Annexure A

KEETMANSHOOP MUNICIPALITY

KEETMANSHOOP ELECTRICITY BUSINESS UNIT (KEBU)

SPECIFICATION FOR METERS

Reference:
KEBU_SPEC_11

Revision: 1

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CONTENTS

FOREWORD

This specification covers Keetmanshoop Municipality's minimum requirements for:

1. Single-phase and three-phase **prepayment meters.**
2. Single-phase and three-phase **programmable energy meters**

Bidders shall complete the technical schedules as detailed in Annexure B – Technical Schedules A and B. All deviations from the requirements shall be stated in the Bid documentation. In the absence of such a statement, it shall be understood that all requirements of this specification are fulfilled without exception.

Specifications are referenced in the normative references section; the list of standards may be used as a guide, but should not be regarded as a complete list. Bidders shall be responsible for obtaining copies of NRS documents and any other relevant and current national and international standards.

Meters shall comply with the relevant SANS and/or IEC standards or similar approved.

1 SCOPE

This specification covers Keetmanshoop Municipality minimum requirements for:

1. Single-phase and three-phase **prepayment meters.**
2. Single-phase and three-phase **programmable energy meters**

2 NORMATIVE REFERENCES

Parties using this specification shall apply the most recent edition of the documents listed below.

1.Prepaid Meters

IEC 62052-11, *Electricity metering - General requirements, Tests and test conditions - Part 11: Metering equipment*

IEC 62053-21, *Electricity metering equipment (a.c.) - Part 21: Particular requirements - Static meters for active energy (classes 1 and 2)*

IEC 62055-31, *Electricity payment metering systems - Part 31: Particular requirements – Static payment meters for active energy (classes 1 & 2)*

IEC 62055-41, *Electricity metering - Payment systems - Part 41: Standard transfer specification (STS) - Application layer protocol for one-way token carrier systems*

IEC 62055-51, *Electricity metering - Payment systems - Part 51: Standard transfer specification - Physical layer protocol for one-way numeric and magnetic card token carriers*

IEC 62055-52, *Electricity metering - Payment systems - Part 52: Standard transfer specification - Physical layer protocol for a two-way virtual token carrier for direct local connection*

IEC 60529, *Degrees of protection provided by enclosures*

BS 7856, *Code of practice for Design of alternating current, watthour meters for active energy (classes 1 and 2)*

SANS 1524-1, *Electricity payment systems - Part 1: Payment meters*

SANS 1524-1-1, *Electricity payment systems - Part 1-1: Mounting and terminal requirements for payment meters*

SANS 1524-1-2, *Electricity payment systems - Part 1-2: Specification for surge arresters for the protection of electricity dispensers*

STS 101-1, *Interface specification - STS 101-1: Standard transfer specification (STS) – Physical layer mechanical and electrical interface for virtual token carriers*

STS 201-15.1.0, *Companion specification - STS 201-15.1.0: Standard transfer specification (STS) - Meter function object: Register Table for electricity payment meters*

NRS 009, *Electricity Sales Systems*

NRS 057, *Code of practise for electricity metering*

2. Programmable energy meters

SANS 62052 Part 11, *Electricity metering equipment (AC) – General requirements, tests and test conditions*

SANS 62053 Part 21, *Electricity metering equipment (a.c.) – Particular requirements: Static meters for active energy (classes 1 and 2)*

SANS 62053 Part 22, *Electricity metering equipment (AC) – Particular requirements: Static meters for active energy (classes 0.2S and 0.5S)*

SANS 62053 Part 23, *Electricity metering equipment (AC) – Particular requirements: Static meters for reactive energy (classes 2 and 3)*

IEC 62053 Part 31, *Electricity metering equipment (AC) – Particular requirements: Pulse output devices for electromechanical and electronic meters (two wires only)*

SANS 62056 Part 21, *Electricity metering – Data exchange for meter reading, tariff and load control: Direct local data exchange*

IEC 62058 Part 31, *Electricity metering equipment (AC) – Acceptance inspection: Particular requirements for static meters for active energy (classes 0.2S, 0.5S, 1 and 2)*

SANS 474/NRS 057, *Code of practise for electricity metering*

BS 5685-1, *Electricity meters – Part 1: Specification for class 0,5, 1 and 2 single-phase and polyphase, single rate and multi rate watt-hour meters*

3 DEFINITIONS AND ABBREVIATIONS

3.1 DEFINITIONS

3.1.1 Active unit

The metering unit that plugs into the passive unit (or socket). The Active Unit may often (but not necessarily) include the Customer Interface Unit.

3.1.2 Base

The back cover of the Active Unit. The Active Unit will plug into a standard socket.

3.1.3 Customer Interface Unit

The portion of a meter that contains interfaces (input and/or output) to interact with the meter. The Customer interface Unit is often included with the Measurement Unit to form a self-contained meter, but it may also exist as a separate Unit e.g. in the implementation of a split meter.

3.1.4 Measurement Unit

As defined in SANS 1524-1 with the additional meaning that the term Measurement Unit may also be used to describe a complete meter where the Measurement Unit and Customer interface Unit are contained inside a single device.

3.1.5 Prepayment Meter

A generic term for prepayment devices encompassing ED, ECU, split ED and other metering devices. This term is also interchangeably used with the word "meter" in the same context.

3.1.6 Split Meter

Meter where the Measurement Unit and Customer interface Unit are contained in separate enclosures.

3.1.7 Demand

The average value of power or a related quantity over a specified interval of time.

3.1.8 Maximum demand

The average value of power (active or apparent) over a specified interval of time. Demand can be based either on active or apparent demand, depending on the tariff in use. Maximum demand is relevant only on tariffs which have a demand component. The maximum demand is the highest value of demand which occurred during a billing period.

3.1.9 Non-volatile memory

A storage device, which can retain information in the absence of power.

3.1.10 Programmable metering device

A device that is capable of calculating, storing and displaying active and reactive energy values according to a user defined configuration.

3.1.11 Reactive energy

The integral of reactive power with respect to time. For the purpose of this document, reactive energy is the energy measured in kvarh.

3.1.12 Real time clock

A device which maintains, to an acceptable level of accuracy, information describing the date and time of day.

3.1.13 Basic current (Ib)

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

3.1.14 Rated current (In)

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

3.1.15 Maximum current (Imax)

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

3.1.16 Starting current (Ist)

The lowest value of the current at which the meter starts and continues to register.

3.1.17 Power loss

The active power and apparent power loss in each voltage and current circuit at nominal voltage and basic current.

3.1.18 Active energy meter (watt-hour meter)

An instrument intended to measure active energy by integrating active power with respect to time. For metering purposes, the unit of active energy is kilowatt-hour (kWh).

3.1.19 Basic current (I_b)

Basic current is that value of the current in accordance with which the relevant performance of the meter is fixed.

3.1.20 Maximum current (I_{max})

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

3.1.21 Power loss

The active power and apparent power loss in each voltage and current circuit at nominal voltage and basic current.

3.1.22 Electronic meter

A device in which the measurements are made by means of an electronic technique.

3.1.23 Induction meter (electromechanical meter)

A meter in which currents in fixed coils react with currents in the conducting moving element, generally a disc or discs, which cause its movement.

3.1.24 Register

Electro-mechanical or electronic device comprising both memory and display which stores and displays information.

3.1.25 Non-volatile memory

An electronic medium for storage of information which retains the information in the event of loss of auxiliary power supply. The information shall be retained for a period of at least four months in the event of a power failure.

3.2 ABBREVIATIONS

CIU : Customer Interface Unit

ECU : Electricity Control Unit; a prepayment meter with earth leakage and overcurrent protection built in. Category as defined in SANS 1524-1.

ED : Electricity Disperser. A prepayment meter without either earth leakage or overcurrent protection. Category as defined in SANS 1524-1.

STS : Standard Transfer Specification

4 TYPES

The following equipment is required:

4.1 Prepaid-meters

a) Multi frequency Single Phase Split DIN-Rail mounted PLC Prepayment meter 230 Vac, 80 A, single-phase split type prepayment meters (wire communications) as Conlog BEC44 (X) with CBU (X) RANGE or equal

b) 230 Vac, 80 A, single-phase non-split type prepayment meters as Conlog's BEC23(09) range or equal

c) 400 Vac, 100 A per phase, three-phase split type prepayment meters (wire communications) as Conlog Split Meter: BEC 62Three phase radio frequency

d) 400 Vac, 100 A per phase, three-phase non-split type prepayment meters.

4.2 Programable Meters

e) Single-phase, 20/100 A, 230 V, kWh (Elster AS 230 or better performance requirements) electronic meters;

f) Three-phase, 20/100 A, 400 V, kWh (Elster 1700 or 1140 direct on line or better performance requirements) electronic meters;

g) Single-phase, 5 A, 230 V, kWh electronic meters(Elster AS 230 or better performance requirements), for use with current transformers;

h) Three-phase, 5 A, 400 V, kWh (Elster 1700 or 1140 direct on line or better performance requirements electronic meters, for use with current transformers; and

i) Three-phase, 160 A, 400 V, kWh (Elster 1700 or 1140 direct on line or better performance requirements electronic meters.

5 REQUIREMENTS: PREPAID-METER

5.1 GENERAL

All meters shall comply with the requirements of SANS 1524-1 unless differences are defined in this specification which will take precedence.

5.2 MECHANICAL ENCLOSURE DESIGN

5.2.1 Single-phase meters designed as self-contained unit

The installed meter shall have an IP rating 51 or better according to IEC 60529.

Single-phase prepayment meters that are not designed as split meters (i.e. EDs and ECUs) shall be constructed in accordance with the requirements of SANS 1524-1-1.

5.2.2 Multi-phase meters and all meters designed as split meters

The installed Measurement Unit shall have an IP rating 54 or better according to IEC 60529.

The Customer Interface Unit shall have an IP rating 52 or better according to IEC 60529.

Multi-phase prepayment meters, and all split prepayment meters shall be designed to adhere to one of the following two enclosure options:

a) The base of the Measurement Unit shall conform to the BS 7856 enclosure and mounting arrangement. The terminals position and spacing shall be according to the same BS requirements with the addition that screw clamp terminals are preferably used. The Measurement Unit shall be in a high impact resistant case. The meter cover shall be dust-proof and sealable. If a terminal block cover is provided, the cover shall be sealable independently from the meter cover.

b) The Measurement Unit enclosure shall conform to the standard circuit breaker mounting format that is suitable for mounting on a 35 mm DIN rail or alternatively with dual-rail mounting capability.

The main "Live" and "Neutral" terminals shall be located on the bottom of the installed meter with the cables entering from the bottom. Live and Neutral terminals shall be of the screw clamp type terminals.

5.3 METER DIMENSIONS

5.3.1 Single-phase meter that conforms to the BS 7856 enclosure standard

- Maximum height: 210 mm
- Maximum stacking width (for adjacent meters): 145 mm
- Maximum depth: 110 mm

5.3.2 Single-phase meters that conforms to the standard circuit-breaker mounting format

- Maximum height: 140 mm
- Maximum stacking width (for adjacent meters): 51,5 mm
- Maximum depth: 110 mm

5.4 TAMPER PROTECTION

Tamper protection shall be fitted.

5.5 SEALING

Provision shall be made for sealing of the Measurement Unit with stainless steel sealing wires. Where the terminals are contained inside the enclosure, they may be sealed with the same seal(s) as the enclosure.

Where implemented, the seals shall be applied in such a way that it will not be possible to undo/loosen the mounting screws used to secure the Measurement Unit to the socket, without breaking these seals. It shall further be impossible to obtain access to the inside of the Measurement Unit or to the connection terminals without breaking the seals.

5.6 MARKING OF METER FOR ALL METER TYPES

The meter number (decoder reference number) and barcode shall be clearly and permanently displayed on the front of the Measurement Unit enclosure as defined in SANS 1524-1 clause 5.1.

It shall be possible to clearly display the meter number(s) on the CIU for the currently active Measurement Unit of a split meter. It shall further be possible to change the displayed number(s) accordingly whenever the Measurement Unit or the CIU is replaced.

Other information as defined in SANS 1524-1 clause 5.1 shall also be displayed.

5.7 INTERFACE PORT

The communication interface to the CIU of a split meter (wire or wireless communication) shall be as specified in schedule A.

The prepayment meter shall have an interface port that may be used for connection to a hand held unit, meter configuration tool or other communication device.

5.8 LCD DISPLAY

At least 5+1 digits; icon information; numeric information display of various meter information such as credit levels, token entry, kWh for the current billing period, Total kWh used since last installation, Instantaneous load etc.

5.9 CLIMATIC REQUIREMENTS

The requirements of SANS 1524-1 clause 6 shall apply.

5.10 ELECTRICAL REQUIREMENTS

The requirements as specified in SANS 1524-1 clause 7 shall apply.

5.10.1 Safety related

In addition to the above requirements, the ECU shall also comply with the conditions of SANS 10142-1 since the protection features of the ECU form part of the electrical installation.

5.10.2 Accuracy Class

Prepayment meters shall be of accuracy class index 2 or better.

5.10.3 Current rating

The basic current for a single phase meters shall be 10 A or less. The basic current for multi-phase meters shall be 20 A or less per phase.

The maximum current for a single phase ED shall be at least 60 A but not more than 100 A. The maximum current for an ECU shall be 20 A. The maximum current for a multi-phase ED shall be at least 80 A but not more than 100 A per phase.

5.10.4 Protection disconnect

As defined by SANS 1524-1 clause 7.9 and IEC 62055-31 Annex C.

5.10.5 Power limit and Out of Credit disconnect

The prepayment meter shall have a power limiting function that will automatically disconnect the load when the average power consumed, exceeds the maximum allowed.

5.11 FUNCTIONAL REQUIREMENTS

In addition to the requirements given in clause 9 of SANS 1524-1 the following shall apply.

All the user interface items shall be visible and accessible on front of the meter for a self-contained unit, or on the Customer Interface Unit of a split meter. They may optionally be displayed on the Measurement Unit of a split meter as well.

In addition to any displays on the Customer Interface Unit, the consumption rate indicator, as well as some indication of the load switch status, shall be displayed on the Measurement Unit of a split meter.

The Customer Interface Unit shall incorporate a practical power source like user replaceable batteries, to enable the display and allow token entry when the meter has disconnected the load.

5.11.1 Token entry indication

Prepayment meters, that operate with numeric tokens shall:

a) Display the numbers entered during token entry

b) Have the means to remove digits, one at a time, from the end of a partially entered number, for example, a "Backspace" button.

c) Have the means to clear a partially entered number, for example, a "Clear" or "Enter" button.

d) All successful button presses shall provide tactile and/or audible feedback.

5.11.2 Token result indication

The prepayment meter shall at least uniquely display the following conditions:

a) Rejection of a token

b) Acceptance of a token. (A prominent indication of the token data content is acceptable)

c) Used (or duplicate) token

d) Old (or expired) token

e) Meter key has expired (if implemented)

f) Token lockout active (See IEC 62055-52 Clause 6.6.7)

Additional status information as defined in IEC 62055-52 Clause 6.8.3.7 may optionally be displayed.

5.11.3 Load status indication

A unique indication shall be provided that, either power is supplied to the load circuit, or that the load circuit is switched on. This indication shall be provided on the Measurement Unit of a split meter, in addition to the unique load indications as described below for all self-contained meters and the Customer Interface Unit of split meters.

Prepayment meters shall provide unique indications if the load has been disconnected due to the following conditions:

a) No credit available

b) Power consumption exceeded the maximum power limit as set with an STS token.

c) The ECU shall provide an additional unique indication if the load has been disconnected due to the detection of an electrical fault, i.e. overcurrent or earth fault.

5.11.4 Power indication

An obvious power indication shall be provided when power is supplied to the meter. This indication shall be provided on both the Measurement Unit and the Customer Interface Unit of split meters as well on all self-contained meters.

5.11.5 Consumption rate indicator

The consumption rate indicator light shall emit visible red light.

The consumption rate indication shall be provided on the Measurement Unit of a split meter as well as on a self-contained meter, for calibration/verification purposes.

Consumption indication shall also be provided on the Customer Interface Unit of a split meter but such an indication is only intended as visual indication for the user.

5.11.6 Credit display

The prepayment meter shall have a numeric credit display and shall indicate if more units are available than can be displayed, for example, by displaying all the numerals 9.

In the event that the available credit is decremented into negative values, the negative credit value shall be displayed as such on the normal credit display and registers of the meter.

5.11.7 Communication indicator

The Customer Interface Unit for a split meter shall provide a unique indication that the communication to the Measurement Unit is active and working correctly.

5.12 STS TOKEN ENTRY AND DECRYPTION

All meters shall comply with the STS/prepayment requirements as defined by IEC 62055-41, IEC 62055-51 and IEC 62055-52 unless where differences are defined in this specification.

All prepayment meters shall be capable of operating as uniquely coded STS units without requiring any modifications.

5.12.1 General Token Acceptance

The prepayment meter shall at least be able to accept tokens of up to 6,000 kWh and shall store at least up to 10,000 kWh of available credit. The transfer of energy credit by tokens shall be in accordance with the STS specification.

5.12.2 Token Re-use Prevention

All prepayment meters shall have a table to store the token identifiers (IDs) of used tokens. The token ID table shall hold a minimum of fifty token identifiers.

5.13 SPECIAL TOOLS

The bider shall detail and submit prices for any special tools and other extras such as secure screwdrivers and seal replacements.

6 REQUIREMENTS: PROGRAMMABLE ENERGY METERS

6.1 GENERAL

The devices shall be multi-function 3-phase solid state units with the ability to connect to either 3 phase, 4 wire or 3 phase, 3 wire delta circuits.

The meters shall be able to record active and reactive energy and active and apparent demand.

6.2 ACCURACY CLASS

The accuracy class with whole current meters for active energy will be at least class 1.0, in accordance with IEC 62053 part 21 and class 2 for reactive energy, in accordance with IEC 62053 part 23.

6.3 MECHANICAL REQUIREMENTS

6.3.1 General

Meters shall be appropriately constructed to provide long life in abusive physical and electrical environments. The mechanical and climatic requirements for the meter shall be in accordance with IEC 62052 part 11.

6.3.2 Insulation

Meters shall meet the insulation requirements of protective class II.

6.3.3 Meter cover

The meter cover shall be sealed by at least two securing screws.

The securing screws for surface mount meters of class 0.5 and class 1 shall be of a shear-off type where the top part will break off if due force is applied to the screw to allow for a permanent fixture.

6.3.4 Terminals

The terminal blocks shall be positioned at the base of the meter and the terminal arrangement shall be in accordance with BS 5685-1.

Fastening of the Current Transformer (CT) and Voltage Transformer (VT) supply wiring shall either be by means of two securing screws on each terminal, or by means of a clamp terminal using at least one screw.

Auxiliary inputs and outputs may either be spring-clamp terminals or screw-type terminals with one securing screw.

The securing screws and terminals shall be of non-ferrous metal and of sufficient length so as to securely clamp/fasten the conductor/wire in the terminal block.

Terminal blocks shall be mounted in a fashion that does not exert undue forces on internal circuitry.

Terminal covers for surface mount meters shall be in accordance with IEC 62052 part 11.

6.3.5 Ingress Protection rating

The meter's electronic circuitry under the meter cover shall be suitably protected against the ingress of solid objects and liquids.

The Ingress Protection (IP) rating of this part of the meter shall be IP52 or better.

6.3.6 Markings

All rating plates shall be in accordance with IEC 62052 part 11.

The meter’s serial number shall comply with the requirements of SANS 474/NRS 057 and shall also be presented in barcode format.

All markings shall be indelible, distinct and legible on the outside of the meter.

Terminal markings shall be clearly indicated on the meter itself.

Meter connection diagrams shall be in accordance with IEC 62052 part 11 and shall be fixed inside the terminal block cover.

6.4 ELECTRICAL REQUIREMENTS

6.4.1 Internal battery

Any batteries used shall have a minimum life of 10 years under normal operating conditions and shall have a backup capacity of at least three months in the absence of auxiliary power.

6.4.2 Current and voltage inputs

The standard reference frequency is 50 Hz ± 5 %.

The standard reference voltage is 110 V for 110 V 1 A and 5 A three-wire meters; 63,5 V for 63,5 V 1 A and 5 A four-wire meters; and 400 V for 400 V 5 A and 400 V 100 A and 160 A four-wire meters.

The standard nominal current is 1 A for a 1 A meter and 5 A for a 5 A meter. Whole current meters shall have a basic current of ≤ 20 A for meters with an I_{max} of 100 A and 40 A for meters with an I_{max} of 160 A.

The meter shall operate correctly with a maximum current input of at least 120 % of the maximum current.

The meter shall operate correctly with a maximum voltage input of at least 120 % of the standard reference voltage of the meter.

The meter shall have the facility to assign two user-configurable multipliers to the meter readings. These will be the current transformer and the voltage transformer ratios. It shall be possible to enter non-standard ratios such as 500 V to 110 V.

6.4.3 Auxiliary power circuits

Meters with an accuracy class of 0.5 or lower shall operate from the phase voltages.

Meters of class 0.2S and 0.2 for active energy shall operate from either the phase voltages or from a single-phase auxiliary supply (these may be different meter models).

If present, the auxiliary supply shall be a nominal 110 V phase to phase for a 110 V meter.

The meter shall operate reliably with an auxiliary supply over a range of ± 20% of nominal and a frequency of 50 Hz ± 5%.

6.4.4 Pulse outputs

The meter shall have a minimum of four pulse outputs provided by potential free contacts for retransmission of parameters. Options shall be provided to increase this to six outputs when specified.

For the retransmitting of active and reactive energy, the contacts shall be fully configurable in terms of the measurand being indicated and the energy value of each pulse.

The meter shall also support pulsing of the following parameters:

a) Integration period resets

b) Active tariff rates

c) Events (as specified in 6.5.9).

6.5 FUNCTIONAL REQUIREMENTS

6.5.1 Power flow measurable required

The meters shall be able to measure import and export active and reactive energy and resolve the reactive energy into the four energy quadrants.

The meters shall be required to register both kilowatt demand and its time and date of occurrence, and kilovolt-ampere demand and its time and date of occurrence. The meter shall be able to display these values locally on its display.

6.5.2 Influence of harmonics on measurements

The accuracy of the meters shall not be adversely affected by the presence of harmonic components in the current and voltage circuits.

The limits of errors under these conditions shall be at least according to the limits as specified by IEC 62053 part 21 and IEC 62053 part 22. For reactive energy meters, the requirements as stated in IEC 62053 part 24 shall suffice.

6.5.3 Real-time clock

Each meter shall have a real-time clock that is accurate to better than ± 2,0 seconds per day under normal operating conditions.

Synchronization of the clock shall not be based on power system frequency.

The clock of each meter shall be able to automatically synchronized through the master station or locally through the optical interface.

During any loss of supply, the time of the clock shall be maintained for at least three months.

6.5.4 Calibration facilities

The meters shall have an optical test output device as specified in IEC 62052 part 11.

Provision shall be made for the calibration verification of active and reactive energy through a flashing LEDs on the faceplate of the meter.

6.5.5 Local display

The meters shall be equipped with an LCD display to facilitate manual meter reading when required.

The meters shall be able to sequentially display, using a manual stepping facility, at least 100 functions selectable from the following:

a) Current time and date;

b) Current and historical billing register values including time and date of reset;

c) Active tariff;

d) Programmed VT and CT ratios with error compensation values;

e) Diagnostic registers including battery age;

f) Display test pattern;

g) Instantaneous input voltages, currents, Watts, VArs, VA and power factor with an indication of which type of quantity is being displayed; and

h) Instantaneous Watts and VArs per connected phase, and/or phase angle between the input voltage and input current per connected phase such that it can be determined whether the input current is leading or lagging with respect to the relevant input voltage.

The display shall be fully configurable to display the register contents in any sequence as required by the user.

The meter shall support the display of these values through the local display and it shall support remote communication retrieval.

The values to be displayed shall consist of at least seven (7) significant digits and it shall be possible to assign a unique register number for each value to be displayed locally on the meter.

The display shall have antiglare and non-blinking properties. The intensity of the display shall not be sensitive to variations in auxiliary supply voltage and frequency, for variations of ± 20% for the voltage and ± 5% for the frequency.

6.5.6 Communication interfaces

The meter shall have an optical port for meter reading and configuration that will conform to IEC 62053 part 21.

The meter shall have a serial port RS232 or RS485 (preferably an RJ12 or RJ45 connection for RS485) that will be used for communication to a remote system.

It shall be possible to cascade at least eight meters through the communication port without the use of additional external hardware.

6.5.7 Maximum demand reset

The meter shall maintain a register that contains the maximum demand over a billing month period. For this reason, a demand-reset switch shall be supplied as part of the metering device. The requirements of this reset switch are as follows:

a) The facility shall exist to manually or automatically reset the maximum demand registers at the end of the billing month. Registers for at least the previous three billing periods shall be maintained in the meter.

b) If the metering device has the facility to reset all the monthly registers to zero at the start of each billing month, this facility shall be stated and it shall be possible to disable this facility.

c) The manual reset mechanism shall be sealable with a mechanical seal.

6.5.8 Load profiles (mass memory)

The meter shall support two independent stacks of load profile memory – one dedicated to billing data and the other to engineering and quality of supply data.

6.5.8.1 Billing data:

a) The meter shall cater for at least six channels of load profile memory for billing purposes (import and export active energy and reactive energy in four quadrants) for a period of at least 100 days over a 30 min integration period.

b) Meters performing line loss compensation or transformer loss compensation shall have a minimum of 12 channels of load profiling memory.

c) These channels shall be user configurable depending on the needs of the installation.

d) The integration period shall be user configurable to cater for typical intervals of 60 min, 30 min and 15 min.

6.5.8.2 Engineering data:

a) The meter shall cater for at least nine channels of data recording.

b) The following shall be supported as a minimum in the Engineering memory stack:

1. Voltages per phase
2. Current per phase
3. Phase angle per phase

c) These channels shall be user configurable depending on the needs of the installation.

d) The integration period shall be user configurable to cater for typical intervals of 60 min, 30 min, 15 min, 10 min, 5 min, 2 min and 1 min.

6.5.9 Meter memory

6.5.9.1 The following non-interval data shall also be stored on the meter and it shall be able to retrieve this data through remote communications:

a) Total energy

b) Energy per Time-of-use period

c) Status alarms

d) Event recording

6.5.9.2 The following status alarms shall be catered for as a minimum:

a) Integrity of the metering data

b) Failed battery or low battery voltage

6.5.9.3 The following event recording shall be catered for as a minimum:

a) Voltage phase failure

b) Over and under voltage

1. The limit setting shall be configurable from ± 5% to ± 15% of nominal voltage, as a minimum.
2. An event shall be recorded if over or under voltage is sustained for a predefined and configurable period.
3. This period shall be settable from 1 s to 3 600 s.
4. The date and time of the beginning of the event, and the date and time of the end of the event, shall be stored.
5. For each under-voltage event, the minimum voltage that occurred during the period shall be recorded. For each over-voltage event, the maximum voltage that occurred during the period shall be recorded. For three-phase meters, the phases affected shall also be recorded.

c) Phase sequence reversal

d) Negative active energy

6.5.9.4 Functionality shall be available for the automatic reporting of at least three of these events to the master station (configurable).

6.5.9.5 The meter shall be capable of storing data equivalent to an average 100 days of events.

6.5.9.6 All data and events (interval and non-interval) shall be date and time stamped at the meter with a resolution of at least 1 min.

6.5.10 Quality of supply

The supplier shall state conformance to quality of supply monitoring for class A and class B measurements according to SANS 1816.

The supplier shall state the recording capabilities supported by the meter for the storage of Quality of Supply (QOS) data. Specifically, the following shall be stated:

a) Load profile capability.

b) Independence of QOS integrating period requirements versus meter billing data integrating period.

c) Retrieval method for QOS data.

6.5.11 Line loss compensation

The supplier shall state the capabilities supported by the meter on line loss compensation. Specifically, the following shall be catered for:

a) The meter shall be capable of performing line loss compensation and transformer loss calculations for all measurable quantities, i.e. import and export active and reactive energy.

b) The supplier shall provide details of the algorithms used for calculating line loss compensation and transformer loss compensation for approval.

c) Provision shall be made for meters performing line loss compensation, to make available both the compensated and uncompensated values in the registers and the load profile.

6.5.12 Data Retention

All programmed and register data shall be retained in memory with long term data retention in excess of 10 years.

6.6 SOFTWARE

6.6.1 General

The metering systems shall be supplied with configuration software.

All software supplied shall be documented comprehensively, with all the features and functions discussed, including a set of examples as to how the meters can be configured for different tariff structures and applications.

Training shall be provided for all relevant staff by the supplier of the meter. This training shall cover the installation, maintenance and operation of the system and the configuration software.

6.6.2 Security within software

To enable programming or resetting of registers, meters must perform security checks which verify that the programming is authorised. Programming must be disabled if this verification fails.

The following shall be password protected:

a) Programming of meters

b) Setting and resetting of time and date

c) Resetting of billing and accumulative registers that are not reset by the normal end of billing period reset signal.

d) Changing of passwords

e) Downloading of meter setup file where applicable.

6.6.3 Tariff implementation through the software

The configuration software shall cater as a minimum for all the different tariff structures applied within Keetmanshoop Municipality. The following shall be catered for:

a) The meter shall be capable of measuring and recording import and export active energy and reactive energy in all four quadrants for various time periods.

b) The time definitions shall be configurable in the meter in the following way:

    1. It shall be possible to set up at least two different seasons within the meter's switching schedules.

    2. The meter shall be able to accept day, month and year when assigning seasons and holidays.

    3. Each season will provide for at least four different day types. The tariff switching will be different in each of the different days.

    4. At least four different time periods will be provided for within each day, and it will be possible to switch them in any possible combination.

    5. Two different weekend day switching schedules will be provided for.

    6. Two different types of holiday day switching schedules will be provided for.

    7. At least 16 holiday days shall be provided for.

c) The meter shall be capable of recording active and apparent demand. The date and time of occurrence shall also be captured.

d) It shall be possible to record active and apparent maximum demand in certain time periods, e.g. only during Peak time or a combination of Peak and Standard time, etc.

e) Cumulative demand values shall also be available.

f) All these values shall be displayed through the meter's display in a user-defined sequence. This display sequence shall be flexible enough to enable shifting displayed values in any sequence.

6.6.4 Remote verification requirements

The software shall cater for remote engineering data verification and the following shall be remotely retrievable as a minimum:

a) Meter configuration;

b) Billing and engineering/quality of supply profile data;

c) Voltage and current phasor data (equipment supporting phasor diagrams shall be given preference);

d) Cumulative energy values;

e) Status data; and

f) Event data.

Provision shall be made in the configuration software to export the raw data in a flat ASCII format suitable for incorporating into a spreadsheet or similar package.

6.7 SELF-DIAGNOSTICS

Meters shall perform self-diagnostic checks to ensure correct operations of ROM, EEPROM, clock and battery.

6.8 FACILITIES FOR SEALING THE METER

The meter shall be sealable using standard anti-tamper seals.

It shall be possible to seal the terminal cover and meter cover separately (if the cover is removable).

6.9 GSM MODEMS

If specified, the meter shall be fitted with an internal cellular modem for communication on the GSM network with provision for, and including, an external aerial, for the purpose of remote interrogation and programming of the meter.

7 DOCUMENTATION

7.1 DRAWINGS

All metering equipment shall be accompanied by drawings as follows:

a) Outline and mounting details of each item;

b) Electrical termination and cabling details. These diagrams shall also be mounted on the metering device; and

c) An exploded view or similar diagram to indicate each physical part with its part number and description.

7.2 MANUALS

All metering equipment shall be supplied with instruction manuals that shall be detailed enough to enable Keetmanshoop Municipality to install, maintain, test configure and use each item of equipment.

Type test results of the ED/EMU, and results obtained for expected life and mean time between failures shall accompany the bid documents.

Full details of the ED/EMU operation and training must be supplied with the bid documents

8 SPARES

The supplier shall supply a comprehensive schedule of spares to be held, relating to all the meters and or part thereof.

9 TEST AND CALIBRATION REQUIREMENTS

The meters shall be type tested according to the requirements specified in IEC 62052 part 11, and the relevant IEC 62053 type specifications. The type tests shall be done at an approved test facility (test facility accredited by a full member facility that is listed at International Laboratory Accreditation Cooperation (ILAC).

10 MAINTENANCE AND GUARANTEE

The equipment offered is to be guaranteed for a period of twelve (12) months from the date of delivery of the equipment to Keetmanshoop Municipality.

During the guarantee period the manufacturer or his appointed representative shall respond to reports regarding equipment malfunctions by dispatching a technically competent person to the installation site within reasonable time of receiving such report.

The bidder shall indicate his nearest service location point.

11 PACKAGING

Every prepayment meter shall be supplied with a low coercivity meter card that complies with the requirements of SANS 1524-4. The Meter (Decoder) number shall be clearly and permanently marked on the front of the card with a font of at least 3 mm high, but embossing is not required.

Every prepayment meter shall be supplied with all the necessary mounting screws and sealing plates/plugs.

The meter serial number with barcode shall be printed onto the packaging of the meter, along with Supply group code, tariff index and power limit. Where multiple meters are supplied within one package all the serial numbers and barcodes of the individual meters shall be printed onto the packaging to allow scanning of the barcodes without unpacking the package.

12 TRAINING

If required, the bidder shall make provision for the following training which shall be of such standard as to leave the personnel familiar with:

a) Installation of EDs and ECUs

b) Testing of EDs and ECUs

c) Operation of all test equipment

d) Operation of all engineering functions and reports; and

e) First line maintenance on all equipment.

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13 QUALITY ASSURANCE

A quality management system shall be set up in order to assure the quality of the meters during development. Production, and installation, Guidance on the requirements for a quality management system may be found in the following standards: SABS ISO 9000, SABS ISO 9001, SABS ISO 9002, SABS ISO 9003 and SABS ISO 9004. The details shall be subject to agreement between Keetmanshoop Municipality and the supplier.

ANNEXURE B: TECHNICAL COMPLIANCE SCHEDULES A AND B