kamstrup

AMI System Specification

Meter Specification

Solid state meters

All cold water meters must use solid state measuring technology with no moving parts. The meter should be resistant to wear and impurities in the water. All sensors and electronics should be designed so that no direct exposure is made with fluid. The meters should be hermetically and vacuum-sealed to prevent humidity from entering the electronics and avoid condensation between the glass and display. Meters should be produced in an ISO 9001C facility.

Accuracy

Maximum permissible error should fall in accordance to AWWA C715-18 in extended low flow range and ± 1.5% in normal and high flow range. The minimum start flow range should measure at .015 GPM for 5/8", 5/8"X¾", ¾" meter sizes. The minimum start flow range should be .04 GPM for 1" meter size, .06 for 1.5" meter size and .1 for 2", .15 for 3" and .35 for 4" meter size.

RF communications module

The meter and RF communication module should be one single integrated unit hermetically sealed for easy installation reducing labor cost and time. The meter should be IP68 rated and submersible suited for installation in flooded meter pits.

The meter should be capable of two communication modes operating within an unlicensed frequency FCC part 15 for the 902-928 MHz band for mobile drive-by operation and support a licensed frequency FCC part 90 within the 450-470 MHz band.

Data Storage

The meter data will store data loggers in the EEPROM, retrievable via Bluetooth converter. It will provide 20 years of annual data, 36 months of monthly data, hourly values for 100 days and the last 50 event codes such as leak, reverse, burst, dry, tamper, and battery capacity. Logged hourly and daily usage data may be viewed on the mobile device or on the headend server. The meter should have the ability to log total usage over various flow rates for historical analysis for right sizing and low flow analysis. Daily max and min flow rate values should be available.

Data options

To support technology changes, feature enhancements, configuration changes and transmission intervals the meter should be programmable. Firmware updates should be permissible over RF without having to gain physical access to the meter and implemented in groups.

Standard data communication intervals will be every 3 hours or up to 8 times a day delivering the past three hourly values.

If the transmissions are not acknowledged by the collector, the meter will accumulate and resend hourly data for up to 24 hours.

The meter shall be capable of delivering near real time events such as;

Leak: Continuous flow for the past 24 hours based on a configurable limit of greater than 0.1%, 0.25%, 0.5%, 1.0% and 2.0% of maximum flow for meter size.

Reverse Flow: Indicating water is running in the opposite direction of normal flow. Reverse flow should be logged in a separate internal register.

Burst: Indicating 30 minutes of flow based on a configurable limit of 5.0%, 10.0% or 20.0% of maximum flow.

Dry: Indication of air in the pipe and no water through the meter.

Tamper: Indication that electronics or meter has been compromised.

Low ambient temperature: Temperature lower than configurable limit of 37 °F or 43 °F to indicate possible freezing.

High ambient temperature: Temperature higher than configurable limit of 95 °F or 122 °F to indicate high temperatures.

LCD and Register Face

The meter should include an easily readable LCD display including nine digit resolution, unit of measure, billable digits for reference, all active information codes and flow rate. Meter serial number will be barcoded and visible on the register face, as well as meter size, FCC identification, NSF compliance, production year, maximum operating pressure, type number and configuration code.

Time Synchronization

All meters are time synchronized with the network to allow for water balancing analysis.

Security

Data must be encrypted using AES 128-bit encryption.

Installation

The meter may be mounted at any angle and position with no minimum straight pipe to meet applicable AWWA accuracy standards.

When the meter is installed, the use of a mobile application should confirm that the meters signal is being received by one or more data collectors and verify the signal strength to determine whether the installation is good before leaving the installation site.

Material

The meter housing will be made from either a polyphenylene sulfide (PPS) with fiberglass reinforcement, stainless steel or lead free brass. The carbon footprint should document the meter's high reusability and low environmental impact including the recycling of materials. The threads shall not be susceptible to cross threading and tightened to a maximum of 11 FT Lbs.

Certifications/Standards

NSF 61 certified. Applies to all applicable AWWA standards. Complies to RF Exposure compliance Part 15 of FCC rules. The manufacturing and testing process should be highly automated and only use materials approved for drinking water. Meters should be disinfected before dispatch and hygienically controlled by frequent audits from external accredited laboratories.

Battery

The battery is an internal lithium battery which can provide up to 20 years of operating life. The meter will provide a low battery warning when battery life reaches 6 months remaining.

Operation

The meter should be able to operate accurately under a maximum pressure of 250 PSI for meter sizes 5/8", 5/8"X¾", ¾" and 300 PSI for 1", 1.5" and 2", 3" and 4" meter sizes.

Data Collectors Specification

Data collectors should consist of a base box and top box to maximize performance based on link budget. The bottom base box provides the network backhaul communication method whether cellular modem or Ethernet and supplies power to the top box. The base box should allow up to four top box connections for maximum performance if the collector site installation requires.

Installation and Configuration

The collector should be plug and play without requiring programming of the base box alleviating the necessity of IT resources.

Built in Network Intelligence

The AMI system will be able to automatically adjust the output power of the meter to extend battery life on the meter. The system will select the optimal collector to read the meter, but in the event the collector is taken out of operation, other collectors will provide redundancy.

Data Storage

The collector must support up to 25,000 meters and be able to store 10 days of hourly data.

Communication

Collector communication backhaul options should include either cellular modem or Ethernet network.

Security

The data collector will follow TLS 1.2 protocol with AES 256 bit encryption to the head end system.

Physical

Collector must be rugged, high enclosure class with built-in lightning protection.

Operation

Collector should operate within -22°-158° F. Power input 110-230 VAC 50/60 Hz. Power output 24 VDC /10A.

System Software AMI Specification

The host software should be an intuitive easy to use solution, with icon-based navigation. It should include online help describing all menus and feature sets with step-by-step tutorials. The software will be a cloud-based solution, based on tiers to support the number of meters as required.

Data Storage

Historical reading data will be kept up to ten years. Hourly data for all meters is saved for 13 months, daily values are saved for 5 years, and monthly values are saved for ten years.

CIS Billing Integration

The software interface to and from CIS should be flexible supporting with single record fixed width or delimited file formats that can be customized to easily integrate to the CIS system.

Features

The software should have search capabilities to search all or specific fields such as address, meter serial number, account number, customer name, etc. The software should be able to filter on meter rollovers and final readings. The software should provide hourly readings, bar graph chart visualization of average flow per hour and hourly, daily, monthly, yearly, consumption over a user defined date range.

The software should be able to prioritize between high and normal priority codes and be able to schedule the frequency and time when the notifications are delivered, or be able to send notifications when they are detected.

The software should allow the creation of meter groups automatically through imports or manually.

Allow user to perform meter exchanges, so that historical data may be referenced under the account with associated meter data history.

The software should have consumption reporting capabilities by group and custom date range with filters higher or lower than configurable thresholds.

The software should provide meter data set comparisons by a defined date range.

The software should allow import and display of custom fields which also may be exported back to the CIS.

Language Support

The software should support multiple languages including English.

Hybrid system: Mobile drive by reading

The AMI software should include the ability to read meters via mobile drive by without installing additional PC software or add on module components. The mobile application should support Android devices (smart phones or tablets). Data may be synchronized from the mobile app and host software at any time via Wi-Fi or cellular network without the loss of captured data.

In addition, if readings were missed by the fixed network system, it will be possible to data log the meter and send data back so that it may be viewed in the host software.

Mapping Visualization

The software should have the ability to import GIS coordinates or be able to geocode by address, city and zip code via Google Maps. The meter may be viewed graphically in the host software and in the mobile application when in the field.

Scheduled jobs

User defined custom data imports and exports should have the ability to be scheduled as automatic jobs to an FTP/FTPS/SFTP server or email.

Performance reporting

The software should provide performance analytics to recognize data collection success of all meters or meter groups on user defined parameters such as daily or hourly reads as a percentage or number to monitor the health of the system.

Data Security

Data communication from the meter should be encrypted using AES 128 bit encryption. Meter encryption keys should only allow the utility end-user to access reading data through their individual utility portal which may be automatically imported to the meter reading platform. The import of meter data should prevent human data entry errors of meter serial numbers. Data sent to the host software should use TLS 1.2 protocol with AES 256 bit encryption.

The system should allow the utility to assign their own roles and permissions to users and have various levels of users, (Administrators, Super User, and User).