

Smart Meters for Electricity

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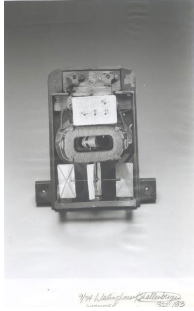
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Brief History of Electricity Metering

Evolution of Electricity Metering



1888

AC Watt Hour Meter
Invented

1st Electronic Watt
Hour Meters

1970's



2009

1st Smart Meters
Deployed



What makes a meter smart?

Automatic Meter Reading (AMR)

- One-way transmission of usage data to utility central systems

Advanced Metering Infrastructure (AMI)

- Two-way communication capability with utility systems and customers



Benefits of smart meters?

Advantages for Electric Companies

- Eliminates manual monthly meter readings
- Monitors the electric system much more quickly
- Makes it possible to use power resources more efficiently
- Provides real-time data that is useful for balancing electric loads while reducing power outages (i.e., blackouts)
- Enables dynamic pricing, which raises or lowers the cost of electricity based on demand
- Avoids the capital expense of building new power plants
- Helps to optimize income with existing resources

Advantages for Users of Electricity

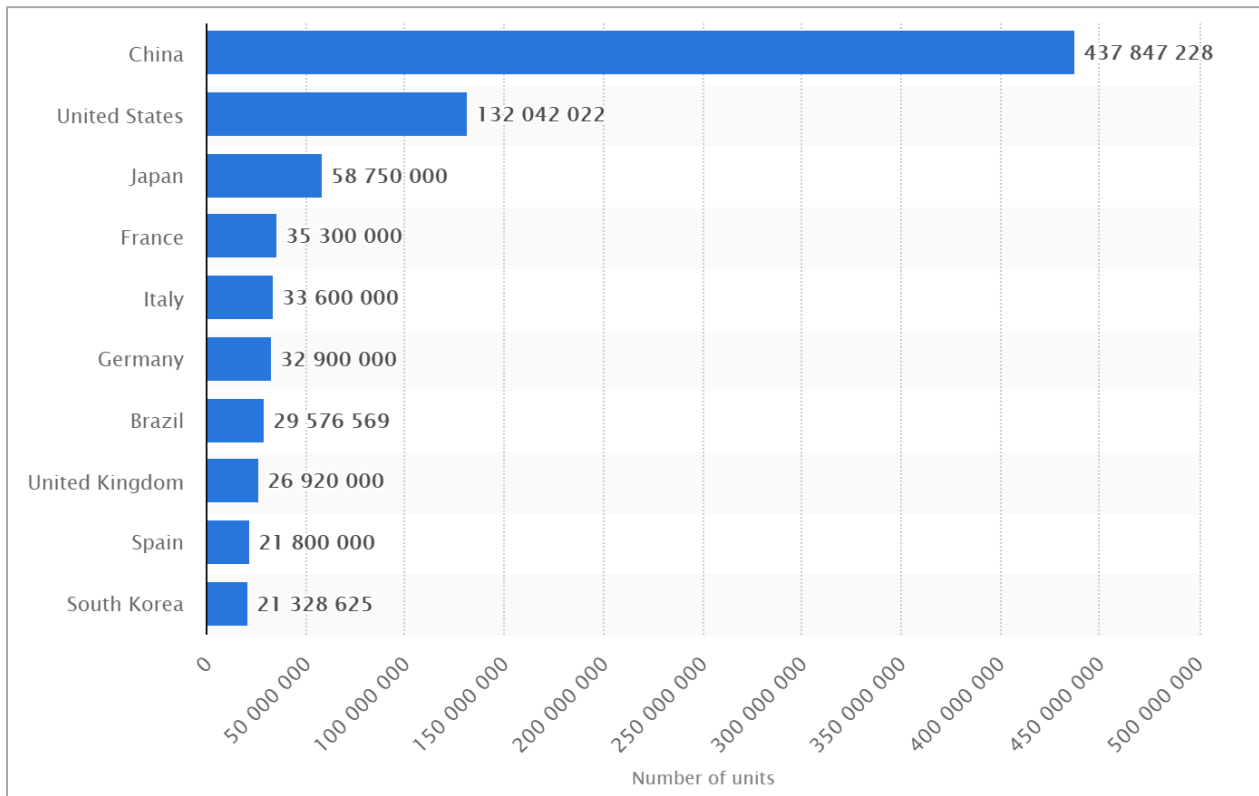
- Far greater (and more detailed) feedback regarding energy use
- Enable consumers to adjust their habits in order to lower electricity bills
- Reduces the number of blackouts and system-wide electricity failures

Advantages for the Environment

- Prevents the need for new power plants that produce greenhouse gases that substantially creates pollution that creates health risks
- Helps curb existing greenhouse gas emissions from existing power plants
- Reduces pollution created by vehicles driven by meter readers



Projected Installations by 2020



Meter Requirements

US Safety Codes

2017 National Electrical Safety Code® (NESC®)

IEEE NESC
011 Scope
(A) Covered
The NESC covers:
(2) The generation, transmission, and distribution of electricity...through public and private utility systems that are installed and maintained under the exclusive control of utilities or their authorized representatives.

NESC 100th ANNIVERSARY EDITION **IEEE**
1 Park Avenue, New York, NY 10016-5907, USA

Utility



Customer

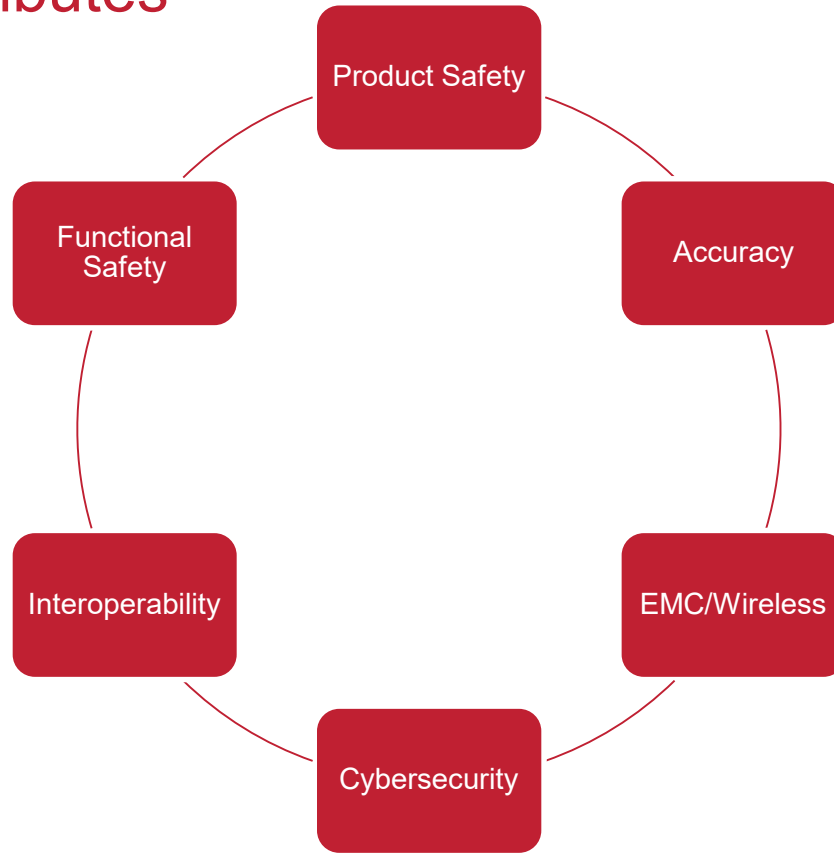
NFPA 70
90.2 Scope
(B) Not Covered
(5) Installations under the exclusive control of an electric utility where such installations...

90.7 Examination of Equipment for Safety
...It is the intent of this Code that factory-installed internal wiring or the construction of equipment need not be inspected at the time of installation of the equipment, except to detect alterations or damage, if the equipment has been listed by a qualified electrical testing laboratory that is recognized as having the facilities described in the preceding paragraph and that requires suitability for installation in accordance with this Code.

Service Point



Smart Meter Attributes



Global Electricity Meter Standards

Market	NA	Mexico	LA	EU	ME	AS/NZ	India	Asia
Safety	UL2735 & UL2735C			IEC 62052-31	IEC 62052-31	IEC 62052-31	IEC 62052-31	IEC 62052-31
Performance/ Accuracy Electricity Meters	ANSI C12.1 C12.10 C12.20	G0100-05 GWH00-09	NBR 14519 NBR 14520	EN 50470-1 EN 50470-3 EN/IEC 62052-11 62053-21 62053-22 62053-23 62053-24 OIML R46	IEC 62052-11 62053-21 62053-22 62053-23 62053-24 OIML R46	AS/NZ 62052.11 62053.21 62053.22 62053.23 62053.24 NMI M6-1 OIML R46	IS23779 IS14697 IS25959 IEC 62052-11 62053-21	IEC 62052-11 62053-21 62053-22 62053-23 62053-24 BREB J-39 OIML R46
Performance/ Accuracy Load Control/ Prepayment Meters				EN/IEC 62052-21 62054-21 62055-31	IEC 62052-21 62054-21 62055-31	AS/NZ 62052.21 62054.21 62055.31		IEC 62052-21 62054-21 62055-31
Inter-operability	ANSI C12.18 C12.19							DLMS COSEM
Security	UL2900 IEC 62443	IEC 62443	IEC 62443	UL2900 IEC 62443				IEC 62443
Wireless	FCC IC WiFi ZigBee	COFETEL	CNC ANATEL	R&TTE	FCC R&TTE	FCC R&TTE	FCC R&TTE	MIC SRRR KCC FCC R&TTE



Safety Standards

UL2735 Scope

These requirements cover the **electrical safety of electric utility (revenue) meters rated up to 600 V**, which measure, monitor, record, transmit, or receive electrical energy generation or consumption information.

Meters covered by this standard **may be provided with one or two-way communication capabilities**, by means of carrier signals, telephone, cable, wireless communication, or other methods.

These meters **may additionally provide signals**, either by direct connection or wirelessly, **for the control of electrical loads or electrical power generation equipment** in response to signals received from the utility or local communication networks

These requirements cover **socket mounted plug-in (Type S) utility meters, and non-socket mounted, bottom connected (Type A) utility meters**, intended for installation in ordinary (non-classified) locations. These may or may not be intended to be under the exclusive control of the serving utility.

These requirements **also cover revenue meters that are not socket mounted (Type S) or bottom connected (Type A) meters**, including those that are intended for factory installation as components within the enclosure of complete equipment.

These requirements **do not cover** equipment intended as **test equipment or equipment intended to make measurements for analysis in a laboratory or industrial setting**.



IEC 62052-31 Scope

These requirements cover the **electrical safety of newly manufactured meters on 50Hz or 60Hz networks rated up to 600 V**, which measure, monitor, record, transmit, or receive electrical energy generation or consumption information in a single case.

Meters covered by this standard **may contain supply and load control switches**, but only those which are electromechanical in operation.

When applying these requirements to equipment intended to be used in matching sockets **tests shall be performed on equipment installed in the specified matching sockets**, requirements for sockets and insertion of meters into sockets are outside the scope of this standard.

When applying these requirements to equipment used for electrical energy measurement and control **there are additional safety requirements that may need to be taken into consideration**, refer to Clause 13 of this standard.

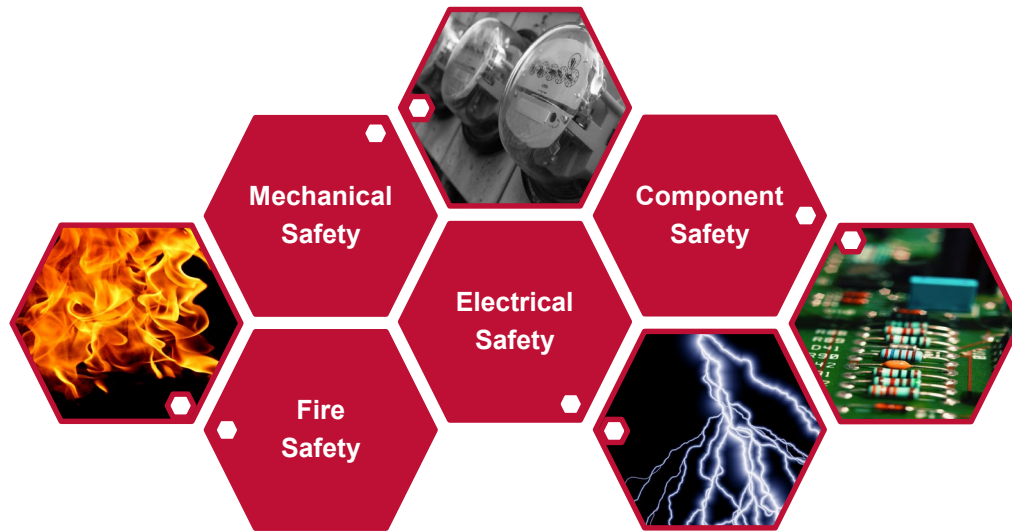
These requirements **do not cover** equipment intended as **test equipment or equipment intended to make measurements for analysis in a laboratory or industrial setting**.

The standard assumes **the meter is installed properly**, all meters are freely accessible however **terminal covers cannot be removed or accessed without using tools**, when work with hazardous live parts becomes necessary only **skilled professionals with training shall perform these tasks**.



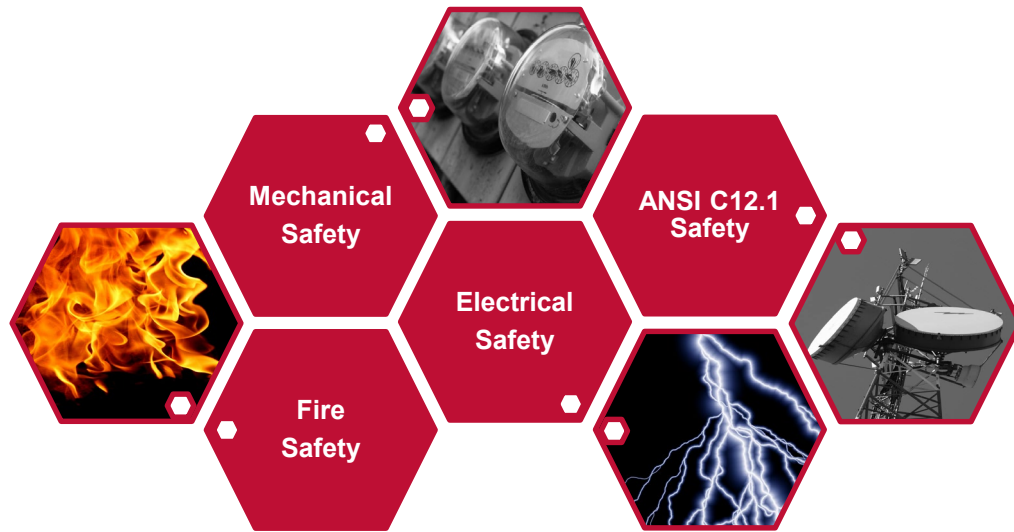
UL2735

UL2735 Requirements - Construction



Components	Electrical	Fire	Mechanical
<ul style="list-style-type: none"> • Compliance with relevant component standards • Used within their recognized ratings • Plastics, printed circuit boards, MOV's, wire, transformers, etc. 	<ul style="list-style-type: none"> • Accessibility of hazardous live parts • Electrical spacings over-surface and through-air • Isolation of current transformer secondary 	<ul style="list-style-type: none"> • Polymeric enclosure flammability • Battery protection, charging, placement and replacement 	<ul style="list-style-type: none"> • Environmental considerations of enclosure • Strength and rigidity of enclosure • Access panels • Form/size per ANSI C12

UL2735 Requirements - Testing

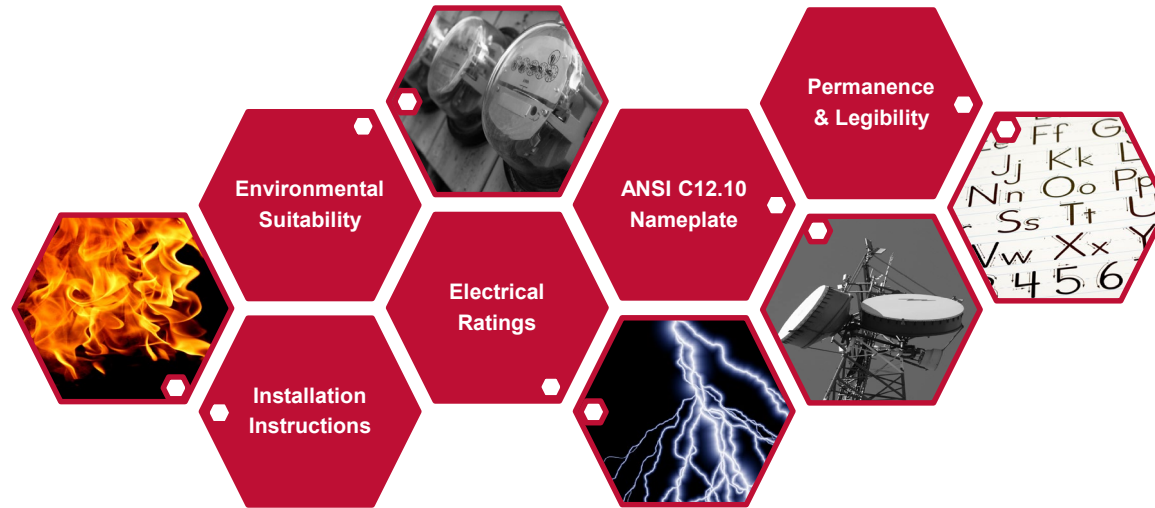


Electrical	Fire	Mechanical	ANSI C12.1
<ul style="list-style-type: none"> • Endurance of load control switch • Single component fault 	<ul style="list-style-type: none"> • Polymeric enclosure flammability • Single component fault 	<ul style="list-style-type: none"> • Static • Impact • Drop 	<ul style="list-style-type: none"> • Temperature rise* • Insulation resistance • HV Line Surges • Temporary Overload* • Fast Transient/Burst • RF interference • RF Conducted/Radiated Emissions • Electrostatic Discharge*



*modified in UL2735

UL2735 Requirements - Markings



**modified in UL2735*



Thank You

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