



ANSI Standards and Updates that Affect Metering Departments

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*North Carolina Meter School
Wednesday, June 10, 2026
10:30 AM*

➤ American National Standard Institute, Inc.

- Not a government agency
- Standards do not have force of Law
- All compliance is voluntary
- ANSI generates standards through the use of a sponsoring organization called the “secretariat” who actually publishes the Standard.
 - For C12.1 NEMA (National Electrical Manufacturer’s Association) is the secretariat.
 - NEMA has seven sections one of which is for Utility Products and Systems. All meter manufacturers and manufacturers involved in electric metering are members of NEMA or are eligible to be members.
 - Paul Orr has been the NEMA’s secretary assigned to C12 for over twenty years providing continuity to the process. NEMA Manufacturing members determine which efforts will be funded and which will not be funded.



➤ American National Standard Institute, Inc.

- NEMA organizes committees to propose and review standards
- Standards are republished approximately every five (5) years and abandoned if not updated or reaffirmed once every ten (10) years.
- Standards codify consensus approaches in common practice
- In recent years the ANSI committee has had to deal with breaking new ground as well as several controversial issues
 - This is unusual for the committee, and the committee has responded by no longer being reluctant to address them, staying more on point during contentious debates, and moving through the work required in a far more efficient manner. Another example of how AMI is changing everything in our industry.

- All ANSI Standards related to Electric Metering are in NEMA's C12 group of Standards
- C12 Main Committee
 - General makeup has expanded slightly over last few years
 - 33 voting members with representation from three groups (no one group can have more than 40%):
 - 16 - Manufacturers: Meter, Socket, Test Equipment, etc.
 - 10 - Users: Utilities
 - 7 - General Interest: PUC, UL, IEEE, Consultants, etc.
 - Meets twice a year in conjunction with EEI/AEIC Meter conference.



➤ C12 Main Committee

- Has final approval for all activities on any C12 family standard
- Establishes Subcommittees (SC) and Working Groups (WG) to address various standards and issues
- Sub committees and Working Groups also meet twice a year in conjunction with EEl Transmission, Distribution and Metering Conference and also hold regular or ad hoc conference calls throughout the year as members put together drafts and other technical material for consideration at the next face to face meeting.



➤ C12 Subcommittees

- Various subcommittees have been organized to review specific standards
- This is where the work is really done
- Each operates slightly differently
- Each meets on a schedule of its own choosing
- Most meet at EEI Biannual Transmission, Distribution and Metering Meetings
- Communication WG meets more often and longer
- Various subgroups meet frequently by teleconference



ANSI Standards Related to Electric Metering

ANSI C12 Standards Status – April 27, 2026					
Designation	Final Action Date	Title	Responsible Subcommittee	Responsible NEMA Section	Project Action
ANSI C12.1-2026		Electricity Metering, Code for	SC 1	GS-EI1	C12.1-2026 Published with Table 30 corrections. Major revision in progress.
C12.2		Dictionary of Definitions, Terminology and Acronyms used by C12 Standards	C12 Main	GS-EI1	Draft in Process
ANSI C12.4-1984 (R2002, R2011)	5/19/2011	Registers, Mechanical Demand	SC 1	GS-EI1	Withdrawn 7/10/20
ANSI C12.5-1978 (R2002)	5/19/2011	Meters, Thermal Demand	SC 1	GS-EI1	Withdrawn 7/10/20
ANSI C12.6-1987 (R2016)	01/12/17	Phase-Shifting Devices Used in Metering, Marking and Arrangement of Terminals for	SC 15	GS-EI3	Published Jan 10, 2018 Submitted PINS for Reaffirmation 8-14-23 Stabilized maintenance (10 years no need for admin action)
ANSI C12.7-2022	11/17/22	Requirements for Watthour Meter Sockets	SC 15	GS-EI3	Figure from C12.8 brought into C12.7 Published March 14, 2023
ANSI C12.8-1981 (R2021)	6/8/21	Watthour Meters, Test Blocks and Cabinets for Installation of Self-Contained "A" Base	SC 15	GS-EI3	Published Dec. 18, 2012 Plan to have C12.8 withdrawn after figure needed from C12.8 is placed in C12.7. Withdrawn 08-14-23
ANSI C12.9-202x		Test Switches for Transformer-Rated Meters	SC 15	GS-EI3	Revision in Work BSR 8 Close March 23. No comments Need to File BSR9
ANSI C12.10-2024		Physical Aspects of Watthour Meters – Safety Standard	SC 1	GS-EI1	Published 9-25-24 New Edition Performance and Safety in work
ANSI C12.11-2006 (R2019)	9/23/19	Instrument Transformers for Revenue Metering, 10 kV BIL through 350 kV BIL (0.6 kV NSV through 69 kV NSV)	SC 15	GS-EI3	Revision published 3/7/25
ANSI C12.14-1982 (R1993)	8/14/2002 WITHDRAWN	Electricity Meters, Magnetic Tape Pulse Recorders for	SC 1	GS-EI1	Withdrawn 2002
ANSI C12.17-1991	8/14/2002 WITHDRAWN	Cartridge-Type Solid-State Pulse Recorder for Electricity Metering	SC 1	GS-EI1	Withdrawn 2002



ANSI Standards Related to Electric Metering (cont.)

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ANSI C12.1-2026		Electricity Metering, Code for	SC 1	GS-E11	C12.1-2026 Published with Table 30 corrections. Major revision in progress.
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ANSI C12.4-1984 (R2002, R2011)	5/19/2011	Registers, Mechanical Demand	SC 1	GS-E11	Withdrawn 7/10/20
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ANSI C12.6-1987 (R2016)	01/12/17	Phase-Shifting Devices Used in Metering, Marking and Arrangement of Terminals for	SC 15	GS-E13	Published Jan 10, 2018 Submitted PINS for Reaffirmation 8-14-23 Stabilized maintenance (10 years no need for admin action)
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ANSI C12 – Sub-Committees

Sub-Committee	Standards
C12 SC1	C12.1, C12.10
C12 SC15	C12.6, C12.7, C12.9, C12.11
C12 SC24	NEMA C12.24 TR (Technical Report) Definitions for Calculations of VA, VAh, VAR, and VARh for Electricity Meters
C12 SC17	C12.18, C12.19, C12.21, C12.22
C12 SC29	C12.29 Standard for Field Testing of Metering Sites
C12 SC31	NEMA C12.31 TR VA Measurement
C12 SC46	C12.46 Draft Performance Standard for the Measurement of AC Active, Apparent and Reactive Energy



➤ C12.1 Code for Electricity Metering - Sub Committee Work

- Demand Type Test working group – grappled with the reckoning of time for type testing. Created a draft standard for Demand type testing. Work in process will be C12.35.
- Working Group formed on creating a Standards Road map as some groups are languishing while others are moving ahead at full speed and we are not releasing everything we need as quickly as we need them.
- C12.10 is being converted into a Stand-alone safety document. This was going to be withdrawn in favor of UL 2735 that was to be drafted jointly by ANSI and UL. Instead, UL created their own. Later an agreement was reached that UL 2735C would be drafted jointly and then once released would also become the new UL 2735. The new UL 2735 was published in 2025.



ANSI C12 SC 1 (cont.)

➤ C12.1 – Code for Electricity Metering Sub Committee Work

- Temperature Rise working group. This was created several years ago to understand what level of temperature rise is to be expected in a meter and can be withstood by a meter and for what period of time. This goes back to hot sockets and their effect on meters. A great deal of data has been generated, L+G is leading this effort. The working group has agreed that based on this data and testing set up they are now need to develop a generic meter box that is not vendor specific that all meter manufacturers can use to generate data that can be compared to each other and to the standard. The work is ongoing.
- In Service Testing Working group.
 - Provide guidance on the use of backdoor meters. Proposed and passed new wording to allow this but to still maintain a statistical comparison of back door meters with pre-selected meters.

➤ C12.1 – Code for Electricity Metering Sub Committee Work

- In Service Testing Working group (cont.)
 - Use of attributes vs variables for electronic meters given their non-normal test distribution. Proposed and passed wording to use only attribute testing for sample testing electronic meters. Also proposed and passed a fifth option for failed groups – performing a second tightened test on the group to confirm the initial results
 - Provide guidance on how best to set up an in-service test plan after an AMI deployment. Proposed a method where AMI analytics can be used in lieu of a test plan provided that a base line is statistically established showing that the analytics are not missing any unanticipated types of failures. Reworking and re-submitting with presentations by three utilities on how they have statistically been checking this methodology in parallel to their in service plans for several years.

- C12.7 – Requirements for Watthour Meter Sockets
 - Working on the tolerance build up between fixed blade meter blades and fixed meter socket locations and how to prevent incompatibilities going forward
 - Now the 2022 publication incorporates Figure 4 from C12.8
- C12.8 – Test Block and Cabinets for Installation of Self contained “A” Base Watthour Meters
 - Has been withdrawn and Figure 4 was moved into C12.7-2022



➤ C12.22 – Protocol Specification for Interfacing to Data Communication Networks

- Updated in 2026. Now published with enhanced security flexibility of the protocol. It now includes both 128-bit or 256-bit AES keys for cryptographic protection.

➤ Sub Committee on Blondel Compliant Metering

- There has been a great deal of discussion about Blondel Compliant Metering at ANSI.
 - L+G proposed a way to modify 2S meters to allow them to act as a 12S and become Blondel Compliant
 - Discussion about the economical practicality of retrofitting 2S cabinets to be 12S cabinets
 - Discussion on providing guidance to recommend that utilities allow only 12S sockets going forward
 - NOTE: Table 2 was updated and Table 2A was added to the latest revision of ANSI C12.20 - 0.1, 0.2 and 0.5 Accuracy Class Metering to clearly list which meter forms and applications were Blondel Compliant and which were not.



Working Group to Merge C12.1 and C12.20

- Determined that there was no longer a need for two standards as it was found to cause some confusion at best and contradictory at worst.
 - This was a huge undertaking as many issues had to be resolved.
 - The merged C12.1 standard incorporating relevant aspects of C12.20 was published in 2022 and C12.1 was updated again in 2024 and more recently in 2026.



Working Group to Merge C12.1 and C12.20 (cont.)

- The work to merge C12.20 into C12.1 covered issues such as:
 - Disturbances test for memory corruption due to rapid power cycling such as during dropout/reclosure events
 - Extended temperature operating ranges
 - True poly phase loading
 - Harmonics testing
 - Auxiliary device influences (requiring accuracy testing with any communication devices active)
 - Voltage range to be accurate over certain condition
 - Temperature range to be accurate over certain conditions



- Field Testing of Metering Installations for Accuracy
 - NEMA C12.29 TR, Field Testing of Electricity Meters. This has been published as an ANSI Registered NEMA Technical Report
 - Testing of electricity meters in the field is significantly different than testing meters in a laboratory. In the field there may be little control of the environment or load conditions.
 - The purpose of this document is to describe the conditions under which field test can be expected to provide useful results and the errors one might encounter.



ANSI C12 SC29 (cont.)

- Field Testing of Metering Installations for Accuracy
 - The Technical Report provides some guidance on acceptable testing under all three types of field testing and what to look for if the installation fails accuracy testing. The three modes of testing defined are;
 - Voltage and current supplied by test equipment
 - Site voltage, equipment provided current
 - Site voltage and current (customer load)
 - This document is not an ANSI Standard at this time but only a NEMA Technical Report that Utilities may use at their own discretion. Would not carry the force of law if a Utility commission pointed to ANSI C12 as their default Code for Electricity in their State



C12.31G TR

- C12.31G TR, Guide for the Measurement of Voltage, Current, Power, Energy, and Power Factor
 - ANSI C12 standards had only defined the value for VA when the waveforms for current and voltage were sinusoidal. Since in the modern world this is seldom the case outside of the laboratory, this guide is a first step to bring definitions and testing more in line with the contemporary load environment.
 - Based on discussion about L+G's proposal of using "source VA" vs Vector VA and Arithmetic VA and the actual load the customer has, Source VA is now included in an Appx of the Technical Report.

- Sub-Committee to Develop a Replacement for C12.1 and C12.20
 - Adopts the structure of OIML IR-46
 - Addresses Active, Reactive, and Apparent Energy as well as all meter accuracy classes
 - Same group that worked on the merger of C12.1 and C12.20 is working on this
 - Expected Publication 2027



ANSI C12.46 (cont.)

➤ Sub-Committee to Develop a Replacement for C12.1 and C12.20 (cont.)

- At times the R46 tests are being used as they are close to the ANSI tests. There are ANSI C12.1 tests that are not in R46 so they are being added. This will make the new C12.46 and the updated C12.1 compatible clearing the way for C12.46 to eventually become the new C12.1 and make the United States compliant with our OIML Standards commitments.
- The Roadmap working group is developing a timeline for C12.46 to supersede C12.1

➤ Sub-Committee for ANSI Standard for DC Metering C12 SC32

- This is becoming a more significant issue as DC Superchargers, although relatively small in number, are drawing significant amounts of power
- There is also the potential to use nothing but DC in residential homes in the not so distant future.
- ANSI C12.32 was published in 2021 and is being reviewed by the IEC for adoption in international DC metering requirements.



ANSI Sub-Metering Working Group

- Sub-Metering is also becoming more prevalent and with the official acceptance of sub-metering the need to provide guidance on this area has become necessary
- Working on guaranteeing the system level accuracy given the preponderance of different equipment.
- Regulators want to know how you test these meters and installations
 - One difficulty is that the transformers may be located many floors away from the meter.
 - Another is that the meter may be installed within the power lines and not readily accessible.
- There are few actual metrology issues



IEEE P1704 – Utility Industry End Device Communications Module

- ANSI also maintains a presence and contributes to Standards that are related to but not covered entirely within the ANSI C12.1 purview.
- This standard will provide a method for providing space for communication modules and USB as the connection method to the Comm module from the meter (vs. RJ11). Micro B USB 2.0 adapter.

- The International Organization of Legal Metrology was formed in 1955. By Treaty 86% of the world's population is covered and 96% of the world's economy.
- The Group works with the International Bureau of Weights and Measures and the International Organization for Standardization (ISO) to ensure compatibility between each organizations work.
- Once again, this organization has no legal authority to impose solutions on the members, but the recommendations are typically used by the member states as part of their own domestic law.



NEMA Power Measurements Handbook

NEMA Power Measurements Handbook Second Edition

The **Power Measurements Handbook Second Edition, NEMA US 80073-2026** serves as a comprehensive handbook designed for professionals involved in electricity metering. This edition starts with foundational topics such as DC and AC circuit theory and advances through more complex power theory, offering a complete and modern presentation of the subject matter.



Technical Documentation and Illustrations

Featuring over 200 technical drawings—most in full color—the handbook thoroughly documents U.S. meter sockets, meter forms, and service types. It includes detailed explanations of current and potential transformers (CTs and PTs) theory and their applications. For every service type, wiring diagrams are provided, covering the most common applications for various meter forms.

Field Testing and Error Analysis

The handbook addresses field testing methods for sites, PTs, CTs, and meters. Additionally, it provides a complete analysis of potential errors for common non-Blondel meter applications.

Updates and NEMA's C12 Standards

This second edition has been fully updated and significantly expanded. It explains the mathematics and assumptions used in the new generation of NEMA's American National Standards developed under NEMA's Accredited Standards Committee, ASC C12, Electricity Metering. Special emphasis is placed on the anticipated C12.31 standard, which will define power quantities, phasor diagram conventions, and the quadrant energy diagram, as well as the anticipated C12.45 standard, expected to be the new performance standard for AC electricity meters. All meter drawings and site wiring diagrams have been updated to align with C12.10 and the forthcoming C12.45 standards. The handbook also includes new information regarding preferred and deprecated meter forms and applications.

The Essential Electricity Metering Resource

The **Power Measurements Handbook Second Edition, NEMA US 80073-2026** is considered the essential resource for everyone who works within the ANSI metering field.

<https://www.makeitelectric.store/us/view-details/power-measurements-handbook-second-edition>

Includes recent ANSI C12 updates – 80 pages of text vs 1000 pages of standards language

Most Recent

NEMA US 80073-2026

Power Measurements Handbook - Second Edition

<input type="checkbox"/> Tracking Off	Published Mar 2026	Pages 84	File Size 21,671 KB
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\$59.00
Members: \$49.00

Printed Edition (Ships in 2-5 business days)

English



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Questions and Discussion

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This presentation can also be found under Meter Conferences and Schools on the TESCO website: tescometering.com



ISO 9001:2015 Certified Quality Company
ISO 17025:2017 Accredited Laboratory
ISO 27001: 2022 ISMS



TESCO Hospitality Suite

We would like you to join us in the TESCO Hospitality Suite for networking and more discussions about metering. The discussion will not be exclusively metering.....but we love metering and that is the most common topic.

TESCO Hospitality Suite 301 – Brighton Tower

Monday and Tuesday 8:00 PM – 10:00 PM



We Hope you Can Join Us!

