HELLENIC ELECTRICITY DISTRIBUTION NETWORK OPERATOR S.A.

NOTICE OF CALL FOR TENDERS No ND-207

PROJECT: "Pilot Telemetering and Management System for the Electric Power Supply Demand by Residential and Small Commercial Consumers and Implementation of Smart Grids"

ELECTRONIC SINGLE PHASE AND THREE PHASE L.V. METER SPECIFICATIONS

CONTENTS

TECHNICAL SPECIFICATION

ELECTRONIC SINGLE-PHASE AND THREE-PHASE L.V. METERS

SCOPE

This specification determines the construction, testing, acceptance check and packing for transportation and delivery to HEDNO warehouses of electronic single-phase and three-phase Low Voltage (L.V.) meters for direct connection to the network for energy measurement.

OPERATING CONDITIONS

Operating Temperature

The temperature zone in which the meter functions properly must be between -20 °C and +55 °C.

The storage and transport temperature zone shall be between -20°C and +70°C.

Humidity

The electronic meter shall operate under an average annual relative humidity of less than 75%.

For 30 days in total interspersed within the year, it shall operate under relative humidity of 75% to 95 %.

Additionally, at random moments within the day, it shall operate under relative humidity 85 % (IEC 62052).

TABLE OF CLIMATIC AND ENVIRONMENTAL CONDITIONS

Maximum altitude	2,000 m
Minimum ambient temperature	- 20^{o} C
Average ambient temperature	20^{o} C
Maximum ambient temperature	55° C
Maximum temperature at external surfaces due to solar radiation	70^{o} C
Minimum relative humidity	5 %
Maximum relative humidity	95 %

REGULATIONS - SPECIFICATIONS

REGULATIONS	TITLE
EN / IEC62052/11 & EN/IEC62053/21-22-23	Alternating current static watt-hour meters for active energy (classes 0.5 & 1)
EN/IEC 62058-11	Electricity metering equipment (A.C.) - Acceptance inspection Part 11: General acceptance inspection methods
EN/IEC 62058-31	Electricity metering equipment (AC) - Acceptance inspection - Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)
EN 50470-1	Electricity Metering equipment (a.c.) Part 1: General requirements, tests and test conditions - Metering equipment (class indexes A, B and C)
EN 50470-3	Electricity Metering equipment (a.c.) Part 3: Particular requirements - Static meters for active energy (class indexes A, B and C)
EN / IEC 60529	Degrees of protection provided by enclosures.
EN/IEC 60068-2-6	Basic environmental testing Procedures Part 2: Tests. Test EA : shock
EN/IEC 60068-2-30	Basic environmental testing Procedures Part 2: Tests. Test Db and guidance: Damp, neat cyclic (12 + 12 - hour cycle).
EN/IEC 60695-2-1	Fire hazard testing part 2: test methods. Glow wire test and guidance.
EN/IEC 60695-2-2	Fire hazard testing part 2: Test methods Needle flame test.
CENELEC / TC13	CENELEC technical body responsible for equipment for electrical energy measurement and load control.

1. The electronic meters shall be industrial products manufactured according to the International-European EN/IEC regulations / standards and to the Technical Specifications of HEDNO as mentioned above, which are valid on the day of the submission of the bids as well as on the day of installation and delivery.

2. In cases where the requirements of this Specification contradict with the above editions of International Regulations / Standards or any other relevant Standards, the corresponding HEDNO specification shall prevail.
3. The meters shall have markings pursuant to the European Standards, and they are also required to have the "CE" conformity mark.
4. The offered meters for residential and light/small commercial applications shall be of **class B**, in compliance with the EU Directive 2004/22/EC (Measuring Instruments) and according to the Ministry Decision (Government Gazette 521 / issue B' / 12.04.2007, No. F2 - 1393).
5. All necessary certificates for the above compliance, that have been issued for the offered meters by a competent Notified Body, should be submitted.
6. Moreover, the supplier of the meters shall submit a certificate certifying that the meters are calibrated in facilities which are compliant with ISO 9001 as well as ISO/IEC 17025.

EQUIPMENT DESCRIPTION

MECHANICAL REQUIREMENTS

Cover

7. The electronic meter shall be designed and manufactured according to the protection class IP51 as specified in EN/IEC 60529 for indoor installation (but with the meter covers closed).
8. The cover window shall be made of a high purity transparent material, enabling the meter's readings to be easily read even after 15 years exposure to the sun.
9. The support dimensions of the meter shall be according to DIN 43857.
10. ~~The meter cover shall be according to DIN 43857 for standardized connection of the phase and neutral conductors and for the connection of the signal outputs, communication units etc.~~

    The meter cover shall be according to the IEC specifications for direct connection of the phase and neutral conductors as well as the pulses output, signal-output, communication device by terminal blocks.

    The meter width shall be according to DIN 43857.
11. The electronic meter cover shall contain a communication port which is accessible through an optical head, which shall be waterproof.
12. The electronic meter shall be properly connected to the communication medium each time used (PLC, GSM/GPRS, etc.). It must be possible to secure the said

communication device inside the meter's housing or inside the meter's cover.

13. The communication with the optical head port must be performed in accordance with EN 62056-21:2002.
14. The electronic meter must be delivered with its cover sealed or completely closed (glued).
15. In case that the meter is delivered with sealed (glued) cover, every attempt to open it shall result in a broken box in a visible manner.
16. In case that the meter is delivered with sealed (glued) cover, if opened, an internal tamper alarm shall be triggered.
17. It shall be possible to perform the following tasks without unsealing the meter cover:
    - Reading through the display and activation of its functions by button (push buttons).
    - Reading of the meter's characteristics (name table).
    - Programming and reading of the electronic meter by a laptop computer or portable handheld unit, using the optical communication port.
    - Manual reconnection of supply via a waterproof button (push button) mounted on the front cover. Note that it is intended that only authorized HEDNO personnel would utilize this method, as the button is not generally accessible by the consumer.
    - Check of measuring accuracy of active energy by a pulse signal from a LED installed on the front cover of the meter.

Terminals and Terminal Cover

18. The size and position of the terminals shall be according to ~~DIN 43857~~ EN/IEC standards.

    For single-phase meters, the terminals shall be able to connect stranded cable of minimum cross-section 4 mm^2 and maximum cross-section 35 mm^2.

    For three-phase meters, the terminals shall be able to connect stranded cable of cross-section at least 25 mm^2.

    The minimum cross-section for connection of stranded cable at the signal or pulse terminals shall be at least: 1 mm^2

    The terminals for output pulses, signal outputs, communication device shall be of spring type without tightening screws.

19. The terminals shall be of front connection type and shall have lifted insulation

diaphragms in order to provide protection against accidental short-circuits between phases and neutral during the connection or disconnection of the meter.

20. Each terminal shall have at least two terminal screws for tighening in order to ensure proper electric contact and no risk of temperature rise or conductor loosening under normal operating conditions.

21. The terminal's cover shall feature a tampering alarm and be sealed, so that any internal intervention in the terminals requires breaking the cover seals with simultaneous activation of the alarm signal, while the terminals position shall be according to VDE-0418.

Nameplate

22. The nameplate of the meter shall be in compliance with the EU Directive 2004/22/EC (Measuring Instruments), according to the Ministry Decision no. F2 - 1393 (Government Gazette 521 / issue B' / 12.04.2007 No F2 - 1393).

23. The nameplate shall be designed and installed so that the following capacities or information are provided:

- The PPC S.A. logo.
- The meter constant.
- The symbol for double insulation protection and the CE mark for compatibility with EU regulations/standards.
- Meter information (including but not limited to meter type, serial number, nominal values / ratings, year of manufacture).
- The nominal values shall include nominal voltage, nominal current and maximum voltage.

Communication via the optical head (IR- Port)

24. The electronic meter shall be equipped with a communication port through an optical head. The communication port shall be infrared type (IR - Port).

25. The communication protocol of the IR Port shall be in accordance with EN 62056-21:2002.

26. The optical head shall be read through a portable handheld device or PC/laptop. The optical head shall be self-supported in a manner that does not affect the proper operation of the meter (e.g. magnetic).

Physical requirements

27. The electronic meter shall be manufactured according to the requirements of DIN 43857-1 and DIN 43857-2. This facilitates the installation of the meter

inside meter cabinets standardized by HEDNO.

ELECTRICAL REQUIREMENTS

Type of Connection to the Network

28. The electronic meter must be designed for connection to a low voltage network.

METERING SYSTEM

General

29. The metering system must be digital for direct connection to the network.
30. The meter must calculate at least the following:
    - Incoming – Outgoing active energy
    - Incoming – Outgoing reactive energy (for three-phase meters)
    - Voltage and current
    - Phase sequence (for three-phase meters)
    - Direction of energy flow

Accuracy Class

31. For residential and small commercial meters, the electronic meter shall be of accuracy class B.

Operating Voltage Range

32. The meter shall be suitable for operation with rated voltage 230 Volts, and shall operate within a voltage range of 0,8 to 1,15xUn (where Un is the nominal voltage).

Measured Current Range

33. The meter maximum current shall be Imax = 60 A for single phase meters.
34. The meter maximum current shall be Imax = 100 A for three phase meters.
35. The meter shall have basic current value Ib = 10 A.

Load Capacity

36. The meter must withstand overload according to EN/IEC 62052-11, 62053-21,-22 and -23 and EN 50470.

Network Frequency

37. The electronic meter shall operate at a network frequency of 50 Hz and a variation zone of ±2%.

OPERATION REQUIREMENTS

Starting current

38. The direct connected electronic meter shall begin the energy measuring when the current reaches at least 0.5% of the nominal current In, according to EN 50470-3.
39. The electronic meter shall use the starting power instead of the starting current in order to define the starting limit.

Accuracy

40. The electronic meter shall achieve the required accuracy for power measuring (W) according to EN/IEC 62053 and EN 50470.

Meter Power Supply

41. The meter shall be suitable for low voltage measuring, with nominal network voltage 230/400V (± 10%, in accordance with EN/IEC 62053-22 and EN/IEC 62053-11).
42. The electronic meter shall be able to operate in each of the following cases of power failure, with the accuracy that characterizes the corresponding voltage asymmetry:
    - Neutral loss
    - Phase(s) loss in three-phase meter
    - Neutral inversion
43. Upon voltage restoration, the meter must return to normal operation in 5 seconds at maximum.
44. The electronic meter must be consistent with EN/IEC 62053, EN 50470 with regard to the overload and over-current requirements.
45. In case of continuous voltage loss, the meter non-volatile memory shall permit information retrieval after a period of 10 years without any auxiliary supply.

Meter self-consumption

46. The energy consumption shall be according to EN / IEC 62052-11, EN/IEC 62053/21-22-23 for multifunctional meters.

47. Without the communications unit and the display backlight the energy self-consumption shall not exceed the values specified in EN/IEC 62052-11 & EN/IEC 62053/21-22-23.

Auxiliary Supply (Clock autonomy)

48. The auxiliary supply shall provide power only to the real time clock (R.T.C).

49. The meter shall be equipped with:
    - Lithium battery capable of providing sufficient energy for the operation of the internal clock (R.T.C) for three years at least (without the meter being connected to the network). The battery's life-time with the meter connected to the network shall be at least 10 years, with a maximum loss of 10% due to self-discharge.

    OR / AND
    - Super-capacitor.

50. In any case the billing values of the meter must be reserved in its memory for at least ten (10) years.

REGISTERS

Energy registers

51. The meter shall be provided with at least six (6) tariff zones with the relevant (12) incoming and outgoing energy registers.

Historical data registers

52. The control of the integration period shall be performed by the internal calendar clock of the meter.

53. Integration period shall be programmable from 5 to 60 minutes (5, 10, 15, 20, 30 and 60).

Instantaneous information

54. The registers of the measured quantities shall be updated at least every second.

55. This information shall be available to be shown on the display or to be registered as events.

Diagnostic functions

56. The electronic meter shall perform a diagnostic check of its circuits each time it is placed under voltage, after every voltage outage and at regular time intervals.

57. In case an error is detected, a corresponding fault message, identifiable by the optical head and via telemetering, shall be displayed on the meter display.

Display readings

58. Beyond measuring information (energy registers, instantaneous values of current-voltage-power, network quality data), the meter shall store in its memory and shall be programmable which of the following additional information shall be shown on the display:
    - Meter serial number (up to 12 digits)
    - Current date and time
    - Tariff zone / calendar information
    - Status of the load switch
    - Error indication

Definition of Tariff Zones

59. The definition of the meter's tariff zones shall be performed with the following methods:
    - through the internal time switch
    - through appropriate meter programming

60. The meter shall have a minimum of 6 zones.

Time Switch / Calendars

61. The meter must be equipped with a calendar time switch for changing tariff zones and determine the end of the billing period.

62. The clock mechanism shall be high precision Quartz (<5 ppm deviation +/- 20%).

Real Time Clock (RTC)

63. The clock shall provide all required timings for the proper operation of the meters.

64. The calendar shall support leap years and programming of daylight time adjustment.

65. The clock shall support automatic change to/from daylight time according to the

European standard.

66. When synchronization is performed by internal crystal, the achieved accuracy shall be greater than 5 ppm (deviation +/- 20%).

67. Moreover, synchronization accuracy of one second shall be achieved through the communication unit.

Display

68. The display shall be able to show information from the energy registers and information from the historical registers, which have been defined through programming.

69. The information shall be read based on CENELEC methods and standards. The decimal digits, the units, the multipliers, the content and the display sequence shall be defined through programming.

70. Similarly, the list content and the display sequence shall be defined through programming.

71. It is required to include at least the following readings:

- Units: ~~W,~~ kW, ~~Kvar, Kvarh, Wh,~~ kWh, V, A
- Units: Kvar, Kvarh for three-phase meters
- Error code
- State of selected Outputs including the load switch
- Active tariff zone

72. The meter display must be visible from a distance of 1m below and 0.75m horizontally from the front side of the meter (observation angle 30°). All screens shall be visible under low lighting conditions.

73. The date display type shall be user-definable as follows:
    - yy/mm/dd

74. The meter shall support the following operation modes of the display:
    - Normal (automatic scrolling of displayed information)
    - Technical Check (Programming - Set mode)

Load switch and push-button

75. The load switch shall not require maintenance throughout the meter's lifecycle.

76. The push-button of the load switch must have a lifecycle of at least 10,000 switching operations under full nominal load with power factor 1.

77. The load switch shall be adjustable relative to the power of the customer's supply.

78. The load switching capability shall be according to IEC 62055-31 UC2.

79. The push button of the load switch shall change state (connection/ disconnection) only following a relevant order in one of the following functions:

    1. Local operation: authorized utility personnel can use the local button to manually connect or disconnect. In this operating mode, remote disconnection is possible, but remote connection is not.
    2. Remote operation: This operating mode does not allow local operation (manual disconnection and connection). To safely execute remote reconnection of a disconnected customer, local operation mode is provided and, then, the operator may reconnect his supply.
    3. Alternating operation: the operating mode of the push-button's disconnection switch must enable remote alternation between "remote operation" and "local operation" and vice-versa.

80. The default operating mode of the disconnection switch when delivered must be "local operation".

81. For reconnection, when the load is disconnected, consumer action is required as follows:

    a. The central system transmits a command enabling the meter to reconnect.

    b. Consumer opens (OFF state) the general switch of the internal electrical installation, which is detected by the meter. Subsequently, the consumer closes his general switch (ON state).

82. During a power outage, the load switch must be kept in the same position as before the power outage.

83. After power restoration, the load switch must be kept in the same position as before the power outage.

84. The state of the disconnection switch shall be remotely readable and any change must be registered in a special file.

85. Load Limitation: The meter shall permit remote setting of load limits.

OUTPUTS

Integrated Relay Output

86. At least 1 integrated relay output shall be included in all meters to provide

information or/and remote switching capability (on/off) of individual customer circuits.

87. The relay output will be capable of operating a relay.

88. The technical specifications of the relay output are the following:

- Solid state relay,
- Voltage 12 - 240 V ac/dc,
- Minimum current 100mA

89. The above relay output should be programmable remotely by the parameterization software of the meters.

COMMUNICATION PROTOCOL

90. Meters must be compatible with standards approved by CENELEC or/and emerging standards that are currently under final evaluation by CENELEC/TC13 committee (Meters & More, Prime, G3-PLC, CX-1, OSGP).

91. At the physical layer, any technology is accepted. A minimum communication speed of 4.8 Kbits/sec is required. All communication technologies (GPRS, Multicarrier, S-FSK, B-PSK, etc) are accepted.

92. At the data link layer any kind of technology is accepted (included among others, TCP/UDP IP and 1334-LLC).

93. At the application layer, full compatibility with COSEM-OBIS/DLMS standard is required.

94. All above must be documented by compliance certification according to DLMS User Association procedure.

    http://www.dlms.com/conformance/certificationprocess/index.html

95. Required speed of at least 4.8 kbits/s must be certified by a certificate issued by a laboratory certified according to ISO / IEC 17025 standard.

COMMUNICATION WITH IN HOME DISPLAYS (IHD)

96. The electronic meter must ensure communication with the in home display (IHD) used. In any case, the meter must transmit readings to the in home display at a range of at least thirty (30) meters inside a building constructed by reinforced concrete.

97. The electronic meter shall communicate with in-home displays via radio-frequency methods (Bluetooth, Zigbee, etc.) or via PLC.

98. The Contractor shall specify the commications method between electronic meter

and the IHD as well as the protocols used, in his Tender offer.

99. The electronic meter shall transmit, to the in home displays, the real-time consumption in KW at least once per 30 seconds.

100. The electronic meter shall transmit at least meter details such as supply number, serial number, MAC address or equivalent unique identifier, and the number of domestic network to which it is connected.

101. The electronic meter shall also transmit the local time to the in home displays.

102. The electronic meter shall transmit simple messages to in home displays including:

- Greetings
- Special Information
- A warning for scheduled power interruptions.

CONNECTION WITH IN HOME DISPLAYS (IHD)

103. The electronic meter shall be capable of being paired remotely with in home displays.

104. The electronic meter shall be capable of being connected locally with in home displays. The electronic meter shall only be paired with an in-home display based on the MAC address or other equivalent unique identifier.

105. Communication between the electronic meter and the in home display shall be secure and encrypted.

106. The pairing state of the electronic meter with the in home display shall be possible to be remotely monitored.

107. Upon loss of power and subsequent restoration, the electronic meter shall automatically be paired with the previously authorized in home display.

ELECTROMAGNETIC COMPATIBILITY (EMC)

108. The meter shall comply with the following standards:

- Electrostatic discharge according to IEC 61000-42
- High frequency electromagnetic field according to IEC 61000-4-4
- Line transients according to IEC 61000-4-4
- Radio interference attenuation according to IEC/CISPR22 class B

HARMONIC DISTORTION 2-150 KHZ:

The offered meter should satisfy tests regarding its tolerance to the influence of symmetric high frequency currents (range 2kHz - 150kHz), such as those produced by photovoltaic inverters.

Successful test results of the offered meter should be proved by the respective test certificate or test protocol issued by a certified by EN ISO / IEC 17025: 2005 test laboratory.

Meters must comply with the Test Procedure as defined in the technical report of CENELEC CLC / TR 50579.

COMMUNICATION INTERFACE

109. The electronic meter shall be capable of communicating via modem GSM/GPRS, PLC, etc. for telemetering – parameterization.
110. The communication modem may be provided inside the meter (On Board), plug-in/modular, or external.
111. When the communication device is not modular and must be installed as external, meter must feature an RS485 communication port.
112. The communication port (if such port exists), shall be in a protected, confined point of the meter, not accessible by non-authorized personnel.
113. Access to the communication port must be protected with a tampering event logging.

ENERGY PROFILES RECORDING

114. Meters must be capable of load profiles recording for the following quantities:
    - Incoming – Outgoing active energy
    - Incoming – Outgoing reactive energy
115. For integration period of 15 min, load profile data shall be stored for at least the last sixty (60) days.
116. Internal memory shall be non-volatile for a minimum preservation time of 10 years.

TAMPERING EVENT LOGGING

117. The meter shall have the capability, via appropriate arrangements and parameterization, of detecting and logging at least the following events, of potential attempt for tampering the meter while in normal operation under voltage (each event individually), by logging the time (date and hour) of

appearance and disappearance of each event:

- strong DC magnetic field influence;
- terminals'cover removal;
- tampering/ any form of removal of the modem cover or connections;

118. The electronic meter shall use passwords to restrict the access to the meter for data reading, parameterization, etc.

POWER QUALITY MONITORING

119. The meter shall have the capability, via appropriate parameterization for the definition of the measured quantities thresholds, of monitoring at least the following events (each event individually), by logging the time (date and time) of appearance and disappearance of each event:

- under-voltage (phase to neutral)
- over-voltage (phase to neutral)
- over-current
- power-down
- power-up

METER HEALTH MONITORING

120. The meter shall have the capability to detect and log the following events:

- Battery low
- Meter error malfunction code
- Meter reprogrammed status/feedback
- Meter communication complete
- Meter communication failed
- Load control switch state

REMOTE CONFIGURATION AND FIRMWARE UPGRADE

121. The electronic meter shall be capable of local and remote configuration.

122. Firmware for the electronic meter shall be capable of being deployed remotely via the engaged communication method.

123. Changes in firmware or configuration shall be acknowledged by the meter via

communication with the central system.

124. Firmware upgrades for the electronic meter shall be validated upon sending (local or remote) and shall be able to be held inactive until activation at a certain future time.

TESTS

DEFINITION OF TESTS

- Type Tests

All tests intended for identifying the type characteristics of the meter in order to prove the compliance with the requirements of the relevant standards/regulations that these characteristics are required to comply with.

- Series tests

Tests performed on new meters to ensure that they comply with the results of the above tests or to prove that the batch meets the specialized general and specific requirements of the relevant specification.

- Acceptance tests

Sampling tests performed on a batch of meters prior to delivery for the purpose of making a decision regarding the acceptance or rejection of the batch.

All tests shall be performed as described in each relevant and most recent issue of the IEC standards.

Sample tests (acceptance tests)

125. Sampling tests for acceptance during the acceptance check are all the tests specified in IEC EN 62058-31.

126. The sampling procedure for the tests shall be according to IEC 60410 using the following criteria:

    - Test level II table I, IEC 60410.
    - Simple or double sampling (tables II and III, IEC 60410).
    - Acceptable quality level A.Q.L. = 1 for each separate test.

SPARE PARTS

127. The suppliers shall guarantee the availability of spare parts for a period of 5 years after the end of the warranty period.

128. The suppliers are required to submit, together with their bid, a price list for the

necessary spare parts.

OPERATING INSTRUCTIONS

129. Bidders shall submit in their offers, the operating instructions manual of the meters.

METERS PARAMETERISATION

130. The meters shall be delivered programmed with the parameterization that will be advised and agreed by HEDNO, during the sample approval procedure, before the starting of the series production of the meters.
131. The meters shall be delivered with the real-time clock (RTC) programmed at the local time in Greece.

GUARANTEE

132. The meters shall be accompanied by five (5) years warranty from their delivery date.