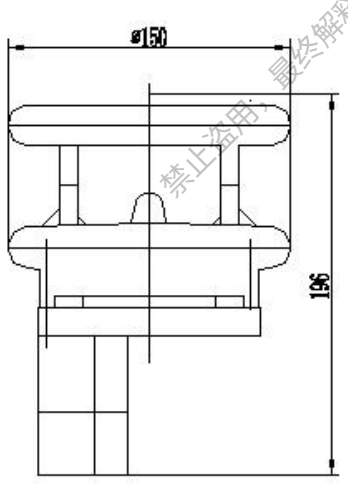
The product can be applied in fields such as meteorology, wind energy, photovoltaics, new energy, oceanography, scientific research, transmission lines, universities, environmental protection, agriculture, highways, etc.

五、技术参数：
Technical parameters

风 速 Wind speed	测量范围 Measuring range	0～60 m/s
	测量精度 Certainty of measurement	±2%（≤20m/s），±2%+0.03V m/s（＞20 m/s）
	分 辨 率 Resolution ratio	0.1m/s
风 向 Wind direction	测量范围 Measuring range	0～359° 全方位，无盲区 （All around, no blind spots）
	准 确 性 Accuracy	±2°
	分 辨 率 Resolution ratio	1°
通讯协议 Protocol		Modbus-RTU 协议 （Protocol）
输出方式 Output mode		RS485
平均功耗	关闭加热功能 Turn off heating	DC12V/0.08A

Average power consumption	function	
	开启加热功能 Turn on the heating function	DC12V/0.7A
存储温度 Storage temperature	-40～80℃	
工作温度 Operating Temperature	-30～60℃	
工作湿度 Operating Humidity	≤100%RH	
产品尺寸 Product dimensions	高×直径 Height x diameter=196×150（mm）	
产品重量 Product weight	≤540g	
材质 material	ABS	
防护等级 Protection level	IP68	
产品清单 Product List	超声波风速风向传感器一台 线缆一根 3 米 One ultrasonic wind speed and direction sensor A 3-meter cable	

六、产品尺寸：
Product dimensions

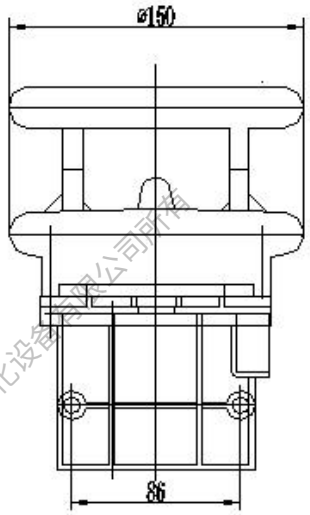


直径 150mm　高 196mm

（Diameter 150 mm, height 196mm）

七、安装结构尺寸图：

（Dimension drawing of installation structure）



直径 150mm　安装弧度直径 57-76mm

（The diameter is 150mm and the installation arc diameter is 57-76mm）

八、安装说明：

（Installation instructions）

1、把线缆（带防水航空插头）穿过安装管，对准限位端口，将插头轻轻往里用力就可以把插头连接到 DC-21 的插座上，并拧紧航空插头紧固螺母；

2、安装时候需要注意保证仪器放置水平，并且指北标识指向正北方向（仪器上面有指北标记）；

3、通过底座连接件，通过 U 型螺栓将底座和固定支架紧固。

友情提示： 安装时，使用指南针确定合适的标志和方向会使安装工作更加简单。

1、Pass the cable (with waterproof aviation plug) through the installation tube, align the limit port, and gently push the plug into the DC-21 socket. Tighten the aviation plug nut;

2、When installing, it is necessary to ensure that the instrument is placed horizontally and the north pointer is pointed to the true north direction (the north pointer is on the instrument);

3、Through the base connector, the base and the fixed bracket are fastened by U-bolts.

Tip: When installing, use a compass to determine the appropriate sign and direction to make the installation easier.

注意：Be careful

1、不要与任何雷达扫描装置在一个平面安装，至少应该保持 2 米以上的距离；

2、建议和周围一些无线电接收天线保持安全距离；

3、不要把传感器安装在高功率雷达或无线电发射装置的旁边，避免周围建筑物比如树、电线杆、高楼等所产生的紊流，这些可以对超声波风速风向传感器精度产生影响。所以最好

安装在盛行风的一侧。

1、Do not install any radar scanning device in the same plane, at least 2 meters away;

2、It is recommended to keep a safe distance from surrounding radio receiving antennas;

3、Do not install the sensor next to a high-power radar or radio transmitter to avoid turbulence from surrounding buildings such as trees, telephone poles, tall buildings, etc., which can affect the accuracy of the ultrasonic wind speed and direction sensor. It is best to install it on the prevailing wind side.**世界气象组织给出以下建议：The World Meteorological Organization has the following recommendations**

1、风速仪安装标准：在开阔地区超过地面 10 米以上。开阔地区的定义是风速仪和任何障碍物之间的距离是障碍物高度的 10 倍以上。

2、如果安装在建筑物上，理论上风速仪安装高度应该是建筑物高度的 1.5 倍。

3、如果安装在桅杆上的吊杆上，塔或者桅杆的分支上，吊杆或者分支的长度必须至少是塔的最小直径或对角线的两倍。吊杆需要安装在盛行风的一侧。

1、Wind speed meter installation standard: in open areas more than 10 meters above the ground. Open areas are defined as the distance between the wind speed meter and any obstacle is more than 10 times the height of the obstacle.

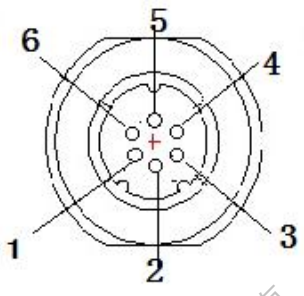
2、If installed on a building, the anemometer should theoretically be installed at 1.5 times the height of the building.

3、If the boom is installed on a mast, the branch of the tower or mast, the length of the boom or branch must be at least twice the minimum diameter or diagonal of the tower. The boom must be installed on the side of prevailing wind.

九、接线方法:
（Wiring method）

传感器线缆一端为 GX12-6 插头，线缆对应的线序如下，其管脚对应的管脚定义如图所示

One end of the sensor cable is GX12-6 plug. The corresponding wire sequence of the cable is as follows, and the corresponding pin definition of its pin is shown in the figure



1、+12V
2、A+
3、GND
4、B-
注：线缆屏蔽层单端与设备大地可靠连接
Note: the single end of the cable shielding layer is reliably connected to the ground of

GX12-6 黑色防水航空插头
线缆：标配：3 米（屏蔽）

Gx12-6 Black Waterproof aviation plug
Cable: standard configuration: 2m (shielded)

其他：可以增加线缆长度（屏蔽） Others: cable length can be increased (shielding)

十、通讯协议:
（Communication protocol）

1、物理端口定义

Definition of physical ports

起始位——1bit,停止位——1bit,数据位——8bits,校验位——EVEN(偶校验)/ODD(寄校验)/NO(无校验)，波特率——9600bps

Start bit ——1bit, stop bit ——1bit, data bit ——8bits, parity bit ——EVEN (even parity) /ODD (odd parity)/NO (no parity), baud rate ——9600bps

2、数据帧格式(十六进制)

Data frame format (hexadecimal)

◆读取设备地址

发送：00 03 00 64 00 01 C4 04

回复：00 03 02 00 XX CRCH CRCL (XX：读取的设备地址 CRCH：校验高位 CRCL：校验低位)

◆Read the device address

Send: 00 03 00 64 00 01 C4 04

Reply: 00 03 02 00 XX CRCH CRCL (XX: read device address CRCH: check high bit CRCL: check low bit)

◆修改设备地址

发送： ID1 06 00 64 00 ID2 CRCH CRCL (ID1：传感器原地址 ID2：传感器修改地址 CRCH：校验高位 CRCL：校验低位)

回复： ID1 06 00 64 00 ID2 CRCH CRCL

◆Modify the device address

Send: ID1 06 00 64 00 ID2 CRCH CRCL (ID1: original address of sensor ID2: modified address of sensor CRCH: high check CRCL: low check)

Reply: ID1 06 00 64 00 ID2 CRCH CRCL

◆设置通讯校验方式

发送：ID 06 00 6C 00 XX CRCH CRCL (ID：传感器原地址 XX: 00： 无校验 01： 奇校验 02： 偶校验 CRCH：校验高位 CRCL：校验低位)

回复：ID 06 00 6C 00 XX CRCH CRCL

◆Set the communication verification mode

Send: ID 06 00 6C 00 XX CRCH CRCL (ID: sensor original address XX: 00: no check 01: odd check 02: even check CRCH: check high CRCL: check low)

Reply: ID 06 00 6C 00 XX CRCH CRCL

◆设置风向风速读取模式：

发送：ID 06 00 65 00 XX CRCH CRCL (ID：传感器原地址 XX: 00： 浮点型风速 02：整形风速 CRCH：校验高位 CRCL：校验低位)

回复：ID 06 00 65 00 XX CRCH CRCL

◆Set wind direction and wind speed reading mode:

Send: ID 06 00 65 00 XX CRCH CRCL (ID: sensor original address XX: 00: floating type wind speed 02: shaped wind speed CRCH: high check CRCL: low check)

Reply:ID 06 00 65 00 XX CRCH CRCL

◆读取风向风速

例：地址为 0x01 ----读取模式浮点风速模式

01 03 00 00 00 03 05 CB（风向+浮点风速）

回复：01 03 06 00 A1 C5 C1 3F C6 60 3E

例：地址为 0x01 ----读取模式整形风速模式

01 03 00 00 00 02 C4 0B （风向+整形风速）

回复：01 03 04 00 A1 00 10 AA 1D

◆Read the wind direction and speed

Example: Address 0x01----read mode floating point wind speed mode

01 03 00 00 00 03 05 CB(Wind direction + floating point wind speed)

Reply:01 03 06 00 A1 C5 C1 3F C6 60 3E

Example: Address 0x01----read mode shaping wind speed mode

01 03 00 00 00 02 C4 0B(Wind direction + shaped wind speed)

Reply:01 03 04 00 A1 00 10 AA 1D

注意：整形风速为*10 运算，实际风速应在读取数据后做/10 运算；

风速浮点：1.55 M/S

整形风速：1.6M/S

风向：161° DC-21

Note: The wind speed of shaping is *10 operation, and the actual wind speed should be /10 operation after reading the data;

Wind speed floating point: 1.55 M/S

Shaping wind speed: 1.6M/S

Wind direction: 161 DC-21

十一、注意事项:

(Matters needing attention)

1、使用本公司所推荐的线缆；

2、如果线缆切断后又没有正确地连接，或者线缆屏蔽线没有很好维护，EMC（电磁兼容性）可能会降低；

3、不需要创建接地回路，根据安装指导说明进行接线；

4、保证 DC-21 在运行中的持续电源供应；

5、切勿带电接线，接线完毕检查无误后方可通电；

6、接地:为避免雷击，辐射的高压静电损坏仪器或伤人，仪器必须正确接地。接地时应将电缆屏蔽线与大地相连；

7、线缆选择：标配线缆：2 米/无屏蔽 其他：长度可定制/带屏蔽。

1、Use the cables recommended by the company;

2、If the cable is cut and not properly connected, or if the shielded cable is not well maintained, EMC (electromagnetic compatibility) may be reduced;

3、There is no need to create a grounding loop, and the wiring should be carried out according to the installation instructions;

4、Ensure continuous power supply for DC-21 during operation;

5、Do not connect the wire with power, and can be powered on only after checking that there is no error;

6、Grounding: In order to avoid lightning strike, high voltage static electricity radiation damage the instrument or injury, the instrument must be correctly grounded. When grounding, the cable shielding line should be connected to the earth;

7、Cable selection: Standard cable: 2 meters / no shielding Other: length can be customized / with shielding.