SULTANATE OF OMAN
METERING AND DATA EXCHANGE CODE

STANDARD: OES-22F
THREE PHASE KILOWATT-HOUR DIGITAL METERS, CURRENT TRANSFORMER OPERATED, CONNECTED FOR SERVICE CONNECTIONS

1.0 GENERAL

Electronic three phase kilowatt-hour meters shall conform to the following standards:

- IEC 62052-11 – Meter tests and testing conditions
- IEC 62053-21 - Static meters for active energy (Class 1.0 and 2.0)
- IEC 62053-23 - Static meters for reactive energy (Class 2.0 and 3.0)

Accuracy class of meters shall be, as a minimum:

- Active energy: Class 1.0
- Reactive energy: Class 2.0

Meter manufacturer to be ISO 9001 accredited.

Where meters conforming to this OES Standard are installed, they shall be used in conjunction with current transformers (CTs) conforming to IEC 60044-1. CTs shall normally have the following characteristics:

- Secondary current rating of 1 or 5 Amps
- Minimum burden rating of 5VA
- Minimum accuracy class of 0.5

All metering equipment shall be suitable for operation in electrical system and site conditions as detailed in OES-11.

2.0 ELECTRICAL

Nominal voltage (Vn):	3 x 240/415V AC
Voltage operating range:	-20% to +15% of Vn
Frequency:	50Hz ±5%
Configuration:	3 phase 4 wire
Nominal current (In):	1 to 5 Amp
Maximum current:	125% of In

Meter must continue to function when:

- One or two phases are missing, while still measuring the active energy on the remaining phases
- Missing neutral
- Inversion of phase and neutral

Electronic components to be protected against over voltage/spikes. A silicon carbide surge arrestor or similar device shall provide this protection.

Electromagnetic Compatibility (EMC) testing required complying with:

- IEC 61000-42
- IEC 61000-42
- IEC/CISPR22 class B

Protection shall be applied to the link between the meter and the external circuit breaker.

3.0 MECHANICAL & ENVIRONMENTAL

Ambient temperature range:	0˚C to 60˚C
Maximum ambient temperature:	60˚C
Minimum ambient temperature:	0˚C
Maximum mean over 24hours:	50˚C
Mean over a year:	35˚C
Storage temperature range:	0˚C to 60˚C
Relative humidity range:	0 to 100%
Maximum relative humidity:	100%
IP rating (minimum):	IP54 (as defined in IEC 60529)

Meter electronics boards i.e. PCBs, shall be sealed by a water, dust and vermin resistant layer/coating giving high humidity resistance.

Meter base and cover to be made of polycarbonate.

Meter main cover and terminal cover shall be capable of being sealed.

Metrological part of the meter to be 'sealed' at factory and access shall not be gained without evidence of damage to such seals.

Meter shall be tamper resistant.

Tamper 'switch' to be fitted which detects intrusion into the meter main cover and terminal cover.

Display

Meter display shall be visible even when meter is not energized.

Viewing angle of display to be ±15˚.

Nominal dimensions of the display shall be 80mm x 20mm.

Individual digit size shall be consistent with the display dimensions e.g. 8mm x 18mm.

Display to have eight digits including one decimal place.

Terminal block

Terminal block shall cater for CT wiring of minimum conductor size 6mm².

Terminal block shall pass ISO 75 for temperature of 135˚C and glow wire test of 960˚C.

4.0 FUNCTIONALITY

Meter to be microprocessor based.

Meters shall have been subjected to a 15 year accelerated life test to verify acceptability.

CT ratio shall be capable of being configured both locally, through IEC 61107 port, and remotely by AMR system.

Meter shall provide an output to switch remotely an externally connected circuit breaker controlling the customer's supply.

When tamper 'switch' operated, as well as an alarm being generated, signal shall be sent to open breaker and cut supply.

Meter to include internal Real Time Clock (RTC).

RTC accuracy to be <5ppm

Date format to be dd/mm/yy.

RTC to display in 24-hour clock.

Calendar to take account of leap years.

RTC shall normally be powered form the mains power.

In case of supply failure, the RTC shall be powered by an internal super capacitor of battery with minimum 15 year life (starting from date of installation), and retain the time and date for at least four days.

RTC shall be capable of being adjusted or reprogrammed remotely.

Meter shall measure and record the following values as a minimum:

- Active energy
    - Total cumulative KWh
    - Cumulative KWh per billing period
    - Time of Use KWh (minimum of four programmable registers)
    - Total Maximum Demand in KW (highest maximum demand ever)
    - Maximum Demand per billing period
    - Maximum Demand per Time of use
- Reactive energy
    - Total cumulative KVArh
- Quality of supply – instantaneous values of:
    - Frequency
    - Voltage per phase

    - Current per phase
    - Power factor
    - V to I phase angle per phase
    - Phase rotation

- Alarms
    - Battery low
    - Tamper
    - Meter error
    - Phase failure (one or more phases)
    - CT reversal (per phase)
    - Meter Reprogrammed.

Quality of supply values recorded and transmitted to be accurate to <±1%.

Billing period and Time of Use registers shall be programmable.

Maximum Demand integration period shall be programmable from 5 minutes up to 60 minutes in 5 minute intervals.

All register values and alarms to be time stamped by internal RTC.

All registers to be non-volatile memory and be retained for 15 years following loss of power.

Register values to reset to zero on reaching 9,999,999.9

Display shall be capable of being programmed to show any register, but shall by default always display:

- Current time and date
- Total cumulative KWh
- Total cumulative KVArh
- CT ratio
- All standing alarms (except tamper alarm)

Display options shall be scrolled using a push button.

Testing the meter accuracy shall be possible through the optical port using a calibration LED. In addition to this, a programmable relay output shall also be provided for calibration purposes.

Load profile shall be retained using hourly values for a period of 6 months.

Meter shall perform periodic self-diagnostic checks and generate an alarm when an error is detected.

Password security shall restrict access to perform different levels of reprogramming activities.

5.0 COMMUNICATIONS

Meter shall be capable of interfacing with a third party AMR system. This means:

- Meters shall use a protocol that allows it to be automatically detected when connected to a communications bus e.g. using DLMS/COSEM, Euridis, or similar proprietary protocol.
- Any protocol employed shall use only open system architecture based on publicly available international standards, and be freely available to any third party for integrating into an AMR/AMI central collection system.
- Protocol employed shall demonstrate compliance and/or certification with any relevant standards e.g. IEC 62056.
- Meters shall also be capable of being multi-dropped on the same communication bus for remote interrogation and programming purposes.
- Electrical interface for remote communications shall have at least RS-485.

Local meter programming and interrogation only shall be capable through a separate optical port to IEC 61107 with magnetic coupler/ring connection.

Meters shall also be capable of connecting directly to a remote communications carrier via a suitable interface e.g. GSM/GPRS modem, PLC modem, etc.

Method of communications should not be restricted to one method e.g. GPRS, PLC, RF, etc.

Note.

Where fitted, modems shall be connected externally to the meter either inside a suitable, sealed enclosure, or with all connections to and from the modem and the meter equipped with a suitable sealing facility so as to minimize possible disruption to data collection.