



# LUSAIL DEVELOPMENT

## GAS SMART SUB-METER SYSTEM GUIDELINES

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## 1.1 INTRODUCTION

This document sets forth minimal functional requirements for an Automatic Meter Reading (AMR) system of gas sub-meters. Gas sub-meters and M-bus operated solenoid valve shall be provided for each tenant/usage and shall measure and disconnect consumption of gas and store data, communicate with extremely located devices, servers, etc. Technical detail of proposed gas sub-meter, M-bus operated solenoid valve shall be submitted by sub-developer in compliance with the guideline for Marafeq's approval. Training for Marafeq's operation & maintenance staff shall be provided / carried out by the manufacturer's experts at no extra cost.

## 1.2 METERING PRINCIPLES

- A. The gas sub-meter and M-bus operated solenoid valve are integral part of AMR system, the sub-meter shall be capable to read, store, visualize and export meter data. The gas sub-meter data received from the AMR system shall allow charging each tenant for the consumption of gas used monthly or on other time scales as advised by the Marafeq.
- B. The gas Sub-meter and M-bus operated solenoid valve shall be provided for each tenant/usage.
- C. To ensure AMR data consistency, the industry standard M-Bus (METER BUS) system shall be used as the communication platform.
- D. The AMR system shall contain the provision of a seamless integration of any kind of resource/gas meters.
- E. Each gas sub-meter shall be installed inside the kitchen or as per Marafeq approved detailed design. Marafeq's personnel shall have unconditional access to all gas sub-meters.
- F. See Figure 1 for gas sub-metering system concept.
- G. The gas sub-meters shall be installed in accordance with manufacturer's instructions.
- H. Automatic Meter Reading (AMR) system consists of gas sub-meters at each individual gas user, M-bus operated solenoid valve and M-bus master/Data collector in each building. Each gas sub-meter measures and archives the gas usage for the user on which it is installed. Each gas sub-meter shall transmit the archived gas usage data to an M-bus master/Data collector to be installed near to gas control panel or as per site recommendations. Each M-bus operated solenoid valve shall be integrated with the same M-bus Master/data collector for remote control and monitor from AMR software. Marafeq's personnel shall have unconditional access to M-bus master/Data collector.
- I. M-bus master/Data collector shall have Ethernet TCP/IP port and to be able to communicate with AMR system on Ethernet TCP/IP protocol.
- J. The gas sub-meter system shall be designed to communicate with common M-bus master/data collector through one IP address which shall be provided by client during testing & commissioning.
- K. M-bus master, gas sub-meters, enclosure and accessories shall be supplied, installed, and commissioned by the sub-developer as per manufacturer's guideline.
- L. M-bus master/Data collector shall be installed in minimum IP 55 enclosure.
- M. AMR licensed software shall be provided for Solenoid valve control and monitor, meters reading, billing, editing, validating, data freezing and with different tariff rules.

- N. M-bus master/Data collector shall be integrated with AMR system on Lusail Integrated Access Network (LIAN) from sub developer telecom room to command and control center's telecom room therefore contractor must follow latest Lusail Smart City Guideline and Lusail Smart Services Interface Guideline for seamless system integration, these guidelines are uploaded on Lusail website.

### 1.3 COMMUNICATION PRINCIPLES

- A. All gas sub-meters shall be provided with an integral or internal M-Bus communication interface, ensuring real data communication between the gas sub-meters and the AMR System. The meter design shall be compact to be suitable for residential metering application.
- B. The individual gas 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 present time scheduled reading job, or by a manual data acquisition.
- C. The transmission of the gas 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 gas Sub-meter and M-bus operated solenoid valve shall be provided for each tenant/usage. Individual gas sub-meter and the M-bus operated solenoid valve are connected on a wired M-Bus network and are connected to a dedicated M-Bus gas master/Data collector. The M-Bus master shall be able connect to the telecom room provider switch in the building telecom room on Ethernet TCP/IP protocol.

### 1.4 FUNCTIONS

**The Gas sub-meter and Solenoid valve for each usage shall have minimum following functions:**

- A. Automatically read gas flow, volume.
- B. Verify the retrieved gas usage data for each individual gas user is in the expected range and that there are no error codes or other issues that could cause the gas usage data to be incorrect.
- C. Store and archive the gas usage data for each gas user.
- D. Gas sub- meter shall follow:
- BS EN 1359:2017 - Gas meters. Diaphragm gas meters.
  - BS 6400 – Specification for the Installation of domestic-sized gas meters maximum capacity not exceeding 6m<sup>3</sup>/h.
- E. Gas sub-meter must not show zero values in case of heavy over gas flow but must be capable of stating at least 20% over maximum gas flow value.
- F. Gas sub-meter shall calculate consumption based on EN 1359:2017, EN14236:2008
- G. Gas sub-meter shall be able to provide historical data logging of monthly values of 12 months, daily values of 120 days, 1440 hours, event, and interval log.
- H. Gas meter calibration shall be according to OIML standard and calibration certificate shall be submitted to Marafeq for reference.

- I. Power supply subjects to the manufacturer requirement, the gas sub-meter shall be provided with integral lithium battery capable for 10 years operation.
- J. Protection class of gas sub-meter shall be IP 54.
- K. Operational temperature range shall be (-) 5°C to (+) 60°C.
- L. Gas sub-meter shall be provided with EEPROM based non-volatile memory for data backup.
- M. EEPROM shall be capable of being read by external equipment in the event of damage or component failure which renders the sub-meter inoperable.
- N. Gas sub-meter shall be provided with LC/ display or mechanical index display.
- O. Data stored in the gas sub-meter shall not be lost during the calibration or upon loss of power supply or without battery power supply.
- P. A communication indicator is lighted when meter is communicating through its communication port.
- Q. A low battery indicator shall flash when the battery needs to be replaced.
- R. All registered data shall be written in the memory at least once per day and whenever power failure occurs.
- S. Alarms shall be generated for the minimum events such as 95 % filling of gas sub-meter memory, password failure, and communication failure.
- T. 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.
- U. The gas solenoid valve shall be suitable for LPG / Natural gas operations and shall meet the minimum following specifications.
  1. Direct acting, Normally Closed
  2. Reference Standard: EN 161
  3. ATEX certified.
  4. IP 65 rated
  5. Closing time: <1Sec
  6. Power Supply Voltage: 220-240 V/50-60 Hz.
- V. Each gas sub-meter and solenoid valve 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:
  1. Manufacture's name or trademark and place of manufacture
  2. Serial number
  3. Year of manufacture
  4. Operating temperature
  5. Maximum operating pressure
  6. Accuracy of the gas sub-meter

## 1.5 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.

## 1.6 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 ICS1.

## 1.7 WARRANTY

- A. All components shall have a warranty of 2 years from date of commissioning.
- 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.

## 1.8 BASIC FUNCTIONAL REQUIREMENTS OF AMR SYSTEM

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

## 1.9 COMMUNICATION

The gas sub-meter and M-bus master/Data collector 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 among gas sub-meters, M-bus operated solenoid valve and M-Bus master shall be through wired M-Bus.
- B. Optical communication port in compliance to IEC 62056-21. The optical port shall allow bi-directional communication with 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. CAT 6 Ethernet cable shall be laid from M-bus master/Data collector to Sub developer telecom room if distance from M-bus master/Data collector to sub-developer telecom room is less than 80 meters else fiber optic cable shall be laid by sub developer as per Lusail smart city guideline, accordingly sub developer needs to provide managed Ethernet/Cu switch with LC/APC redundant ports in compliance with the smart city guideline.
- E. A standard serial port (RS485) for M-bus communication with maximum communication speed upto 115200 baud rate. Serial port shall support digital communications of internal logical points to other sub-meters, M-bus operated valve and master meter.
- F. Sub-meter system shall support the following communication protocols: M-Bus, Optical.

## 1.10 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 Personal computer (PC) or other secondary data acquisition and storage device.
  3. Manual entry by authorized personnel.
- B. Meter data acquisition through digital communication with the gas 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.

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



## 1.12 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.

## 1.13 DATA FREEZING

- A. The administrator of the system shall have the capability to freeze any gas sub-metering data for selected period. 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.

## 1.14 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 gas 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 schemes 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 username 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. Gas sub-meter number
  2. All consumption registers reading.
  3. All tariff registers reading.
  4. All tariff registers stored in the historical data.

## 1.15 RESET FUNCTIONS AND HISTORICAL DATA RECORDING

- A. The reset shall be carried through one of the following ways:
  1. On command from Personal computer (PC)
  2. On command via the remote communication interface
  3. Automatically under control of gas sub-meter internal clock at specified configurable predetermined time.





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- B. The manual and automatic reset options can be enabled/disabled through configuring the gas sub-meter. Enabling the manual reset shall disable the automatic reset and vice-versa.
- C. On every reset all the registered data along with date and time of reset shall be transferred to historical register storage.

## 1.16 PERIPHERAL DEVICE

- A. Handheld Unit (HHU)/Personal computer (PC)

Handheld Unit/PC shall be commonly available and compatible with any gas sub-meter reading software that operates with M-bus, Ethernet TCP/IP or equivalent protocol as approved by Marafiq.

## 1.17 SECURITY AND SEGMENTATION

Minimum following safety and security features shall be provided:

- A. Lockable front access of sub-meter panel.
- B. 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.
- C. 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

## 1.18 RECOMMENDED GAS METER MANUFACTURER LIST

1. Honeywell / Elster
2. Itron / Actaris
3. Apator Metrix
4. Pietro Fiorentini

## 1.19 DOCUMENT SUBMITTALS

1. Compliance Statement
2. Highlighted Technical Documents
3. Bill of Materials
4. System Architecture, General Arrangement, Electrical and Riser Diagram

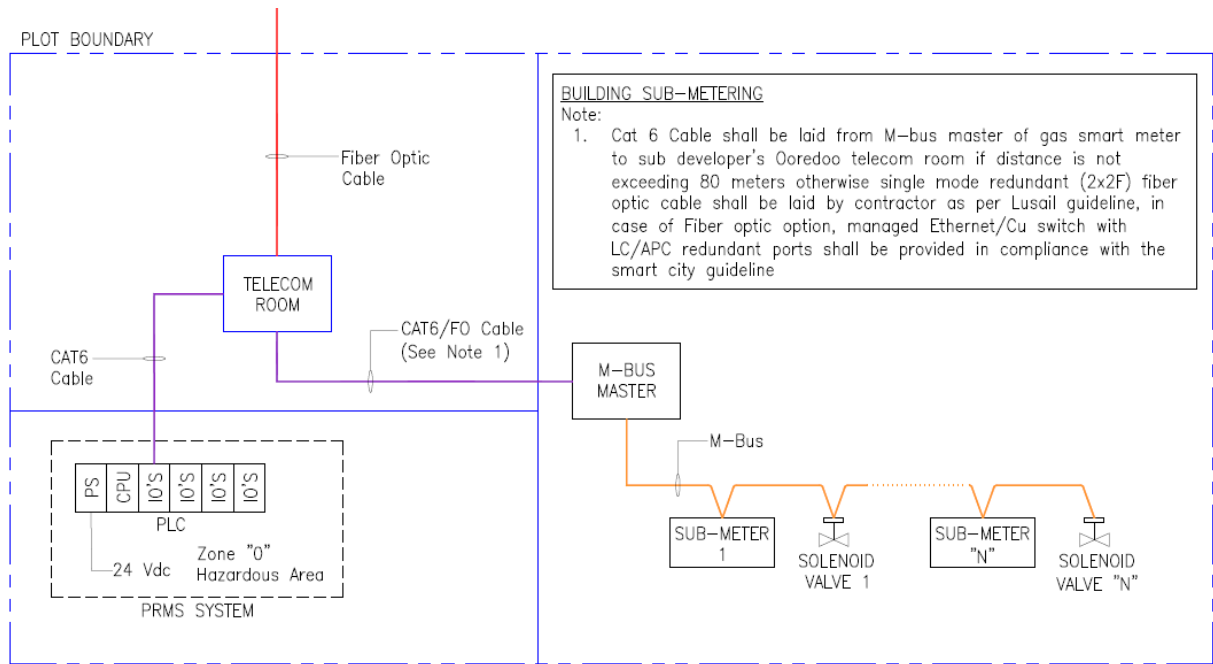


Figure1 : GAS SUB-METERING SYSTEM

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