PAKISTAN
WATER AND POWER DEVELOPMENT AUTHORITY

SPECIFICATION NO. DDS-60 :2007

STATIC 3-PHASE, 3 ELEMENT, 4-WIRE
WHOLE CURRENT ENERGY METER
(CLASS - 1)

WAPDA

DISTRIBUTION & STANDARD DEPARTMENT
IEEEP BUILDING FAISAL TOWN, LAHORE.

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SPECIFICATION

DD-S-60:2007

SOLID–STATE, 3-PHASE, 3 ELEMENT, 4-WIRE WHOLE CURRENT ENERGY METER

0 FOREWORD

0.1 This Specification has been prepared by the Standard, Directorate of Distribution Engg. Department of WAPDA.

0.2 This Specification is intended for the purpose of technical specification only for the procurement of material and does not include provisions of contract, unless otherwise provided in the contract.

0.3 This Specification is subject to revision as and when required.

0.4 This specification will supercede the previous specification DDS-60:2003 with all relevant amendments

1. SCOPE

1.1 The Specification covers total static poly-phase energy meters capable of measuring MDI-KW, KWH, along with other quantities and built-in programmable features mentioned in this specification.

1.2 This Specification covers:

1) 3 Phase, 4 wire, 3 element, 3x230/400 V, 10/100 Amp, 50 Hz whole current energy meters of Accuracy Class 1.

2) As above with additional Multi-rate Tariff function

2. REFERENCE STANDARDS.

The Reference standards are listed and provided in Annex – I.

3.0 DEFINITIONS

3.1 STATIC WATT-HOUR METER

Meter in which current and voltage act on solid state (electronic) elements to produce an output proportional to watt-hour.

3.2 MULTI-RATE METER.

Energy meter provided with a number of registers, each becoming operative at specified time intervals corresponding to different tariffs.

3.3 MEASURING ELEMENT

Part of the meter, which produces an output proportional to the energy.

3.4 TEST OUTPUT

Device which can be used for testing the meter.

3.5 OPERATION INDICATOR

Device which gives a visible signal of the operation of the meter.

3.6 MEMORY

Element which stores digital information

3.7 NON-VOLATILE MEMORY

Memory which can retain information in the absence of power

3.8 DISPLAY

Device which displays the content(s) of (a) memory (ies)

3.9 REGISTER

Electronic device comprising both memory and display which stores and displays information.

3.10 CURRENT CIRCUIT

Internal connections of the meter and part of the measuring element through which flows the current of the circuit to which the meter is connected.

3.11 VOLTAGE CIRCUIT

Internal connections of the meter, part of the measuring element and power supply for the meter supplied with the voltage of the circuit to which the meter is connected.

3.12 AUXILIARY CIRCUIT

Elements (lamps, contacts, etc.) and connections of an auxiliary device within the meter case intended to be connected to an external device, for example clock, relay, impulse counter.

3.13 CONSTANT

Value expressing the relation between the energy registered by the meter and the corresponding value of the test output. If this value is a number of pulses, the constant should be either pulses per kilowatt-hour (imp/kWh) or watt hours per pulse (Wh/imp).

3.14 INDOOR METER

Meter which can only be used with additional protection against environmental influences (mounted in a house, in a cabinet)

3.15 OUTDOOR METER

Meter which can be used without additional protection in an exposed environment.

3.16 BASE

Back of the meter by which it is generally fixed and to which are attached the measuring element, the terminals or the terminal block, and the cover.

3.17 COVER

Enclosure on the front of the meter, made either wholly of transparent material or opaque material provided with window (s) through which the operation indicator (if fitted) and the display can be read.

3.18 CASE

Comprises the base and the cover.

3.19 PROTECTIVE EARTH TERMINALS

Terminal connected to accessible conductive parts of the meter for safety purposes.

3.20 TERMINAL BLOCK

Support made of insulating material on which all or some of the terminals of the meter are grouped together.

3.21 TERMINAL COVER

Cover which covers the meter terminals and generally, the ends of the external wires or cables connected to the terminals.

3.22 CLEARANCE

Shortest distance measured in air between two conductive parts.

3.23 CREEPAGE DISTANCE

Shortest distance measured over the surface of insulation between two conductive parts.

3.24 BASIC INSULATION

Insulation applied to live parts to provide basic protection against electric shock.

3.25 BASIC CURRENT (I_b)

Value of current in accordance with which the relevant performance of the meter is fixed.

3.26 MAXIMUM CURRENT (I_{MAX})

Highest value of current at which the meter purports to meet the accuracy requirements of this standard.

3.27 REFERENCE VOLTAGE (U)

Value of the voltage in accordance with which the relevant performance of the meter is fixed.

3.28 REFERENCE FREQUENCY

Value of the frequency in accordance with which the relevant performance of the meter is fixed.

3.29 PERCENTAGE ERROR

Percentage error is given by the following formula:-

$$\text{Percentage error} = \frac{\text{Energy registered by the meter} - \text{True energy}}{\text{True energy}} \times 100$$

Since the true value cannot be determined, it is approximated by a value with a stated uncertainty that can be traced to standards agreed upon between manufacturer and user or to national standards.

3.30 REFERENCE CONDITIONS

Appropriate set of influence quantities and performance characteristics, with reference values, their tolerances and reference ranges, with respect to which the intrinsic error is specified.

3.31 ELECTROMAGNETIC DISTURBANCE

Conducted or radiated electromagnetic interference which may effect functionally or meteorologically the operation of the meter.

3.32 RATED OPERATING CONDITIONS

Set of specified measuring ranges for performance characteristics and specified operating ranges for influence quantities, within which the variations of operating errors of a meter are specified and determined.

3.33 SPECIFIED MEASURING RANGE

Set of values of a measured quantity for which the error of a meter is intended to lie within specified limits.

3.34 SPECIFIED OPERATING RANGE

Range of values of a single influence quantity which forms a part of the rated operating conditions.

3.35 LIMIT RANGE OF OPERATION

Extreme conditions which an operating meter can withstand without damage and without degradation of its metrological characteristics when it is subsequently operated under its rated operating conditions.

3.36 STORAGE AND TRANSPORT CONDITIONS

Extreme conditions which a non-operating meter can withstand without damage and without degradation of its metrological characteristics when it is subsequently operated under its rated operating conditions.

3.37 NORMAL WORKING POSITION

Position of the meter defined by the manufacturer for normal service.

3.38 THERMAL STABILITY

Thermal stability is considered to be reached when the change in error as a consequence of thermal effects during 20 min. is less than 0.1 times the maximum permissible error for the measurement under consideration.

4. PERFORMANCE STANDARDS

4.1	i.	Reference Temperature	23 Degree C
	ii.	Reference Frequency	50 Hz
	iii.	Reference Voltages	3x230/400 V

4.2 SERVICE CONDITIONS

4.2.1 Temperature Range

Specified Operating Range	-25 Degree C to 60 Degree C
Limit range of Operation (extreme condition)	-25 Degree C to 80 Degree C
Limit range for storage and transport	-25 Degree C to 80 Degree C

4.2.2 Relative humidity may range upto 95% non- condensing.

4.2.3 Altitude: Up to 1000 meter above sea level.

5. MECHANICAL REQUIREMENTS

5.1 GENERAL MECHANICAL REQUIREMENTS

Meters shall be designed and constructed for Outdoor use in such a way as to avoid introducing any danger in normal use and under normal conditions, so as to ensure especially:-

- Personal safety against electric shock.
- Personal safety against effects of excessive temperature.
- Protection against spread of fire.
- Protection against penetration of solid objects.
- Protection against Dust and Water.

All parts which are subject to corrosion under normal working conditions shall be protected effectively. Any protective coating shall not be liable to damage by ordinary handling nor damage due to exposure to air, under normal working conditions. Meters shall withstand solar radiation test.

5.2 The electrical connections in the meter shall be resistant to tampering. These shall be made so as to prevent their opening from outside the meter base/cover accidentally or deliberately without breaking the seals.

5.3 CASE

5.3.1 The meter shall have a reasonably dust proof and moisture proof case, which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seals. The meter shall comply with the dust proof and water proof requirements of IEC-60529 amended to date.

5.3.2 Meter Cover

The cover of meter shall either be made of clear or opaque shatter proof ultra violet stabilized polycarbonate material. In case of Clear polycarbonate material the electronics of the meter shall be protected with a shield inside the Meter Cover made of a suitable opaque material to protect the electronics from extreme environmental/especially solar radiation conditions. Arrangement for a suitable manual MDI reset mechanism shall be provided on the meter cover. The reset mechanism shall be such that it can be sealed with a security seal. The resetting device shall not allow ingress of thin wire/film or similar objects even when the reset mechanism is unsealed.

5.3.3 Meter Base

The base of the meter shall be made of strong insulating material.

5.3.4 Meter Security Box

The meter is to be supplied in a transparent Polycarbonate Meter Security box. Meter Security Box shall be designed incorporating the following requirements:

i) Thickness of Polycarbonate shall be 3mm minimum
ii) Continuous Ultrasonic welding shall be provided at the points of contact between Upper and Lower parts and the Meter Cover. The Meter Cover maybe integrated with the Upper part of the Meter Security Box.
iii) The Terminal Strip once inserted cannot be pulled back.
iv) The Terminal Strip once fully inserted should be flush with sidewall.
v) Terminal Strip in fully inserted position should cover the Terminal Hole opening completely and it shall not be possible to pull it back for all practical purposes.
vi) Provision should be made to avoid accidental insertion of Terminal Strip before installation.
vii) The Meter Box shall be supplied with Rag Bolts along with nut and washer.

5.4 TERMINALS – TERMINAL BLOCK

5.4.1 The terminals shall be grouped in a terminal block having adequate insulating properties and mechanical strength. The material (Bakelite or similar material) of which the terminal block is made shall be capable of passing the tests given in ISO Standard 75 for a temperature of 135 Deg. C and glow wire test of 960 Degree C.

5.4.2 Arrangements may be provided to prevent the exit of terminal block by force from outside without opening the meter cover.

5.4.3 The terminal shall be pressure plate type to permit the connection of both solid and stranded aluminum conductor of diameter 11mm to a depth of atleast 25mm without being directly bitten by the screws used for fixing the conductors. The terminals in which screws bite directly into the conductor shall not be acceptable.

5.4.4 The moving parts of the terminals including screws shall be made of brass having minimum electrical conductivity of 65% of copper. The fixed part of terminal i.e. pressure plate shall be made of copper having a thickness of 5mm and minimum electrical conductivity of 99 % of stranded copper.

5.4.5 The terminals shall be Tin or Nickel-plated. In case of Tin plating the thickness shall be 20 microns on all parts except threaded portions on which it shall be min 10 microns on all parts except the threaded portion on which it shall be min 7 microns.

5.5 EARTHING CONNECTION ARRANGEMENT

As the base is of insulating material, the common ground of the main PCB shall be internally connected to the neutral point of the terminal block.

5.6 TERMINAL BLOCK COVER

A terminal block cover of transparent polycarbonate insulating material shall be provided. The terminal Block cover shall be fixed with two screws fastened to the terminal block. No access to the terminals shall be possible without breaking the seals.

5.7 PROTECTION AGAINST HEAT, FIRE, PENETRATION OF DUST & WATER, SOLAR RADIATION.

The complete meter i.e. case terminal block shall meet the requirements of clauses 5 & 6 of IEC 620529. For protection against penetration of dust &Water the meter shall be IP51 compliant.

6. ELECTRICAL REQUIREMENTS

6.1 STANDARD RATINGS

Basic/max. Current	10/100 Amp
Reference Voltage	3x230/400 V
Reference Frequency	50 Hz
Accuracy Class	1.0
Meter Type	3 Phase, 3 Element, 4 Wire, Whole Current Meter suitable for recording true energy in a 4 wire system, neutral solidly grounded.

6.2 OTHER ELECTRICAL REQUIREMENTS

Power Losses of voltage circuit at reference voltage	2.0 W & 10 VA
Current circuit at basic current	4 VA
Starting current	0.4% of Ib at unity power factor
Running with no load	From 0.8 to 1.15 of reference voltage but with no current. Meter shall not produce more than one pulse or shall not complete one revolution.
Initial start Up	Within 5 sec., after application of rated voltage meter display shall start functioning.
Temperature rise of external surface	25 Degree C with ambient temp. of 40 Degree C.
Temperature rise of terminal	30 Degree C with ambient temp. of 40 Degree C.

6.2.1 Dielectric strength

Power frequency withstand	4 KV for one minute
Impulse voltage withstand	8 KV : 1.2/50 micro sec & minimum 9 joules
Short time Over current	30 times Imax with a relative tolerance of 0% to – 10% for ½ cycle at rated frequency
Insulation resistance	More than 5 Mega Ohms.
Creepage Distance	20mm Min

6.3 VOLTAGE RANGE

Specified operating Range	From 0.9 to 1.1 of reference voltage
Extended Operating Range	From 0.8 to 1.15 of Ref. voltage.
Limit range of operation	From 0.0 to 1.15 of ref. Voltage

6.4 ACCURACY REQUIREMENT

6.4.1 Limits of error due to variation of the current.

When the meter is Under reference conditions given in clause 8.5 of IEC 62053-21, the percentage errors shall not exceed the limits given in Table I & II.

T A B L E – I

Percentage error limits with balanced loads

Value of Current	Power Factor	Percentage error Limits for meters
0.05 Ib $\leq$ I < 0.1Ib	1	$\pm$ 1.5
0.1 Ib $\leq$ I $\leq$ Imax	1	$\pm$ 1.0
0.1 Ib $\leq$ I < 0.2 Ib	0.5 Lagging 0.8 leading	$\pm$ 1.5 $\pm$1.5
0.2 Ib $\leq$ I $\leq$ 1max	0.5 Lagging 0.8 leading	$\pm$1.0 $\pm$ 1.0
0.2 Ib $\leq$ I $\leq$ Ib	0.25 lagging 0.5 leading	$\pm$3.5 $\pm$ 2.5

T A B L E – II

Percentage error limits

(Meter carrying a single phase load but with balanced polyphase voltages applied to the voltage circuits)

Value of Current	Power-Factor of the relevant element	Percentage Error Limits For meters
0.1 Ib ≤ I ≤ Imax	1	± 2.0
0.2 Ib ≤ I ≤ Imax	0.5 lagging	± 2.0

The difference between the percentage error when the meter is carrying a single phase load and a balanced polyphase load at basic current and unity power factor, shall not exceed 1.5%.

6.5 INFLUENCE OF OTHER QUANTITIES

6.5.1 Limits of error due to influence quantities:

The additional percentage error due to the change of influence quantities with respect to reference conditions, as given in clause 8.5 of IEC 62053-21 shall not exceed the limits given in Table-III.

T A B L E – III

Influence Quantities

Influence quantity		Value of current (balanced unless) otherwise	Power Factor	Limits of Variation in % age error for meters
Voltage variation ± 10%	1)	0.05 Ib ≤ I ≤ Imax 0.1 Ib ≤ I ≤ Imax	1 0.5 lagging	0.7 1.0
Frequency variation ± 2%	-	0.05 Ib ≤ I ≤ Imax 0.1 Ib ≤ I ≤ Imax	1 0.5 lagging	0.5 0.7
Reversed phase sequence	-	0.1 Ib	1	1.5
Voltage unbalance	3)	Ib	1	2.0
Harmonic components in the current and voltage circuits	4)	0.5 Imax	1	0.8
Odd harmonics in the a.c. current circuit	4)	0.5 Ib 2)	1	3.0
Sub-harmonics in the a.c. current circuit	4)	0.5 Ib 2)	1	3.0
Continuous magnetic induction of external origin	4)	Ib	1	2.0
Magnetic induction of external origin 0.5 mT	5)	Ib	1	2.0
Electromagnetic RF fields	-	Ib	1	2.0

Operation of accessories	6)	0.05 Ib	1	0.5
Conducted disturbances, induced by radio-frequency fields	-	Ib	1	2.0
Fast transient burst	-	Ib	1	2.0

1) For the voltage ranges from -20% to -10% and +10% to +15% the limits of variation in %age errors are three times the values given in table-III.
Below 0.8Un, the error of the meter may vary between +10% and –100%.

2) The distortion factor of the voltage shall be less than 1%.

3) Polyphase meters shall measure and register within the limits of variation in %age error shown in table-3 if one or two phases of the 3-phase network are interrupted.

4) The test conditions are specified in 8.2.1 to 8.2.4 of IEC 62053-21.

5) A magnetic induction of external origin of 0.5 mT produced by a current of the same frequency as that of the voltage applied to the meter and under the most unfavorable conditions of phase and direction shall not cause a variation in the percentage error of the meter exceeding the value shown in the table-III.

The magnetic induction shall be obtained by placing the meter in the centre of a circular coil, 1m in mean diameter, of square section and a small radial thickness relative to the diameter, and having 400 At.

6) Such an accessory, when enclosed in the meter case, is energized intermittently, for example the electromagnet of a multi rate register.

It is preferable that the connection to the auxiliary device(s) is marked to indicate the correct method of connection. If these connections are made by means of plugs and sockets, they should be irreversible.

However, in the absence of those markings or irreversible connections, the variations of errors shall not exceed those indicated in this table if the meter is tested with the connections giving the most unfavourable condition.

6.5.2 Limits of error due to ambient temperature variation.

The mean temperature coefficient shall not exceed the limits given in Table-IV.

T A B L E – IV

Temperature Coefficient

Value of Current	Power Factor	Mean Temp. coefficient %K for meters
From 0.1 Ib to Imax	1	0.05
From 0.2 Ib to Imax	0.5 lagging	0.07

6.6 METER CONSTANT

The relation between the test output and the indication in the display shall comply with the marking on the name plate.

Output devices generally do not produce homogeneous pulse sequences. Therefore, the manufacturer shall state the necessary number of pulses to ensure a measuring accuracy of atleast 1/10 of the class of the meter at the different test points.

7. METER CHARACTERISTICS

The meter shall generally comprise of the following characteristics as a minimum. A list of characteristics is appended below :

7.1 BASIC DATA RECORDING AND STORAGE

7.1.1 STATIC WATTHOUR METER

- Energy (KWh).
- Max. Demand (KW), Block and Rolling both shall be programmable.
- Demand Interval shall be programmable for 15, 30 and 60 minutes for Block Demand. Which should be divisible in five equal sub-intervals in case of Rolling Demand.
- Cumulative Max. Demand (KW).
- No. of Resets.
- Time left in Interval.
- At-least twelve months Billing Data kWh, KW and number of resets shall be available at all times.

7.1.2 MULTI-RATE METER (when applicable)

- Min. Four Multi Rate periods Energies (KWh).
- Min. Four Multi Rate periods Max. Demand (KW).
- Min. Four Multi Rate periods Cumulative Max. Demand (KW).
- Min Two Seasons per year should be programmable
- Min 100 days per year holidays should be programmable
- Max. Demand (KW), Block and Rolling both shall be programmable.
- Demand Interval shall be programmable for 15, 30 and 60 minutes for Block Demand. Which should be divisible in five equal sub-intervals in case of Rolling Demand.
- Cumulative Max. Demand (KW).
- No. of Resets.
- Time left in Interval.
- At-least twelve months Billing Data kWh, KW and number of resets shall be available at all times.

7.1.3 BACK-UP BATTERY (APPLICABLE IN CASE OF MULTI-RATE METERS)

- The Back-up Battery shall be of Lithium-Ion type.
- Low Battery indication shall be displayed when min. 25% battery life is left.
- Storage life of Battery shall be more than 15 years.
- Without any Power the Back-Up battery shall maintain the time, calendar and Multi-Rate program for a continuous period of at-least 12 months.

- The battery shall be connected using standard connectors, it shall not be welded, brazed or soldered and it shall be replaceable in the field.

7.2 SECURITY FEATURES, EVENT RECORDING, AND DIAGNOSTICS:

7.2.1 Security Features

- Every Meter shall have a unique serial No. in its memory which can be displayed/reported.
- The No. of times programmed and the identification of the last programmer along-with Date & Time stamp shall be reported/displayed.
- A programmable meter ID code shall be provided.
- At-least two levels of access/security codes shall be provided one for meter reading (only) by the authorized personnel and a second one for programming and reading.
- Meter shall keep on recording/operating as long as voltage exists on any two terminal of the meter with or without neutral.
- If data entry keys/button are provided in the meter for manual entry of data these shall be inside the meter cover except the reset device and display scroll push button. No data shall be changeable modified by the simultaneous operation of these switches or in any way without opening the meter cover.
- The meter shall be protected against any external interference such as influence of Strong Electromagnet, CD drive, Mobile phones and shall comply to all relevant IEC/ANSI standards for functional performance and loss of data.
- A strong magnet having strength of **0.7 Tesla**, when measured in an air gap of **3mm**, rectangular in shape with minimum dimension of **65 x 35 x 35mm** shall not effect the accuracy of meter by more than **4%** at Basic Current and Unity Power Factor when applied on the meter from any direction. After the test meter shall perform within prescribed **limit of Accuracy**

7.2.2 Security Features

- Total No. of Power Outages.
- Phase failure/Disconnection of wires.
- Reverse energy flow.
- Reverse Polarity.
- At-least 100 total events shall be recorded in the meter at any one time before Roll Over they may comprise of the above or any additional features.

7.2.3 Diagnostics

The meter shall display cautions and diagnostics for the following conditions;

- Un-programmed Meter.
- Self check diagnostics for RAM/ROM, Processor, non-volatile memory failure and other essential hardware circuitry.

7.3 DISPLAY

- The Display shall be LCD type with at-least 6 digits for Energy consumption.
- Display scrolling time shall be programmable.
- Min. three programmable Display modes shall be available.

- First Display mode shall be the Normal or Automatic display mode. Second display mode shall be for Security / Diagnostics etc. The third Display mode shall be for Test Purposes. Activation of Display Mode shall either be with a secure Push Button or an equally secure alternate method.
- Phase Indicators shall be permanently displayed in all Display modes.
- All Segment Check.
- Display Mode Indicator.
- Display Quantity Labels.
- Pulse Output for field testing of Meter shall be available optically.

7.4 METER PROGRAMMING, SOFTWARE, AND SECURITY

The following features shall be programmable in the meter as a minimum along-with other features that may be provided:

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- Demand Time interval (10,15,30,60 minutes).
- Demand resets shall be configured for automatic resets on a preset date to override the manual reset.
- The meter shall have non-volatile EEPROM memory.
- Once programmed the meter shall be re-programmable as a new meter or as existing meter without loss of previous data, through the required security passwords.
- The meter should have the capability for reprogramming as a new meter or amending the existing program without loss of previous data.
- Meter programming shall be DOS/Windows based.
- An Optical Communication Port shall be provided on the meter cover and shall either be IEC 62056-21 or ANSI C12.18 Type II compliant

8. TESTS

Following routine, type and sample tests shall be carried out as per requirements of IEC standards.

8.1 ROUTINE TESTS

Following routine tests shall be carried out on KWH, KW meters as per respective IECs:

Accuracy Test
Running with no load test
Starting current test
Insulation resistance test

8.2 TYPE TEST

Following type tests shall be carried out on KWH, KW meters as per respective IECs.

8.2.1 Tests of mechanical requirements

- Spring hammer test
- Shock test
- Vibration test
- Test of resistance to heat and fire
- Test of protection against penetration of dust and water

8.2.2 Test of climate influence

- Dry heat test
- Cold test
- Damp heat cycle test
- Solar Radiation test

8.2.3 Tests of electrical requirements

- Test of power consumption of voltage circuit
- Test of power consumption of current circuit
- Test of effect of voltage dips and short interruptions
- Test of influence of short time over current
- Test of influence of self heating
- Test of influence of heating
- Impulse voltage test
- A.C. voltage test.

8.2.4 Tests for electromagnetic compatibility (EMC)

- Test of immunity to electrostatic discharges
- Test of immunity to electromagnetic HF fields
- Fast transient burst test
- Radio interference measurement

8.2.5 Tests of Accuracy requirements (for KWH meter parts as per IEC 62053-21 where applicable

- Test of Accuracy
- Test of influence quantities
- Test of ambient temperature influence
- Test of no load condition
- Test of starting condition

9. NAME AND RATING PLATE

9.1 A suitable name/rating plate shall be provided inside at the front of the meter, indicating the following informations:

- Name of the manufacturer and country of origin
- Type of meter
- Meter rating and other information
- WAPDA P.O. No.
- Serial No. and year of manufacture

10. PACKING

10.1 Each meter shall be individually packed in Corrugated packing with thermopore lined packing, covered with adhesive tape at joints or plastic strips etc.

10.2 For overseas shipment, a suitable number of individually thermopore packed meters shall then further be packed in sea worthy packing.

10.3 The packing shall be strong enough to withstand rigors of ocean, rail, road etc.

11. SAMPLE

At least one number sample of multirate meter shall be submitted with the bid.

12. PROTOTYPE APPROVAL

The successful bidder shall submit 3 Nos samples for Prototype Approval in case valid Prototype Approval as per WAPDA purchase procedure does not exist for the offered model/type. All tests shall be carried on the submitted prototype meters to ensure compliance to WAPDA and IEC specs. Meters shall be subjected to all tests including type, routine and sample tests. Once approved such prototype approval shall be valid as per WAPDA purchase procedure.

12.1. JOINT TYPE TESTING

Over and above normal inspection, the representative of Chief Engineer (Design & Standard) and Chief Engineer (Material Inspection) WAPDA will carry out all possible locally available type tests jointly, twice during the calendar year and it shall be applicable during this period to all WAPDA/DISCOs purchase orders., The type testing will be carried out keeping in view that every time different DISCOs purchase order will be selected for the test.

13. INSPECTION

The successful bidder shall offer the meters for testing/inspection, Procedure for pre-shipment inspection is given below:

13.1 SAMPLE TESTS (ELECTRICAL)

13.1.1 The meters offered for acceptance shall be grouped into lots containing upto 1000 meters. A sample comprising of five (05) meters shall be selected at random from each lot and subjected to tests as below:

Starting Current Test
Creep Test
Accuracy Test
A.C. Voltage Test

13.1.2 The meters offered for acceptance shall be grouped into lots containing upto 1000 meters. A sample comprising of two (02) meters shall be selected at random from each lot and subjected to following tests:

Impulse Test
Power Loss Test

13.1.3 The lot shall be accepted if all the meters qualify in the tests described in clause 13.1.1 & 13.1.2 above. The lot shall be rejected if two or more meters fail in any of the tests. If any one meter fails in any of the above tests re-sampling shall be carried out after collecting

same No. of meters and subjected to the tests described in clause 13.1.1 & 13.1.2 above. If any one meter fails in any of the above tests the whole lot shall be rejected.

13.2 SAMPLE TESTS (MECHANICAL)

13.2.1 The meter offered for acceptance shall be grouped into lots containing upto 1000 meters. Sample comprising of three (03) meters shall be selected at random from each lot and subjected to tests as below:

Sr. No.	Description	Nos. of Meters
1.	Test of protection against penetration of dust and water	One meter
2.	Dimensional Check	One meter
3.	Tests of Electromagnetic Compatibility/Interference (EMI)	One meter

The lot shall be accepted if meters qualify the above tests in clause 13.2.1. In case any meter fails in the relevant test, another sample of double the size shall be selected and test/tests repeated. If any meter fails in the relevant in the second group, the entire lot shall be rejected.

13.3 VERIFICATION TEST OF FUNCTIONALITY OF SOFTWARE

13.3.1 Verification test of the functionality of software and display features on offered meters shall be promoted by loading/unloading of programme and auditing the diagnostic reports. The number of meters shall be three if any meter fails to comply with the functionality requirements the entire offered lot shall be rejected.

13.4 TYPE TESTS

13.4.1 The remaining type tests not performed on the above samples shall be carried out (as per recommended sequence of IEC 62052-11 Annexure (F) on three (03) Nos. meters out of the total offered meters. If two meters fail in any of the above tests, the lot shall be rejected. If one of the meters fails to qualify any of the above tests, re-sampling shall be carried out. In case of failure of any of the tests the lot shall be rejected.

13.5 Procedure for inspection for local manufacturers is given below:-

13.5.1 ROUTINE TEST

Following routine tests shall be carried out by manufacturer on each meter and witnessed by the Inspector as per respective clauses of IEC 62053-21.

- Accuracy test (clause 8.1)
- Starting current test (clause 8.3.3)

If failure exceeds than 5%, the group offered for routine inspection be rejected:-

13.5.2 SAMPLE TEST

The meters offered for acceptance shall be grouped into lots containing upto 500 meters. A sample comprising ten meters shall be selected at random from each lot and eight meters be subjected to electrical test and two meters for mechanical test.

(i) Sample test (Electrical)

(a) Following tests be performed on each of two selected sample meters:-

- Impulse test
- Power loss test
- Influence of DC and even harmonics.

(b) Following tests be performed on each of four selected sample meters:-

- Accuracy test
- Starting current test
- Running with no load test (Creep test)

(c) Following EMC tests be performed on each of two selected sample meters:-

- Fast Transient burst test
- Surge Immunity test.
- Electrostatic discharge test

(ii) Sample Tests (Mechanical)

(a) Following tests be performed on each of two meters already selected:-

- Impact test
- Tin coating test

(b) Following tests be performed on three meters selected randomly from offered lot twice in a purchase order. Dimensional check be performed on one meter and remaining two tests be performed on both the meters:-

- Dimensional check
- Shock and vibration test
- Rain fall test

13.5.3 ACCEPTANCE CRITERIA

a) Electrical Test

- The lot shall be accepted if one meter fails in any one of the tests described in clause 13.5.2 (i).

- Re-sampling of the same size should be carried out if :-

  One meter fails in any of the two tests
  OR
  Two meters fail in any one test

- The lot shall be rejected if:

  Three or more meters fail in any of the test
  OR
  One meter fails in any three or more tests
  OR
  One meter fails in any two tests and one meter in one test

b) Mechanical Test

- The lot shall be accepted if meters qualify the above tests in clause 13.5.2 (ii) (a).
- In case any meter fails in the relevant test, another sample of double the size shall be selected and test be repeated.
- If any meter fails in any test during re-sampling, the entire lot shall be rejected.

NOTE Rejected lot can be re-offered for routine tests.

13.6 VERIFICATION FUNCTIONALITY TEST OF SOFTWARE

13.6.1 Verification test of the functionality of software and display features on offered meters shall be performed by loading/down loading of and auditing of the reports. Copy of the report be retained for official record. The number of meters shall be two. If any meter fails to comply with the functionality requirements, the entire offered lot shall be rejected.

14. WARRANTY

The supplier shall provide two years warranty for the successful operation of the meter including its maintenance where ever required.

15. TRAINING

The successful bidder shall arrange a comprehensive practical training regarding programming, billing, loading of software etc. in Pakistan.

16. BID DATA, TEST CERTIFICATES, DRAWINGS, LITERATURE, REFERENCE LIST & MANUFACTURING EXPERIENCE

All the bidders shall submit complete technical data, detailed drawings test certificates, literature in English language, supply reference list and manufacturing experience alongwith the bid.

Annex – I

REFERENCE STANDARDS

When following standards referred to in this document have been superseded, the latest revisions shall apply.

1. METERING STANDARDS

a. IEC

62053-21:2003	Static meters for active energy (Classes 1 and 2).
62052-11:2003	Metering equipment.
60514 Ed. 1.0	Acceptance inspections of Class 2 alternating current watthour meter.
62056-21	Direct local data exchange

b. ANSI

C12.1 - 1995	Electric Meters Code for Electricity Metering
C12.10 - 1997	Physical aspects of watthour meters-Safety Standards
C12.18 - 2002	Protocol specification for ANSI type 2 Optical ports
C12.19 - 1997	Utility industry end device data tables

2. ELECTRICAL TESTING STANDARDS

a. IEC

60038: 1983 IEC standard voltages
Amendment 1 : 1994
Amendment 2 : 1997

60060-1: 1989	High voltage test techniques-Part 1 General definitions and test requirements
60085:1984	Thermal evaluation and classification of electrical insulation
61000-4-2:1995	Electromagnetic compatibility (EMC) – Part 4 Testing and measurement techniques – Section 2 Electrostatic discharge immunity test Basic EMC publication
61000-4-3:2002	Electromagnetic compatibility (EMC) – Part 4-3 Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test

61000-4-4:1995	Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test. Basic EMC publication
61000-4-5:1995	Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity test
61000-4-6:1996	Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 6: Immunity to conducted disturbances, induced by radio-frequency fields
61000-4-12:1995	Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 12: Oscillatory waves immunity test. Basic EMC publication
CISPR 22:1997	Information technology equipment – Radio disturbance characteristics limits and methods of measurement Amendment 1:2000

b. ANSI

C37.90.1 – 1989	IEEE standard surge withstand capability
C62.41 – 1991	IEEE recommended practice on surge voltages in Low-voltage AC power circuits.

3. MECHANICAL TESTING STANDARDS

a. IEC

60529:1989	Degrees of protection provided by enclosures (IP Code) Amendment 1:1999
60695-2-11:2000	Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products
60068-2-75:1997	Test Eh: Hammer tests

b. ISO Standard

75-2:1993	Plastics – Determination of temperature of deflection under load – Part 2: Plastic and ebonite.

4. ENVIRONMENTAL STANDARDS

a. IEC

60068-2-1:1990	Test A: Cold Amendment 1:1993, Amendment 2:1994

60068-2-2:1947	Tests B: Dry heat Amendment 1:1993, Amendment 2:1994
60068-2-5:1975	Test Sa: Simulated solar radiation at ground level
60068-2-6:1995	Test Fc: Vibration (sinusoidal)
60068-2-30:1980	Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)
60068-2-27: 1987	Test Ea and guidance: Shock.
60721-1-3-3: 1994	Classification of environmental conditions- Part 3: Environmental parameters and their severities-Section 3 Stationary use at weather protected locations

PREPARED BY:

- FAISAL MEHMOOD
  Asst. Director
  Design & Standard _____

- MANSOOR NASIR
  Deputy Director
  Design & Standard _____

- MAHBOOB ALAM
  Director
  Design & Standard _____

- RANA ANWAR UL HASSAN KHAN
  Chief Engineer
  Distribution Engineering _____

****

SCHEDULE OF TECHNICAL DATA
Static 3-Phase, 3-Element, 4-Wire Whole Current Energy Meter
DDS-60:2007

A. GENERAL

a) Bidder's name & Address _____

b) Manufacturer's name & Address. _____

c) Manufacturing Experience _____

B. ENERGY METERS

1. Model No./ Type _____
2. Basic current _____
3. Maximum current _____
4. Minimum starting current at ref. Voltage & ref. Frequency _____
5. Operating voltage _____
6. Overload capacity _____
7. Accuracy class
   - i. KWH Meter _____
   - ii. MDI _____
8. No. of elements _____
9. Detail of:
   - i. KWH part _____
   - ii. MDI part _____
10. Losses in
    - i) Potential Ckt _____
    - ii) Current Ckt _____

11. Encapsulation Details

    i) Current Sensor _____

    ii) Class of Insulation _____

12. Max. current that meter can withstand during short circuit for 0.5 second. _____

13. Dielectric strength

    i) Impulse Voltage _____

    ii) A.C test Voltage _____

14. Insulation resistance of meter. _____

15. Material of:

a. Base _____

b. Cover _____

c. Security Box. _____

d. Terminal Block _____

e. Terminals _____

f. Printed Ckt Board _____

(All the above shall be indicated on drawings to be supplied with the bid.)

16. Temperature rise of meter _____

17. Type of terminals _____

18. Centre to centre clearance between different phases

a. Creepage Distance _____

b. Clearance _____

19. Whether the meter is compliant to the reference standards for testing mentioned in Annex -I of the specs. _____

20. Whether the meter have the following characteristics:

a. Basic data recording and storage; (as per clause 7.1 of the spec.), give details. _____

b. Security Features, Events recording and Diagnostics; (as per clause 7.2 of the spec.), give details. _____

c. Display; (as per clause 7.3 of the spec.), give details. _____

d. Back-up Battery; (as per clause 7.1.3 of the spec.), give details. _____

e. Meter Programming, Software and Security; (as per clause 7.4 of the spec.), give details. _____

21. Operating ambient temp. range.

a. Specified Operating Range _____

b. Limit Range of Operation (Extreme Condition) _____

c. Limit range for storage and Transport _____

22. Size & No. of digit of LCD Display. _____

23. Whether meter have the upgrad-ability option for AMR. _____

24. What is the sampling rate. _____

25. IP class of meter _____

26. No. of digits for following features;

i) KWH _____

ii) Demand KW _____

iii) Cumulative KW _____

iv) No. of Reset digits _____

27. What values / readings are controlled through resetting device? _____

28. Detail of resetting device with sealing arrangement (give drawing). _____

29. Min. No.of tariff/rates for which the tariff register can be programmed for:

- KWH _____
- KW _____

30. Effect of external magnetic field as per IEC 62053-21 Cl 8.2.4 _____

31. Effect of Radio frequency signals. _____

32. Effect of Influence of DC and Even Harmonics as per IEC 62053-21 cl 8.2.3 _____

33. Effect of other Influence Qtty as per IEC _____

34. Type of Meter Memory _____

35. Storage capacity of memory _____

36. Time to retain the memory _____

37. In case of error in register Which types of checks are Provided which automatically Identifies the error. _____

38. Meter Clock:

a) Source of operation of Built in clock. _____

b) Effect of variation of _____
Frequency of source

c) Source of operation of Clock in case of power outage. _____

d) If battery is used what is the life of battery. _____

e) Period / life for which the battery can supply power continuously to check and register prior to its discharge below 25%. _____

g) No. of programmable dates to account for holidays and week ends. _____

39. The Meter Programming/Reading Software is DOS or Windows _____

40. Name / Rating Plate;
Detail of information given on Name Plate _____

41. Attachments
Whether the following material has been attached;

a. Accuracy Curves _____

b. Drawings of meter showing dimensions, mounting details etc. _____

42. Bidders / manufacturers have to supply all relevant drawings & technical literature duly marked. _____

43. Details of the deviations of the offered equipment from specification (use separate sheet if required. _____

Signature & Seal of
Bidder/ Manufacturer

Annex. – II

FORMAT OF SOFTWARE

LIST OF DISPLAY ITEMS IN TOD METER

NORMAL MODE

1. All Segment On
2. Date
3. Time
4. kWh (Total)
5. kWh Rate A
6. kWh Rate B
7. Max. kW
8. Max. kW Rate A
9. Max. kW Rate B
10. kW CUM
11. kW CUM Rate A
12. kW CUM Rate B
13. No. of Resets
14. Instantaneous Power

Cautions (Code)
Diagnostic (Code)
UN programmed meter (Freezing)

Self check diagnostics for RAM/ROM, Processor, non-volatile Memory failure and other essential hardware circuitry (Freezing)

LIST OF DISPLAY ITEMS IN TOD METER

ALT MODE

1. Meter ID
2. Previous Interval Demand
3. Time Left Interval
4. Average P.F. current Month
5. Average P.F. Rate A current Month
6. Average P.F. Rate B current Month
7. Last Month kWh (Total)
8. Last Month kWh Rate A
9. Last Month kWh Rate B
10. Last Month kW
11. Last Month kW Rate A
12. Last Month kW Rate B
13. Cumulative kW (Total)
14. Cumulative kW Rate A
15. Cumulative kW Rate B
16. Last Reset Date
17. Last Reset Time
18. Last Interval kW
19. Voltage Phase A
20. ~~Voltage Phase B~~
21. ~~Voltage Phase C~~
22. Current Phase A
23. ~~Current Phase B~~
24. ~~Current Phase C~~

Programming Report

Meter Information

1	Consumer Identification	
2	Consumer Name	
3	Consumer Address	
4	Meter Serial No.	
5	Meter Type	
6	Current Date	
7	Current Time	

Meter Parameters

1	Over Voltage	Programmable
2	Under Voltage	Programmable
3	Date of Reset	Programmable
4	Display Scrolling Time	Programmable in second
5	Reset Method	Automatic
6	Intergration Period (Demand Interval)	30 Minutes

Tariffs Parameters

1	Number of Seasons	04
2	Tariff Number	04

2321

Season Setting

No.				
01	01 / 03	Day 1	18-22, 22-6, 6-18	
		Day 2	19-23, 23-7, 7-19	T_2
		Day 3	20-22, 24-6, 8-18	
		Day 4	17-21, 21-5, 5-17	
02	01 / 06	Day 1	18-22, 22-6, 6-18	
		Day 2	19-23, 23-7, 7-19	T_3
		Day 3	20-22, 24-6, 8-18	
		Day 4	17-21, 21-5, 5-17	
03	01 / 09	Day 1	18-22, 22-6, 6-18	
		Day 2	19-23, 23-7, 7-19	
		Day 3	20-22, 24-6, 8-18	T_2
		Day 4	17-21, 21-5, 5-17	
04	01 / 12	Day 1	18-22, 22-6, 6-18	
		Day 2	19-23, 23-7, 7-19	
		Day 3	20-22, 24-6, 8-18	T_1
		Day 4	17-21, 21-5, 5-17	

Billing Report

Meter Information

1 Consumer Identification
2 Meter Serial No
3 Programmed Identification
4 Current Date
5 Current Time
6 Current Season

Revenue Data (Current Reading)

Energy

1	Current Total kWh	0.00
2	Current kWh Rate-T1	0.00
3	Current kWh Rate-T2	0.00
4	Current kWh Rate-T3	0.00
5	Current kWh Rate-T4	0.00

Maximum Demand

1 Current Max kW Date and Time
2 Current Max kW Rate T1 Date and Time
3 Current Max kW Rate T2 Date and Time
4 Current Max kW Rate T3 Date and Time
5 Current Max kW Rate T4 Date and Time

Cumulative Demand

1	Current Cum kW	0.0000
2	Current Cum kW Rate T1	0.0000
3	Current Cum kW Rate T2	0.0000
4	Current Cum kW Date Rate T3	0.0000
5	Current Cum kW Date Rate T4	0.0000
6	Nos. of Reset	
7	Date of last Reset	

Billing Report

Meter Information

1 Consumer Identification
2 Meter Serial No.
3 Programmer Identification
4 Current Date
5 Current Time
6 Current Season

Revenue Data (for Twelve Months)

The following information should be available in the meter for Last Twelve Months.

Energy

1	Total kWh	0.00
2	kWh Rate-T1	0.00
3	kWh Rate-T2	0.00
4	kWh Rate-T3	0.00
5	kWh Rate-T4	0.00

Maximum Demand

1 Max kW Date and Time
2 Max kW Rate T1 Date and Time
3 Max kW Rate T2 Date and Time
4 Max kW Rate T3 Date and Time
5 Max kW Rate T4 Date and Time

Cumulative Demand

1	Cum kW	0.0000
2	Cum kW Rate T1	0.0000
3	Cum kW Rate T2	0.0000
4	Cum kW Date Rate T3	0.0000
5	Cum kW Date Rate T4	0.0000
6	Nos. of Reset	
7	Date of Reset	

Security Report

Meter Information

1 Consumer Identification
2 Meter Serial No.
3 Programmer Identification
4 Current Date
5 Current Time
6 Current Season

Security Data

1 Last OPTOCOM Communications Date and Time
2 No. OPTOCOM Communications
3 Last Demand Reset Date and Time
4 No. Demand Reset
5 Last Programming Date and Time
6 I.D of Last Programmer
7 No. of Programming
8 Last Power Outage Date and Time
9 No. of Power Outages

Event Log Report

Meter Information

1 Consumer Identification
2 Meter Serial No.
3 Meter Type
4 Programmer Identification
5 Current Date
6 Current Time
7 Current Season

Name of Event

Power Outages

Event Occurance		Event Recovery	
Date	Time	Date	Time

Disconnection of Phases

Event Occurance		Event Recovery	
Date	Time	Date	Time

Reverse Energy

	Event Occurance		Event Recovery	
Phase	Date	Time	Date	Time

Event Log Report

Meter Information

1. Consumer Identification
2. Meter Serial No.
3. Meter Type
4. Programmer Identification
5. Current Date
6. Current Time
7. Current Season

	Event Occurance		Event Recovery	
	Date	Time	Date	Time
Under Voltage				
Over Voltage				

Reverse Polarity

Event Occurance		Event Recovery	
Date	Time	Date	Time

Copy → 35/1

PAKISTAN WATER AND POWER DEVELOPMENT AUTHORITY
Office of the Chief Engineer (Design & Standards) WAPDA
17/C-I, Ist. Floor, IEEEP Building, Faisal Town, Lahore
Ph.# 042/9231641 – Fax # 042/9231646
Email: cedengg@yahoo.com

No. 4242-59/CEDS/Z-224 Dated: 26-10-2007

The Chief Executive Officer,
Gujranwala Electric Power Co, (GEPCO)
Gujranwala.

Subject: AMENDMENT NO.1 - WAPDA SPECIFICATION NO. DDS-60:2007 FOR STATIC 3-PHASE, 3-ELEMENT, 4-WIRE WHOLE CURRENT ENERGY METER.

Ref'nce: - Your office letter No. 2925-27 dated 06-10-2007.

The copy of Amendment No.1 dated 25.10.2007 of the WAPDA Specification DDS-60:2007 for Static 3-Phase, 3-Element, 4-Wire Whole Current Energy Meter is enclosed herewith for official record and guidance please.

26/X/07
(AZIZ UR REHMAN)
DIRECTOR (D&S)
26/X/07

Cc to:-

1. All Chief Executive Officer DISCOs _____.
2. General Manager (C&M) Power WAPDA WAPDA House, Lahore.
3. Chief Engineer (Material Inspection) WAPDA, Sunny View, Lahore.
4. Chief Engineer (P&D) WAPDA, Lahore .
5. All meter manufacturers.

SPECIFICATION NO. DDS-60:2007

STATIC 3-PHASE, 3 ELEMENT , 4 WIRE

WHOLE CURRENT ENERGY METER

AMENDMENT NO.1

DATED 25th OCTOBER, 2007

- **Replace the heading of Title page to read as: -**

STATIC 3-PHASE, 3 ELEMENT, 4-WIRE

WHOLE CURRENT ENERGY METER

kW, kWh (CLASS-1)

kvarh (CLASS-2)

- **Add following word after Kwh in first paragraph of 1.1 under heading SCOPE.**

"Kvarh"

- **Read Clause 1.2 as under instead of existing:**

1.2 This Specification covers:

1) 3 Phase, 4 Wire, 3 Element, 3x230/400 V, 10/100 Amp, 50Hz Whole Current Energy Meters Kwh of Accuracy Class 1 & Kvarh of Accuracy Class 2.

2) As above with addition Multi-rate Tariff function.

- **Add following new clause after 6.5.2**

6.5.3 Limits of error due to variation of the currents

When the meter is under reference conditions given in clause 8.5 of IEC 62053-23, The percentage errors shall not exceed the limits given in Table V & VI.

TABLE – V

Percentage error limits with balanced loads

Value of Current	Sin Ø (Inductive)	Percentage error limits
0.05 $I_b \leq I < 0.1\ I_b$	1	±2.5
0.1 $I_b \leq I \leq I_{max}$	1	±2.0
0.1 $I_b \leq I < 0.2\ I_b$	0.5	± 2.5
0. 2 $I_b \leq I \leq I_{max}$	0.5	± 2.0
0. 2 $I_b \leq I \leq I_{max}$	0.25	± 2.5

TABLE – VI

Percentage error limits (meter carrying a single phase load but with balanced polyphase voltages applied to the voltage circuits)

Value of Current	Sin Ø (Inductive)	Percentage error limits
0.1 $I_b \leq I \leq I_{max}$	1	±3.0
0.2 $I_b \leq I \leq I_{max}$	0.5	±3.0

The difference between the percentage error when the meter is carrying a single-phase load and a balanced poly phase load at basic current I_b and Sin Ø = 1 shall not exceed 2.5%

The energy for inductive load be recorded and should register the absolute sum of quadrant 1 and 3.

6.5.4 Limits of error due to influence quantities

The additional percentage error due to the change of influence quantities with respect to reference conditions, as given in 8.5 of IEC 62053-23 shall not exceed the limits given in Table-VII.

TABLE – VII

Influence Quantities

Influence quantity	Value of Current (Balanced Unless otherwise stated) for Direct – connected meters	Sin Ø (Inductive)	Mean temperature coefficient % K for Meters of class 2
Ambient temperature Variation 7)	0.1 $I_b \leq I \leq I_{max}$ 0.2 $I_b \leq I \leq I_{max}$	1 0.5	0.10 0.15
			Limits of variation in Percentage error for Meters of class 2
Voltage variation ± 10% 2)	0.05 $I_b \leq I \leq I_{max}$ 0.1 $I_b \leq I \leq I_{max}$	1 0.5	1.0 1.5
Frequency variation ± 2% 2)	0.05 $I_b \leq I \leq I_{max}$ 0.1 $I_b \leq I \leq I_{max}$	1 0.5	2.5 2.5
DC component in the Current circuit 3)	$\frac{I_{max}}{\sqrt{2}}$	1	6.0
Continuous magnetic induction of external origin 4)	I_b	1	3.0
Magnetic Induction of external rigin 0.5 mT 5)	I_b	1	3.0
Electromagnetic RF Fields	I_b	1	3.0
Operation of Accessories 6)	0.05 I_b	1	1.0
Conducted disturbances, Induced by radio-frequency fields.	I_b	1	3.0
Fast Transient burst	I_b	1	4.0

1) For the voltage ranges from -20% to -10% and +10% to +15%, the limits of variation in percentage errors are three times the values given in this Table-VII.
Below 0.8 Un the error of the meter may vary between + 10 % and -100%

2) The recommended point for voltage variation and frequency variation is Ib for direct connected meters

3) The purpose of this test is to check for current sensor saturation only.

4) The test conditions are specified in 8.2.2 of IEC 62053 -23.

5) A magnetic induction of external origin of 0 5 mT produced by a current of the same frequency as that of the voltage applied to the meter and under the most unfavourable conditions of phase and direction shall not cause a variation in the percentage error of the meter exceeding the values shown in this Table.
The magnetic induction shall be obtained by placing the meter in the centre of a circular coil, 1 m in mean diameter, of square section and of small radial thickness relative to the diameter, and having 400 At.

6) Such an accessory, when enclosed in the meter case, is energized intermittently, for example the electromagnet of a multi rate register.
It is preferable that the connection to the auxiliary device(s) is marked to indicate the correct method of connection. If these connections are made by means of plugs and sockets, they should not be interchangeable.

7) The mean temperature coefficient shall be determined for the whole operating range. The operating temperature range shall be divided into 20 K wide ranges. The mean temperature coefficient shall then be determined for these ranges, by taking measurements 10 K above and 10 K below the middle of the range. During the test the temperature shall be in no case outside the specified operating temperature range

- **Add following under new heading 7.1.1**

7.1.1 STATIC WATT & VAR HOUR METER

- Reactive Energy (Kvarh).
- There should be a separate LED for testing and calibration of Reactive Energy.
- At least twelve month billing data kWh, kvarh, kW & No. of resets shall be available at all time.

- **Add following under heading 7.1.2**

7.1.2 MULTI-RATE METER (when applicable)

- Min. Four Multi Rate periods Reactive Energies (Kvarh).
- At least twelve month Billing Data kWh, kvarh, kW & No. of resets shall be available at all time.

- **Add following new clause**

7.5 LOAD PROFILING /RECORDING

- Min. Two Channel recording having sufficient capacity to record at –least 65 days of Data of 30 minutes interval.
- After downloading Load Profile Data in computer through reporting software, it should be available in tabular and graphical form.
- There should be date and time stamp for every entry of Load Profile data.
- All Load Profile Data shall be stored in a Non-Volatile Memory.

(MANSOOR NASIR) Deputy Director (D&S)	25/x/07 (AZIZ UR REHMAN) Director (D&S)	25/10/2007 (YAQOOB BAIG MIRZA) Chief Engineer (Design & Standards)

PEPCO

PAKISTAN ELECTRIC POWER COMPANY LIMITED
Office of the Chief Engineer (Design & Standards) PEPCO
17/C-I, Ist Floor, IEEEP Building, Faisal Town, Lahore
Ph.# 042/9231641 – Fax # 042/9231646
Email: cedengg@yahoo.com

No 764-86/CEDS/2-224 Dated 21-02-08

Chief Executive Officer
All DISCOS

Subject: AMENDMENT NO.2 - WAPDA SPECIFICATION NO. DDS-60:2007 FOR STATIC 3-PHASE, 3 ELEMENT, 4 WIRE WHOLE CURRENT ENERGY METER

The copy of Amendment No.2 dated 26.02.2008 of the WAPDA Specification DDS-60:2007 for Static 3-Phase, 3 Element, 4 Wire Whole Current Energy Meter is enclosed herewith for official record and guidance please.

26/2/08

(AZIZ UR REHMAN)
DIRECTOR (D&S)

Cc to:-

1. General Manager (C&M) Power PEPCO WAPDA House, Lahore
2. Chief Engineer (Material Inspection) PEPCO WAPDA, Sunny View, Lahore
3. Chief Engineer (P&D) PEPCO WAPDA, Lahore
4. All meter manufacturers.

A/Amendment/P-18

SPECIFICATION NO. DDS-60:2007

STATIC 3-PHASE, 3 ELEMENT , 4 WIRE

WHOLE CURRENT ENERGY METER

AMENDMENT NO.2

DATED 26th FEBRUARY, 2008

- **Add the following under clause 7.3 "Display"**

  - The meter shall be equipped with fixed long life battery to display reading during power supply failure.

(MANSOOR NASIR) Deputy Director (D&S)	26/2/08 (AZIZ UR REHMAN) Director (D&S)	(RANA MUHAMMAD AJMAL KHAN) Chief Engineer (Design & Standards)

NATIONAL TRANSMISSION & DESPATCH COMPANY
Office of Chief Engineer (Design & Standards) NTDC
48-L Model Town Extension, Lahore
Ph No.042/5161916, Fax No.5161917
Email: cedengg@yahoo.com.

No. 6301-17/CEDS/Z-224 Dated: 05-11-2008

The Chief Executive Officers

All DISCOs.

Subject: **SPECIFICATION DDS-60:2007 - STATIC 3-PHASE, 3-ELEMENT, 4 WIRE WHOLE CURRENT ENERGY METERS – AMENDMENT NO.3 DATED 05.11.2008.**

Enclosed please find herewith Amendment No.3, specification No. DDS-60:2007 of the subject meter for your reference and record please. This amendment will be implemented for the purchase orders issued from April, 2009 onward. However, the manufacturers can develop the fixation of battery within meter body earlier which will be acceptable.

5/11/08
(AZIZ UR REHMAN)
MANAGER (D&S)

Cc to:-

1. General Manager (Services Division) NTDC, PEPCO, Wapda House , Lahore.
2. Chief Engineer (Material Inspection) NTDC PEPCO, Sunny View, Lahore.
3. Chief Engineer (P&D) NTDC, WAPDA House , Lahore.
4. All meter manufacturers.

Mr. Tariq Jawed
16/1/09

SPECIFICATION NO. DDS-60:2007

STATIC 3-PHASE, 3 ELEMENT, 4 WIRE WHOLE CURRENT ENERGY METER CLASS-1.

AMENDMENT NO. 3

DATED 5TH NOVEMBER, 2008

Last sub clause of Clause 7.1.3 may be read as :-

- The battery shall be solidly welded, brazed or coldered and placed within the meter body, so that it may not be easily approached.

(MANSOOR NASIR) DY. MANAGER (D&S)	(AZIZ UR REHMAN) MANAGER (D&S)	(RANA MUHAMMAD AJMAL KHAN) CHIEF ENGINEER (D & S) NTDC
	5/11/08	05.11.08

NATIONAL TRANSMISSION & DESPATCH COMPANY
Office of Chief Engineer (Design & Standards) NTDC
48-L Model Town Extension, Lahore.
Ph No.042/99230024, Fax No.99230025
Email: cedengg@yahoo.com.

No. 445365/CEDS/ Z-224 Dated: 15-10-2009

The Chief Executive Officers

All DISCOs.

Subject: **AMENDMENT NO. 4 DATED 15.10.2009 – SPECIFICATION NO. DDS-60:2007 OF STATIC WHOLE CURRENT ENERGY METER.**

Enclosed please find herewith a copy of Amendment No. 4, PEPCO Specification DDS-60:2007 of the subject meter for your reference and record.

DA/As above.

15/X/09

(AZIZ UR REHMAN)
MANAGER (D&S)

CC: -

1. General Manager (Services Division) NTDC, PEPCO, Wapda House , Lahore.
2. Chief Engineer (Material Inspection) NTDC PEPCO, Sunny View, Lahore.
3. Chief Engineer (P&D) PEPCO, WAPDA House , Lahore.
4. All manufacturers.

MAM/Amend.

SPECIFICATION NO. DDS-60:2007

STATIC 3- PHASE, 3 ELEMENT, 4-WIRE WHOLE CURRENT ENERGY METER

AMENDMENT NO. 4

DATED 15TH OCTOBER 2009

1. **The existing Sub Clause 12.1 shall be replaced as under:**

12.1 JOINT TYPE TESTING

Over and above normal inspection, the representative of Chief Engineer (Design & Standards) and Chief Engineer (MI) WAPDA will carry out all possible locally available type tests jointly, once during the calendar year and it shall be applicable during this period to all WAPDA / DISCOs purchase orders. The type testing will be carried out keeping in view that every time different DISCOs purchase order will be selected for the test. Chief Engineer (MI) will communicate the schedule for joint type testing due well before time for a lot of reasonable size (not less1000 meters).

2. **Add following new Sub Clauses**

12.2 TESTING CRITERIA

For joint type testing five (05) meters shall be selected jointly from the offered lot and all the type tests mentioned in the specification shall be performed.

12.2.1 Out of above five (05) samples, three (03) meters shall be subjected to following tests in sequence as mentioned in IEC 62052-11 Annexure-F:

a) Tests of Insulation Properties;
b) Test of Accuracy Requirements;
c) Tests of Electrical Requirements;
d) Tests of Electro Magnetic Compatibility (EMC), in house;
e) Tests of the effect of the Climatic Environments.

12.2.2 One (01) meter out of three (03) meters be subjected to EMC test of RF Field to be performed at AWC Wah Cantt.

MAM/Amend.

12.2.3 Remaining two (02) meters out of five (05) shall be subjected to following tests: -

f) Mechanical tests = One meter
g) Miscellaneous requirement including verification of components and dimensions, = One meter

12.2.4 (a) If any one (01) meter fails in any test then double the quantity of samples shall be collected and all tests shall be repeated in sequence mentioned above. If any meter fails again in any test, whole lot shall be rejected.

(b) In case one (01) meter fails in two tests or two (02) meters fails in one test then whole lot shall be rejected.

12.2.5 In case of rejected lot, the manufacturer shall identify the cause of failure and re-offer the meters for joint inspection after rectifying the defect. Warranty of the meters already supplied during preceding months of the last joint type testing or prototype approval (whichever is earlier) shall be doubled.

3- **The existing Clause 13.5.2 (Sample Test) shall be replaced as under**: -

13.5.2 SAMPLE TEST

The meters offered for acceptance shall be grouped into lots containing up to 1000 meters. A sample comprising five meters shall be selected at random from each lot and subjected to following tests: -

(i) Electrical

1- Impulse Voltage Power loss & Influence of DC & even harmonics test = 02 Nos.

2- Test of accuracy requirement: = 05 Nos. already selected
   a) Test of starting condition
   b) Test of no load condition

3- EMC tests = 02 Nos.
   a) Fast transient burst test
   b) Test of immunity to electro static discharges
   c) Surge immunity test

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(ii) Mechanical

1-	Shock & Vibration test	=	01No. **(Once in P.O)**
2-	Test of protection against penetration of water	=	Any 02 meters already selected
3-	Dimensional check and verification of components	=	Any 01 meter **against each inspection call**
4-	Impact test and Tin coating test	=	Any 01 meter already selected

(iii) Extreme Temperature Condition

Following test to be performed on one meter selected for climate test:

- Test of Extreme Temperature condition:
  Temperature = 80 ^{0}C
  Duration = 04 hours

Meter shall be energized with reference voltage and Imax current be flown continuously for four hours. Accuracy of meter with specified limits shall determine its qualification in test.

(iv) Software and Security Verification:

Following tests be performed on one meter selected for software and security.

-	Radar Magnet 0.7 Tesla	1 No.
-	Verification of Security Features	Once in Inspection call
-	Accuracy with & without Neutral	Once in Inspection call
-	Verification of functionality of software & display features shall be performed by loading / down loading and auditing of the reports (copy of the report be retained for official record).	Once in Inspection call

MAM/Amend.

4- **Acceptance Criteria.**

a) **The existing Sub Clause 13.5.3 (a) shall remain the same**

5- **The existing clause 13.5.3 (b) shall be read as under:**

b) Mechanical Test, Extreme Temperature Condition, Software and Security verification:

- The lot shall be accepted if meters qualify the above tests in clause 13.5.2 (ii), (iii) & (iv)
- In case any meter fails in the relevant test, another sample of double the size shall be selected and test be repeated.
- If any meter fails in any test during re-sampling, the entire lot shall be rejected.

6- **Replace the existing clause 13.6 & 13.6.1 as under: -**

13.6 Visual Inspection

The meter shall be inspected visually for, but not limited to, the defects mentioned below :

Examination	Defects
Material	1. The material used are not of good quality finish, contain surface defects or other imperfections injurious to the working of the meter. 2. The parts of terminal block e.g. terminals, pressure plates and terminals screws are not of specified material / quality. 3. Sealing screws are not made of steel.

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Design and Construction

1. The design or construction differs in any respect from that of the approved prototype.
2. Any part or components is missing, loose or damaged, effecting use or performance of the meter in any respect.
3. Clearance between various live parts and that between live and earthed metal parts is not sufficient.
4. The connections of leads to the potential coil are not soldered securely and show tendency to opening.
5. Sealing screws are not captive. If washers are used to keep them captive, they are not of proper design.
6. Sealing hook for the terminals is not of proper design, size or is found broken.
7. Gaskets are not of neoprene, not properly embedded, shows cracks, uneven thickness of surfaces.

Workmanship/Finishing/Marking

1. Meters are not uniform in quality, show scale, chips, dented or bent edges or other disfiguring / blemishes.
2. The terminal block is chipped at some places, shows signs of breakage, presence of weak points or other moulding defects.
3. Ultrasonic welding are not strong and smooth.
4. Joints are not in proper alignment, causing assembly defects of nature that interferes with normal working.
5. Nameplate markings are missing, incomplete, incorrect, illegible, not permanent, or not in accordance with relevant clause.

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6. The connection diagrams and terminal marking are missing, incomplete, or applied in a temporary manners.

7. Polycarbonate cover is not clear transparent, not properly finished, deformed, shows burrs, extra material, cracks, cold shots, voids and air bubbles etc.

7- **Add the following at the end of Clauses 8.2.5 and 13.5.2.**

NOTE: ***The manufacturer should provide UV Stabilized LCD Certificate from their principal at the time of prototype approval and during mass production.***

8- **Add new clause 17 as under:**

17. **VERIFICATION OF LOCAL VENDORS**

The verification of local vendors for the manufacturing of locally manufactured components of their meter shall be done once in the calendar year which shall be applicable to all purchase orders for all DISCOs.

15/x **(MANSOOR NASIR)** Dy. Manager (D&S)	15/X/09 **(AZIZ UR REHMAN)** Manager (D&S)	15/X/09 **(MUHAMMAD SHAFQAT)** Chief Engineer (Design & Standards)

MAM/Amend.

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ADDENDUM

Subject: WAPDA SPECIFICATION NO.DDS-60:2007.

The following line be added in between "Specified Operating Range" and "Limit Range of Operation" under clause 6.3 VOLTAGE RANGE at Page No.11 of the revised WAPDA Specification DDS-60:2007 circulated vide this office letter No.154-70 dated 20.01.2007,:-

Extended Operating Range **From 0.8 to 1.15 of ref. voltage**

(MAHBOOB ALAM)
DIRECTOR (D&S)

Cc to:-

1. General Manager (C&M) Power WAPDA WAPDA House, Lahore.
2. All DISCOs
3. Chief Engineer (Material Inspection) WAPDA, Sunny View, Lahore.
4. Chief Engineer (P&D) WAPDA, Lahore
5. All meter manufacturers.

28/1/10

meters