# **COMPLETE INSTRUCTION MANUAL**

# Weather Flow Tempest system and smart weather stations





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# 1. Parts List:

- Tempest sensor device
- · Flat base and pole mount attachments
- WiFi hub
- USB power cable and wall socket for Hub
- Does not include hardware for installation.



## 2. Measured variables and characteristics:

- Outdoor temperature, humidity, dew point, temp. Perceived
- Station pressure and sea level pressure
- · Wind speed, wind direction, average and gusts
- Lightning activity (hits and range up to 25 miles)
- · Beginning, intensity, duration and accumulation of rain
- DeltaT, wind chill, wet bulb temperature, air density
- UV index, brightness, solar radiation
- IOS and Android app and free personal weather page
- Free personal weather page: <u>https://tempestwx.com/station/12949/Self-</u> calibrationwithcontinuouslearningsystem
- Works with Alexa, Google Home, IFTTT, and more



# 3. Detailed installation instructions

#### Download the app and create an account

- 1. Download the 'Tempest Weather' mobile app. Follow these links to get the Tempest Weather app in the Google Play Store or the Apple App Store.
- 2. Enable Bluetooth on your smartphone or tablet and launch the app. If you are using an Android device, make sure you enable Location Services for the Bluetooth connection services to work properly.
- 3. Enter an email address and password. (Write it down so you don't forget!) The hardware (Hub + Tempest device) can only be configured on one account at a time. You can share the account login or public URL generated for your station after it is set up.
- 4. Now tap "Setup Station" and follow the guided steps in the app to set up your hardware on a "station". A station consists of a Hub and connected sensor devices, such as the Tempest device.

- 5. Plug in the hub. Tap the NEXT button and proceed with the configuration.
- Twist off the base of your AIR & SKY device. (It's water tight *twist hard!*). Insert 4 AA lithium batteries in AIR and use the solar panel accessory for SKY device (recommended) or 8 AA batteries. Make sure batteries are oriented correctly. See Batteries & Solar Power for further installation instructions. Tap NEXT and proceed.
- 7. Enter your Hub serial number (located on a sticker at the bottom of your Hub). Tap the NEXT button.
- 8. Give the station a name. (We suggest you choose a name that describes the place like "NW River Bend" or even the name of the town and street works great.)
- 9. Tap "Set" to set the geographic location. A map should appear to pinpoint your geographic location (make sure location services on your phone or tablet are enabled). If necessary, you can drag the map to adjust the marked position. Once the pin is in the desired location, tap the check mark in the top right corner. Tap NEXT and proceed. The altitude above sea level is automatically determined based on your geographic location.
- 10. Click the "Next" button.
- 11. Give your AIR/ SKY device a familiar name (e.g. for *AIR* backyard, upper deck, or patio and for *SKY* roof, chimney, or fence). Choose if the device will be located outdoors or indoors. Input the approximate height you will place the device above the ground. Then tap the "Save" button.
- 12. Gather your home WiFi network name and password. Tap the "Next" button.
- 13. Select your desired WiFi network. Enter the WiFi password. (If you don't see your desired WiFi network, tap "Refresh" in the upper right and/or reboot your WiFi router.)
- 14. Success! Wait about 5 minutes for the initial sensor data to start filling in, then it's time to site your sensors.
- 15. See, AIR & SKY siting and installation for the installation. Here are installation examples: <u>https://help.weatherflow.com/hc/en-us/articles/</u><u>360059011334-Tempest-Installation-Gallery</u>. Step by step guide for mounting on flat base and pole: <u>https://help.weatherflow.com/hc/en-us/</u><u>articles/360047672153-Flat-Base-Pole-Mount-Step-by-Step-Guide</u>

Check out the **community forum**! Chat with other station owners, forecasters, weather enthusiasts, developers, and WeatherFlow staff and stay up to date on all of Tempest.

# 4. Positioning and installation of the AIR & SKY device

#### Location and installation for AIR & SKY

AIR and SKY can be easily placed and installed in various locations around your property. The sensor devices are capable of maintaining a connection to the hub up to 1000 feet (300m) away without obstacles.

The Tempest device can maintain a connection to the hub up to 300m away with direct line of sight. Obstacles such as walls and ceilings will reduce signal strength and weather. You can make sure your Tempest device is getting a good signal with the hub by viewing the RSSI value in the app, go to settings> stations> select station> status. An RSSI close to 0 indicates a good connection while weaker connections are between -80 and -100.

The Tempest device should be mounted vertically and as horizontal as possible for accurate wind readings.

Correct alignment is critical for accurate wind direction and exposure of the panels to the sun for solar charging.

The blue arrow A on the side of the device should face true north or true north and the solar panels aligned south for optimal sun exposure. If your station is in the Southern Hemisphere, point the arrow south with the panels aligned north. Tempest devices configured in the Southern Hemisphere will automatically receive a 180 ° wind direction correction via the software.

True or geographic north / south is not the same as magnetic north / south. A compass will point towards the magnetic poles. Geographical north / south is the true center point of a hemisphere and is the basis for referring to wind direction.

#### Correct orientation of Tempest



A compass can help you align your Tempest, but you need to adjust the compass reading with your magnetic declination. An easy way to accurately align the device is to find a north or south landmark on the map when locating the station and use it to align the arrowhead. For example, the side of your house or any landmark you can see that gives you a clue to a known cardinal direction.

## 5. Simple Installation Kit Instructions

Be sure to read our Siting & Installation guide to help you decide the best location on your property to install your Tempest. The Simple Installation Kit, available in our online store, can be attached to any vertical structure like a fence post, a shed, the side of your house, etc. The Tempest should extend above the structure as far as possible.



## **Basic Instructions**

Follow the diagram to assemble your Simple Installation kit. The PVC parts can be press-fit together. For a more secure installation, PVC glue may be used, but it is not required. The kit includes six stainless steel screws suitable for attachment to sturdy wood, plastic or metal. You may need to obtain alternative hardware if the screws are not appropriate.



#### Customization

Feel free to make adjustments if you find that the dimensions of the Simple Installation Kit do not accommodate your installation location. You can customize the length of the pipes by cutting the included pipes or by purchasing additional PVC pipe from your local hardware store. Be sure to use schedule 40 or schedule 80 PVC pipe. Individual pipe sections should not exceed 36 inches.

# 6. AIR (temperature, humidity, pressure and lightning)

For correct measurement of temperature, humidity, pressure and lightning, locate the AIR as follows:

- At least 3 feet off the ground
- In full shade or on a radiation shield If you don't have a fully shaded place all day, the small, wireless form factor makes it easy to move the AIR unit from season to season as the angle of exposure to the sun changes.
- Away from potential sources of heat and humidity (sprinklers, greenery, vents, bricks and other dark surfaces)
- Away from nearby sources of electromagnetic interference (antennas, electric fences, boilers, ovens, outdoor speakers, motion lights)

**Orientation**: AIR should be vertical for the most effective lightning detection. Proper moisture removal requires the AIR to remain upright unless the AIR is protected from water and condensation.

**Relative Humidity Note**: If the humidity reading appears to be high (or low), remember that AIR is reporting hyperlocal conditions. An accurate measurement can differ greatly from other sources you are used to. Remember, this is YOUR TIME, not airport time reported by your phone or TV news. Your yard has its own `` microclimate " and will report the truth about the exact location your AIR is in - this means it will be wetter near things like trees, ground cover, wet decks, air vents 'dryer, etc. it will be closer to surfaces that receive direct sun.

Lightning  $\not\sim$  Detection Note: Although AIR should detect most lightning strikes, it may not log all lightning strikes. The lightning sensor is relatively sensitive to both position and direction. If the AIR detects regular "false positive" strikes, this could be due to another source of electromagnetic interference (motors, fluorescent lights, radios, computer electronics, etc.). Make sure you locate your AIR away from these sources. On the other hand, if you feel your AIR is detecting fewer real lightning strikes than you experience, try moving or rotating it slightly. Small changes in the positioning of AIR can make a difference.

## AIR - Device observations

There is often an explanation for readings that seem just a little wrong. Observations from nearby weather stations and other data sources may not match exactly. Weather stations can be located differently and some areas are subject to microclimatic conditions. Instrumentation also varies between weather stations; different sensor manufacturers and instrument styles have different accuracy specifications and limitations.

**Microclimates** are localized atmospheric conditions that differ from those of the surrounding area. For example, most airport weather stations read higher temperatures and lower humidity as they are located on an asphalted surface where the ground material is best suited to radiate heat into the air above. These microclimates can be created by soil, soil vegetation and trees, streams, urban areas or soil influences, etc.

**Location differences** can also lead to different readings. Some personal home weather stations may be misplaced or simply experiencing the environment as it is around them. Moisture on wooden decks, dryer vents, lack of proper radiation shields, and direct sun exposure lead to distorted temperature readings.

If possible, try moving your AIR and analyzing the data - you may be surprised by the various microclimates around you and the careful location for accurate data.

## Temperature

- The temperature reading is high: even in the case of direct sun exposure, the thermometer used in the Tempest device is shielded from direct solar radiation and the extra heat from the device is represented by the integrated software that corrects the radiation of the ambient temperature. For ease contact us if you have problems reading the temperature.
- The temperature is low: temperature discrepancies are often explained by differences in location and location. Other weather station equipment could be placed near heat sources or something that radiates heat such as a roof or the side of a house. Tempest software adjusts the raw temperature reading to an ambient temperature by simulating an ambient sucked by a fan. If other equipment (used for comparison) uses a thermometer drawn in by a fan, there may be cobwebs, leaves, or other debris that could restrict airflow. Some weather station equipment uses batteries that need to be replaced or fans with motors that need to be replaced. If other equipment is not drawn in by the fan, this could explain why Tempest gives a cooler temperature reading.

# **Relative humidity**

• Relative humidity is high: typically caused by nearby moisture sources. Check that the environment surrounding the AIR device does not have potential sources of moisture, soaking the wood, try moving AIR to a drier place if the humidity remains high for a long time. See <u>https://</u> help.weatherflow.com/hc/en-us/articles/115005229767-Proper-Siting-Installation#AIR.

#### Pressure

• The pressure is not correct: Check the AIR "ground clearance" setting in the app. This should be set as the height of the unit above the ground surface, not the elevation of your location above sea level. Open the app, go to Settings> Stations> choose your station> Manage devices> select an AIR> change ground clearance.

# Lightning

- False positives: The lightning detector in AIR detects the small electromagnetic pulse produced by the lightning. While it will reject most triggers from non-lightning fast sources, it could signal false positives. Possible sources of EMI (electromagnetic interference): piezo lighters, electric drill, electric motors, ignition system (cars, boilers, ovens), appliances, fluorescent lights, televisions, light switches, high voltage cables, solenoids, motion detectors , speakers. Make sure you place the AIR away from such sources. Relocate your AIR if you receive false positives from electromagnetic interference. If you can't identify any obvious potential interference or are limited in placement options, subtle changes to AIR's placement can make all the difference. Try rotating the AIR so that the logo or the ventilation slots are facing another direction.
- If you can't find a location on your property that is free from electromagnetic disturbance, you can turn off lightning alerts in the app: settings> alerts> tap lightning alerts to disable them.

You can also disable the lightning sensor altogether (make sure you have the latest app update installed): settings> stations> [select your station]> manage devices> [select your AIR device]> advanced> disable lightning . While disabling the lightning sensor isn't ideal, it's a good solution for those who simply can't avoid frequent false positives.

• **Does not detect lightning**: the lightning detector is designed to detect thunderstorm activity and approximate distance; it cannot detect every lightning bolt. Make sure your AIR is mounted vertically / upright and unshielded from a metal object from any direction. The lightning detection

antenna inside the AIR is oriented in such a way as to optimize the uptake of lightning activity.

 If you are not receiving any lightning observations, check the app to make sure the lightning sensor is enabled: go to settings> stations> choose your station> manage devices> AIR> advanced> "Disable lightning" should be unchecked.

## 7. SKY (wind, rain and UV / solar)

Your SKY will report accurate data wherever it is installed. Your SKY doesn't need to be installed on a tall tree or roof - it's perfectly fine to install it on a fence post or shed, for example. For an ideal measurement of wind, rain and solar conditions, try positioning your SKY as follows:

- With full exposure to the sun and sky ... Shadows from trees and buildings can block light and rain sensors.
- With unobstructed wind exposure ... Obstacles upwind of your SKY will affect wind measurements. Try to install SKY over nearby obstacles in all directions permitted from your location. SKY also needs at least 15 cm (6 inches) of horizontal distance from any object for the wind sensor to function properly.

**Mounting**: make sure that the structure (pole, pole, tree roof, wall, railing, etc.) on which SKY is mounted does not move, does not move or otherwise transfer movement or vibrations to the SKY unit.

If you can easily trigger false rain readings by pushing the mount or mast, you might want to consider adjusting your setup. There are two standard ways to mount your SKY:

- The pole mount is designed to fit a standard "one inch" nominal pole (OD = 1.315 "or 33.4mm) as well as a 1.25" (32mm) OD pole and anything in the half. You can find a shaft length at your local hardware store or order one online.
- The flat base mount attaches to a horizontal surface via a 1/4 "-20 threaded insert (standard camera mount) or keyhole slot on a screw or nail.

**Rain Note:** The SKY rain touch sensor detects rain by detecting the vibration caused by individual raindrops hitting the top surface. There are filters in place to identify and correct non-rainy sources of vibration (loose fitting, bird landing, etc.), but these filters err on the side of caution. This means that some sources of vibration may appear to the sensor as real rain. If this "false rain" phenomenon occurs, the installation may need to be adjusted to avoid any movement or vibration that may cause it.

## SKY sensor readings Wind speed

- The wind speed is incorrect make sure there is nothing between the transducers and the reflector plate, such as snow, leaves, bird droppings, or other debris.
- The wind speed is too low: observe the surrounding area, 360 ° around your Tempest device; take note of any obstacles that could affect wind flow. Winds are typically faster at higher altitudes due to surface turbulence. Notice how high your Tempest device is mounted. Tempest uses an ultrasonic anemometer to sample an instant wind speed, there is no inertia involved in the measurement. A rotating cup anemometer or any mechanical sensor relies on the momentum of the moving air to rotate the bearings. A method of measuring wind speed without inertia has inherent differences from a mechanical anemometer and the data provided will not be exactly the same. Tempest has a slower activation rate than most consumer anemometers; it is capable of measuring very light winds. Take note of any low calm readings that lower the average wind speed. Low pauses or speeds close to 0 are an indicator of turbulent flow around the device. Try to locate the Tempest device farther away from any obstacles that could create turbulent flow. You may find that the wind speed readings are more in line with expectations.
- Unreal Wind Gust: Incorrectly high gust readings are typically caused by water droplets or other debris on the lower reflector plate. In winter, ice buildup can also cause erroneous readings. Anything that obstructs the ultrasonic signals within the air gap can cause problems with the readings. Check if the super hydrophobic coating is still intact, look for signs of flaking that could allow water or debris to build up.



## The direction of the wind

- Wrong direction: Make sure the "N" marked on the exterior of the SKY unit is pointed towards true North (not magnetic north). Also ensure the mast and SKY is level. See info on proper orientation for Tempest. If you notice anything off with any of the transducers, please contact us.
- Direction is not displayed: Sometimes direction cannot be determined during precipitation events. Check the SKY's sensor status in the Smart Weather app: go to settings > station > choose your station > tap Status > scroll down to SKY's Sensor Status. If you read a "Wind Failed" message, please contact us.

# Rain

• False rain readings: Most false rain readings can result from strong winds on unstable mounts which cause the Tempest to sway or shake leading to vibrations detected by the haptic rain sensor. Check your mounting situation and see if you might be able to mitigate any unwanted vibrations. Sturdy masts and added cushioning on the mount can help improve structural stability and reduce wind driven vibrations.

Birds can be another common cause of false rain. If birds become a problem, consider installing a higher perch for them to land on or use shiny, reflective stickers on the Tempest and/or the mast to deter avian visitors.

- Over-reporting rain accumulation: Excess rain accumulation is inevitable on wobbly, unstable mounts, especially in in strong winds. The haptic rain sensor in Tempest is a precision instrument that is very sensitive to vibrations. It is essential to install the Tempest unit on a sturdy mast with secure mount. Check your mounting situation and see if you might be able to mitigate any unwanted vibrations.
- **Under-reporting rain accumulation:** If your sensor is consistently under-reporting rain accumulation, please see the Rain Accumulation help page.
- Inaccurate rain accumulation: Please see the Rain Accumulation help page.
- Not registering rain: Tempest will pick up on light rain but trace amounts of precipitation are unlikely to be detected. If the rain was heavy enough to make an impact on the device, but no rain was reported, first check the device's battery level in the app. The haptic rain sensor will be disabled under 2.36v to conserve power.

If the battery level is above 2.36v, check the Tempest's sensor status in the Tempest app to see if there has been a failure, go to settings > station > choose your station > tap Status > scroll down to Tempest's "sensor" status. Try power cycling the Tempest unit first, twist the device off its mounting attachment and flip the power switch off and back on. If you still see any failed sensor message, please contact us.

• No accumulation after rain start: If rain has started, but you are not seeing an accumulation value, simply wait for the accumulation to build. The rain is probably very light and if so, there will not be an accumulation above 0.01" immediately.

## UV

- Low UV readings: check that nothing obstructs the UV sensor at the top of the SKY device; leaves, ice, debris, shadows, etc.
- Inaccurate Calibration: It can take many days of clear skies to properly calibrate the UV/solar radiation sensor as many cloudless days of measurement are needed to perform calibration routines. Be careful when comparing UV index readings from different equipment. If you find any abnormalities with the sensor readings or notice your UV readings do not improve after a month or so, please contact us.

# 8. Additional information on the operation of the lightning sensor

Tempest's lightning sensor has several features that highlight why the Tempest System is more than just hardware. The lightning sensor in your Tempest device can detect strikes up to 40 km away, and while it does a good job at detecting many strikes in this range, it is far from 100% efficient. The closer the strike, the more likely the sensor will detect it, but it can miss-report strikes at any distance. It can also be susceptible to nearby electromagnetic interference and sometimes it's difficult for the algorithms onboard to tell if a strike is real or a "false positive". Fortunately, the data reported by the individual sensor in your Tempest is supported by additional data and a sophisticated back-end process that significantly improves the reporting of lightning. This is accomplished by comparing data from your Tempest with other nearby Tempests along with several trusted, third-party lightning data sources. The result is the best lightning strike data available.

## **Features**

- Strike Confirmation: Lightning strikes observed by a Tempest device are validated and processed normally.
- False Strike Identification: When a strike from a particular Tempest device cannot be validated, it is flagged as a false positive (useful for quality control & analysis), and not reported to the user.
- **Missed Strike Correction:** If the combined additional data sources confirm a lightning strike near a Tempest that was not detected by the device, the system will fill in the gap with the validated strike information.
- Long-Term Improvement: The Tempest lightning detection system is already the most accurate system available to consumers and, over time, you will see
- **∂**WeatherFlow

even better and faster results. The rapidly expanding Tempest network is quickly making the system better and our Continuous Learning system will make adjustments to the lightning sensor configuration parameters in individual Tempest devices, when necessary.

This customized fine-tuning of the sensor will optimize its performance at its particular location. Also, quality control alerts will proactively notify users in case there is some action they can take (such as relocating the Tempest away from sources of EMF) to further improve performance.

## 9. Additional information of the tactile rain sensor and the Rain Check Software Accuracy of the Haptic Rain Sensor

Rain Accumulation values are calculated over a 24 hour period from midnight to midnight using the station's local time. Be cautious when comparing rain accumulation readings to other sources, collection times may differ and rain does not fall evenly across regions, towns or even neighborhoods.

A default calibration is used for haptic rain sensors in the Tempest and SKY devices. The haptic rain sensor detects and quantifies rain through vibrations not directly by volume or weight and so, there are many factors that can influence the readings. Each and every haptic sensor in the field is subject to unique external factors that can contribute to accumulation discrepancies, for example, mount materials, mast height, environment, wind, and turbulence can all affect the rain accumulation readings.

When well sited and calibrated, the haptic sensor can measure rain accumulation very accurately (90-100% accuracy in Tempest and 80-100% accurate in SKY) compared to accumulation measured by a conventional rain gauge, which should also be well sited and co-located.

A conventional rain gauge can be highly precise but a haptic sensor is able to provide details on rain start time, event duration, relative intensity and rain rate at 1 minute resolution! Not to mention there is no need for the user to manually collect data after each rain event.

# **Calibration Adjustments**

A calibration adjustment can help improve accuracy of the haptic sensor readings if accumulation measurements are way outside of accuracy specifications. Due to the factors that contribute to different vibration signatures, calibrations may need to be applied in the field, after final installation. You should first ensure that your mount is sturdy and there are no external vibration contributing to over-reporting accumulation. Calibration cannot fix the effects of an unstable mount or random vibrations caused by winds, birds, etc.

If you think your device needs a calibration adjustment, we'd be happy to help. Our meteorological data science team can apply a calibration update to your devices using comparison rain data.

• I have another rain gauge I can use for comparison data

Using rain accumulation data from another trusted gauge sited close by is by far the best method to re-calibrate with successful results. Please send us the comparison data, 24 hour rain accumulation (from midnight to midnight local time).

- 1. Register your co-located gauge you are using for comparison data.
- 2. Once registered, **report individual rain events** (ideally over a 24-hour period, from 12AM to 12AM local time)

More data from a larger sample size of rain events is preferred. Submit comparison data from at least several precipitation events with varying intensity for the best results.

- 3. Follow up with us after you think you have submitted enough reports for a decent calibration adjustment.
- I do not have access to another gauge. Can I still get help with a calibration adjustment?

We can use data published online from nearby gauges and/or Rain Check values to help with calibration adjustments. If there is another trusted weather station close enough nearby that is reporting data online, we can review rain data to use as a reference for a calibration adjustment. Please contact us for assistance.

## Rain Check

Rain Check is a free and an *optional* bonus tool in the app. Because rainfall can vary so greatly over small distances, the goal of Rain Check is to provide a *WeatherFlow* 19 <u>https://weatherflow.com/</u>

representation of daily rainfall at the "neighborhood" scale, rather than just the rain that landed exactly on your Tempest device.

The Rain Check accumulation value starts with and depends on raw data from the haptic sensor in your Tempest, but it also considers other measures of precipitation in your area (including other Tempest devices).

Rain Check data is provided in the app each and every day in the AM hours (exact times may vary depending on weather conditions), Rain Check compares the raw accumulation calculations from the haptic rain sensor against a reference data set described below to create an accurate representation of the average rainfall for your location.

It does not erase the saved raw data derived from the haptic rain sensor but it does replace the accumulation value shown in the app. You'll know if you're seeing Rain Check data if the logo appears next to the rain accumulation value in the app.

## Availability

The Rain Check system currently only applies to stations located in the continental United States and some parts of Canada. WeatherFlow will continue efforts to make Rain Check or similar data available in other areas of the globe.

## Troubleshooting

Rain Check accuracy has a lower confidence score in areas where brief showers/thunderstorms are frequent and large terrain influence is present.

Rain Check can be enabled or disabled in the app under the **advanced device settings:** go to settings > stations > choose your station > manage devices > choose your Tempest or SKY device > advanced > toggle Rain Check feature on/off.

A well-calibrated haptic sensor, in SKY or Tempest, installed on a stable mounting position, free of vibration, will produce rain accumulation values that are remarkably good. Rain Check will improve the accumulation values in cases where a particular device is not ideally mounted, which is difficult to do in most home locations (see these siting & installation tips for more details). If you believe your haptic sensor is experiencing significant accuracy issues over multiple rain events, please contact customer service.

# **Technical Details**

Rain Check is a proprietary system that combines WeatherFlow device data with sophisticated 3rd party precipitation models that integrate up to seven (7) key precipitation data inputs to produce the most accurate rain accumulation estimate for a particular location. Precipitation inputs include: a reference network of over 25,000 quality-controlled precipitation gauges, climatological basemaps to account for complex terrain influences, a mosaic of state-of-the-science dual-pol estimated precipitation derived from NEXRAD radar sites, level-II radar reflectivity translated into a rainfall rate using standard Z-R algorithms, isopercental interpolation estimates in areas of complex terrain without adequate radar coverage, low altitude radar beam confidence rating to determine spatial suitability, and satellite rainfall estimates from NOAA's Center for Satellite Applications and Research (STAR) known as "Hydro-Estimator".

# **10. Solar Power & Rechargeable Battery**

#### Solar Power Module & Internal Rechargeable Battery

The Tempest device uses an integrated solar power charge module with four south-facing (north-facing in the southern hemisphere), vertically-oriented solar panels. This geometry provides optimal solar charging even in low sun angles at high latitude locations.

The internal rechargeable battery in Tempest is an LTO (Lithium-titanate) type, 1300mAh battery. This is ideal for use outdoors and in extreme temperatures. LTO batteries are safe on the environment and have a very long lifetime of almost 50,000 cycles - which is decades of recharging.

#### Operation

Your Tempest is shipped with a full battery and should give you about 2 weeks of operation without any additional power input, but you should put it in the sun as soon as possible. Note, it must be powered on in order for battery charging to occur.

From an empty state, it takes about 4 hours of adequate sunlight (350 W/m2 or so) on one or more of the four solar panels to reach a full charge. This is a rule-of-thumb and your mileage may vary. It will charge faster in direct sun but can still charge slowly with indirect sunlight. As long as your Tempest gets the equivalent of at least 4 hours of adequate sunlight every two weeks, it will continue happily running along. In the event of extended periods of low light conditions, power management code in the firmware will help your Tempest operate for as long as possible.

The LTO battery will continue normal charging up to about 113°F (45°C) and down to about -40°F (-40°C). And the battery will continue providing power well outside this temperature range for as long as it has a charge - usually long enough to return to a range where the battery can resume charging again.

#### Battery Level Indicator

You can check the battery level for your device by viewing the status page for your station: In the app, go to Settings > Stations > (choose a station) > Status

#### Battery Card Display



You can display a device's battery voltage in the app. To enable a battery card indicator on the data display, go to Settings > Stations > (choose a station) > Advanced > toggle Enable Battery Card

If you're watching the voltage level (because you are a true weather geek!), it may appear the Tempest is not charging even when the sun is out. That's because there is a "start-charge" threshold that must be reached before charging begins. This prevents the battery from going through a multiple charge cycle "yo-yo" during the day. Don't worry, that's normal. Every battery is a little different, but once it starts charging it will continue until the sun is no longer shining or it gets to a maximum of around 2.7 or 2.8 volts. From there, with no further input, it will decrease relatively quickly (over a couple hours) to around 2.6v, and then very slowly from there until the cycle starts again when the sun comes back out. This is perfectly normal too!

## **Power Save Modes**

#### Mode 0: Voltage $\geq$ 2.455

• All sensors enabled and operating at full performance

**Mode 1:** Voltage  $\leq$  2.415 from Mode 0 or  $\geq$  2.41 from Mode 2

Wind sampling interval set to 6 seconds

**Mode 2:** Voltage  $\leq$  2.39 from Mode 1 or  $\geq$  2.375 from Mode 3

• Wind sampling interval set to one minute

#### Mode 3: Voltage $\leq 2.355$

- Wind sampling set to 5 minutes
- All other sensors' sampling interval set to 5 minutes
- Lightning sensor disabled
- Haptic Rain sensor disabled

# Need some simple installation ideas? Check out some simple installation example esempi di installazione !

More information about the installations and height from the recommended land ...

- About 4 feet above the surface are sufficient for good reading and humidity reading.
- If you measure the speed and direction of the wind is important for you, we recommend that you get a cleaner wind. At about 6-10 feet from the ground is better if the surrounding area is free and open. Mounting above any nearby obstacles is better for ideal winds, but do so if the installation is feasible and easily accessible. Do not worry about mounting a roof line or a line of trees if it is too tiring. Professional anemometers are positioned at a standard height of 10 m (~ 33 feet from the ground) and have a clean wind detection (no obstacle to that height) for 10 times the distance of height, eg. It is almost impossible for the owner of a home meteorological station to meet these professional installation standards.
- For more ideal rain readings, it is recommended to place any all-in-one weather station at soil level in a waterproof area, away from trees, etc. For a higher precision, mounting on a robust structure, lowering the ground is particularly important for the Tactile Rain Temperature, which detects and quantifies the rain from vibrations.





## Additional Resources

Here is a link to the CWOP guide which outlines the general advice for the location of the personal meteorological stations: <u>https://www.weather.gov/media/epz/mesonet/cwop-siting.pdf</u>.

The CWOP location guide is a great reference, but for the vast majority of the user-friendly users simply you can not satisfy every guide line (especially being 100 feet from any concrete and no closer to 4 times the height of trees or buildings). It's okay! Your Tempest system is not a reference location for climate research. We invite you to consider your unbealing challenges / opportunities and observation needs when you decide where to fit your Tempest. Do not discuss you if your options are not ideal for each parameter. A common question among the observer meteorologists is that "you know a observation, is more useful", so we encourage all users to maintain their accurate and up-to-date metadata. This will improve your capacity of the Tempest system to provide you with the best weather data for your location.

#### **11. Troubleshooting / Hub Fix up Issues** Hub not found

If you get a "Hub not found" error message ...

- Be sure to enter the hub serial number when prompted and not the sensor device serial number.
- Make sure the app has permission to use Bluetooth on your device. Enable Location Services on Android devices.
- Turn off Bluetooth on other nearby devices. The hub could connect to other nearby BLE devices, laptops, smartwatches, etc.

If the problems persist, follow these steps:

- 1. Restart your smartphone or tablet.
- 2. Unplug the hub for 10 seconds and plug it back into the device power loop. It will take a few moments to restart.
- 3. Enable Bluetooth on your smartphone or tablet and stay close to the Hub.
- 4. Open the app and proceed with the configuration of the station in the app.

# Additional Tips

**For Android Devices**: Activate localization services. Enabling localization services is required to search for Bluetooth devices.

For iOS devices with the new iOS 13: after the new IOS 13 update, the Bluetooth authorization may be disabled. Make sure that the app has the Bluetooth authorization. G O Settings> Scroll down and find the Tempest App and activate "Bluetooth Sharing" for the application.

## Tempest device not found

The Tempest device must be in association mode before connecting to the hub. The coupling mode is indicated by a green LED flashing slowly on the base of the unit.

- 1. Remove the mounting attachment.
- 2. Based on the device, hold down the cancellation button next to the power switch until the LED blinks.
- 3. After a few seconds, the LED will flash slowly in green, pointing to it is ready for coupling to a hub. Continue with the configuration procedure in the app.

#### Additional suggestions

If the LED on the unit base does not light up at all, there may be a low battery problem. **Make sure your device is switched on and place it outdoors** with solar panels facing the sun. The Tempest device can be loaded enough within a few hours. Check the LED again.

If the LED is not slowly blinking green, reset the device to put it in pairing mode.

- 1. Press and hold the clear button on the base of the unit and release it when the LED flashes green. Using the SKY solar panel accessory: The solar power accessory should be sufficiently charged to supply power to the SKY unit out of the box. Use a thin tool to go through the slot in the solar panel and press and hold the clear button and release when the LED flashes green.
- 2. Continue with the setup process in the app.

# The app cannot find my AIR / SKY device

- 1) Open the battery door and check the batteries, make sure they are new and inserted correctly. Using the SKY solar panel accessory: If you are using the SKY solar panel accessory, check the voltage available in the app. See Batteries in AIR & SKY Batterie in AIR & SKY for more information.
- 2) Close the battery door after a few seconds the LED button will slowly flash green, waiting for connection to the Hub. Follow the setup procedure in the app. If the light does not slowly flash green, press and hold the LED button for five seconds, release it when the LED flashes green. Continue with the setup in the app. Using the SKY Solar Panel Accessory: The solar panel should have adequate charge out of the box. Use a thin tool to go through the slot in the solar panel and press and hold the LED button for five seconds, then release it when the LED flashes green. Continue with setup in the app.

## Bluetooth connection issues "Hub not found"

If you receive an "Hub not found" error message ...

- Make sure you enter the UH series sector and not the serial number of the sensor device.
- Make sure that the app has the authorization to use Bluetooth on your device.
  - 1. Restart your smartphone or tablet.
- 2. She stops the hub for a moment and reconnect it to the power supply cycle. Wait a minute to restart completely.
- 3. Enables Bluetooth on your smartphone or tablet and are near the hub.
- 4. Open the app and wait for the blue LED to turn on the back of the hub.
- 5. Proceed with the station configuration in the app.

#### Additional Tips for Bluetooth Connection

- for Android Devices: Enable localization services.
- Enabling localization services is required to search for Bluetooth devices.
- For iOS devices with the new iOS 13: after the new IOS 13 update, the Bluetooth authorization may be disabled. Make sure that the app has the Bluetooth authorization. G O Settings> Scroll down and find the Tempest App and activate "Bluetooth Sharing" for the application.

## WIFI Network Connection Wifi Not Found

If you have problems with your WiFi network, try the following suggestions ...

- Tap "Update" at the top right on the Wi-Fi configuration screen in the Tempest app.
- Make sure the router sends a 2.4GHz band network. The hub only communicates on a 2.4GHz network that offers a greater reach of 5 ghz. The hub does not require a large or fast data transfer.
- Restart your hub and your WiFi router as well as any range extender.
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- If your network is hidden, choose **Manual Configuration** and Enter the SSID.
- If anything this helps and you can confirm that your network is transmitting, choose **Manual Configuration** and Enter the SSID.

## The hub can not connect to the WiFi

- If the message "Hub unused connected" is displayed, see Bluetooth Connection issues Problemi di connessione Bluetooth.
- Check your password and try again.
- The hub connects only to 2.4GHz band networks. Make sure your router is transmitting a 2.4GHz network.
- The hardware restarting many problems: **Restart the hub, network router**, **and any range extender. Disconnect for a moment and then reconnect them.** Then try the WiFi configuration in the Tempest app.
- Completely app full app, make sure to leave the background. Check the LED on the hub. If it is blue, it means that the app is not fully closed or that the hub is connected to another Bluetooth device. Disables bluetooth on nearby devices and turn off and on the hub, disconnect and reconnect it. Wait a minute to the hub restart completely. The LED on the UB should be red. Repair the app and wait for the blue LED on the hub. Go to Settings> Stations> Choose Your Station> Wifi Configuration> Next> Follow steps in the app to connect to your WiFi network.

#### Additional tips for wifi connection

- Check your router settings. **The hub does not support the WEP security protocol.** Change the protection to the router from WEP to WPA. Some less routers may still use a obsolete WEP security and not just as sure.
- The hub does not support business networks.

- Try to configure a guest network if your router is able to do it. See the router user manual for specific instructions. Some models may have the administrator access information on a sticker on the router itself.
- The mesh network can cause connection problems with the hub. If you use multiple access points, temporarily close all access points except one, locate the hub closest to the "Main" access point and try the Wi-Fi configuration again.

## The hub loses WiFi connection - "Offline Station"

- Move the Hub closer to the router. Check the RSSI value which is an indicator of the signal strength: go to settings> stations> (select station)> tap the Status line and write down the RSSI value for the Hub. A weak signal would be between -85 and -100. If you have a weak signal, consider placing the hub closer to the router.
- <u>Restarts your hub, your WiFi router and all range extender / access</u> <u>points.</u> Wait the hub to re-automatically re-select, the LED will become green, if the app is open on any device will show a blue LED. The manually registered to WiFi, open the Tempest app> Go to Settings> Stations> (Select Station)> WiFi Configuration> Follow Steps to Reconnect the Hub of the Station to your Wizard Network 2.4 GHz.
- Check the power.
  - Verify that the cable and power supply are securely connected.
- Connect the hub to the main access point that will offer a much more stable connection than when connecting to an extender range. Disconnect all range extender to avoid confusion on which network connect.
- If the problems persist, try to delete the saved WiFi connection and proceed. To clear the saved WiFi connection, while the hub is powered, press and hold the reset button on the back of the hub with a toothpick or a clip and release the button when the LED flashes.

## Hub Status Indicators

# **GREEN**: Hub connected to WiFi and Station Online. Everything good!

## **BLUE**: Hub connected to Bluetooth (BLE)

- Occurs when the mobile app is open on a nearby device.
- The status of the BLE connection overrides the status of the WiFi connection.

**Flashing BLUE** + **CYAN** = Hub is in pairing mode.

**RED**: the hub is powered but not connected via Bluetooth or WiFi.**> WeatherFlow**28https://weatherflow.com/

## 12. Troubleshooting the device (Tempest)

To troubleshoot measurement accuracy, i.e. temperature, humidity, pressure, wind, rain, lightning, see Tempest - Device Observations <u>https://help.weatherflow.com/hc/en-us/articles/360050050673</u>.

#### The Tempest does not report current data

#### 1. Tempest device has lost power

• Check the app to see if the device is powered. The voltage reading in the app for the Tempest device should be above 2.35 volts. Make sure the solar panels get direct sunlight to charge.

#### 2. The Tempest device has disconnected from the station hub

- Check the RSSI value, which is an indicator of signal strength. Go to settings> stations> (select station)> tap the Status menu> scroll down and make a note of the RSSI value for the connected device. A weak signal would be between -85 and -100. If the last reported RSSI is poor, consider moving the hub closer to the device, which may be easier than repositioning the sensor device.
- Turn the Tempest sensor device off and on again: remove the base attachment on the bottom of the unit, turn off the switch for a moment and then turn it back on. You should see a green LED that flashes quickly if the device reconnects to the hub successfully.
- Try resetting the hub radio:
  - 1. Disconnect the hub.
  - 2. Using a thin tool, press and hold the reset button on the back of the hub.
  - 3. Press and hold the button and reconnect the hub.
  - 4. Wait for the blue LED on the back of the hub, then release the button.

# 3. Status of faulty sensors or one or more sensors are not reporting, "-" displayed in the device observation display.

- If your Tempest device is connected to the Hub and is powered but still not reporting any data from a particular sensor, (temperature, pressure, wind, UV) check the status menu in the app for technical information from the device: settings> stations> choose your station> scroll down and tap the status menu> scroll to connected device> take note of the sensor status message down. If you see a faulty sensor status in the app, please restart your device to try to fix the problem.
  - 1. Remove the Tempest device from its mounting attachment.

- 2. Turn off the power switch for a moment and then turn it back on.
- 3. Wait for the status LED. To check the LED status, press the button once to display a light. See the LED status indicator references below.

If you see a faulty sensor status in the app or a red LED on the device itself, please contact us <u>https://help.weatherflow.com/hc/en-us/requests/new</u> for assistance. Please do not delete the device from the Station Hub.

#### **13. Tempest device LED status indicators**

The Tempest device LED will not remain illuminated, even when powered. To activate the LED status indicator, press the translucent button on the base of the unit once next to the power switch.

Light Pattern	When?	Meaning	Duration
	Initial state OR following reset*	All good but not joined	15 min
000000000	On joining to hub	Successful join to hub	5 sec
	On boot OR after button tap	Joined, all good	5 sec
	On boot OR after button tap	Joined, no connection	5 sec
	On boot OR after button tap	Bad sensor**	5 sec

**RED LED:** sensor fault; the state replaces all other states. If you see a failed sensor status in the app or a red LED on the device itself, check the Tempest device troubleshooting steps above. Contact us <u>https://help.weatherflow.com/</u><u>hc/en-us/requests/new</u> for assistance if you can't solve the problem.

- 1. Try turning the unit off and on again; For AIR, open and close the battery door. For SKY, disconnect and reconnect the solar power accessory. Check the status again: Press the clear button on the base of the unit for an indicator light. Do you use the SKY solar accessory? Use a thin tool to go through the slot in the bottom of the solar power accessory and press the LED button.
- 2. If your unit still has a bad sensor status (red LED) you may need to contact us <u>https://help.weatherflow.com/hc/en-us/requests/new</u> for assistance.

**PURPLE LED:** The device has not connected properly to a hub. Reset the device and reconnect it to the Station Hub:

1. Remove the mounting attachment from the Tempest device.

2. On the base of the device, press and hold the translucent button next to the power switch until the LED lights up flashes.

3. After a few seconds, the LED will slowly flash green, indicating it is ready to pair with a Hub.

4. Open the app, go to settings> stations> (select your station)> manage devices> tap "+" to add the device to the station Hub.

**GREEN LED:** the device is associated with a Hub.

The Tempest device should be connected and reporting data to the station hub. If you have a green status and don't see any minute-by-minute observations, you may need to reset and re-pair your device:

- 1. Reset the drive: Press and hold the clear LED button next to the battery door for five seconds, then release it when the LED flashes green.
- 2. Using the SKY Solar Panel Accessory: Use a thin tool to go through the slot in the solar panel and press and hold the LED button for five seconds, then release when the LED flashes green.
- **3.** Reboot the hub Unplug the hub for a few moments, then reapply power.
- 4. Add the device to your station again: go to Settings> Stations (select station)> Manage devices> tap "+" (top right) to add the device and follow the procedure.

# 14. Merging Stations or Replacing Hubs

This guide is intended for:

- merging US & Canada versions of the AIR & SKY devices onto a new Hub (station)
- replacing an old Hub with a new Hub

## Procedure:

- 1. Retrieve the old hardware: Unplug the old hub. Physically retrieve the sensor device(s) that you want to migrate to the new station.
- 2. Delete the old station: Open the app, go to settings > stations > slide the old station left, then confirm delete.
- 3. Create a new station: In the app, set up a new station with the new Hub.
- At this point, you can add any new devices that have never been paired to either Hub (Tempest).
- If you don't have any new devices to pair to the Hub, proceed to step 4.
- 4. Reset and add the old devices to the new Hub:
- If you don't have any old devices to pair to the Hub, proceed to step 5.
- <u>Reset each device:</u>

Press & hold the translucent button on the base of each device until you get

a flashing green LED. The LED will then slowly blink green indicating the device is ready to pair to a new Hub.

- <u>Add device(s) to the new station Hub:</u> In the app, go to settings > stations > choose the new station > manage devices > tap "+" in the top right corner and add each device.
- **5. Reinstall the devices**: You can install the device(s) outdoors once you confirm data is reporting in the app. You're done!
- 6. Contact Us. Once you're up and running, please contact us and we'll merge the data and calibration settings from the old station into the new station. Be sure to include the email address you use to sign in to the Tempest app. (This step is technically optional if you don't need or want to merge your old data, you can stop at step 5)

#### For European and Australian/NZ versions of the Smart Weather Stations

Originally, we expected complete compatibility with the original AIR and SKY devices with the new Tempest Hub. To our surprise, we discovered that this would not be possible due to some radio communication issues. The old AIR and SKY devices will not be able to be added to the new Hubs. We actually knew this would be a limitation with Australian versions of the devices due to recent changes of RF standardization but the incompatibility was unanticipated for European versions.

The only consequence of this is that owners of the original Smart Weather Station will need to keep the AIR and SKY operating on the old Hub. You can still operate multiple stations (Hub + devices) on your account; two Hubs, two stations with AIR + SKY on the old Hub and Tempest on the new Hub.

#### Re-linking the new station's WU data feed

You can easily use the same WU PWS station ID and Key - first unlink the old station on your account on the web: https://tempestwx.com When the new station is set up and reporting, re-do the WU data feed on the website and use the same ID and key to link them. You'll need to grab the WU PWS ID and key from your account on WU under your weather station profile.

# 15. Web Access and Sharing Station Data

**Private online access**: You can access your weather data anytime, anywhere from any browser. Go to <a href="https://tempestwx.com/">https://tempestwx.com/</a> and login with the same username & password that you created for the mobile app.

**Shared online web access**: To enable others to see your weather data, make sure your station is sharing data publicly. Check the settings in the mobile app: Go to Settings > Stations > choose your station > Public Data > Share Publicly (toggle on).

Then simply log into https://tempestwx.com/ and click on the share button in the bottom left corner to get your station URL. You can also find the share button in the mobile app.

**Shared mobile app access**: Each station can only be linked to one user account. If you want to share your station data with someone else in the app, they will need to sign into your account. There are no sign in restrictions with the app, so you and multiple family members can all have the app open at the same time.

## 16. Hub Power Bank

The *Hub Power Bank* (HPB) is designed to be used with the WiFi Hub device from the Tempest Weather System and is available for purchase in our store.

Using a battery backup to keep power to your Hub is ideal for Tempest owners living in areas prone to power outages or severe weather. While powered, the Hub will continue to receive weather observations from Tempest devices and can store up to 7 days worth of data from a single Tempest device. Once an internet connection is restored, the Hub will be able to backfill stored weather data.



The power bank provides pass-through charging, powering the Tempest's WiFi Hub while charging itself. It will fully charge in 1-2 hours, and can keep a single Hub powered for up to 7 days. Upon power loss, the device will automatically begin powering the Hub so the Hub can continue storing data.

#### Operation



- Use the **Power Button** to turn on the device, allowing power bank to supply power to the Hub.
- The power adapter gets plugged into the power bank's **Input** port and plugged into a wall outlet.
- There are two **Outputs** to supply power to multiple Hubs if you have them.
  Plug your Hub's USB power cable into the first or second output port on the power bank.
- The power bank has four Charge Indicator Lights to indicate charge level. Pressing the power button with nothing plugged in lights up the LEDs to indicate the current charge level of the battery.

#### **Technical Specifications**

- Capacity: 20000mAh 74 WH
- Input: 5V-2.0A, (Micro USB/Type-C)
- Output 5V-1.0A (USB1), 5V-2.0A (USB2)
- Weight: 1.1 lbs

# 17. Integration with Weather Underground, IFTTT service, Google Home and Amazon Alexa

**Tempest Systems** have direct integrations with the most popular third party services, including Weather Underground, IFTTT services, Google Home and Amazon Alexa (currently, only the English skill is available). See Tempest Integrations for the latest details.

## Weather Underground

Tempest can send data directly to a Weather Underground PWS, here's how to set up a data feed...

- 1. Log in to your account on WeatherUnderground.com
- 2. Go to My Profile > My Weather Stations > Click button 'Add new PWS'
- 3. Gather your new Weather Underground PWS ID and station key
- Sign in to your Tempest account on the web: https://tempestwx.com/ 30
- 5. Then go to settings > stations > select your station > Public Data > Link Weather Underground > enter your WU PWS station ID and key > (optional) toggle rain > Link

It could take at least 30 minutes to an hour before WU starts publishing your station data on their websites and apps.

## • IFTTT

If This Then That, also known as IFTTT, is a freeware web-based service that creates chains of simple conditional statements, called applets. An applet is triggered by changes that occur within other web services, like the Tempest System! IFTTT is the free and easy way to do more with your Tempest and the hundreds of apps you love, including Twitter, Dropbox, Nest, Fitbit, and countless others. See more on using IFTTT with Tempest.

Connect your WeatherFlow smart weather station to thousands of IFTTT services. Turn off the sprinklers when it rains, close the blinds when it's sunny and millions of more combinations!

## Smart Home Technology

The Tempest System is being built to work with most popular smart home tech platforms and some direct integrations are already available.











## Amazon Alexa Skill

To install the Smart Weather skill say, "Alexa, enable WeatherFlow Smart Weather"

Then link your Smart Weather account using the Alexa app or the <u>Alexa</u> <u>website</u>.

Once linked, you can ask Alexa things like: "Alexa, ask WeatherFlow how's the weather?" "Alexa, ask WeatherFlow what is the temperature?"

**Note**: <u>The Tempest Alexa skill is currently available in English in the</u> <u>following countries: US, Canada, UK, Ireland, Australia, New Zealand and</u> <u>India. We hope to add more countries and languages soon.</u>

Get Started

## Google Home Action

Just say,

"Hey Google, talk to WeatherFlow."

You will be prompted to link your WeatherFlow Smart Weather account.

Once your account is linked you can say things like:

"Hey Google, ask WeatherFlow how's the weather?"

Hey Google, ask WeatherFlow what is the temperature?"

The Tempest Google Home Action is currently available in English. We hope to add more countries and languages soon.

#### **Get Started**

# Third Party Applications

Tempest data can be accessed remotely as well as on your local network (even when the internet connection is down), which means your smart home system doesn't have to rely on your Internet connection. Tempest is supported by a growing list of third-party platforms that can take advantage of this feature.

Here are just some of the ways to use weather observation and forecast data from the Tempest System with your smart home tech:









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- Adjust your irrigation schedule based on the rain • that's fallen... or the rain that's forecast to fall
- Turn on attic exhaust fans if the temperature is high
- Turn on ceiling fans if the temperature is high •
- Turn on whole house attic fan & turn off the AC if the outside temperature is • cooler than inside
- Turn on outside accent lighting when light level falls below a set limit •
- Turn on an engine block heater on work days when the outside temperature • is close to freezing
- Adjust heating/cooling levels based on the temperature and humidity • forecast
- Adjust indoor lighting levels based on outdoor sunlight levels •
- Adjust awning and shade positions based on ambient light, solar radiation, • wind, etc

In addition to direct integration with your smart home systems, there's also a growing list of devices and software that let you do all sorts of things with the data from your Tempest System.

Learn more about available third party applications.



#### Flexible API

Integration with your smart home technology is simple but even more complex integrations are possible with our rich set of developer tools. The Tempest System exposes a collection of self-service APIs and documentation that make it easy for developers to build apps and integrations that access data on behalf of a Tempest station owner. For more information, please visit the Tempest Developer documentation.

#### **Troubleshooting Integrations**

Note: the "Share Publicly" setting must be enabled for integration services to work. Open the app, go to Settings > Stations > choose your station > Public Data > make sure the "Share Publicly" setting is toggled on.

Version Public Data

Share Publicly

## **18. TECHNICAL DATA**

MEASUREMENTS	RANGE	ACURACY	INTERVAL	
Air Temperature	-35°F - 140°F -37°C - 60°C	±0,7°F o ±0,7°C	1 minute	
Relative humidity	0 - 100%	±2%	1 minute	
Atmospheric pressure	Up to 1100mb	±1mb; station and sea level	1 minute	
Lighting activity	0 to 40km (25 miglia)	Varies by distance	Instantly	
Wireless	300 m (1000 ft++)	Sub-gHz telemetry		
Wind speed	0 to 100 mph 0 to 160km/h	±0,5 mph or ±0,5km/h	Continuous sampling	
Wind direction	0 - 359°	±5°	Continuous sampling	
Ambient light	1 to 128 kLUX	±100 mLUX	1 minute	
UV index	0 to 11 +index		1 minute	
Solar irradiance	0 to 1900 w/m2	±5%	1 minute	
Rain onset		First rain drops	Instantly	
Rain intensity	Light to torrential	±0,2mm / hr	Instantly	
Rain duration	Daily total	1 minute	1 minute	
Rain accumulation	Daily total	±10%	1 minute	
Mount	Adjustable pole mount			
Power	Solar powered			

## 19. Warranty & Hardware Terms of Use

## **WeatherFlow Hardware Products Terms**

Thanks for your interest in the products and services provided by WeatherFlow, Inc. ("WeatherFlow", "we", or "our"). Your purchase of WeatherFlow devices or accessories ("Devices") from the WeatherFlow online store at shop.weatherflow.com (the "Store") or an authorized WeatherFlow reseller, including without limitation, WeatherFlow consumer Weather Stations products and WeatherFlow handheld weather meter products, constitutes your agreement to be bound by these WeatherFlow Hardware Products Terms ("Hardware Products Terms") and any applicable rules, policies, and terms available at www.weatherflow.com (the "Website"), on or through a Device's companion app, or incorporated herein by reference, including our Terms of Use and our Privacy Statement (collectively, this "Agreement").

YOUR PURCHASE OF A DEVICE REQUIRES THAT YOU AGREE TO THIS AGREEMENT. IF YOU DO NOT UNDERSTAND THE AGREEMENT OR DO NOT ACCEPT ANY PART OF THE TERMS HEREIN, DO NOT PLACE AN ORDER FOR A DEVICE.

For WeatherFlow hardware product terms open the following link and read the agreement: <u>https://help.weatherflow.com/hc/en-us/articles/360055890614-Warranty-Hardware-Terms-of-Use</u>