Arklay S. Richards Co., Inc.
Industrial Wind Sensors and Alarm Systems

C5C Series

Anemometer

Instruction Manual
Revision Number 20240930r17F*

Covers Industrial Anemometer Models
C5C-1263-2-SP, C5C-1263-2-AC, C5C-1265-2-SP,
C5C-1265-2-AC, C5CD-1263-2-SP, and C5CD-1265-2-SP

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**Please note the revision number on this document. Due to our continuous improvement manufacturing policy, contents in this manual may change without notice.*

Table of Contents

1 - Initial Product Inspection and Setup Instructions

1.1 - Package Inspection

When your wind sensor arrives, make sure the package is in good condition. Damaged packages should be refused and given back to the carrier. If the package is in good condition it can then be received from the carrier. Open the white inner wind sensor box and carefully inspect the sensor and rotor for any visible signs of damage from shipping. Make sure the box also includes all documentation and a small red bag containing the rotor set screw, tower pin, and Allen keys.

1.2 - C5C Series Anemometer Quick Setup

This quick setup guide will help you unpack and correctly assemble the C5C Series Anemometer. Proper setup is very important in order to prevent damage to the rotor and to ensure the sensor will operate a peak performance while in service.

⚠ **All Richards C5C Series Anemometers are packaged in specially designed boxes with the 3-Cup rotor removed at the factory to prevent damage to the sensor during transit.**

This guide will outline how to properly install the 3-Cup Rotor Assembly on the anemometer shaft. After the anemometer is assembled, please retain the original sensor packaging and documentation. Anemometers requiring upgrades, maintenance, calibration, or repair, should be returned in their original packaging to prevent damage to the instrument during transit.

Major Sub-Assemblies (See Photo 1)

- Rotor Assembly – (Cups, Arms, Pin Set Screw and Hub)
- Depending on the model, Orange, Green, or Black Shaft Tower Assembly – (Tower with two Bearings, Bearing Shields, Lock Ring Retainer, Shaft, and Magnet Assembly)
- Body and O-Ring – (Main Housing with O-Ring and Set Screws for Post Mounting)
- Reed Switch Cartridge Assembly – (Removable Reed Switch and M8 Round Pin Connector)

Initial Assembly of the C5C Anemometer

1. Remove the C5C anemometer from the shipping box and place on a flat surface.
2. Remove the 3-cup Rotor Assembly from the shipping box and place on a flat surface.
3. Locate the red plastic bag with the small Allen wrenches, spare O-ring, and pin set screw.
4. Remove the pin set screw.
5. You will need the pin set screw to secure the 3-Cup Rotor Assembly to the shaft.
6. Rotate the shaft so that the drilled pin hole and machined flat in the top of the shaft is facing you.
7. Take the Rotor Assembly and slide it on the shaft so that the pin hole and machined flat is in line with the pin set screw threads on the side of the rotor hub.
8. Using the included Allen Wrench, carefully screw in the pin set screw all the way in until it finds the hole in the shaft. If the screw stops before going all the way in, remove the screw and rotor. Line up the rotor and shaft again and carefully screw the pin set screw in.
9. ⚠ ***Important! Do Not Force the Pin Set Screw!***
10. If lined up properly it should easily screw all the way in flush with the Rotor Hub.
11. Once the screw is flush you can fully tighten with the Allen Wrench.
12. The 3-Cup Rotor should now spin freely on the Tower Assembly.
13. The C5C Anemometer is now complete and ready for service.
14. ⚠ ***Note when placing the C5C Anemometer down; do not let it rest on the wind cups.***

2 - Important Wind Instrument Information for Your Records

Please take some time to record all your instrument's specific details in the table below. Store your sensor information in a safe place for future reference. This product information is very important when ordering replacement parts for your Richards C5C Series Anemometer. This information is required if your instrument is returned for service, upgraded, or recalibration in our wind tunnel.

Wind Sensor Detailed Information for Your Records

Model Number _____

Serial Number _____

Date of Purchase _____

Purchase Order Number _____

Company Name _____

Contact Name _____

Sensor Options _____

Bearing Replacement Dates_____

3 - Notes Regarding Your Wind Instrument

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4 - About This Manual

The Richards C5C Series cup anemometers are the finest industrial grade wind instruments made today. These instruments have been designed from the ground up to insure many years of trouble-free service even under the most demanding conditions. In order to obtain optimum performance from your wind sensor, it is recommended that you follow the grounding, installation techniques, and periodic maintenance practices described in this manual.

5 - Product Overview

Model 63

Model 65

C5C-1263-2-SP Industrial Anemometer
Deep Drawn and Welded Wind Cups (Photo 1)

C5C-1265-2-SP Industrial Anemometer
Cast Arm and Wind Cups (Photo 2)

5.1 - Principals of Operation and Construction

The C5C Series anemometers are high performance horizontal wind speed measurement devices. The sensor incorporates a stainless steel and Titanium three cup rotor which is set into rotation by the wind. The rotation of the wind cups can then be converted to horizontal wind speed by monitoring the electrical output generated by the sensor.

The C5C Series anemometer is manufactured in two types of output configurations. The C5C-1263-2-SP Anemometer (Called SP) has a switch pulse output and the C5C-1263-2-AC (Called AC) has an analog low-level AC voltage output. In the case of the C5C-1263-2-SP anemometer, the rotor drives a precision ceramic bearing mounted shaft with a 4-pole magnet assembly. Each complete revolution of the rotor will generate 4 contact closures of a reed switch which can then be converted into wind speed.

The C5C-1263-2-AC anemometer is typically used in low power applications since no external power is required to operate the sensor. The rotor in this type of anemometer also drives a precision metal bearing mounted shaft with a 4-pole magnet assembly. The rotation of the rotor will create a low-level AC sine wave with frequency linearly proportional to wind speed. Each complete revolution will product two sine wave cycles. The low-level AC voltage and switch pulse outputs are very common and compatible with all commercial data loggers and displays.

C5CH Series heated anemometers are available for use in cold climates. These anemometers are identical to the C5C anemometers but have a powerful 15-Watt heater in the body of the sensor. The heater will heat the body and shaft tower of the anemometer to prevent the bearings from freezing in cold weather applications. The C5CH anemometer's heater is powered and controlled by a separate SBJ-1263-H-01C-VC 12 Volt power supply. The SBJ-1263-H-01C-VC has a 12 Volt power supply and thermostat enclosed in a polymer weatherproof enclosure. The thermostat is configured to turn on the heating element only during periods of cold temperatures below 37°F or 2.8°C. The C5CH Series of heated anemometers also have a black anti-ice coating on the cups; hub and shaft tower to absorb heat from sunlight and help to keep snow and grime from building up on the sensor outer surfaces.

The superior construction and extreme durability of the Richards C5C Series anemometers have put these instruments in a category all their own. The C5C is the finest, and only industrial strength 3-cup style anemometer on the market today. The C5C was designed by our engineers with quality and durability as their primary goals. Using the highest grade of raw materials and components available and state-of-the-art machining techniques, the Richards anemometers have proven to be the highest quality precision anemometer you will find. The C5C anemometers' superior design and commercial grade construction also enable it to perform in the most severe environments.

The Richards C5 Series anemometer's durability has been proven in numerous wind tunnels tests at speeds up to 230 mph and has a very high accuracy test range (8.97 mph to 100.60 mph or 4.01 m/s to 44.97 m/s). This insures accurate wind speed data at elevated wind speeds.

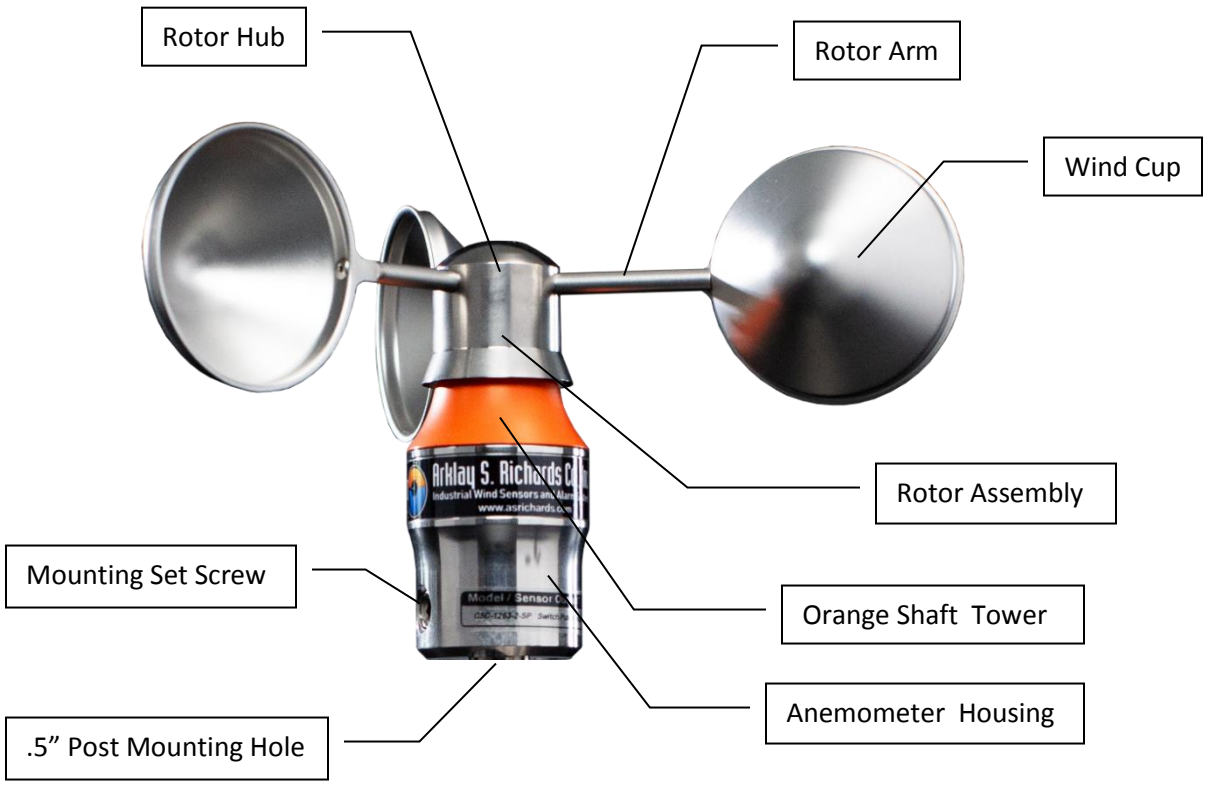
All the C5C anemometer components are made from either corrosion resistant stainless steel or high-grade Titanium. The C5C housing, and tower, are all CNC machined from solid 316 Stainless Steel bar stock for maximum corrosion resistance, precision performance, and industrial strength. The C5C Anemometer utilizes high performance rotor cups, arms, and hardware which are also fabricated from stainless steel. In order to have maximum strength and the lowest threshold possible, the rotor hub is CNC machined from solid light weight Titanium and further skeletonized to remove all unnecessary mass. The C5C Anemometers superior performance is produced by a hardened stainless-steel shaft, rotating on two specially designed double shielded ceramic ball bearings for superior accuracy, maximum durability, corrosion resistance and long service life.

The C5C incorporates our own specially designed high-performance stainless-steel wind cups. These cups are incredibly strong and will not distort even at extreme wind speeds. The wind cups have our own unique shape, which has been wind tunnel tested for superior output linearity, stability, and performance. There are two styles of wind cups available. The model 63 (Photo 1) has heavy duty deep

drawn and micro-welded 316 Stainless Steel wind cups. The model 65 (Photo 2) has virtually indestructible one piece 316 stainless steel cast cups and gusseted rotor arms. All Richards C5C anemometers include a special orange, black or green anti-ice coating on the shaft tower to help prevent dirt and snow build-up on the sensor. The C5C anemometer internal electronics are also completely protected against water, high humidity, salt spray, and dust by an O-ring and thread sealed stainless steel housing.

6 - Major Parts of the C5C Series Anemometer

Review Photo 3 and become familiar with the major parts of the C5C Series anemometer. This will help you as you read through the later and more technical sections in the manual.



C5C-1263-2-SP Series Anemometer (Photo 3)

7 - Technical Specifications for C5C Series Anemometers (HD Wind Cups)

7.1 - Covers Anemometer Models C5C-1263-2-SP, C5CD-1263-2-SP and C5C-1263-2-AC

Anemometer Output Types

Single Pulse output **(C5C-1263-2-SP)** from reed switch contact closure (4 pulses per revolution)
Dual Pulse outputs **(C5CD-1263-2-SP)** from reed switch contact closure (4 pulses per revolution)
Analog output **(C5C-1263-2-AC)** voltage is low level AC sine wave with frequency linearly proportional to wind speed

Anemometer Performance

Maximum speed (230 mph or 102.82 m/s)
Reed switch pulse output signal range (0 to 366)
Distance constant @ 63% recovery (35.30 ft or 10.76 m)
Measuring range (0 mph to 230 mph or 0 m/s to 102.82 m/s)
Starting threshold all positions averaged (2.70 mph or 1.21 m/s)
Starting threshold @ optimum flow position (1.54 mph or 0.69 m/s)
Accuracy test range (8.97 mph to 100.60 mph or 4.01 m/s to 44.97 m/s)
Accuracy within range with characteristic transfer function (.2 mph or .1 m/s)
Characteristic switch pulse (C5C-1263-2-SP) transfer function (V [m/s] = .319 x f [Hz] + .725)
Characteristic switch pulse (C5C-1263-2-SP) transfer function (V [mph] = .7136 x f [Hz] + 1.62)
Characteristic AC sine wave (C5C-1263-2-AC) transfer function (V [m/s] = .638 x f [Hz] + .725)
Characteristic AC sine wave (C5C-1263-2-AC) transfer function (V [mph] = 1.4272 x f [Hz] + 1.62)

Electrical Technical Data

Transducer voltage (C5C-1263-2-AC) (2.0 VAC @ 60 cycles)
Single Coil (C5C-1263-2-AC) (Bobbin wound, 4100 turns of #41 wire)
Reed switch (C5C-1263-2-SP) (Voltage 24 Vdc max, current 1.0 A max)
Magnet (C5C-1263-2-SP) (4-Pole)

Materials of Construction

Shaft Tower (316 stainless steel)
Shaft (316 stainless steel)

Anemometer Housing (316 stainless steel)
Bearings (ALSC shielded, precision ceramic)
Cups, arms, and rotor assembly (316 stainless steel and Titanium)

Physical Dimensions

Height (4.25 inches or 107.95 mm C5C-1263-2-SP)
Weight (.942 pounds or 427.28 grams C5C-1263-2-SP)
Body diameter (1.50 inches or 38.10 mm C5C-1263-2-SP)
Swept diameter of rotor (7.55 inches or 191.77 mm C5C-1263-2-SP)
Rotor cup conical cross-section (2.196 inches or 55.77 mm C5C-1263-2-SP)

Electrical Connections and Cables

Cable end (108" cable with bare leads)
Cable (3 conductors, 24 gauge, Shielded with Drain, and PE Jacket)

Tools Required for Mounting, Installation, and Maintenance

Tools (1/8", 5/32", Allen wrench and .25" torque pin)
Mounting (0.5 inch or 12.7 mm diameter mast with set screws)

Environmental Specifications

Operating humidity range (0 to 100% RH)
Bearing operating temperature (-65°F to 300°F or -54°C to 148°C)
Reed switch operating temperature (-40°F to 257°F or -40°C to 125°C)

Anemometer Protection

Optional finish (Orange Cerakote anti-ice coating)
Climatic protection (Protection against water, high humidity, salt spray, and dust)
Electrical protection (Over voltage and surge protection incorporated in **C5C-1263-2-SP**)

8 - C5C Series Anemometer Calibration Test Standards

8.1 - C5C-1263-2-SP and C5C-1263-2-AC Anemometer Calibration Test Standards

ASTM D 5096-02 (Standard Test Method for Determining the Performance of a Cup or Propeller Anemometer)
ISO 17713-1 (Meteorology Wind Measurements Part 1: Wind Tunnel Test Methods for Rotation Anemometer Performance)
MEASNET, IEC 61400-12-1:2017 Annex F, Modified for 1-45m/s (Wind Tunnel Test Calibration Procedure for Anemometers)

15 - Technical Specifications for C5C Series Anemometers (Cast Cups)

15.1 - Covers Anemometer Model Number C5C-1265-2-SP and C5C-3265-2-SP (Dark Phase)

Anemometer Output

Pulse output from reed switch contact closure (4 pulses per revolution)

Anemometer Performance

Maximum speed (230 mph or 102.82 m/s)
Reed switch pulse/sec output signal range (0 to 322)
Distance constant @ 63% recovery (41.40 ft or 12.62 m)
Measuring range (0 mph to 230 mph, 0 m/s to 102.82 m/s)
Characteristic transfer function (V [m/s] = .411 x f [Hz] + .340)
Characteristic transfer function (V [mph] = .920 x f [Hz] + .760)
Starting threshold all positions averaged (3.92 mph or 1.75 m/s)
Starting threshold @ optimum flow position (3.24 mph or 1.45 m/s)
Accuracy test range (8.90 mph to 101.50 mph or 3.97 m/s to 45.37 m/s)
Accuracy within range with characteristic transfer function (.2 mph or .1 m/s)

Electrical Technical Data

Reed switch (C5C-1265-2-SP) (Voltage 24 Vdc max, current 1.0 A max)
Magnet (C5C-1265-2-SP) (4-Pole)

Materials of Construction

Shaft Tower (316 stainless steel)
Shaft (316 stainless steel)
Anemometer housing (316 stainless steel)
Bearings (ALSC shielded, precision ceramic)
Cups, arms, and rotor assembly (316 stainless steel and Titanium)

Physical Dimensions

Height (4.25 inches or 107.95 mm)

Weight (1.051 pounds or 476.72 grams)
Body diameter (1.50 inches or 38.10 mm)
Swept diameter of rotor (5.5 inches or 139.70 mm)
Rotor cup conical cross-section (2.196 inches or 55.77 mm)

Electrical Connections and Cables

Cable end (108" cable with bare leads)
Cable (3 conductors, 24 gauge, Shielded with Drain, and PE Jacket)

Tools Required for Mounting, Installation, and Maintenance

Tools (1/8", 5/32", Allen wrench and .25" torque pin)
Mounting (0.5 inch or 12.7 mm diameter mast with set screws)

Environmental Specifications

Operating humidity range (0 to 100% RH)
Bearing operating temperature (-65°F to 300°F or -54°C to 148°C)
Reed switch operating temperature (-40°F to 257°F or -40°C to 125°C)

Anemometer Protection

Optional dark phase finish (Modified black anti-ice coating on **C5C-3265-2-SP**)
Climatic protection (Protection against water, high humidity, salt spray, and dust)
Electrical protection (Over voltage and surge protection incorporated in **C5C-1265-2-SP**)

16 - C5C Series Anemometer Calibration Test Standards

16.1 - C5C-1265-2-SP and C5C-3265-2-SP Anemometer Calibration Test Standards

ASTM D 5096-02 (Standard Test Method for Determining the Performance of a Cup or Propeller Anemometer)

ISO 17713-1 (Meteorology Wind Measurements Part 1: Wind Tunnel Test Methods for Rotation Anemometer Performance)

MEASNET, IEC 61400-12-1:2017 Annex F, Modified for 1-45m/s (Wind Tunnel Test Calibration Procedure for Anemometers)

17 - Technical Specifications for C5C Series Anemometers (Cast Cups)

17.1 - Covers Anemometer Model Number C5C-1265-2-AC and C5C-3265-2-AC (Dark Phase)

Anemometer Output

Analog output voltage is low level AC sine wave with frequency linearly proportional to wind speed

Anemometer Performance

Maximum speed (230 mph or 102.82 m/s)
Distance constant @ 63% recovery (41.40 ft or 12.62 m)
Measuring range (0 mph to 230 mph, 0 m/s to 102.82 m/s)
Characteristic transfer function (V [m/s] = .822 x f [Hz] + .340)
Characteristic transfer function (V [mph] = 1.8388 x f [Hz] + .760)
Starting threshold all positions averaged (3.92 mph or 1.75 m/s)
Starting threshold @ optimum flow position (3.24 mph or 1.45 m/s)
Accuracy test range (8.90 mph to 101.50 mph or 3.97 m/s to 45.37 m/s)
Accuracy within range with characteristic transfer function (.2 mph or .1 m/s)

Electrical Technical Data

Transducer voltage (20mv/mph)
Single Coil (Bobbin wound, 4100 turns of #41 wire)
Magnet (4-Pole)

Materials of Construction

Shaft Tower (316 stainless steel)
Shaft (316 stainless steel)
Anemometer housing (316 stainless steel)
Bearings (ALSC shielded, precision ceramic)
Cups, arms, and rotor assembly (316 stainless steel and Titanium)

Physical Dimensions

Height (4.25 inches or 107.95 mm)
Weight (1.051 pounds or 476.72 grams)
Body diameter (1.50 inches or 38.10 mm)
Swept diameter of rotor (5.5 inches or 139.70 mm)
Rotor cup conical cross-section (2.196 inches or 55.77 mm)

Electrical Connections and Cables

Cable end (108" cable with bare leads)
Cable (3 conductors, 24 gauge, Shielded with Drain, and PE Jacket)

Tools Required for Mounting, Installation, and Maintenance

Tools (1/8", 5/32", Allen wrench and .25" torque pin)
Mounting (0.5 inch or 12.7 mm diameter mast with set screws)

Environmental Specifications

Operating humidity range (0 to 100% RH)
Bearing operating temperature (-65°F to 300°F or -54°C to 148°C)

Anemometer Protection

Optional dark phase finish (Modified black anti-ice coating on **C5C-3265-2-AC**)
Climatic protection (Protection against water, high humidity, salt spray, and dust)

18 - C5C Series Anemometer Calibration Test Standards

18.1 - C5C-1265-2-AC and C5C-3265-2-AC Anemometer Calibration Test Standards

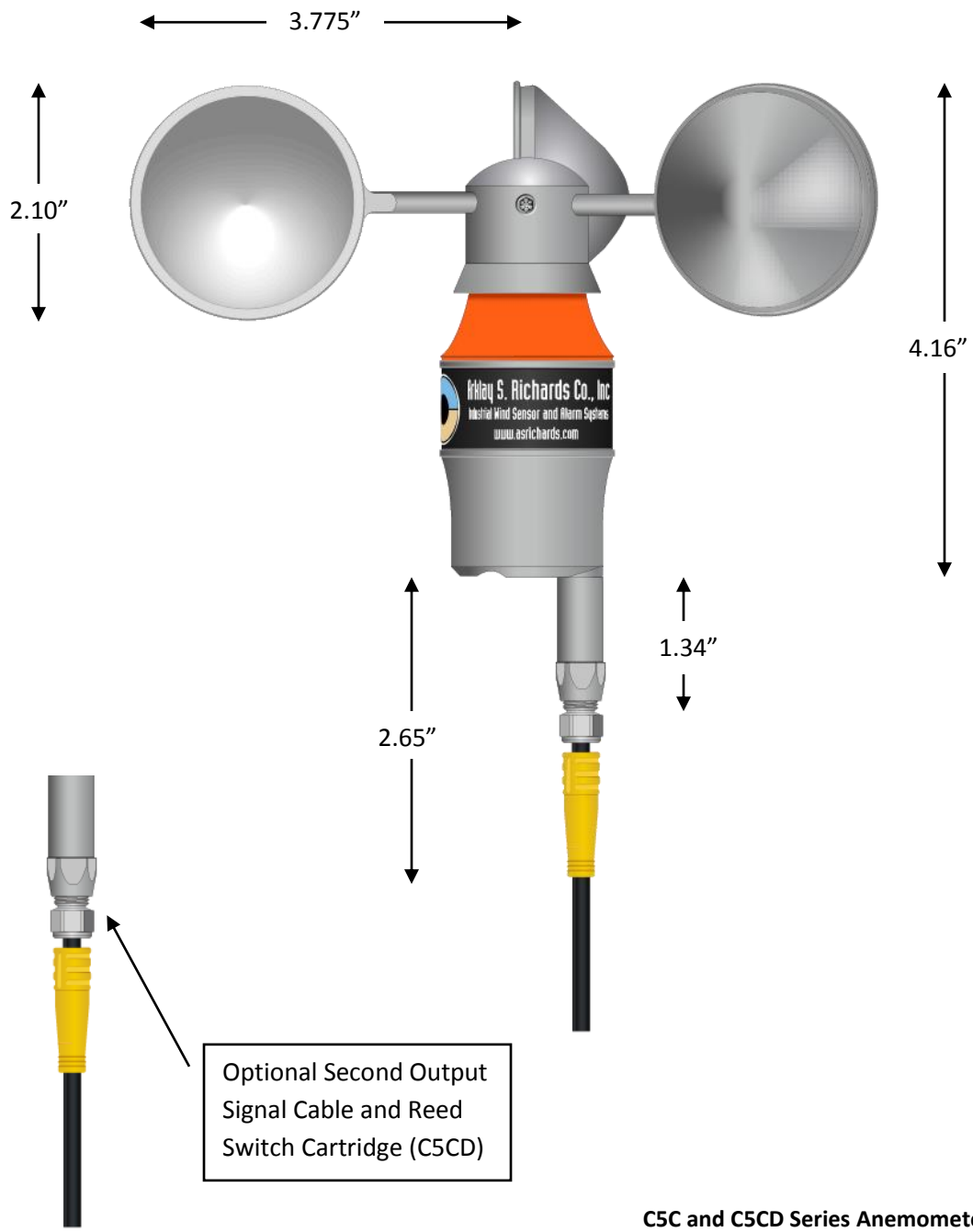
ASTM D 5096-02 (Standard Test Method for Determining the Performance of a Cup or Propeller Anemometer)

ISO 17713-1 (Meteorology Wind Measurements Part 1: Wind Tunnel Test Methods for Rotation Anemometer Performance)

MEASNET, IEC 61400-12-1:2017 Annex F, Modified for 1-45m/s (Wind Tunnel Test Calibration Procedure for Anemometers)

19 - Dimensional Drawings

19.1 - C5C Anemometer Dimensions



C5C and C5CD Series Anemometers (Figure 1)

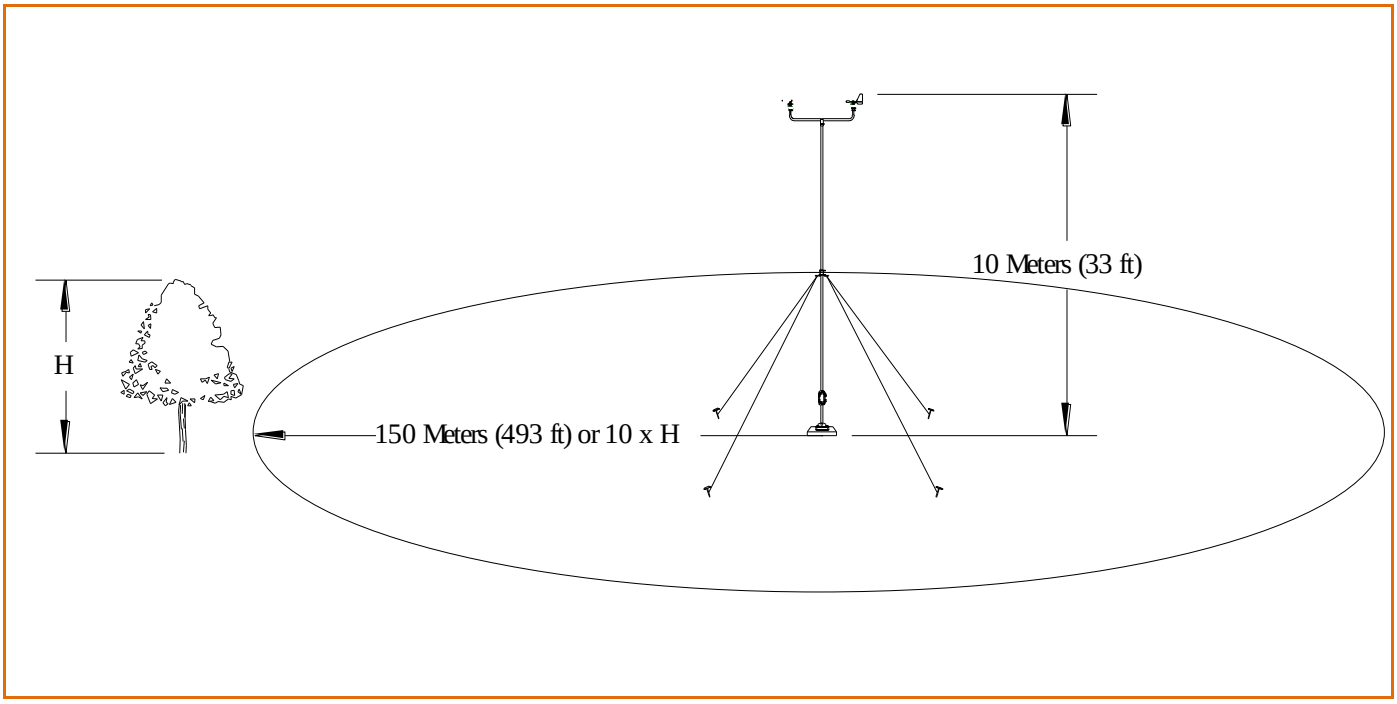
20 - Wind Sensor Installation

20.1 - Single Mast Mounted or Top Mounted Anemometers

The most important aspect of any accurate wind measuring system is the selection of the monitoring location or site and the actual placement of the anemometer and the wind direction vane on the tower or mast. It is very important that the wind instruments are to be installed in order to place the sensors in a clear and undistorted wind path.

The anemometer and wind direction vane should also be mounted on a well-designed, sturdy cross arm like the Richards BHC-36-C-SS. The BHC-36-C-SS cross arm locates the wind sensors the required 36" apart to prevent each instrument from disturbing the others wind path (Figure 3).

Under ideal conditions the location of the instrument tower should be installed in an open area free from any obstructions within 150 meters (493 feet) in all directions of the site. If there are any obstructions near the tower, the sensor height should be adjusted so that it will be at least 10 times the height of the obstruction (Figure 2). Wind sensors mounted on roof tops should be installed at a height of 1.5 times the height of the building. For basic meteorological installations, the anemometer and wind vane should be mounted on top of the mast at a height of 10 meters (33 feet) above ground level.



C5C Series Anemometer Installation (Figure 2)

22.2 - Tower Mounted or Multiple Side Mounted Anemometers

Anemometers which will be mounted on tall wind resource towers must be installed out of any potential turbulence caused by the tower itself. Most towers will have two anemometers at each height to record data. If the prevailing wind direction at the site is known, the first anemometer should be mounted into the wind 60 degrees to the right. This will position the anemometer where the wind flow is the least distorted. The second redundant sensor should also be positioned into the wind but 60 degrees to the left. The anemometers should be mounted on a sturdy horizontal boom which extends 12 times the diameter of a cylindrical tower. If a lattice tower structure is used, the anemometer should be extended 5 times the width on one of the tower sides. If the prevailing wind direction at the site is not known, anemometer pairs should be mounted 180 degrees and extended out the same 12 times the diameter of a cylindrical tower.

It is important to remember that the horizontal boom itself will cause some wind flow distortion and this must be taken into consideration. It is recommended that anemometers positioned at the end of booms should be mounted a minimum of 15 diameters above the supporting boom.

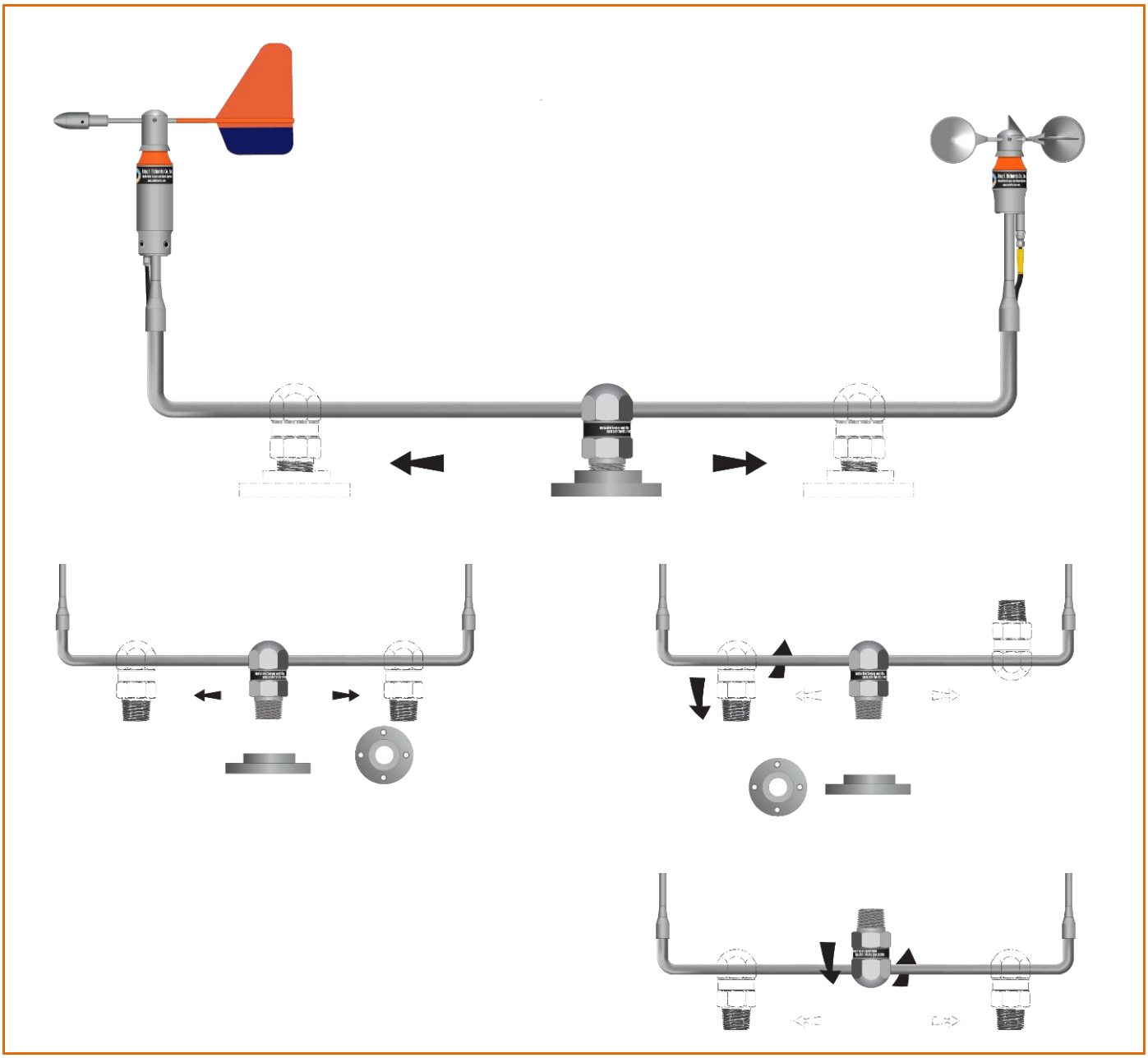
20.3 - Mounting C5C Anemometers and D5C Wind Vanes to Adjustable BHC-36-C-SS Crossarms

Wind Sensor Adjustable Cross Arm Possibilities (Photo 4)

Wind Sensor to Cross Arm Surface Installation (Figure 3)

The Richards C5C Anemometer and D5C Wind Vane will mount to any standard .5” O.D. tubing. In order to simplify the installation of wind speed and direction sensor sets we developed the BHC-36 Series of cross arms. The Arklay Richards adjustable BHC-36-C-SS Wind Sensor Cross Arm (Figure 3 and 4) was specifically designed to position the wind sensors the required 36” apart to prevent each instrument from disturbing the others wind path. The cross arm also has two .5” O.D. posts for mounting the sensor pair and a 1.0” NPT Female coupling to mount to a vertical pipe mast or horizontal boom.

The C5C Anemometer and D5C Wind Direction Vane both utilize two set screws to secure the sensor to the .5” O.D. tubing or mounting post. The threads on the screws have been coated from the factory with an anti-vibration material to help prevent them from becoming loose. The sensors should be placed on the mounting posts and all set screws tightened securely.



Adjustable Cross Arm Mounting Options (Figure 4)

The Arklay Richards adjustable BHC-36-C-SS Wind Sensor Cross Arm was designed to allow the wind sensors to mounted in a variety of positions. The central mount has a set screw which allows the mount to slide horizontally on the arm and rotate 360 degrees (Figure 4 and Photo 4). Sensors can now be mounted on roofs or equipment which are not level. It also allows the arm to be mounted under strictures like bridges or building overhangs.

⚠ **Do not put permanent Loctite products on the threads of these screws!** If required only use removable Loctite products.

Anemometer Redundant Pair to Cross Arm Installation (Figure 5)

20.4 - Mounting C5C Anemometers or D5C Wind Direction Vanes to C-MMA-16-06 Mast Adapters

Many applications require only a single anemometer or wind vane mounted on a mast or pole. For this type of application, the C-MMA-16-06 mast adapter (photo 5) is available. The adapter is machined from solid 316ss bar stock for strength and corrosion resistance. The C-MMA-16-06 adapter has a 0.5” O.D. sensor mount on one end and a female 1.0” NPT thread on the other. This allows the use of standard pipe and fittings to install the sensor. The overall length of the mast adapter is 6.0” and the 0.5” O.D. sensor mount section is 3.0”.

The C-MMA-16-06 Mast Adapter (Photo 5)

21 - Grounding, Electrostatic Discharge (ESD), and Lightning Protection

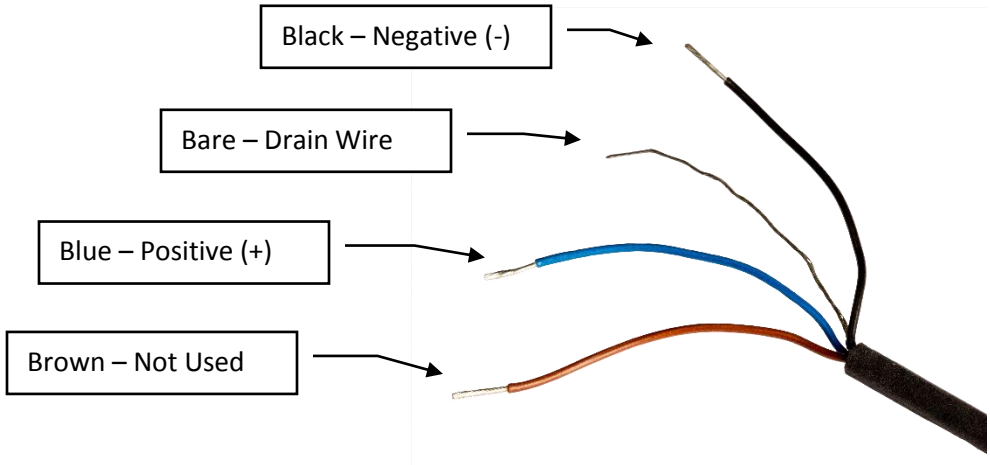
Anemometers and wind vanes are typically installed in remote open areas and at significant heights from the ground. This type of installation by nature will subject wind sensors to potential damage if certain precautionary measures are not taken. Improperly grounded sensors mounted on masts or towers are at potential risk to severe electrical damage from the accumulation of a static electrical charge and a subsequent electrostatic discharge (ESD). ESD will not only damage your anemometer and wind vane but also any connected loggers and displays.

Wind sensors are also frequently damaged by direct lightning strikes and stray voltages from indirect strikes. Quality wind measuring systems can become a substantial investment and must be protected from ESD damage through earth grounding and from lightning strikes through proper lightning protection techniques. In order to protect yourself from injury and your instruments from damage, consult with a qualified electrician to ensure that the tower and all instruments are earth grounded and a quality lightning protection system has been properly installed.

22 - Wiring Information

22.1 - Wire Color Codes for C5C and C5CH Series Anemometers (Table 1)

Anemometer Model	1st Conductor Color	2nd Conductor Color	Output Type or Power
C5C-1263-2-AC (HD Cups)	Black (-) (Coil Reference)	White (+) (Coil Hz Out)	AC Frequency
C5C-1263-2-SP (HD Cups)	Black (-) (Reed Switch)	Blue (+) (Reed Switch)	Switch Pulse
C5CD-1263-2-SP (HD Cups)	Black (-) (Reed Switch)	Blue (+) (Reed Switch)	Dual Switch Pulse
C5C-1265-2-AC (Cast Cups)	Black (-) (Coil Reference)	White (+) (Coil Hz Out)	AC Frequency
C5C-1265-2-SP (Cast Cups)	Black (-) (Reed Switch)	Blue (+) (Reed Switch)	Switch Pulse
C5CH-3263-2-AC (Heated)	Black (-) (Coil Reference)	White (+) (Coil Hz Out)	AC Frequency
C5CH-3263-2-SP (Heated)	Black (-) (Reed Switch)	Blue (+) (Reed Switch)	Switch Pulse
C5CA-1264-2-SP (High Res)	Black (-) (Reed Switch)	Blue (+) (Reed Switch)	Switch Pulse
C5CH Heater Element	Black (-) V out Terminal	Red (+) V out Terminal	12 Volts DC



23 - Wind Sensor Signal Protection from (EMI) or Electrical Noise

23.1 - Wind Sensor Shielded Cable Information

All Richards wind sensors are provided with twisted and shielded cables. It is very important that any cables used with the sensors also be properly shielded to prevent electromagnetic interference (EMI) from sources near the installation. Wind sensor cables should not be run near power cables or other noise generating sources. Electrolytic processes, heavy motors, generators, transformers, induction heating, relay controls, and control wire are some of the more common noise sources which can disrupt wind sensor signals.

⚠ ***When wiring anemometers or wind vanes, always use a high-quality shielded cable and avoid (EMI) sources which may disrupt your sensor signals.***

24 - LW-1261-CD Series Wind Speed LCD Displays

24.1 - Wiring LW-1261-CD Wind Speed Displays to Your C5C-1263-2-AC Anemometer

LW-1261-CD Wind Speed Displays come standard with a 50ft length of shielded cable. C5C series anemometers are manufactured with a 108" length of signal cable. To prevent signal problems, it is very important that all the same color wires should be connected, and the shield drain wires. On wind speed systems Both of the black (-) wires should be connected. The white (+) wires should also be connected. The shield drain wires should be connected as well.

⚠ ***When wiring the LW-1261-CD instrument to the anemometer, always maintain the wire color codes. Black to black, white to white and shield drain to shield drain.***

25 - Periodic Wind Sensor Maintenance

25.1 - Cleaning of the Anemometer

In order to maintain the peak performance and high accuracy of your Richards C5C Series Cup Anemometer, it is important to periodically inspect the instrument for any accidental physical damage, wear, or excessive dirt build up on the instrument. Visually inspect the sensor for any excessive accumulation of dirt, dust, bird droppings, or any other foreign material collecting on the outer surfaces of the rotor cups or instrument housing. Clean any of this build-up with a damp soft cloth to prevent scratching the sensor's orange, green, or black protective coatings. Solvents and cleaning fluids should not be used since they may also damage the sensors protective coatings.

25.2 - Physical Damage Inspection

All wind sensors in the field should be inspected periodically for any signs of physical damage. Anemometers can on occasion be struck by birds or flying debris which may inflict slight damage to the sensors. The C5C anemometers rotor arms should also be checked to make sure that they are straight. Any rotor arms with minor damage can be carefully re-straightened in the field if required. Severely damaged rotors should be returned to the factory for repair, balancing and recalibration.

It is important to inspect the anemometer signal and heater element cables for signs of damage. Cables which are not securely fastened to the tower or mast can blow in the wind and cause wear damage to the cable's outer insulation. Any cables which show signs of wear or damage should be repaired or replaced immediately.

Make sure the anemometer signal cable is securely fastened to the mast to prevent the wind from causing wear damage to the outer insulation.

25.3 - Removable Wind Sensor Shaft Towers

All Richards wind sensors utilize a specially designed removable bearing shaft tower mounted between the rotor and housing assemblies. The shaft tower has been installed and factory torqued to provide a weather tight O-ring seal. The tower should remain secure for the service life of the unit but should be routinely inspected. To check, grasp the tower with your hand and confirm that it remains hand tight. If the sensor tower has become loose, grasp the tower and firmly again tighten by hand. Place the included torque pin into the hole and turn about 1/8 of a turn.

Do not use a wrench to tighten the tower. The use of tools will damage the orange, green, black, or blue protective coating on the sensor.

25.4 - Testing Sealed Precision Bearing Condition

The C5C Series Cup Anemometers have stainless steel shafts which rotate using a pair of sealed precision ceramic ball bearings for extreme meteorological conditions or areas of high turbulence. It is normal for these bearings to wear over time while the sensor is in service. In order to maintain the peak performance and accuracy of your sensors, it is recommended that these bearings be replaced every three to four years or at any time it is determined that they have become worn. Some of the more severe installations may require more frequent bearing changes as on a yearly basis. Wind sensor ball bearings should be checked once a year. Under average low wind conditions, the precision bearings used in C5C Series Anemometers have a typical service life of up to 3-4 years. The actual condition of the bearings can easily be determined in the field with a few simple tests without the removal of the sensor. Both the C5 and C5C anemometers can utilize the same bearing test procedures. Gently grasp the rotor and check for any excessive wobble, grinding, or side play in the bearings. Gently pull up on the rotor and observe the amount of shaft endplay. There should only be between .005" to .010" of end play.
Tap one of the rotor cups into slow rotation and observe the stopping motion of the rotor assembly. The anemometer rotor should spin smoothly and return to a slow even stop without grabbing, binding, or any audible noise. Continue checking the rotor motion 360 degrees around the sensor. Each time the anemometer it should return to a slow even stop.

After performing these simple tests, if any of the ball bearings show signs of significant wear or binding, they should be replaced. It is important that both bearings always be replaced as a set. Any C5C

anemometer found with worn ball bearings or noticeable threshold increases above an acceptable level should be replaced by a qualified technician or returned to the factory for service and recalibration in our wind tunnel. Please follow our outlined instrument returns process in this manual if required.

25.5 - Procedure for Field Replacement of Sensor Bearings

The C5C Series Anemometer utilizes two high precision ceramic bearings which can easily be replaced in the field. It is not necessary to disconnect the wiring to the sensor. The bearings can also be changed with the sensor body still mounted on the cross arm or horizontal boom. The anemometer shaft tower can be removed and transported to a suitable work area for the service.

1. The rotor hub has three wind cups attached. There is a special pin set screw on the side between two of the wind cups which hold the rotor on to the shaft.
2. Locate the 3/32” Allen wrench and remove the screw all the way out. It must come all the way out since there is a pin on the point of the screw which goes through the shaft.
3. Gently pull the rotor off the anemometer shaft and put aside with the pin set screw.
4. Locate the 1/8” diameter torque pin included with the anemometer or new bearing set.
5. Place the pin in the hole on the side of the anemometer shaft tower.
6. The shaft tower is the orange cone shaped part of the sensor above the main housing.
7. Push the pin with your thumb counterclockwise to unscrew the shaft tower from the housing.
8. Lift off the tower.
9. ⚠ Make sure the thin housing O-ring remains in the housing groove (replace if damaged)
10. Locate the Allen key access hole on the side of the tower threads.
11. Use a 5/64” Allen key and remove the set screw holding the magnet to the shaft.
12. Gently grasp the shaft and pull up and the magnet assembly will come off the shaft on the bottom.
13. Gently pull the shaft all the way off both upper and lower bearings.
14. Remove the upper E-clip from the top bearing.
15. Remover the upper bearing shield from the tower
16. Remove the old upper bearing from the shaft if it is stuck on.
17. Clean off any dirt or rust particles from the shaft.
18. Put the shaft aside.
19. Using a Philips screwdriver, remove the two screws inside the shaft tower which hold the lower bearing retainer plate.
20. Remove the plate.
21. Put the screwdriver thru the upper bearing opening and gently tap out the lower bearing.
22. Put the screwdriver thru bottom of the shaft tower and gently tap out the upper bearing.
23. Using your thumb carefully press the **new** lower 1/8” bearing (C-BRNG02-ALSC-00) into the bottom of the shaft tower.
24. Replace the bearing retainer plate and secure with the two Philips screws.
25. Using your thumb carefully press the **new** upper 3/16” bearing (C-BRNG03-ALSC-00) into the top of the shaft tower.
26. Install the top bearing shield.
27. Install the top E-clip.
28. Slowly slide the shaft down through the upper and lower bearings.
29. Replace magnet assembly all the way onto lower shaft.
30. Push down on the top of the shaft and up on the magnet to remove any play.
31. Align one of the set screws with the flat on the shaft.

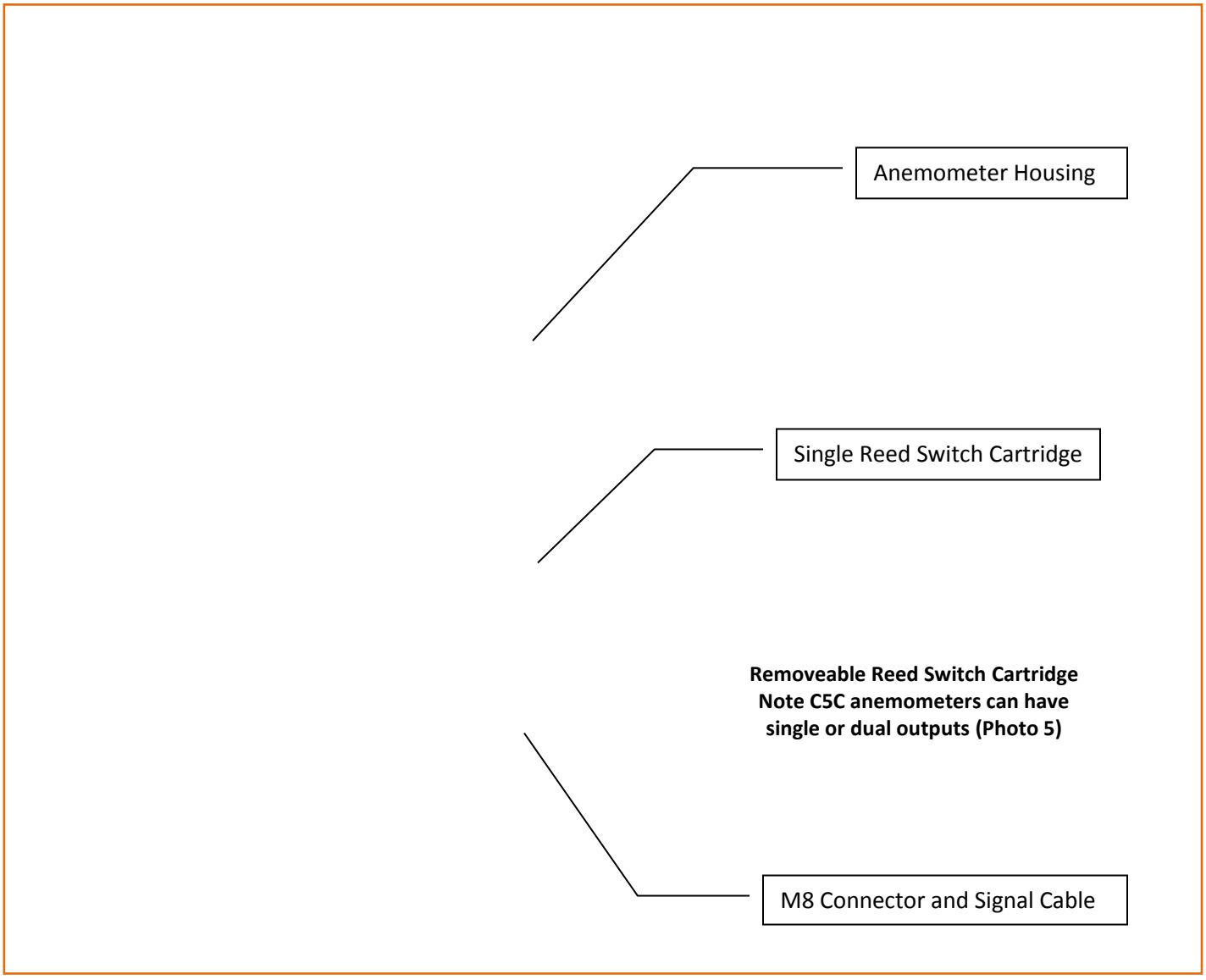
32. Use the 5/64” Allen wrench to secure the magnet assembly with the two set screws.
33. Gently pull up on the shaft and make sure there is a small amount of play. If there is excessive play, the magnet assembly is not all the way on the shaft and needs to be pushed on more. If it does than loosen the two set screws and while holding the shaft push up on the magnet and retighten the set screws.
34. Replace completed shaft tower assembly back onto anemometer housing.
35. Make sure O-ring is still completely seated in the housing groove.
36. Tighten the shaft tower clockwise by hand only until the shaft tower is all the way down to the O-ring surface of the anemometer housing.
37. Place the 1/8” pin into the shaft tower hole on the curved surface of the side of the tower.
38. Using your thumb, tighten the tower about ¼ turn or until face of the shaft tower is all the way down to the housing.
39. ***Do not over tighten.***
40. You will need the Pin Set Screw to secure the 3-Cup Rotor Assembly back onto the shaft.
41. Thread the Pin Set Screw into the Rotor Hub only about 1/8”.
42. Rotate the shaft so that the pin hole in the top of the shaft is facing you.
43. Grasp the rotor assembly and slide the hub on the shaft so that the flat and pin hole on the shaft are in line with the Pin Set Screw threads on the side of the hub .
44. Carefully screw in the set screw till it finds the hole in the shaft.
45. **DO NOT FORCE THE SCREW!** If lined up properly it should screw all the way in flush with the outer surface of the rotor hub.
46. Once the screw is flush you can fully tighten.
47. The 3-Cup Rotor should now spin nicely on the tower assembly.
48. The wind sensor is now ready for service.

25.6 - Procedure for Field Replacement of the Anemometer Reed Switch Cartridge Assembly

The C5C Series Anemometer utilize one or two field replaceable reed switch cartridge assemblies which were specifically designed to be easily replaced in the field. C5C series anemometers have single pulse outputs and have one reed switch cartridge and the C5CD series anemometers have two separate pulse outputs using two cartridges. The replaceable reed switch cartridge can be ordered using the Arklay S. Richards **Part number C-R2919-1055-500-10.** Since C5C anemometers are of metal construction and tend to be mounted at elevated heights they can occasionally be struck by lightning. If the sensor is struck by lightning the reed switch can become damaged. In order to repair the sensor, the reed switch assembly can be removed from the bottom of the anemometer and a new assembly can simply be screwed into the bottom of the wind sensor.

Follow the instructions below to safely disconnect the male M8 cable connector and reed switch cartridge assembly. Improper removal of the male M8 cable connector can cause damage to the reed switch cartridge.

Note, the anemometer does not have to be disassembled to remove the reed switch cartridge.



Reed Switch Cartridge Assembly (Photo 6)

1. Remove the anemometer from its mounting location.
2. On the bottom of the anemometer you will see the yellow cable end with a round M8 Connector.
3. Turn only the M8 nut counterclockwise until all the way out and gently pull the M8 connector from the reed switch cartridge to disconnect the wind sensor signal cable.
4. Grasp the knurling on the reed switch cartridge and turn counterclockwise all the way out of the anemometer housing.

5. **Do not put a wrench on the female connector on the reed switch cartridge housing. Rotating the female connector can cause internal damage to the reed switch in the housing.**
6. Install new reed switch cartridge in the bottom of the housing.
7. Screw in counterclockwise by only turning the knurling on the cartridge until hand tight.
8. Plug the signal cable back into the reed switch cartridge by first aligning the key inside the plug.
9. **Note the M8 connector has this key so it only will go in one way (Photo7).**
10. Screw the M8 connector nut back into the female connector socket on the housing until tight.
11. The wind sensor is now ready for service and can be mounted back on the mast adapter.

Reed Switch Cartridge Assembly (Photo 7)

26 – Troubleshooting Anemometers with Pulse Output (Reed Switch)

26.1 - General Information

The C5C Series Anemometer creates a pulse output signal from a reed switch contact closure (4 pulses per revolution). The C5C output can be checked with a multi-meter which is set to read continuity. Resistance is too small to check with a meter. As the rotor rotates the meter will beep as the switch opens and closes. It is also possible to set a meter to Voltage and see if a pulse is detected. If there is no pulse indicated when the sensor is in motion, the first thing to check is the connection between the sensor leads and the instrument or PLC cable. The continuity should be checked at the sensor leads. If there is no pulse detected the rotor magnet assembly should be checked and make sure it has not become loose. If the rotor is not damaged or loose, the switch may be damaged.

26.2 - Causes for Reed Switch Damage

The reed switch in the C5C Series Anemometer must be operated below the following parameters: For DC power **(Max 20 Watts, Max 24 Volts, Max 1 Amp)** and AC power **(Max 20 Watts, Max 140 Volts, Max 1 Amp)**. If any of these specifications are exceeded the switch will burn back or weld together. In most cases when there is an anemometer failure it is due to a spike in Amps which will destroy the reed switch. Lightning or stray voltage can also damage the sensors reed switch. A lightning arrester should be installed if possible. Most PLC's usually operate with 24 volts or less in milliamps which is fine for the reed switch. If the PLC has a surge when powered on, this spike could damage the anemometers reed switch, but this is not very common.

26.3 - Condition – C5C Anemometer Has Lost its Pulse Signal

If the C5C Series Anemometer has lost its pulse output signal, rotate the rotor and check the continuity with a multi-meter. Verify that the switch is pulsing 4 contact closures per revolution of the rotor. You should have 4 open readings and 4 closures of the switch with about .1 to .4 Ohms of resistance. If the meter shows high resistance (5-14 Mega Ohms) during the closures, this indicates that the switch has burned out and not closing completely. This condition can be caused by a high voltage power surge, or a possible lightning strike. If the reed switch cartridge assembly is damaged, it can be replaced by purchasing **Arklay S. Richards Part Number C-R2913-1055-500-10**. The Arklay S. Richards Co., Inc. can be reached at 617-527-4385 Monday-Friday 8:30am - 5:00pm EST.

26.4 - Wind Sensor Electrical Protection

The reed switch in the C5C Series Anemometer must be protected from potential power surges caused by the turning on and off equipment and nearby lightning strikes. A line conditioner is a good idea and a power interrupter between the power source and the PLC is recommended as well.

Note: C5C Series Anemometers have an internal varistor for protection from most stray voltages, but additional protection is always a good idea.

27 - Regulatory Compliances and Test Standards

27.1 - Wind Tunnel Calibration Test Standards

ASTM D 5096-02 (Standard Test Method for Determining the Performance of a Cup or Propeller Anemometer)

ISO 17713-1 (Meteorology Wind Measurements Part 1: Wind Tunnel Test Methods for Rotation Anemometer Performance)

MEASNET, IEC 61400-12-1:2017 Annex F, Modified for 1-45m/s (Wind Tunnel Test Calibration Procedure for Anemometers)

28 - Replacement Parts and Accessories

28.1 - Parts List for Consumables and Accessories (Table 2)

C5C Series Anemometer Parts and Accessories	Part Number
Adjustable Buck Horn Cross Arm for Compact Series Wind Sensors (36”, 316ss)	BHC-36-C-SS
Heater Control Box for C5CH Series Anemometers, 120 VAC	SJB-1263-H-VA
Heater Element for Wind Sensors (12 V Assembly, 108”)	C-H050-15-12-A-108
Wind Sensor Cable (M8, 3 Meter, 3 Wire, Shielded, Drain, White/Black/Blue, Urethane)	C-CBL-C5C-PSG-3M-S
Mast Adapter for Compact Wind Sensors (6”, 316ss, 1” Female NPT)	C-MMA-16-06
Replacement Wind Sensor Shaft Tower Bearing Set (Bottom, Ceramic)	C-BRNG02-ALSC-00
Replacement Wind Sensor Shaft Tower Bearing Set (Top, Ceramic)	C-BRNG03-ALSC-00
Replacement Reed Switch Cartridge Assembly (R2)	C-R2919-1055-500-10
Surge Protector for Wind Sensors (External Unit)	PI-325-C
Wind Sensor Cable (Anemometer, White/Black, Arctic Ultra Flex)	20I01-AU-S
Wind Sensor Cable (Anemometer, Shielded, Drain, White/Black, PVC)	20I01-PP-S-SD-DW
Wind Monitor/Alarm (LCD Display, Wind Speed, Direction and Temperature)	490-A
Wind Sensor Outdoor Junction Box	SJB-1263-X
Wind Speed Display, Waterproof Aluminum Housing (LCD Display, Red Powder Coat)	LW-1261-CD
Wind Speed Recording Kit	PI-W-110
Wind Speed Micro Transmitter (4-20 MA Output)	421-TS100

29 - Warranty and Service Information

29.1 - The Arklay Richards 5-Year Warranty

The Arklay S. Richards Company is extremely proud of the superior quality, performance, and durability of our industrial wind sensors. We expect all our C5C Series Anemometers and D5C Series Wind Direction Vanes to provide many years of trouble-free service for our customers. We stand by our products and guarantee that your Richards wind instrument will be free from any defects in materials or craftsmanship for a period of 5 years from your original invoice date. If at any time within this warranty period, your C5C Series Anemometer or D5C Series Wind Direction Vane is found to be defective, we will repair or replace the unit at no cost. This warranty does not include consumable components consisting of ball bearings, shafts, or sensor damage caused by improper installation, negligent handling, unauthorized modifications, lightning strikes, ESD damage, power surges, lack of necessary maintenance, or flying debris.

30 – Wind Sensor Return Authorization Instructions

If at any time your C5C Series Anemometer or D5C Series Wind Direction Vane requires service for general repairs, maintenance, or recalibration in our wind tunnel, please follow our instrument return instructions. All Richards C5C Anemometers and D5C Wind Direction Vanes are shipped in custom made boxes for maximum protection of the sensors during transit. All instruments returned for service should be shipped back in the same packaging. Before instruments can be returned you must contact us to obtain a Return Material Authorization or RMA number and provide us with your instrument serial number and details regarding the reasons for return. If the sensor is being returned for repair, please submit a report which details the following information; the reason for returning the unit, description of the problem with the sensor, where the sensor what installed, how many sensors have this particular problem, what type of electronics were driving and controlling the sensor, and the power source type and voltage used.

31 – Wind Sensor Return Mail Address

31.1 - All Wind Instrument Returns Should be Sent Prepaid to the Following Address.

Arklay S. Richards Co., Inc.
Wind Instrument Services
72 Winchester Street
Newton Highlands, MA 02461 USA

32 - Arklay S. Richards Co., Inc. Sales and Support Contact Information

32.1 - Sales and Support Contact Information

Phone: 617.527.4385
Fax: 617.964.3746
Email: sales@asrichards.com
Arklay S. Richards Industrial Wind Sensor Website: www.arklayrichardswind.com

33 – Made in the USA

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