काठमाण्डौ उपत्यका खानेपानी लिमिटेड

मुख्य कार्यालय,त्रिपुरेश्वरमार्ग,काठमाण्डौ

फोन नं.४११७३५२

# १५ एम. एम. पानी मिटर ( AMR Compatible) को प्रतिईकाई दररेट पेश गर्ने बारेको सूचना

सूचना प्रकाशन मितिः२०८३/०८/३

यस कम्पनीको लागि आवश्यक १५ एम. एम. पानी मिटर ( AMR Compatible ) को प्रतिईकाई दररेट २०८३/८/७ गते कार्यालय समयभित्र लागत अनुमान तयारी प्रयोजनका लागि पेश गर्नु हुन सम्बन्धित आपुर्तिकर्ताहरुलाई आह्वान गरिन्छ। Technical specification यसैसाथ संलग्न छ ।

**KATHMANDU UPATYAKA KHANEPANI LIMITED (KUKL)**
**SPECIFICATION FOR AMR/AMI-COMPATIBLE CLASS 2 VOLUMETRIC WATER METERS (DN 15)**

## Introduction

This specification defines mandatory metrological, technical, material, manufacturing, testing and acceptance requirements for Class 2 volumetric (rotary piston) water meters, DN 15, liquid-filled register, direct transmission, and AMR/AMI compatible external module capability. The specification is primarily aligned with NS 428:2075. Where NS 428 does not specify a subject, ISO 4064-1:2014/2024 and ISO 4064-2:2024 shall apply.

## General Requirements

### Manufacturer & Evidence:

The supplier shall be an experienced manufacturer or authorized distributor of volumetric (rotary-piston) water meters and shall have :

a) Valid ISO 9001 and ISO 14001 system certification,

b) Valid type-approval / pattern-test certificates issued by an ISO/IEC 17025 accredited laboratory showing compliance with NS 428 or ISO 4064-1/2, and

c) Evidence of satisfactory field performance or Field performance references for the proposed model. The supplier shall include contact details and report copies as part of the bid.

## Materials

All materials in contact with potable water shall be non-toxic, corrosion-resistant and certified for drinking-water contact (e.g., WRAS/ ACS/ NS or equivalent). The meter body shall be manufactured from lead-free brass (Cu ≥ 50 %) or stainless steel; the supplier must confirm alloy composition and demonstrate compliance with the national drinking-water material requirements. The materials shall be appropriate both mechanically and chemically to the operating conditions. In connecting units, they shall be mechanically chemically and electrochemically compatible with one another and with the environment. Where necessary, protective coating and lining shall be applied. Protective coatings or linings (if used) shall comply with ISO 12944, maintain adhesion throughout the meter's service life and be suitable for potable water. All seals and elastomers shall be compatible with potable water and resistant to commonly encountered disinfectants used in water treatment.

## Design and Construction

### Classification and Ratings:

Meters shall be designed and constructed to meet NS 428:2075 and ISO 4064-1 requirements for Class 2 meters. Each meter shall be designed for and meet the following:

- Temperature class T50 (0.1 °C–50 °C),
- MAP 16 bar (1.6 MPa)

- Pressure loss class tp63 (≤ 0.63 bar at $Q_s$).
- Installation sensitivity $U_0/D_0$ or better.
- Permanent flowrate designation by $Q_s$ and R ($Q_s/Q_1$).
- The supplier shall state the material specification, manufacturing tolerances, and all design life assumptions.

Main construction features of the meters are as follow:

- **Strainer:** Each meter shall incorporate a removable, corrosion-resistant strainer at the inlet with free area ≥ 2 × the inlet cross sectional area, easily removable for cleaning without special tools. The screen mesh size shall be stated by the supplier and shall be suitable for typical Kathmandu Valley water quality.
- **Register:** Register shall be hermetically sealed semi-dry (liquid-filled) totalizer complying with NS 428 / ISO 4064-1. Registers shall ensure IP68 ingress protection rating and compliance with ISO 4064-1 requirements for register sealing and condensation prevention. The register shall display cumulative volume in $m^3$, with a minimum of 4 black digits for whole cubic metres and 4 red digits for submultiples; minimum digit height 4.0 mm. The register shall be condensation-free, UV-resistant, and readable in ambient lighting typical of service pits and meter boxes. The register window shall be impact-resistant polycarbonate or glass.
- **Calibration:** Meters shall be non-adjustable in the field; no user accessible calibration device shall be fitted. Calibration shall be achieved by design and verified by type testing. Any factory calibration adjustments shall be permanently sealed and documented in the test report. Factory calibration data shall be recorded and traceable to reference instruments calibrated per ISO/IEC 17025.
- **Surface quality:** All wetted surfaces shall be smooth to minimize encrustation and hydraulic loss
- **Particle Resistance:** The measuring chamber and piston shall be designed to resist normal levels of suspended solids encountered in potable water distribution without permanent damage or loss of metrological performance. The supplier shall state the maximum permissible particle size recommended for the meter and provide evidence from endurance/type testing. Endurance testing shall confirm no permanent damage or metrological drift beyond MPE as specified in ISO 4064-1, following the particle resistance test per ISO 4064-2.

- **Design life:** The meter shall have a minimum design life of 10 years under normal operating conditions. The supplier shall provide evidence (type/endurance test reports) demonstrating stability of metrological performance after endurance testing per ISO 4064-2.
- All meters shall be provided with wire and lead seals, both to upper and lower body.
- The water meter shall be suitable for out- and indoor connection for tough conditions.
- Each delivered part shall be new and not used before and supplied according to technical specifications descript.

All water meter shall be volumetric water meters, Rotary Piston, liquid filled register with

direct transmission. The two ends shall be threaded connection complying with ISO 228-1 (BSP) and the inlet and outlet shall have a common axis. They shall have water tight dismantling coupling on each side to allow easy removal of the instrument from the pipe works. Meters shall be operable in horizontal and vertical positions without exceeding Class 2 error limits.

The water meter shall be suitable for out- and indoor connection for tough conditions and shall afford reasonable safeguards against destruction. Special regards shall be given to the strength of glass & the cover- lid. Each meter shall include union couplings and seals suitable for indoor and outdoor installation. All transparent parts (register window, lid) shall be impact-resistant and UV-stabilized (e.g., polycarbonate). The meter shall incorporate anti-tamper features including sealing provision for body joints and AMR modules. Adequate connecting nipples for the inlet as well as for the outlet together with all necessary seals shall be provided.

**Markings**

Each meter shall be indelibly marked on the body (excluding removable cover) with at least the following:

- Manufacturer/trademark and model
- Year of manufacture and serial number
- DN and Q3 ($m^3/h$)
- R ratio (Q3/Q1) and Accuracy Class (2)
- Pressure-loss class (tp63), Temperature class (T50)
- MAP (16 bar), Orientation (H/V)
- Flow-direction arrow
- Unit of measurement ($m^3$)
- Embossed 'KUKL' marking shall be located visibly on the main body casting (not on detachable parts), with a minimum letter height of 5 mm

Marking must remain legible after normal installation and weathering.

**Metrological Characteristics**

Required Performance and accuracy shall comply with NS 428:2075 and ISO 4064-1:2014 for Class 2 accuracy and the meters shall have the following minimum performance characteristics:

- The DN 15 meter shall be designated $Q_3$ = **2.5 $m^3/h$**, $Q_4$ = **3.125 $m^3/h$**, $Q_1$ = **15.625 L/h**, $Q_2$ = **25 L/h**, and measuring range **R = 160**.
- Flow relationships shall satisfy $Q_2/Q_1$ = **1.6** and $Q_4/Q_3$ = **1.25**.
- Pressure loss at $Q_3$ shall not exceed **0.063 MPa (0.63 bar)** including any integral non-return valve.

**AMR / Electronic Module Requirements:**

Meters must be externally upgradable to accept an AMR/AMI module. The supplier shall provide technical datasheets for the recommended module showing: pulse output (pulse weight in litres), pulse polarity and impedance, connector type, signaling standard (SO /

open collector / other), power supply options (battery rating and replaceability), ingress protection (IP rating min IP68 for buried installations for modules designed for permanent outside exposure; otherwise IP67), EMC/EMI conformity (EN 61326 or relevant), anti-magnetic/tamper protection, and mechanical attachment method. The AMR/AMI module shall not degrade metrological performance or sealing integrity of the base meter. Any interfacing shall maintain the protection level (IP68 for external mounting). Modules shall be functionally and EMC tested in a 17025-accredited laboratory as per ISO 4064-1 where applicable.

**TEST CERTIFICATES / PATTERN TYPE APPROVAL**

a) The supplier must submit valid type-approval / pattern test certificates issued by an ISO/IEC 17025 accredited laboratory. Test reports must be in ISO 4064-3 format (or provide equivalent content) and demonstrate full compliance with NS 428 or ISO 4064-1/2:2024. Where testing was performed outside the laboratory afterwards, the supplier must present raw test data and certified copies of calibration certificates for the reference standards used. Laboratories shall be signatory to ILAC MRA or equivalent.
b) Third Party Verification Report of the supplied meter lot, stating 100 % compliance of supplied meter with the Overall KUKL Specification. Inspection and sampling shall be conducted in accordance with ISO 2859-1:1999, using single sampling plans at General Inspection Level II, with an Acceptance Quality Limit (AQL) of 0.65%. The sampling size, acceptance number, and rejection number for each lot shall be determined based on the lot size in accordance with the relevant tables in ISO 2859-1. The lot shall be accepted if the number of nonconforming meters is equal to or less than the acceptance number; rejection shall apply when nonconforming meters exceed the rejection number.

**Factory Quality Assurance & Pre-Shipment Inspection:**

The supplier shall submit a detailed Manufacturer Quality Assurance Plan (QAP) with the bid specifying production tests, acceptance criteria, equipment, and calibration traceability. The supplier shall implement routine production checks verifying body weight and wall thickness per the approved drawing. Records shall be available for audit. Any deviation > ± 5 % from approved weight or thickness shall cause rejection prior to shipment.

KUKL (or its authorized representative) may witness factory testing at KUKL cost for travel where required. The first factory inspection visit by KUKL or its representative shall be at KUKL's cost. In the event of a failure to meet tolerance or specification criteria in that inspection, any subsequent inspection including travel, testing, and administrative costs shall be entirely borne by the supplier.

**Mandatory Tests:**

It is required that quality and compliance with these specifications shall be demonstrated during preshipment inspection at factory testing for all materials and equipment by appropriate tests performed during the various phases of the work of production. Each

type and selected production samples shall be tested to demonstrate compliance. Tests to be performed during factory testing shall include but not limited to:

- Accuracy tests at $Q_1$, $Q_2$, $Q_3$, $Q_4$.
- Hydrostatic pressure test: 1.6 × MAP for 15 minutes and 2.0 × MAP for 1 minute (no leakage/deformation).
- Pressure-loss (Δp) measurement at $Q_3$ (tp63).
- Magnetic immunity / tamper test (100 mT or per ISO 4064-1 clause).
- Dimensional verification (include minimum wall-thickness measurement at critical points.)

Where a full suite cannot be conducted at the factory, tests shall be arranged at an accredited external laboratory at the supplier's cost.

**Laboratory Testing:**

Since Nepal currently has no accredited laboratories capable of performing full type/pattern testing per ISO 4064-2, the supplier shall arrange and pay for all type/pattern and endurance testing in a suitable ISO/IEC 17025 accredited laboratory outside Nepal prior to shipment. The laboratory must be signatory to ILAC MRA. The accredited laboratory must confirm compliance with NS 428 or ISO 4064 test methods for accuracy, pressure, temperature, and environmental tests, including hydrostatic, pressure loss, endurance, and magnetic immunity tests. Test reports shall be supplied in ISO 4064-3 format and contain raw data, calibration certificates of reference instruments, and witness signatures where applicable. KUKL reserves the right to witness these tests at the laboratory (at KUKL cost for travel where required) or to require third-party witness. The supplier shall notify KUKL at least 21 days before the start of accredited testing to allow optional KUKL witnessing.

**Documentation To Be Submitted before each shipment:**

The supplier shall provide following documents before each shipment:

a) Type/pattern test reports (ISO 4064-3 format),
b) Batch test certificates traceable to serial numbers,
c) Metallurgical composition reports (Cu, Zn, Pb content) of the brass used in case of brass body water meter, verified through a 17025-accredited material testing laboratory.
d) Calibration curves (error vs flow $Q_1$–$Q_4$) for each model,
e) Dimensional drawings, Dimensional drawings must explicitly show minimum wall-thickness values and meter weight for verification at inspection.
f) Installation, operation & maintenance manuals,
g) Spare parts list with item numbers and prices (10-year availability), and
h) Electronic module technical datasheets (pulse weight, output impedance, power requirements, sealing and ingress protection rating, EMC conformity).

**INSPECTION OF DELIVERY LOTS AND ACCEPTANCE TESTING**

Delivery lots handed over to the stores according to the delivery schedule in the tender document will be subjected to an Inspection procedure formulated by KUKL. KUKL will perform acceptance tests on delivered samples limited to test available in KUKL. Acceptance criteria are the Maximum Permissible Error (MPEs) specified in this

document.

Random sampling of supplied water meter will be done for testing by Kathmandu Upatyaka Khanepani Limited.

Table 5.1 Sample Size

| Size of the Lot | Size of First Sample |
|---|---|
| Up to 50 | 5 |
| 51 to 150 | 13 |
| 151 to 280 | 20 |
| 281 to 500 | 31 |
| 501 to 1200 | 50 |
| 1201 to 3200 | 80 |
| 3201 to 10000 | 125 |
| 10001 to 35000 | 200 |
| 35001 and over | 315 |

The supplier is responsible for ensuring that all meters in a lot have passed prior accredited factory/type tests; a single failure in KUKL's acceptance test may trigger additional testing at the supplier's expense and may lead to lot rejection per contract terms. KUKL's acceptance testing yields non-conformance beyond MPE, the supplier shall at its expense arrange accredited laboratory retesting for the failed batch and replace or repair non-conforming meters. KUKL reserves the right to randomly select up to 5% of factory-tested meters for independent retesting in an ILAC-accredited laboratory at the supplier's expense in case of dispute.

Delivery lots failing the inspection procedure shall be wholly rejected without any payment for such meters and the Supplier shall take over and remove the whole lot from the KUKL premises. Rejected delivery lots shall be promptly removed at the supplier's expense. No part-lot acceptance will be allowed; entire non-conforming lots will be fully rejected and not paid for. No payment for rejected lot shall be made.

**Warranty**

Warranty starts from the day of delivery and written acceptance by the client and shall be **minimum 36 months** after issuance of completion certificate. This includes:

- Meter performance,
- Materials, and
- Function.

Defective units shall be replaced or repaired by the supplier within 15 calendar days of written notification by letter or email, at the supplier's expense including shipping and installation costs. In the case of any pattern-design or material defect affecting more than 2% of the installed population, KUKL reserves the right to demand recall and replacement of the entire affected lot at the supplier's expense.

**Spare Parts & Support:**

The bidder shall submit an itemized priced spare-parts list sufficient for 5 years operation and must guarantee availability of critical spare parts for at least 10 years. Lead times for spare parts must be stated. Supplier shall provide recommended replacement intervals for wear parts.

The supplier shall furnish extra lead seals free of charge in a quantity equivalent to at least

50% of the total number of water meters supplied under this contract. These seals shall be identical in material quality, design, and tamper-evident features to those originally supplied with the meters and shall be suitable for use in routine maintenance, servicing, and sealing replacement during the meter's service life. The provision of these additional lead seals is mandatory and shall be documented as part of the supply package.

**Shipping and Storage Conditions:**

Meters shall be packaged to prevent impact and moisture ingress per ISO/IEC 780:2015, with each package bearing durable labels including contract number, lot number, serial range, and gross weight.