



LUSAIL DEVELOPMENT

District Cooling Sub-Meter System Guideline

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REV NO.	DATE	CHANGES	PREPARED BY	CHECKED BY	APPROVED BY
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1.01 INTRODUCTION

This document sets forth minimal functional requirements for an Automatic Meter Reading (AMR) system. Sub-meters and solenoid valve shall be provided for each tenant and shall measure energy consumption (chilled water); store data, communicate with externally located devices, servers, etc., including receiving commands from the external sources. Technical detail of proposed sub-meter shall be provided by sub-developer for Marafiq's approval. Training for Marafiq's operation & maintenance staff shall be carried out by the manufacturer's experts.

1.02 METERING PRINCIPLES

- A. The sub-meter is integral part of AMR system, sub-meter shall be capable to read, store, visualize and export meter data. The sub-meter data received from the AMR system or Hand Held Unit (HHU) shall allow charging each tenant for the consumption of chilled water energy used on a monthly basis or on other time scales as advised by the client.
- B. To ensure AMR data consistency, the industry standard M -Bus (METER BUS) system shall be used as the communication platform.
- C. The AMR system shall contain the provision of a seamless integration of any kind of resource meters e.g. chilled water sub-meter
- D. Sub-meters shall be centrally located in separate locked rooms. Marafiq's personnel shall have unconditional access to all sub-meters.
- E. See Figure 1 for sub-metering system overview and Figure 2 for sub-meter schematic.
- F. Meters shall be installed in accordance with manufacturer's instructions.
- G. Automatic Meter Reading (AMR) system consists of chilled water sub-meters at each individual chilled water user in each building. Each chilled water sub-meter measures and archives the chilled water usage for the user on which it is installed. Each sub-meter shall transmit the archived chilled water usage data to an M-bus master.
- H. M-bus master shall be able to communicate with AMR system on Ethernet TCP protocol
- I. M-bus master and sub-meters shall be supplied, installed and commissioned by the sub-developer as per manufacturer's guideline.

1.03 COMMUNICATION PRINCIPLES

- A. All sub-meters shall be provided with an integral or internal M-Bus communication interface, ensuring real data communication between the sub-meters and the AMR System. The interface shall be according to the EN 1434 standard. The meter design shall be of compact design suitable for residential metering application.
- B. The individual sub-meter data shall be read out by the AMR software through the M-Bus Master. On timely scales to be defined by the operator, the AMR software shall receive all meter data automatically based on a preset time scheduled reading job, or by a manual data acquisition
- C. The transmission of the sub-meter data from the M-Bus Master to the Centralized AMR software on fiber optic network architecture provided by the telecom provider.

- D. The individual sub-meters are connected on a wired M-Bus network and are connected to an M-Bus master. The M-Bus master shall be able to connect to the telecom provider switch in the building telecom room on TCP/IP protocol
- E. The AMR shall communicate with the M-Bus master in each building.
- F. The sub-meter shall have minimum following functions:
1. Automatically read chilled water usage, flow, temperatures (supply and return), and delta T.
 2. Verify the retrieved chilled water usage data for each individual chilled water user is in the expected range and that there are no error codes or other issues that could cause the chilled water usage data to be incorrect.
 3. Store and archive the chilled water usage data for each individual chilled water user.
 4. Flow meter shall be ultrasonic type, in-line, suitable for cooling application for water based system.
 5. Flow sensor shall measure minimum 20% over the stated maximum flow
 6. Flow sensor must not show zero values in case of heavy over flow but must be capable of stating at least 20% over maximum flow value
 7. Sub-meter shall calculate energy based on EN 1434.
 8. 2 wired Pt 500 temperature sensor pair shall be provided. All temperature sensors shall be fitted in thermo wells. The chilled water supply and return sensors shall be interchangeable to verify accuracy. Sufficient length of cable and conduits shall be provided so that such checking and interchange can be done easily.
 9. Sub-meter shall be able to provide historical data logging of values of 15 months and daily values of 460 days and 960 hours
 10. All instruments shall be calibrated. A certificate of calibration shall be provided for each measuring instrument.
 11. The required accuracy of the measuring systems (including calculator, temperature sensors and flow sensors) shall be in accordance with EN 1434, Class 2.
 12. Power supply shall be 230 VAC at 50 HZ. The calculator shall be provided with integral battery, AA size capable for 15 years operation.
 13. Protection class of calculator shall be IP 54 and for flow sensors shall be IP65.
 14. Operational temperature range shall be (-) 5°C to (+) 60°C
 15. Sub-meter shall have auto calibration facility.
 16. Sub-meter shall be provided with EEPROM based non-volatile memory for data backup.
 17. EEPROM shall be capable of being read by external equipment in the event of damage or component failure which renders the sub-meter inoperable.
 18. Calculator shall be provided with LCD display, for displaying parameters like flow, temperature, delta T, power, energy, accumulated flow, accumulated energy and volume.
 19. Data stored in the sub-meter shall not be lost during the calibration or upon loss of power supply or without battery power supply.
 20. A communication indicator is lighted when meter is communicating through its communication port.
 21. A low battery indicator shall flash when the battery needs to be replaced.
 22. All registered data shall be written in the memory at least once per day and whenever power failure occurs.
 23. Alarms shall be generated for the minimum events such as 95 % filling of sub-meter memory, password failure, and communication failure
 24. Internal real Time clock with battery backup shall automatically synchronize with AMR system clock, and the calendar shall be corrected for meter service life and automatically compensate for leap year. This sub-metering shall record time based on Qatar standard time

25. Each sub-meter shall be provided with a suitably sized name-plate in non-corrodible material and fastened inside the sub-meter cover. Sub-meter data shall be readable from outside through a glass window. The name-plate shall have minimum following information:
- i. Manufacture's name or trademark and place of manufacture
 - ii. Serial number
 - iii. Year of manufacture
 - iv. Operating temperature
 - v. Accuracy of the sub-meter

1.04 QUALITY ASSURANCE

- A. Provide hardware to manufacturer's latest revision level. Provide hardware release upgrades, on overlapped exchange basis, as issued by manufacturer from date of initial equipment shipment through end of warranty period of the contract.
- B. Provide manufacturer's system software upgrades as issued, from date of initial equipment through end of warranty period of contract. Display software revision level on main menus.

1.05 DELIVERY, HANDLING, AND STORAGE

- A. Delivery, storage, and protection shall be in accordance with manufacturer's recommended procedures.
- B. Accept products on site in factory containers and verify any damage.
- C. Store products in clean, dry area. Maintain temperature in accordance with NEMA ICS 1.

1.06 WARRANTY

- A. All components shall have a warranty of 2 years from date of handing over.
- B. Specified availability shall be maintained throughout warranty period. Failure to achieve specified availability may result in extension of warranty period until specified performance has been met for continuous period equivalent to warranty period.

1.07 BASIC FUNCTIONAL REQUIREMENTS

- A. Capability of exporting data in standard formats
 1. .txt
 2. .xls
 3. .xml
 4. .cvs
- B. Long term data storing – archiving functionality,
- C. Customized data reporting functions
- D. Capability of remote access through any internet browser when assigned access is granted.

1.08 COMMUNICATION

The sub-meter shall be provided with multiple communication port and support multiple open protocols. Minimum following communication ports shall be provided in the sub-meter:

- A. The interface between sub-meters and M-Bus master shall be through M-Bus. The system shall be capable of upgrading to communicate through Lusail City fiber optic network when it is available. The system shall use open TCP/IP protocol.
- B. Optical communication port in compliance to IEC 62056-21. The optical port shall allow bi-directional communication with Hand Held Unit (HHU) or a PC for rapid, error free electronic data transfer and to configure the meter.
- C. M-bus master shall have Ethernet TCP/IP protocol port to communicate with AMR software
- D. CAT6 with RJ45 cable shall be laid by sub-developer from M-bus master to Ooredoo's telecom room, the cable shall not be spliced or joint and shall be less than 90 meters.
- E. A standard serial port (RS485) with maximum communication speed upto115200 baud rate. Serial port shall support digital communications of internal logical points to other sub-meters and master meter
- F. Sub-meter system shall support the following communication protocols: M-Bus, DLMS, HANDHELD.

1.09 DATA ACQUISITION

- A. Meter data acquisition shall be by the following processes:
 1. Digital communication between the AMR system and the sub-metering master in each building.
 2. Digital communication with a hand-held or other secondary data acquisition and storage device.
 3. Manual entry by authorized personnel.
- B. Meter data acquisition through digital communication with the sub-metering master in each building shall be initiated by the AMR system due to the following:
 1. Automatically on a user defined and selected time interval.
 2. Manual when selected by the user.
 3. Automatically when a user defined event occurs.

1.10 VALIDATION PROCESS

- A. Data validation shall be performed by a series of automatic check routines.
- B. As a minimum, the validation program shall verify that the current meter data is within expected ranges for the following parameters:
 1. Minimum instantaneous consumption – the minimum expected flow through the meter at any time.
 2. Maximum instantaneous consumption – the maximum expected flow through the meter at any time.
 3. Daily consumption – the expected flow for each day.
 4. Interval consumption - expected total flow for the time interval.
 5. Daily Consumption
 6. Monthly Consumption
- C. Customizable validation reports shall be generated following the completion of the validation process.

1. Provide capability to automatically and manually generate the validation report.
2. Provide capability to automatically email validation report to defined email addresses.

1.11 EDITING PROCESS

- A. Defined users of the system shall have the capability to edit existing meter data, add new meter data, or delete meter data.
- B. Original metering data shall be available for retrieval and restoration during the editing process.
- C. System shall track and report the following:
 1. What metering data was edited
 2. Who performed any metering data edit
 3. The time any metering data was edited

1.12 DATA FREEZING

- A. The administrator of the system shall have the capability to freeze any sub-metering data for selected period of time. That prevents any further data change. The functionality is used after validation and editing process in order to guarantee that data in the database will remain unchanged.
- B. It is possible to unfreeze the data but could be only done by administrator with appropriate rights.

1.13 TARIFF RULES

- A. The system shall provide the capability of inputting 10 tariff rules and generate reports based on those tariff rules.
- B. This option shall allow the user to read the sub-meter from the preset list of billing features called billing scheme
- C. The billing feature of the sub-meter shall be displayed on a dialogue box through which one can select the required features and store in the billing scheme. One of many stored billing scheme shall be selected and used for reading the sub-meter for billing purpose.
- D. All billing reading taken on a single day shall be appended to one file and stored with user name and the date of reading as a reference and later on it may be exported in a different data format for billing purpose.
- E. The reading tariff features are as given below:
 1. Sub-meter number
 2. All energy registers reading
 3. All tariff registers reading
 4. All tariff registers stored in the historical data.

1.14 RESET FUNCTIONS AND HISTORICAL DATA RECORDING :

- A. The reset shall be carried through one of the following ways:
 1. Manual, by pressing reset button
 2. On command from HHU or PC
 3. On command via the remote communication interface

4. Automatically under control of sub-meter internal clock at specified configurable predetermined time

- B. The manual and automatic reset options can be enabled/disabled through configuring the sub-meter. Enabling the manual reset shall disable the automatic reset and vice-versa.

On every reset all the registered data along with date and time of reset shall be transferred to historical register storage

1.15 PERIPHERAL DEVICE

- A. Hand Held Unit (HHU)

Hand Held Unit shall be commonly available and compatible with any sub-meter reading software that operates with M-bus, DLMS or equivalent protocol as approved by Marafiq. HHU shall include RS232 or USB data cable to communicate with PC.

1.16 SECURITY AND SEGMENTATION

Minimum following safety and security features shall be provided:

- A. Lockable front access of sub-meter panel.
- B. Hot swappable and redundant power supply
- C. The system shall maintain history of the changes made in the database. The changes' history includes information about the user who has changed and/or deleted information, and about the time when the respective operation was done, as well as the data that have been modified and/or deleted.
- D. Provide a minimum of three separate general user levels:
1. User with view rights
 2. User with edit rights
 3. Administrator with system configuration rights

1.17 ACCEPTABLE MANUFACTURER LIST:

The selected sub-meter for procurement shall be submitted for Marafiq's approval to ensure Marafiq's requirement.

1. Kamstrup
2. ITRON
3. Landis+Gyr
4. Elster



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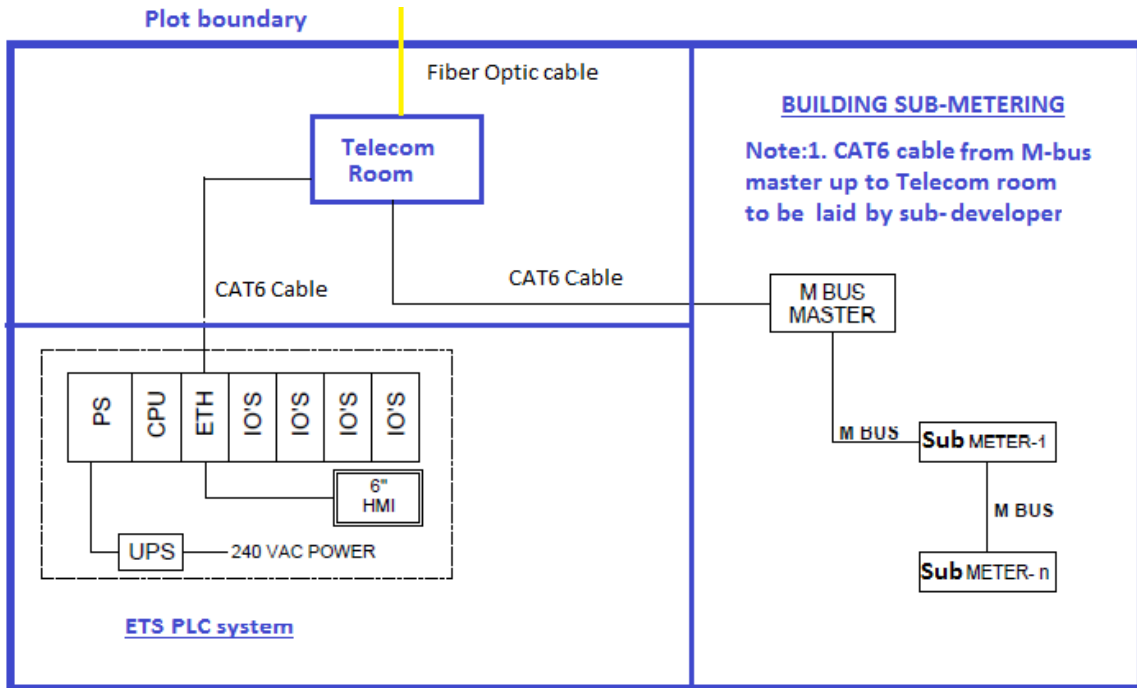


FIGURE 1 : Sub-metering system overview

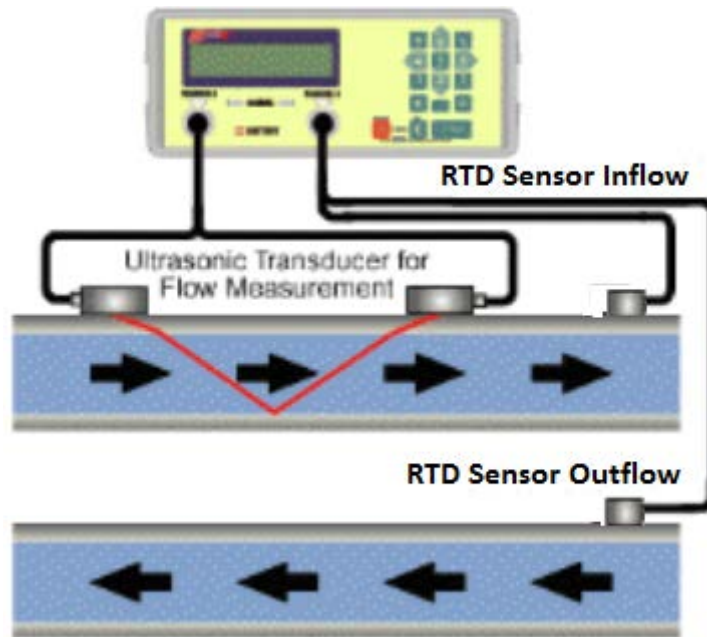


Figure 2: Sub-meter schematic

END OF SECTION