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S-E-08 — Specifications for the Installation and Use of Electricity Meters - Measurement Canada Standard Drawings for Electricity Metering Installations

Category: Electricity

Bulletin: S-E-08 (rev.2)

Document(s): S-E-03, PS-E-08, E-24

Issue Date: 2012-10-19

Effective Date: 2012-11-01

Supersedes: S-E-08 (rev.1)

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1.0 Purpose

The purpose of this specification is to formally establish Measurement Canada (MC) requirements pertaining to the appropriate connection of electricity meters to electrical circuits in which legal units of measurement (LUM) are intended to be measured for establishing the basis of a charge. The initial consolidated package of Standard Drawings which was established by MC in 1975 has been modified and augmented, and subsequently re-drafted in electronic format to facilitate posting on the MC web site.

2.0 Scope

This specification applies to all electricity metering installations (as well as installations of self-contained meters) which are intended to be used in revenue metering with the exception of Multiple Customer Metering Systems (MCMS).

3.0 Authority

This specification is issued under the authority of section 12(2) of the [Electricity and Gas Inspection Regulations](#) (EGIR).

4.0 Terminology

Additive Totalizing

A manner of additive summation whereby the total declared quantity for a given legal unit of measurement (LUM) is established through addition of those LUM values as registered by two or more individual meters connected between an electricity distributor and a purchaser.

Deductive Totalizing

A manner of deductive summation in which one meter is connected between an electricity distributor and multiple loads (consumption or generation), and additional meters are connected between that meter and all but one of the loads. This manner of summation is used to determine the un-metered load indirectly by subtracting the value of all metered loads from the value of the total metered load.

Electricity Metering Installation

An installation that consists of more than one electricity meter installed at the same location and that is used for the purpose of obtaining the basis of a charge for electricity supplied to a purchaser. (*Electricity and Gas Inspection Regulations* (SOR/86-131), s.2(1)).

Meter

Defined in the *Electricity and Gas Inspection Act* (Chapter E-4, R.S.C), s.2(1).

Self-contained Meter

Means a meter designed to be connected directly to a power circuit, without the use of external devices such as instrument transformers or shunts.

5.0 Standard Installations

5.1 Meter Connections

Each meter (including instrument transformers) forming part of an electricity metering installation shall be connected in accordance with the appropriate diagram established in the Measurement Canada Standard Drawings for Metering Installations. Refer to Appendix A.

5.2 Colour Codes

MC standard wire colour codes are established in Appendix B. Colour coding of wires shall be continuous from end to end.

5.3 Voltage Connection Points

All voltage transformers and/or meter voltage terminals shall be connected to the line side of the circuit being measured, (i.e. between the supply and any current transformers).

5.4 Neutral Conductor

Current sensors placed in the circuit neutral conductor shall not contribute to the determination of a quantity of any legal unit of measure.

6.0 Non-standard Installations

6.1 Meter Connections

Meter connection configurations other than those established in Appendix A may be used subject to the terms established in section 4.2.1 of Specification *S-E-03 — Specification for the Installation and Use of Electricity Meters — Input Connections and Ratings*.

6.2 Colour Codes

Colour codes other than standard are acceptable subject to the following requirements:

- a. the difference between current and voltage leads is clearly distinguishable;
- b. the use of green and white is restricted only to purposes which conform to the Canadian Electrical Code; and,
- c. the code is consistent in other installations owned by the electricity distributor/contractor.

6.3 Voltage Connection Points

Meter voltage terminals may be connected to the load side of the circuit being measured subject to the following conditions:

- a. a ring or "window" type current transformer is used; and,
- b. the installation conforms to standard drawing number 1305 or 1306 in all other aspects.

7.0 Transformer Secondaries

7.1 Current transformer secondary returns may be shared via one wire connected from the meter terminals to the test-block/switch provided that the wire is of sufficient gauge to conduct the load without imparting a burden which exceeds the burden rating of the transformers.

7.2 Voltage transformer secondary returns may be shared via one wire connected from the meter terminals to the test-block/switch provided that the wire is of sufficient gauge so as not to impart a burden which exceeds the burden rating of the transformers.

8.0 Grounding

8.1 The case of each meter (including instruments transformers) forming part of an electricity metering installation shall be appropriately grounded.

8.2 Instrument transformer secondary wires shall be grounded. Secondary wires which are interconnected shall be interconnected and grounded at only one point.

9.0 Totalizing

9.1 Additive Totalizing

9.1.1 Additive totalizing of two or more circuits may be performed in the following manners:

- a. via parallelling of current transformer (CT) secondaries, or
- b. through use of a totalizing current transformer.

9.1.2 Parallelling CT secondaries is permitted subject to the following conditions:

- a. parallelled circuits are of the same voltage and frequency;
- b. current transformers have identical ratios;
- c. the voltage circuits of the meter are supplied from a common bus to which the primary circuits are connected; and,
- d. the meter ratings are sufficient for the totalized load.

9.1.3 A totalizing current transformer may be used subject to the following conditions:

- a. the primary circuits are of the same voltage and frequency;
- b. the voltage circuits of the meter are supplied from a common bus to which the primary circuits are connected;
- c. the primary windings of the totalizing transformers are supplied from corresponding phases of the primary lines;
- d. each primary winding of the totalizing transformer in conjunction with its primary current transformer produces the correct proportion of the total secondary current; and,
- e. the overall multiplier for the totalizing transformer is the sum of the ratios of all the primary current transformers which supply the totalizing transformer.

9.1.4 A totalizing meter may consist of two or more complete meter units supplied from separate primary circuits which supply a common meter register subject to the following conditions:

- a. the voltage coils of each meter unit are supplied from the primary circuit which supplies the current coils of the corresponding meter unit; and,
- b. each meter unit contributes to the totalized value of measurement from its correct proportion of the total load.

9.1.5 Summation of VA/VA-hour units in totalized circuits shall be performed by vectorial addition only.

9.1.6 Peak demands from multiple demand measuring devices may be summed only if the demand intervals are coincident. All the devices shall be synchronized together such that the demands to be summed occur in the same interval. Synchronization error shall be no greater than 1.0 % of the demand interval length.

9.2 Deductive Totalizing

9.2.1 Deductive totalizing is not permitted as a means to determine a quantity of a legal unit of measurement in distinct trade measurement transactions. The resulting calculated quantity declaration can deviate from true value to a degree which is significantly greater than the limits of error prescribed by section 46 of the *Electricity and Gas Inspection Regulations*. Such a deviation in accuracy of the declared value can occur even if the accuracy of the individual meters are in compliance with the prescribed limits of error.

Note: Similar to Time-of-Use allocation, deductive totalizing utilized solely for the purposes of apportioning a measured and declared quantity into multiple sub-quantities for rate allocation purposes within a distinct trade measurement transaction is permitted.

10.0 Connection of Ancillary Devices

Relays, instruments, auxiliary transformers and other devices may be connected between the test-block/switch provided that they do not affect measurement accuracy, and do not interfere with testing of the meter and/or installation. In addition, wiring diagrams and all burden details for such devices must be available on-site.

11.0 4-Wire Circuits Metered with 2-Element Meters

11.1 Delta Connection at Test-block/switch

Standard drawings (3400-D series) outlining acceptable delta connections are established in Appendix A.

11.2 VA and VA-hour Measurement

Volt-ampere and Volt-ampere hour measurement is permitted subject to the requirements established in section 6 (b) of *PS-E-08 — Provisional Specifications for the Installation and Use of 2-Element Electricity Meters*.

11.3 New metering installations are subject to the policy established in section 5.1 of bulletin *E-24 — Policy on Approval and Use of 2½ Element Metering*. This means that new 4-wire installations (as of April 1, 2003) shall not be metered with 2-element meters.

12.0 Polyphase Circuits Metered with Single-phase Meters

The use of two single-element meters to meter a 3-phase 3-wire circuit and the use of three single-element meters to meter a 3-phase 4-wire circuit is permitted only where the units of watt-hour and/or var-hour energy are measured. The single element meter must be approved as bi-directional or net meters. This form of metering is not permitted for VA-hour measurement nor for demand measurement.

13.0 Revisions

The purpose of Revision 2 is to include additional drawings for single-phase installations with test blocks. Appendix A has been amended to remove standard drawings depicting meters that contravene bulletin *E-24: Policy on Approval and Use of 2½ Element Metering*, drawings representing outdated measurement techniques, and drawings with meters that are now obsolete due to their vintage (legacy drawings). Additional changes have been made to correct minor errors and add missing information. Changes have also been made to this document to make it more accessible.

The purpose of Revision 1 was to include clarification of the requirements pertaining to totalizing, section 9, and consequently to add definitions for "additive totalizing" and "deductive totalizing". Section 5.4 is modified to allow current transformers connected into the neutral conductor provided they do not contribute to the determination of a LUM. Section 9.1.6 is added to clarify totalizing requirements when pertaining to demand measurement. Section 9.1. (c) and section 9.4 are deleted as they are no longer applicable. Section 12 is amended to require bi-directional or net meters where single-element meters are used to measure the load in polyphase circuits.

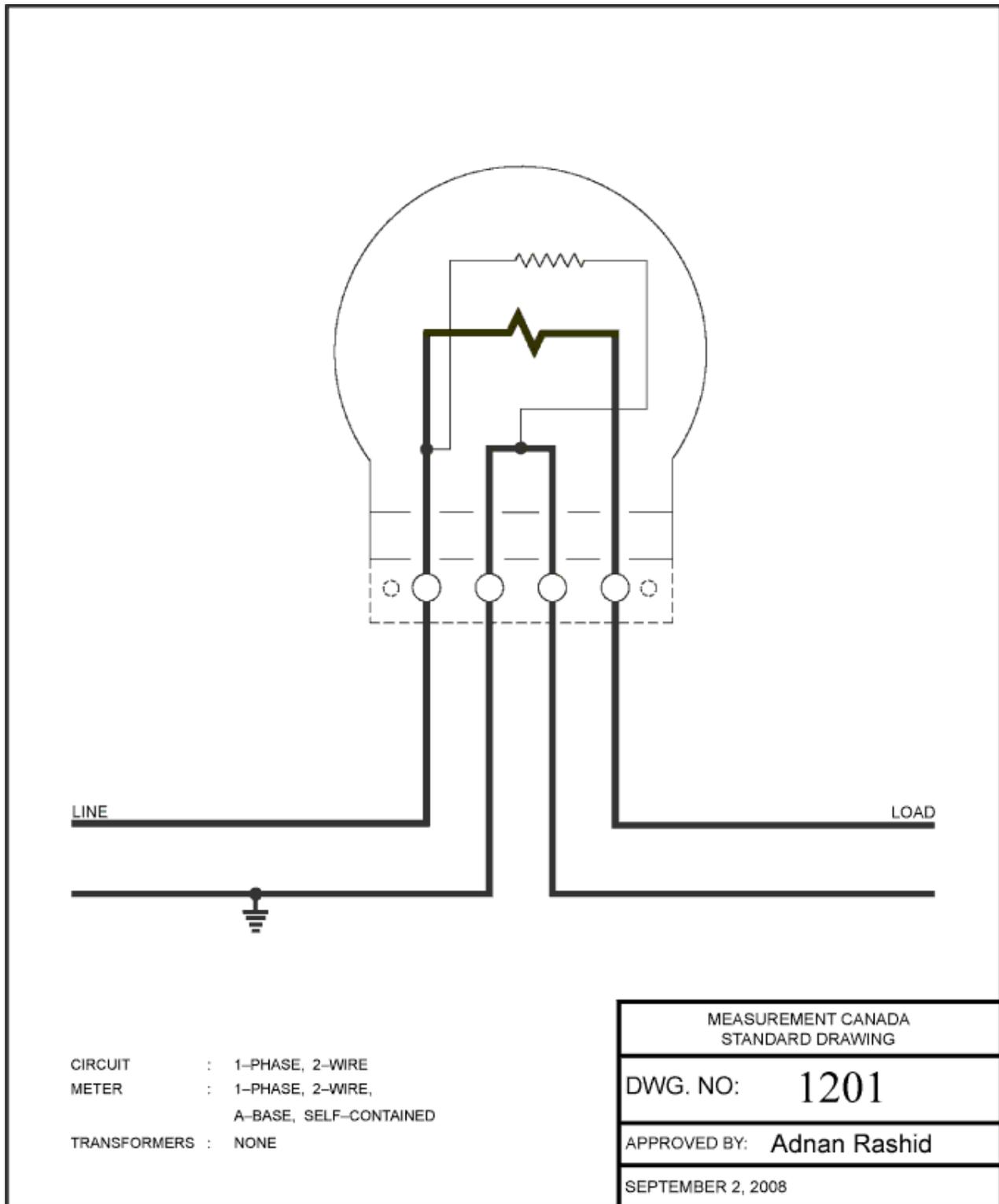
Appendix A

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Connection of a self-contained, single-phase, 2-wire, A-base electricity meter in a single-phase, 2-wire circuit:

1. The two circuit conductors are referred to as "line" and "neutral". The neutral conductor is grounded.

2. The meter contains one voltage coil, one current coil and a four position terminal block with the positions referenced from left-to-right as numbers one through four. Internal meter connections are as follows:
 - the voltage coil is connected at terminal block positions one and two
 - the current coil is connected at terminal block positions one and four
 - a current bypass conductor is connected at terminal block positions two and three.
3. The meter is connected to the circuit as follows:
 - the supply side of the line service conductor is connected at terminal block position one
 - the load side of the line service conductor is connected at terminal block position four
 - the supply side of the neutral service conductor is connected at terminal block position two
 - the load side of the neutral service conductor is connected at terminal block position three.

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This appendix is available as a separate package due to its large size.



[S-E-08 — Appendix A](#)

[PDF \(Portable Document Format\) - 5MB \(Megabyte\)](#)

Appendix B — Measurement Canada Standard Colour Codes for Electricity Metering Installations

Table 1

Application	Phase	Current Transformer Leads		Voltage Leads	
		Line	Load	Line	Load

Application	Phase	Current Transformer Leads		Voltage Leads	
		Line	Load	Line	Load
3-Phase, 3-Wire, Delta 2-Element Meter 2 CTs 2 VTs	A	Red – White	Red – Black	Red	Yellow
	B				
	C	Blue – White	Blue – Black	Blue	White
	N				
3-Phase, 4-Wire, Y 2-Element Meter 3 CTs, (delta at test links) 2 VTs	A	Red – White	Red – Black	Red	Yellow
	B	Yellow – White	Yellow – Black		
	C	Blue – White	Blue – Black	Blue	White
	N				
3-Phase, 4-Wire, Y 2½-Element Meter 3 CTs 2 VTs	A	Red – White	Red – Black	Red	Yellow
	B	Yellow – White	Yellow – Black		
	C	Blue – White	Blue – Black	Blue	White
	N				
3-Phase, 4-Wire, Y 2½-Element Meter 3 CTs, (Y at transformers) No VTs; direct connection.	A	Red – White		Red	
	B	Yellow – White			
	C	Blue – White		Blue	
	N		White		White
3-Phase, 4-Wire, Y 3-Element Meter 3 CTs, (Y at transformers) 3 VTs, (Y at transformers)	A	Red – White		Red	
	B	Yellow – White		Yellow	
	C	Blue – White		Blue	

Application	Phase	Current Transformer Leads		Voltage Leads	
		Line	Load	Line	Load
	N		White		White
3-Phase, 4-Wire, Delta 3-Element Meter 3 CTs, (Y at transformers) No VTs; direct connection.	A	Red – White		Red	
	B	Yellow – White		Yellow	
	C	Blue – White		Blue	
	N		White		White
3-Phase, 4-Wire, Delta 2-Element Meter 3 CTs, (all secondaries to test links) No VTs; direct connection.	A	Red – White		Red	White
	B	Yellow – White			
	C	Blue – White		Yellow	Blue
	N		White		
3-Phase, 4-Wire, Delta 2-Element Meter One 3-Wire CT, one 2-wire CT, (all secondaries to test links) No VTs; direct connection.	A	Red – White	Red – Black	Red	White
	B				
	C	Yellow – White	Yellow – Black	Yellow	Blue
	N				

Green is used only for non-current carrying ground conductor

White is used for current-carrying neutral or common conductor



[Record of installation](#)

[PDF \(Portable Document Format\) - 192KB \(Kilobyte\)](#)

Date modified:

2017-03-28