MATERIAL STANDARD

Kilowatthour Meter, Polyphase, Solid-State, Electronic

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Standards Coordinator Robin Byun	Standards Supervisor John Shipek	Unit Director Darnell Cola

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2. Scope

This standard covers the requirements for polyphase, solid-state, kilowatthour meters.

This standard applies to the following Seattle City Light (SCL) stock numbers:

Stock No.	Form Designation	Current Class	Rated Voltage (V)	External Wires	Meter Type
012396	9S	20	120 to 480	4	kV2c
012407	16S	200	120 to 480	4	kV2ce
012414	16S	200	120 to 480	4	kV2c
012433	12S	200	120 to 480	3	kV2c
012434	45S	20	120 to 480	3	kV2c
012683	25S	200	120	3	I-210+n
013368	12S	200	120	3	CN1SR

Single-phase, solid-state, kilowatthour meters are outside the scope of this standard and are covered in SCL 4911.05.

3. Application

Polyphase, solid-state, kilowatthour meters are used to measure and record the electric energy usage of commercial and industrial customers.

4. Industry Standards

Polyphase, solid-state, kilowatthour meters shall meet the applicable requirements of the latest revision of the following industry standards:

ANSI C12.1-2008; Electric Meters Code for Electricity Metering

ANSI C12.10-2011; Physical Aspects of Watthour Meters-Safety Standard

ANSI C12.18-2006; Protocol Specification for ANSI Type 2 Optical Port

ANSI C12.20-2010; Electricity Meters - 0.2 and 0.5 Accuracy Classes

IEC 61000-4-4:2012; Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test

IEEE 519; IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems

IEEE C37.90.1-2012; IEEE Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus

ISO 9000:2005; Quality Management Systems

5. Requirements

5.1 Common

The vendor shall specify all tools and training necessary to verify meter accuracy, and to install and maintain a meter. This includes support equipment (hardware), documentation (manuals, instructions, etc.), and software.

Software shall include site licenses, upgrades, tracking, life expectancy, and compatibility (such as any standard read protocol).

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Each polyphase kilowatthour meter shall be provided with a nameplate meeting the requirements of SCL 4980.10.

Polyphase kilowatthour meters shall meet the requirements listed in Table 5.1.

Table 5.1. Common Requirements for Polyphase Kilowatthour Meters

Attribute	Value
Phase	Poly
Mounting	Socket S (detachable)
Frequency	60 Hz
Accuracy Class	(See Section 5.2 in this standard.)
Construction	Solid-state operation
	5- or 6-character LCD display
	Single-mold polycarbonate cover
	Current transformer built into base
	Dustproof and raintight for outdoor use
	Sealed effectively with a T-bar seal
	5th terminal in the 9:00 position
Input voltage, operating range	± 20%
Temperature, operating range, degrees	
°C	-40 to +85
°F	-40 to +185

5.2   Detailed

Polyphase kilowatthour meters shall meet the requirements listed in Table 5.2.

Table 5.2. Detailed Requirements for Polyphase Kilowatthour Meters

Stock No.	Accuracy Class	Meter Option[1]	Metering Type	Reading	Format	Register Multiplier
012396	0.2	2	Demand	kWh	xxxxxx[2]	Programmable
				kvarh	xxxxxx[2]	
				kW	xxx.xxx[2, 3]	
012407	0.2	N/A	Non-demand	kWh	xxxxx	Kr = 1
012414	0.2	2	Demand	kWh	xxxxxx[2]	Programmable
				kvarh	xxxxxx[2]	
				kW	xxx.xxx[2, 3]	
012433	0.2	2	Demand	kWh	xxxxxx[2]	Programmable
				kvarh	xxxxxx[2]	
				kW	xxx.xxx[2, 3]	
012434	0.2	2	Demand	kWh	xxxxxx[2]	Programmable
				kvarh	xxxxxx[2]	
				kW	xxx.xxx[2, 3]	
012683	0.5	N/A	Non-demand	kWh	xxxxx	Kr = 1
013368	0.5	1	Non-demand	kWh	xxxxx	Kr = 1

Notes

1. See section 5.4 in this document for a definition of each option.

2. Or as programmed by the user.

3. The interval is 15 minutes (set for shortest consecutive rolling subintervals.)

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5.3 Accuracy Class

The accuracy of each meter shall meet the requirements as specified in SCL 4980.05.

5.4 Meter Options

Option 1

Itron meters shall be able to transmit energy reads with continuous RF transmission.

Transmissions must be compatible with existing SCL meter reading equipment. Meters shall be set for 5-digit read with Kr (multiplier) = 1 for a self-contained meter or Kr = TF (transformer factor) for a transformer-rated meter.

Transmission module identification shall be clearly marked on the meter. It shall also be included in the certified test report as noted in SCL 4980.05.

The following communication modules are approved:

- Itron Centron R300 in a high power configuration at 100 mW output.
- Itron Centron R300 in a standard power configuration at 0.75 mW output.

Option 2

Programmable soft switches for demand, reactive, recorders, etc., shall be programmable both into the meter and back out of the meter using an ANSI Type 2 Optical Port as specified in ANSI C12.18.

5.5 Meter Register

5.5.1 Common

Software used to program the register shall be compatible with Windows 7 and available to SCL for use on Technical Metering computers. Software shall be onsite, licensed for use by SCL and acceptable to the users.

A pulsing infrared or LCD output on the register shall be provided for testing watthours.

Optical meter communications for reading, programming, and for configuring soft switches shall be performed through an ANSI Type 2 Optical Port as specified in ANSI C12.18.

The serial number shall be 9 digits or fewer. Details on size and style of the serial number are included in SCL 4980.10.

The following features and functions shall be provided on the register or nameplate:

- Potential indication on the display of each energized element (if not otherwise shown on the meter).
- Power flow indication on the display to determine load and direction.
- A segment check as part of the normal display sequence.
- A programmable "K" value, if used. Display is optional.
- An electronics self-check to indicate errors.
- Space on the meter's front, and visible through the cover, for multiplier and other programmable values (such as the "K" value).
- The SCL security code (applies to any meters with an optical communications port). Contact the SCL meter lab for details.

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5.5.2 Non-Demand Metering

A serial-numbered Encoder Receiver Transmitter (ERT) communication module, if used, must be readily removable (preferably without tools after the meter cover is removed).

Kilowatthours shall be displayed or programmed to display on a 5-digit LCD.

Integral registers must share the meter's serial number.

The following features and functions shall be provided on the register or nameplate:

- Kilowatthours identified on the display if there is any possibility of confusion. This indication may be a 2-digit code.
- Provisions for field installation of pulse output board or other options.
- Programmable by SCL to accumulate delivered-only kWh, received-only kWh, delivered plus received kWh, and delivered minus received kWh (not applicable to Stock No. 013368).
- Instantaneous power displayed in the normal display. The display shall be an auto-ranging value (applicable only to Stock No. 012683).

5.5.3 Demand Metering

Demand register interval lengths shall be 1 hour, 30 minutes, and 15 minutes. Also, demand register subintervals shall be 3 minutes or less or programmable to 3 minutes or less for a 15-minute interval.

Digital source pulses that drive the register functions of energy, reactive, and demand shall be specified as K_h or K_h / n where n = the number of pulses required to produce the specified energy or reactive value (K_h).

Kilowatthours, kilovarhours, and maximum kilowatts demand shall be displayed or programmed to display on a 5- or 6-digit (user programmable) LCD.

The following features and functions shall be provided on the register or nameplate:

- Kilowatthours, kilovarhours, and maximum kilowatts demand identified on the display. This indication may be a 2-digit code.
- A unique program number stored in the register (display is optional).
- A pulsing infrared or LCD output on the register for testing watthours and varhours.

6. Testing

6.1 Test Data

Test data that establishes compliance with the requirements of ANSI C12.1 and this standard shall be provided upon request.

6.2 Certified Test Data File

A certified test data file shall be provided as specified in SCL 4980.05.

6.3 Calibrations

Calibrations shall be stable whether fixed or adjustable by SCL personnel.

Adjustments (on adjustable meters) may be made by using either hardware or software. All adjustments shall be stable over the life of the meter.

6.4 Meter Acceptability

Meter acceptability shall be determined through sample evaluation by SCL. Test results obtained during acceptance or verification testing shall meet the requirements as specified in SCL 4980.05.

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6.5 Testing Capability

Meters shall be capable of being tested using existing utility test equipment.

Field tests shall be performed in a test mode that does not affect the measured register data. Or, the register read must be able to be reset to a reading.

The test mode may be accessed through software or a switch (hardware), or both.

Provisions shall be made to assure that a meter cannot be inadvertently left in the test mode. This shall be done by through a software program or by a message on the display (least desirable) when the meter is placed back in service.

7. Design Changes

The manufacturer shall inform SCL in writing of all design changes that could affect the understood or published capabilities of the product.

8. Marking

Polyphase kilowatthour meters, cartons, and shipping containers shall be labeled according to the requirements of SCL 4980.10.

9. Packaging

Polyphase kilowatthour meters shall be packaged to prevent damage during shipping, handling, and inside storage.

Polyphase kilowatthour meters shall be packaged up to four per carton.

Cartons shall be shipped stacked and shrink wrapped to wood pallets.

10. Issuance

EA.

11. Approved Manufacturers

Stock No.	Form Designation	Current Class	Rated Voltage (V)	External Wires	Manufacturer	Meter Type	Part No.
012396	9S	20	120 to 480	4	GE Energy	kV2c	784X900077
012407	16S	200	120 to 480	4	GE Energy	kV2ce	784X400305
012414	16S	200	120 to 480	4	GE Energy	kV2c	787X400138
012433	12S	200	120 to 480	3	GE Energy	kV2c	787X100069
012434	45S	20	120 to 480	3	GE Energy	kV2c	784X500150
012683	25S	200	120	3	GE Energy	I-210+n	727X000074
013368	12S	200	120	3	Itron	CN1SR	0190519

12. References

SCL Material Standard 4980.05; "Test Data Requirements, Electricity Meters"

SCL Material Standard 4980.10; "Bar Code, Nameplate, Shipping Label Requirements, Electricity Meters"

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13. Sources

Byun, Robin; SCL Standards Engineer, subject matter expert, and originator of 4913.05 (robin.byun@seattle.gov)

Gilmore, Dan; SCL Meter Technician and subject matter expert for 4913.05 (dan.gilmore@seattle.gov)