# HELIOT AWS Sensor Specifications

| S. No. | Description | Sensor Specifications |
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| ***1. Temperature and Relative Humidity Sensor with Radiation Shield*** | | |
| **1.1** | **Air Temperature** | |
| **a** | Range | 0°C to +60°C |
| **b** | Accuracy | 0.2 °C or better (with radiation shield) |
| **c** | Resolution | 0.1°C |
| **d** | Sensor type | PT 100 1/3 class B or solid state or equivalent<br>Type: Any type of sensor having range, accuracy and resolution as specified in the technical specifications and certified by IMD/WMO/ NIST or its recognized agencies. |
| **e** | Response time | 10 sec or better |
| **1.2** | **Relative Humidity** | |
| **a** | Measuring Range | 0 to 100% RH |
| **b** | Accuracy | ± 2% RH or better |
| **d** | Stability | Better than ±1 % RH per year |
| **e** | Sensor type | PT 100 1/3 class B or solid state or equivalent<br>Type: Any type of sensor having range, accuracy and resolution as specified in the technical specifications and certified by IMD/WMO/ NIST or its recognized agencies. |
| **f** | Response time | 10 sec or better |
| **g** | Output Signal | 0-1 VDC |
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| ***2. Ultrasonic Wind Speed & Direction sensors*** | | |
| **2.1** | **Wind speed** | |
| **a** | Measuring Range | 0 to 60 m/s or better |
| **b** | Sustainability | 75 m/s |
| **c** | Accuracy | ± 0.5 m/s or better |
| **d** | Resolution | 0.1 m/sec (0.02 Knots) |
| | | Ultrasonic Type: Any type of sensor having range, accuracy and resolution as specified in the technical specifications and certified by IMD/WMO/ NIST or its recognized agencies. |
| **f** | Threshold | 0.5 m/sec or less |
| **g** | Response time | 10 sec or better |
| **2.2** | **Wind Direction** | |
| **a** | Measuring Range | 0 to $359^{0}$ - $^{no}$ dead band |
| **b** | Accuracy | ± $3^{0}$ or better |
| **c** | Resolution | $1^{0}$ or better |
| | | Ultrasonic Type: Any type of sensor having range, accuracy and resolution as specified in the technical specifications and certified by IMD/WMO/ NIST or its recognized agencies. |
| **e** | Threshold | 0.5 m/sec or better |
| **f** | Response time | Output 1,2 or 4 outputs per second or better |

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| **g** | Startup time | <1 second |
| **h** | Parameters | Wind Speed & Direction or U and V (vectors) |
| **i** | Units of Measure | m/s, Knots, mph, kph, ft/min |
| **j** | Output Signal | RS-232 (offered wind Sonic- Option-I) |
| **k** | Height | Wind Speed and Wind Direction measurements are to be made at a height of 03 meters above ground level at all the AWS stations. Tower height for the installation of wind speed, wind direction and other sensors to be sufficient to meet above requirements. |
| **3. Tipping Bucket Rain Gauge sensor** | | |
| **a** | Collector Area | Specified Collector Area should be between 200 $cm^2$. |
| **b** | Collector Diameter (Type) | 159.6 mm |
| **c** | Height above funnel | Height above funnel should be sufficient to accumulate rain during heavy rainfall as per WMO Guidelines. |
| **d** | Switch | Rugged Magnetic Proximity |
| **e** | Material of Outer Body/ housing (Base/ Collector) | Stainless steel/ABS material |
| **f** | Output | 0.1 sec switch closure |
| **g** | Leveling | Suitable leveling adjustment screws and circular spirit level must be provided on the base of TBRG for leveling the Tipping bucket Mechanism. |
| **h** | Debris protection filter | A suitable (Wire mesh) debris protection filter should be provided inside the collector. |
| **i** | Range | Above 600 mm per hour |
| **j** | Accuracy | 0-250mm per hour, ± 2% as per IMD Standards |
| **k** | Resolution | 0.5 mm per tip |
| **l** | Sensor type | Tipping bucket rain gauge or with better technology certified by IMD/WMO |
| ***4. Atmospheric Pressure Sensor*** | | |
| **a** | Pressure Range | 600 to 1100 hpa |
| **b** | Accuracy | 0.5 hPa or better |
| **c** | Resolution | 0.1 hPa |
| **d** | Sensor type | Type: Any type of sensor has range, accuracy and resolution as specified in technical specifications and certified by IMD/WMO/NIST or its recognized |
| **e** | Response Time | 10 sec or better |
| ***5. Global Radiation Sensor*** | | |
| **a** | Sensor Type | High stability silicon voltaic detector |
| **b** | Accuracy | ± 5% typical under natural daylight conditions |
| **c** | Stability | <± 2% change over a one year period |
| **d** | Resolution | 5 $W/m^2$ |
| **e** | Linearity | Max deviation of 1% up to 3000 $Wm^2$ |
| **f** | Sensitivity | 10mV per 1000$Wm^2$ with mV adapter |
| **g** | Size | 3" Dia x 1.4" H |

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| **6. *Soil Moisture Sensor*** | | |
| **a** | Sensor Type | Type: Any type of sensor has range, accuracy and resolution as specified in technical specifications and certified by IMD/WMO/NIST or its recognized |
| **b** | Accuracy | ± 5% |
| **c** | Depth: | 30 cm, 60 cm and 100 cm |
| **d** | Resolution | 1 % or 10 centibars suction |
| **e** | Range | 0 to 100 % or 10 to 200 centibars suction |
| **f** | Response Time | Instantaneous |
| **g** | Interchangeability | ±0.1°C |
| ***7. Data logger and GPRS/ System*** | | |
| **7.1** | **Data logger** | |
| **a** | Design | Type: Bare metal |
| | | Controller: 32-bit ARM |
| **b** | Storage | Type: SD card or Flash memory |
| | | Backup: Retain at least one year data recorded for all parameters |
| **c** | Measurement | Sampling Interval: min 1 sec (configurable) |
| | | Event generation: Change of ± tolerance (configurable) |
| **d** | ADC | Type: SAR |
| | | Resolution: 12 bit or better |
| | | Accuracy: ± 1 LSB |
| **e** | Watchdog | Type: In-built |
| | | Trigger: System haywire |
| **f** | Real-Time Clock | Type: In-built |
| | | Battery Backup: Yes |
| ***7.2*** | ***GPRS /LTE/NB-IoT or equivalent Modem with SIM facility*** | |
| **a** | GPS & Time Synchronization | Primary: GPS Secondary: Central Server |
| | | Antenna: With Antenna Short Circuit Protection |
| **b** | Sensor Interfaces | Analog: 4-20mA, 0-5V, 0-10V |
| | | Digital: SPI, I2C, UART, GPIO |
| **c** | Data Quality | Shall have in-built logic complying to WMO data quality standards (Shall provide documentary proof of how data quality is assured) |
| **d** | Communication | Interfaces: RS485 or higher, 4G/LTE Cat 1 TCP |
| **e** | Cyber security | Support secure communication protocol and provide third party cyber security audit |
| **f** | Firmware Updates | Over the air update or through local updation. |
| ***7.3*** | ***Battery with FRP IP66 or higher certification*** | |
| **a** | Power Supply | Solar Panel of rated capacity 50W or better, Open circuit voltage: 21V DC |
| | | Consumption: < 1A at 12V DC (Nominal) |
| | | Battery: 12V 65AH depends on requirement IP66 or higher certification |
| | | SMF (Sealed Maintenance free) BATTERY with FRP (Fiber-Reinforced Polymer) IP66 or higher Certification |

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| *7.4* | ***Data logger housing Material*** | |
| **a** | Operating Conditions | Temperature: -10°C to + 70°C |
| | | Humidity: 0–100 %RH |
| **b** | Enclosure | Type: MS (Mild Steel) CR (Cold Rolled sheet) |
| | | Coating: Powder Coated / Anodized |
| | | Engraving: As per details shared |
| | | Ingress Protection: IP66 |
| **c** | Compliance | EMI/EMC: EN 61326-1 |
| | | Environment: IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-30 |
| **d** | Measurement & Logging Intervals | Wind speed and direction: 4 readings per second for gust determination. Hourly Maximum gust and direction of gust to be logged hourly for the previous hour, Squall Calculations also to be stored. Ability to change measurements and log duration of all sensors whereby different stations can have different measurements and log duration. |
| **e** | Requirement | Non-volatile internal flash memory that can store Five years of data as specified under measurement and logging interval section. Data download Through USB (performed at station) to be provided in text/.csv format with all data having a date/time stamp and being in scan order. Provision to download data by user selectable time periods. If Data Logger power is interrupted the Data Logger will automatically restart data collection and transmissions once power is restored without loss of previously recorded data 16x2/20x2-LED/LCD Display & 4/6 Tactile Keypad OTA for Firmware upgradation Internal battery backup for clock The internal clock drifts less than 1 second per day. Time sync of GSM/GPS Demonstrated ability to measure and store all parameters once per minute and transfer this data every minute. Demonstrated ability to measure and store all parameters once per minute and transfer this data every minute. Programmable rainfall accumulation periods of daily or annual totals Programmable rainfall reset to 0 from every day, to once per year, at a user selectable day of the year. Automatic restore and backup mechanisms shall be enabled to ensure data recovery with selected intervals ( Min. one Month) in case of any interruptions. |

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| ***8. Solar Panel with mounting accessories on the mast with solar charge controller*** | | |
| **8.1** | **Site conditions** | |
| **a** | Ambient temperature | -10$^0$C to 70$^0$C |
| | Relative humidity | 10% to 100%, |
| | Altitude | 0 to 1680 m |
| **8.2** | **Power supply** | |
| **a** | Common | Common power supply for data logger, sensors, and transmitter. |
| **b** | Input | Input power 12 V solar photo voltaic system with the capacity to power all equipment associated with the station. |
| **c** | Capacity | the solar panel and battery must be sized according to the needs of the equipment provided and ensure at least 30 days of full operation without recharge. A power budget indicating how this requirement will be met should be attached. |
| **d** | Regulator | Including voltage / charge regulator, a solar regulator for each station to regulate power and maintain optimum battery and data collection platform operation. |
| **e** | battery test indicator | with battery test indicator |
| **f** | On line Status reporting | The balance battery charge available and the number of days it can support all the equipment at a site should be reported everyday live to the Data Centre. |
| **g** | battery chargers | include battery chargers (in: 230 V AC / out: 12 V DC) |
| **i** | Accessories | All accessories (fixing units, etc.) as required. |
| **h** | Lightning protection | all devices for lightning / over voltage protection of sensors, data logger, transmitter and solar power supply equipment to be included, as required for the specific station configuration |
| **j** | Tools | complete tool kit for installation and routine maintenance giving full detail (number of pieces and type) |
| **k** | Manuals | Full documentation and maintenance instructions in English (1 copy per station). |
| **l** | Batteries | The batteries required for the equipment above shall be maintenance free, rechargeable sealed battery with the following features: |
| | | Overcharge and deep discharge protection Leak-proof Easy handling – no special shipping container required Long service life Excellent recharge ability |
| | | The AWS shall be work on Solar Power when battery discharged conditions |

| 9. | *AWS Galvanized Iron Pole & Fencing Specifications* | |
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| 9.1 | **AWS Pole Specifications** | |
| | Material | Galvanized Iron (GI) with 2 stems. |
| | Diameter | 3 inches |
| | Height | 3.5 meters |
| | Strength | Designed to withstand moderate wind loads and field conditions |
| | RCC Foundation & Base Plate for erecting of AWS | ○ Square base dimensions approx. 1.5 ft. × 1.5 ft.<br>○ Central pipe diameter ~0.55 ft.<br>○ Total height ~3 to 6 ft. Based on soil conditions. (Above ground level: ~1 ft. Below ground level: ~3 ft. foundation)<br>○ J-type M12 × 600 mm foundation bolts – 4 nos.<br>○ 18 mm dia. rods – multiple sets for vertical<br>○ 10 mm dia. rods @ 150 mm c/c – 8 nos. for added stability. |
| 9.2 | Lightning Arrestor Earthing | Ensure the AWS pole is directly connected to the mast-top arrestor |
| 9.3 | **AWS Fencing Specifications** | |
| | Fencing for AWS site | 5m x 5m perimeter chain-link fence. |
| | Fence Height | Minimum 1.5m to prevent animal interference. |
| | Gate | Gate with lock & key. |
| | Fencing support Pole | Heavy-duty, corrosion-resistant telescopic or fixed mast with guy-wire points if required by local wind load conditions. |