

# Measuring, Monitoring & Documentation Systems

The **Sensors Layer** defines all devices and measurement systems used by AOFS controllers to monitor irrigation, energy usage, water distribution, and environmental conditions. All AOFS-compliant deployments **must implement the sensors and documentation systems specified here.**

## 1. Sensor Categories

AOFS uses five main sensor categories:

- **Soil Monitoring Sensors**
- **Weather Monitoring Sensors**
- **Water Monitoring Sensors**
- **Power / Energy Sensors**
- **Optical / Camera Monitoring Systems**

## 2. Soil Monitoring Sensors

**Purpose:** Measure soil conditions to optimize irrigation schedules.

### Required Measurements:

- Soil moisture (volumetric water content) per zone
- Soil temperature (optional but recommended)
- Electrical conductivity (optional; for salinity monitoring)

### Placement Guidelines:

- At least one sensor per irrigation zone
  - Multiple sensors for large or heterogeneous fields
- Sensors should be placed at root depth appropriate to the crop type

### Data Collection:

- Sample at a frequency suitable for crop needs (typically 15–60 min)
- Data logged locally in Field Controller and synced with Farm/HQ controllers

### Calibration & Maintenance:

- Sensors must be calibrated according to manufacturer recommendations
- Regular inspection to prevent soil compaction or damage

## 3. Weather Monitoring Sensors

**Purpose:** Monitor on-site weather conditions to inform irrigation decisions and safety lockouts.

### Required Measurements:

- Rainfall (e.g., tipping bucket rain gauge)
- Ambient temperature
- Relative humidity
- Wind speed (optional but recommended)
- Solar radiation / light intensity (optional)

### Placement Guidelines:

- Rain gauges placed in open areas, away from obstructions
- Temperature and humidity sensors shielded from direct sunlight and precipitation
- Wind sensors mounted at standard height for consistent readings

### Data Collection:

- Sample at frequency sufficient for crop and irrigation needs (typically 10–30 min)
- Logs sent to Field Controller for local decision-making and later synced with Farm/HQ controllers

### Integration with AOFS:

- Rainfall triggers **irrigation suspension / rain lockout**
- Temperature and humidity can refine irrigation thresholds and scheduling
- Optional predictive analytics using solar radiation and wind

### Calibration & Maintenance:

- Regular inspection and cleaning of rain gauges
- Sensors must be calibrated according to manufacturer specifications
- Logs of calibration and maintenance events must be maintained

---

## 4. Water Monitoring Sensors

**Purpose:** Ensure safe and efficient water delivery.

### Required Measurements:

- Tank levels: FULL and LOW float switches
- Flow meters on main and zoned pipelines
- Pressure sensors for distribution lines
- Optional: rain gauges (redundant, for additional verification)

### Placement Guidelines:

- Tank sensors at critical fill/drain points
- Flow meters before distribution manifolds
- Pressure sensors after pumps and at main lines

**Safety Requirements:**

- Water sensors must enforce Field Controller fail-safes (pump cutoff, overflow prevention)
  - Must function independently of network connection
- 

## 5. Power / Energy Sensors

**Purpose:** Monitor energy consumption and optimize PUE (productive use of electricity).

**Required Measurements:**

- DC battery voltage and current
- Pump energy consumption
- Valve power usage
- Optional: solar panel output monitoring

**Placement Guidelines:**

- Measure energy at the main DC bus and key loads
- Optional per-zone energy monitoring for detailed efficiency analysis

**Integration:**

- Data feeds into Field Controller for fail-safe shutdowns on low voltage
  - Logged for auditing and analytics
- 

## 6. Optical / Camera Monitoring Systems

**Purpose:** Supplement sensor data with visual field observations.

**Use Cases:**

- Crop growth monitoring
- Pest or disease detection (optional, non-critical for irrigation)
- Soil surface moisture and coverage assessment

**Requirements:**

- Cameras must be oriented for optimal coverage of zones
- Images or video must be timestamped and logged
- Data should integrate with Field Controller for automated or semi-automated analysis

## 7. Data Logging & Documentation

- All sensor readings **must be logged locally** on the Field Controller
- Logs include timestamp, sensor ID, measured value, and status/quality flags
- Data must be synced with Farm Controller for aggregation and with HQ Controller for analytics
- Field workers may document crop growth, harvest outcomes, and environmental observations via **Field Survey Interfaces**, complementing automated measurements

## 8. Calibration & Maintenance

- All sensors **must be regularly calibrated** according to manufacturer specifications
- Field inspections are required to prevent sensor drift, damage, or misplacement
- AOFS-compliant deployments **must maintain logs of calibration and maintenance events**

## 9. Compliance Notes

- All AOFS deployments **must implement at minimum**:
  - Soil moisture per irrigation zone
  - Tank LOW/FULL switches
  - Flow meters and pressure sensors on all irrigation manifolds
  - Power monitoring for pumps and valves
  - Rainfall measurement for irrigation lockout
- Optional sensors (temperature, conductivity, wind speed, solar radiation, cameras) are recommended for **advanced optimization**, but not mandatory
- All data must be **timestamped, logged locally, and synchronized** according to federation rules

## 10. References

- [Field Controller Layer](#)
- [Farm Controller Layer \(Local / Federated\)](#)
- [Hydraulic & Water Systems](#)
- [Electrical & Control Interfaces](#)
- [Optical Monitoring \(Cameras\)](#)

From:

<http://wiki.irrigation.afriticgroup.com/> - **Afritic Open Farming Standard**

Permanent link:

<http://wiki.irrigation.afriticgroup.com/doku.php?id=sensors:start&rev=1769030085>

Last update: **2026/01/21 21:14**

