

Residential Electrical Metering



Advanced ANSI metering for the Smart Grid

For over 100 years, GE's metering solutions have provided utilities with a dependable partner known for our robust and quality metering platform. The I-210 product line brings innovative and flexible technology solutions that covers all your metering needs from basic electronic energy-only meters to highly-flexible smart metering solutions that provide advanced functionality to meet the evolving Smart Grid system needs.

GE's family of meters goes beyond meeting your complex business challenges. The advanced, powerful and easy-to-use meters give you an extra edge in the energy business. You can look forward to real-time instrumentation, power quality monitoring and easy access to critical information. All these add up to give you higher productivity, improved efficiency and reduced energy costs.

Key Benefits

- Reliable and accurate cash register for utilities
- AMR/AMI Plug-n-Play functionality
- Multiple communication technologies tied to AMI systems provide reliable data in a timely manner
- Smart metering functions such as Time of Use demand metering and service switch capabilities
- Demand side management through pre-payment and demand limiting features
- Advanced functions such as reactive measurement and, IEEE reliability indices measurement
- Robust meter security and standards compliance

ANSI Single Phase Meters



I-210+c Full featured, Smart Grid enabled metering

This is GE's flagship residential meter product, offering demand, load profile, TOU, service switch, and a full complement of communication options.



I-210+ Value packed Smart Grid functions

World class accuracy and reliability in a solid-state kWh meter platform package. Available with a service switch, as well as a wide array of communications options.

Communications

- Broad AMI/AMR Plug-n-Play options - RF Mesh, Power line carrier, Cellular, etc
- Allows interchangeability of AMR/AMI Plug-n-Play options
- Supports connectivity and integration with 3rd party communications solutions providers

Smart Configuration

- Ability to customize advanced metering options to suit customer's needs
- Configure load profile, time of use and demand metering capabilities
- Versatile programming Softswitches allowing the selection of advanced functionality such as power quality measurement and reactive power measurement
- Service Switch option improves operational efficiency and addresses issues such as demand side management, remote repayment systems, and controlled outage restoration

Reliability

- Robust revenue-grade watt-hour and demand meters
- Based on GE's cutting edge technology providing typical 0.2% accuracy, and reliability
- Enable utilities with tools to lower operational cost and provide accurate metering solutions



Reliable Metering

In this dynamic time of regulatory scrutiny and customer engagement, you can be assured of the product and the company behind the product. We have ANSI and ISO certified labs to ensure that our product design and manufacturing processes yield a robust product every time.

Our testing procedures go well beyond the ANSI and IEC requirements for which we design to, including some of the most aggressive internal standards in the market place today. We now have included world-class Radio Frequency (RF) communications expertise to ensure that our meter products are hardened to withstand even the harshest of RF environments without sacrificing the quality or integrity of the metrology or the communications technology.

Accurate & Dependable

Typically measured at +/- 0.2%, the GE I-210 family of meters provides best-in-class capabilities for accuracy. Combined with the low starting watts, the utility can have confidence in the metered value and measured electricity usage.

Integrity of Supply

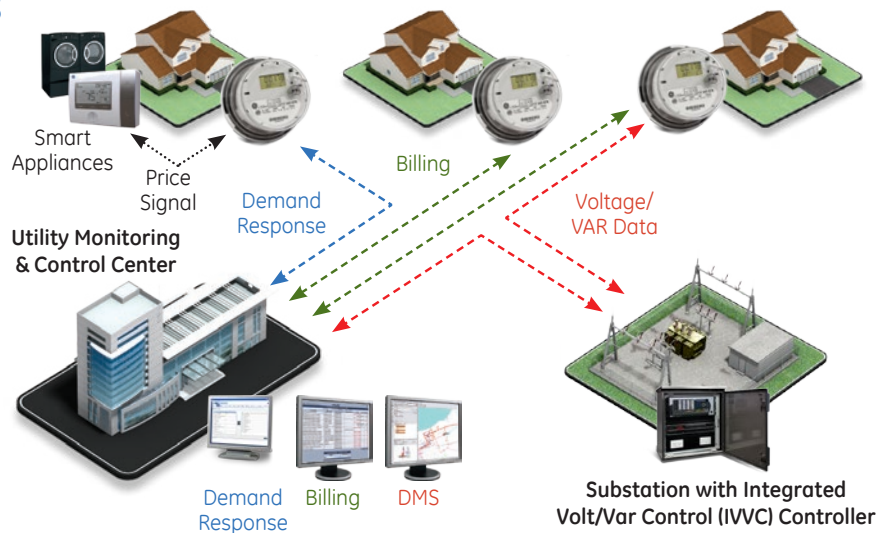
Having a partner that can provide assurance in supply is critical when a utility begins a mass deployment of meters. GE's process focus and rigor around supply chain excellence minimizes the risk to the utility, giving them confidence to manage installation crews and provide accurate scheduling to customers.

Broad Communications Support

The I-210 family has been designed to allow for the interchangeability of AMR/AMI modules and cover the broadest range of possible AMI communication technologies including RF Mesh, Cellular, Power Line and Ethernet. Modules can be added at the GE factory, after the fact, or replaced with another compatible module if the meter is redeployed.

Billing & Smart Applications

Traditional billing continues to be a vital component of today's solid state meters, but they are also now a vital part of your grid operation. We've leveraged the strength and knowledge of GE Digital Energy around distribution automation, volt-var control, demand optimization, and distributed generation to develop a line of metering products that are designed to integrate and provide the critical information needed to optimize all of these grid operation solutions. As GE continues to build on its Smart Grid solutions, you can count on GE Digital Energy and our new metering products to include innovative and unique capabilities you never thought possible.



Leading the way on integrated appliances for demand response

One of the most compelling benefits of the Smart Grid is the promise of delivering demand management or load control. Utilities will save energy, lower costs, and defer additional transmission and generation expenses with the ability to shave peak load, shape load and curtail load to mitigate grid events. Additionally, consumers will be able to conserve energy and shift energy use to benefit from time of use or time based rate structures. Various studies have shown that these actions can generate customer savings from 5% to 15% of their monthly electricity use.

GE, through our Digital Energy and Appliance businesses, is continuing to work on integrated solutions for electricity metering and smart appliances in the home. This is an exciting time for our business as we pioneer a new generation of electricity smart meters and smart appliances that work seamlessly together to deliver energy savings never thought possible.



Full featured, Smart Grid Meter

I-210+c

Smart Grid enabled, consumer friendly metering

GE's most advanced residential electricity metering product line, the I-210+c, delivers Smart Grid capability for today and the future. Derived from our industry leading commercial and industrial product line, the kV2c, the I-210+c benefits from our advanced metrology capability and lessons learned from over 10 years of solid state metering design. All the way down to the advanced microprocessor, the I-210+c contains much of the advanced polyphase functionality that GE has been known for. We have also added capability that makes the I-210+c the referenced residential product line in the industry.

Capability

Designed for today's dynamic rate structures, the I-210+c provides capability for demand, load profile, and TOU recording, along with a number of other power quality and demand response related functions. Configurable to support various metering quantities, this meter supports delivered (+), received (-), and net metering for distributed generation.

Advanced Functionality

With the addition of the fully rated 200 amp service switch, the meter is capable of pre-payment metering without all the historical cost associated with card readers or other legacy pre-payment technology. Load limiting and emergency conservation modes set this meter apart when working in conjunction with a demand response program. Having the capability to be remotely configured, as well as being firmware upgradeable, this product serves today's needs, as well as tomorrow's evolving requirements.

Communications

Designed to specifically accommodate the communications technology required to support a Smart Grid, the I-210+c has the same electrical and mechanical interface as our I-210+ platform, making communications interchangeable and interoperable between these two residential metering platforms. Designed with an enhanced power supply, the platform is ideally optimized for RF Mesh, PLC, and 3G/4G point-to-point communication technologies.

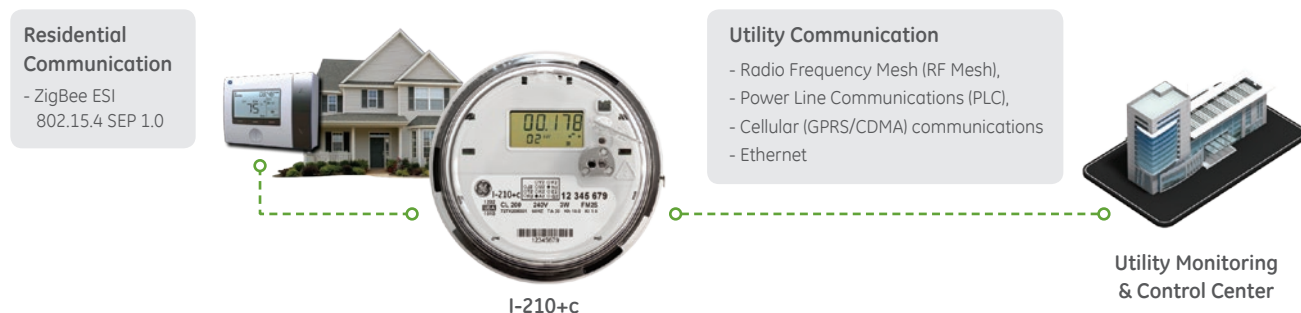


Features & Benefits

- Customize advanced metering options through SoftSwitches
- AMR/AMI Plug-n-Play designed to accommodate:
 - Radio Frequency Mesh (RF Mesh)
 - Power Line Communications (PLC)
 - Cellular (GPRS/CDMA) communications
 - Ethernet
- Advanced functionality such as:
 - time-of-use, insensitive demand load profile recording, event logging.
- Typical accuracy: within +/- 0.2%
- Service Switch to improve operational efficiency and address issues such as:
 - Demand side management
 - Remote prepayment systems
 - Controlled outage restoration
- Low starting watts; capture energy consumption at levels typically not registered by electromechanical meters
- Low burden, which minimizes utility system losses
- Patented tamper algorithm to detect tamper-by-meter inversion
- Meets or exceeds ANSI C12.1, C12.10, C12.20, C37.90.1
- Communications Options:
 - Silver Springs Networks NIC
 - Trilliant SecureMesh
 - Itron Cellular
 - Itron 57ESS ERT

AMR/AMI Plug and Play Communications

Multiple communication options on the I-210+c allows greater customer choice. Ideally optimized for RF Mesh, PLC, 3G/4G point-to-point communication technologies, the I-210+c can cover a wide variety of communication scenarios.



Value packed, Smart Grid Meter

I-210+



Load Management

The I-210+ is one of the most popular single phase meters among US utilities for residential metering installations. Equipped with a fully-rated 200A service switch, this meter platform is ideal to provide basic load management functionality.

Reliability

The I-210+ has enjoyed tremendous success in the marketplace for smart meters, with over 3.5 million units shipped since 2009. This product is the industry benchmark for quality and reliability, having passed both internal and external validation tests for billing accuracy. At GE, we have an unprecedented testing and validation process to ensure that our products are robust and exceed the industry standard ANSI requirements.

We have substantial expertise in wireless communications and the testing that is required to ensure that our meters perform flawlessly, even in the harshest of radio frequency (RF) environments.

Communications

The I-210+ has the same electrical and mechanical interface as our I-210+c platform, designed to specifically accommodate Smart Grid communications technology, making communications interchangeable and interoperable between these two residential metering platforms. Multiple RF Mesh and PLC communication technologies are supported with a newly updated power supply.

Features & Benefits

- AMR/AMI Plug and Play designed to accommodate: RF Mesh, PLC, Cellular (GPRS/CDMA), Ethernet
- Communications Options:
 - Grid IQ P2MP
 - SSN NIC
 - Trilliant SecureMesh
 - Aclara UMT-R
 - Itron 54ESS ERT, 55ESS ERT, 56ESS ERT
 - Tantalus TC-I210
- Advanced functionality such as; time-of-use, insensitive demand load profile recording, event logging.
- Customize advanced metering options through SoftSwitches
- Service Switch to improve efficiency and address:
 - demand side management
 - remote prepayment systems
 - controlled outage restoration

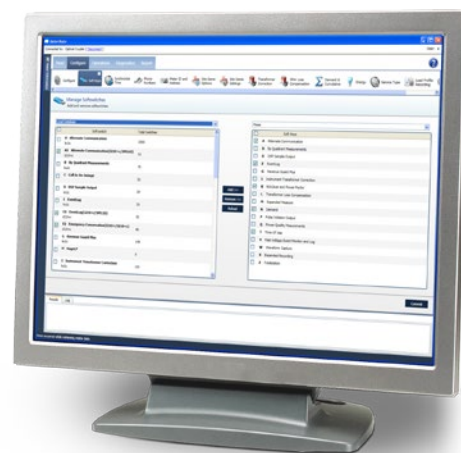
AMI Technology Selection for I-210+ and I-210+c Meters

AMI Technologies	Type	I-210+	I-210+c
Aclara UMT-R	PLC	X	
Grid IQ P2MP	RF P2MP	X	
Itron 54ESS ERT, 55ESS ERT, 56ESS ERT	1-way RF AMR	X	
Itron 57ESS ERT	1-way RF AMR		X
Itron Cellular	Cellular Network		X
Silver Springs Networks NIC	RF Mesh	X	X
Tantalus TC-I210	RF Mesh	X	
Trilliant SecureMesh	RF Mesh	X	X

Full featured, Secure Metering Software

MeterMate™

GE's innovative MeterMate software suite enables meter administrators to easily configure and manage GE meters. Each software component in the MeterMate suite is optimized to address the different aspects of a meter's lifecycle. MeterMate program creation software enables the user to effortlessly configure the meter's basic and advanced functionality, ranging from creating a simple demand program and setting up the meter display to configuring the meter's I/O and alerts. With MeterMate reading and programming software, a user can read, program and perform real-time instrumentation and power quality monitoring on a meter, via a variety of different communication methods such as local OPTOCOM, remote telephone, RS-232/485 and IP communications.



The suite also provides the MeterMate Batch Control, MeterMate Load Profile (MMLp) and MeterMate XTR utilities. MeterMate Batch Control enables the user to automate remote meter reading. MeterMate Load Profile (MMLp) provides analysis of load profile data and MeterMate XTR supports the export of meter data to the MV-90 HHF format.

Features & Benefits

- One software suite to configure and read from the GE portfolio of meters: kV family, I-210 family and SGM3xxx family
- Supports the ANSI C12.19 communication protocol
- Multiple methods to communicate with meters: USB & RS232 OPTOCOM, RS485, Modem
- Modular configuration workflow that enable the reuse of frequently used configuration settings and measurements
- Various reports to display information for meter management, auditing, billing and monitoring power quality
- Command line interface and batch-control enabling automated and scheduled meter operations
- Configurable role-based access control security

With GE meters, your business case just got a whole lot better

At GE, we've leveraged our expertise to ensure you get the most out of your investment in GE products and solutions. The capability available in the GE Smart Meter's provide for data that can be used to optimize a number of utility operational systems outside of traditional billing. These integrated solutions include:

- Outage events and alarms integrated into PowerOn™, GE's Outage Management Solution
- Voltage and Var data, provided in real-time, to enhance distribution automation solutions for Conservation Voltage or Integrated Volt/Var Coordination
- Integration with GE's GridIQ™ Demand Optimization Solution for coordinated load control and demand response for surgical implementation of load shedding and load deferral

The strength of metering products come from our broad knowledge of electrical utilities and their operational systems. We will continue to provide metering products that build on this knowledge and provide differentiated value for both the utilities and the consumer.



Residential Meter Selector

	Product Characteristics	I-210+ Basic Energy	I-120+c																																										
1	Meter Functionality	<ul style="list-style-type: none">• Real Energy Consumption Management	<ul style="list-style-type: none">• Real Energy Consumption Management• Reactive Energy Consumption Measurement• Apparent Energy Consumption Measurement• Voltage Measurement (Min, Avg, Max)• Sag/Swell Measurement• Outage Count and Duration																																										
2	ANSI Models	<table><thead><tr><th>Form</th><th>Class</th><th>Volts</th></tr></thead><tbody><tr><td>1S</td><td>100</td><td>120 & 240</td></tr><tr><td>2S</td><td>200 & 320</td><td>240</td></tr><tr><td>3S & 3CS</td><td>20</td><td>120 & 240</td></tr><tr><td>4S</td><td>20</td><td>240</td></tr><tr><td>12S</td><td>200 & 320</td><td>120 & 240</td></tr><tr><td>25S</td><td>200 & 320</td><td>120 & 240</td></tr></tbody></table>	Form	Class	Volts	1S	100	120 & 240	2S	200 & 320	240	3S & 3CS	20	120 & 240	4S	20	240	12S	200 & 320	120 & 240	25S	200 & 320	120 & 240	<table><thead><tr><th>Form</th><th>Class</th><th>Volts</th></tr></thead><tbody><tr><td>1S</td><td>100</td><td>120 & 240</td></tr><tr><td>2S</td><td>200 & 320</td><td>240</td></tr><tr><td>3S & 3CS</td><td>20</td><td>120 & 240</td></tr><tr><td>4S</td><td>20</td><td>240</td></tr><tr><td>12S</td><td>200 & 320</td><td>120 & 240</td></tr><tr><td>25S</td><td>200 & 320</td><td>120 & 240</td></tr></tbody></table>	Form	Class	Volts	1S	100	120 & 240	2S	200 & 320	240	3S & 3CS	20	120 & 240	4S	20	240	12S	200 & 320	120 & 240	25S	200 & 320	120 & 240
Form	Class	Volts																																											
1S	100	120 & 240																																											
2S	200 & 320	240																																											
3S & 3CS	20	120 & 240																																											
4S	20	240																																											
12S	200 & 320	120 & 240																																											
25S	200 & 320	120 & 240																																											
Form	Class	Volts																																											
1S	100	120 & 240																																											
2S	200 & 320	240																																											
3S & 3CS	20	120 & 240																																											
4S	20	240																																											
12S	200 & 320	120 & 240																																											
25S	200 & 320	120 & 240																																											
3	Soft-Switches to upgrade meter function	<ul style="list-style-type: none">• Optional Softswitches can be loaded in the factory or by the user to activate advanced functions<ul style="list-style-type: none">O — Activates communication capability with AMR/AMI modulesS₂ — AMI/AMR calculated demand displayed on meter LCDV₂ — Simple Voltage Event monitor in addition to a display of RMS momentary voltage on the 3 lower LCD digits	<ul style="list-style-type: none">• Optional Soft-switches can be loaded in the factory or by the user to activate advanced functions<ul style="list-style-type: none">A₂ — Activates communication capability with AMR/AMI modulesE₂ — Activates Event Log Recording (up to 200 Events)K₂ — Activates Reactive/Apparent Energy Consumption recordingN₂ — Activates DemandQ₂ — Activates Power Quality (Min, Avg, Max Voltage) recordingR₂ — Activates LP recording (up to 4 channels)T₂ — Activates TOU recordingV₂ — Activates Sag/Swell monitor and recording																																										
4	AMR Interface (Factory enabled or installed by customer)	<ul style="list-style-type: none">• Quadrature Pulse• SPI Format-1 data• SPI Format-2 data• PSEM Communications	<ul style="list-style-type: none">• PSEM Communications																																										
5	Energy Accumulation	<ul style="list-style-type: none">• Must specify at time of order either:<ul style="list-style-type: none">- Delivered only- Delivered + Received- Delivered – Received- Received only• Customer can change selection later using MeterMate	<ul style="list-style-type: none">• Specified at time of order for factory programmed meters or configured by the customer using MeterMate. Any two or four of the following energy measurements can be selected:<ul style="list-style-type: none">- Delivered only kWh- Received only kWh- Delivered + received kWh- Delivered – received kWh- Lagging only kvarh; requires K₂ Soft-switch- Leading only kvarh; requires K₂ Soft-switch- Lagging + Leading kvarh; requires K₂ Soft-switch- Lagging - Leading kvarh; requires K₂ Soft-switch- Phasor apparent VAh; requires K₂ Soft-switch																																										
6	Cycle Insensitive Demand	<ul style="list-style-type: none">• Not available	<p>Requires T₂ & N₂ Soft-switches to be enabled</p> <ul style="list-style-type: none">• Provides an alternative method for calculating the maximum demand in meters equipped with one-way AMR system.• The meter maintains the daily maximum demands and the two peaks for the period.• Demand is calculated using the programmed method (Block, rolling or thermal).• The daily maximum demands are stored in a circular queue.• Each entry in the circular queue contains a date.																																										
7	Power Quality	<ul style="list-style-type: none">• With V₂ Softswitch enabled, provides a count of Sag/Swell Events. Value and duration thresholds are programmable.	<ul style="list-style-type: none">• With Q₂ and R₂ Softswitches enabled, Min, Max and Average Voltage recording is possible.• With V₂ Softswitch enabled, provides counts and magnitude recording of Sag/Swell Events with date and time stamped. Value and duration thresholds are programmable. This Sag/Swell Event Log is separate from the Event Log recording provided by the E₂ Softswitch• With E₂, R₂ and T₂ Softswitches enabled, recording of sustained and total outage counts and duration is possible to permit calculation of IEEE Reliability indices.																																										
8	MeterMate Reading and Programming access	<ul style="list-style-type: none">• Available	<ul style="list-style-type: none">• Available																																										
9	Service Switch (provide remote controllable disconnection and reconnection of electrical service for residential applications)	<ul style="list-style-type: none">• A switching device intended to provide remote controllable disconnection and reconnection of electrical service for residential applications.• Factory installed option, specify at time of order.• Full functionality requires two-way AMI module• Switch is installed under standard size cover• Typical applications include:<ul style="list-style-type: none">- Remote disconnect and reconnect of service- Energy conservation demand limiting- Demand limiting as an alternative to service disconnection- Prepayment metering- Outage management/restoration <p>Note: Energy conservation demand limiting and prepayment metering functionalities are not available on forms 12S and 25S.</p>	<ul style="list-style-type: none">• A switching device intended to provide remote controllable disconnection and reconnection of electrical service for residential applications.• Factory installed option, specify at time of order.• Full functionality requires two-way AMI module• Switch is installed under standard size cover• Typical applications include:<ul style="list-style-type: none">- Remote disconnect and reconnect of service- Energy conservation demand limiting- Demand limiting as an alternative to service disconnection- Prepayment metering- Outage management/restoration																																										

Technical Specifications

I-210+c

Basic Functions
Single Phase Demand Meter
- Energy management, 4 quantities
- Demand, block, or rolling demand
- Fundamental plus harmonic measurements
- Bi-directional energy measurements
Load Profile recording
Time of Use Billing Measures
Four Energy options (Delivered, Received, Delivered+Received, Delivered-Received)
Tamper detect capability
Broad communication module options
Network applications
Models available for 120 or 240 volt CL 20, CL 100, CL 200, CL 320 applications.
50 or 60 Hz operation

Optional Functions
Factory integrated Service Switch Capability

Soft-Switch Functions
A ₂ Soft-switch
- The Alternate Communication Soft-switch allows a communication option board to communicate with the meter
E ₂ Soft-switch
- The Event Log Soft-switch allows the meter to track the most recent 200 events. Use MeterMate™ Program Manager, Diagnostics Editor, to select the event types to be logged and how many occurrences should be tracked, up to a maximum of 200 events. Date and time stamps are included on logged events for Demand/LP or TOU meters
K ₂ Soft-switch
- The kVA and kvar Soft-switch adds kVA(h) and kvar(h) measurement capability.
N ₂ Soft-switch
- The Demand (N ₂) Soft-switch adds billing demand calculations.
Q ₂ Soft-switch
The Power Quality Measurements Soft-switch enables
- Voltage (L-N): VA (max, min, store) for summations, demand, and load profile recording
- RMS voltage measurement for reading and display
- Low potential caution
R ₂ Soft-switch
- The Load Profile Soft-switch activates up to 4 channels of LP recording
T ₂ Soft-switch
The Time-of-use Soft-switch enables TOU operation
- Up to four TOU periods and four Seasons
- Up to three daily rate schedule types and one holiday schedule

- Up to 80 TOU schedule set points
- Up to 50 programmable dates:
- Holidays, season changes, Daylight Savings Time (DST), self-read, and demand reset
- Perpetual calendar handles most dates
- Up to two billing and two demand measures per TOU period
- Self-read actions on specified dates, with or without a demand reset
V ₂ Soft-switch
- The voltage Soft-switch activates Sag/Swell monitor and recording

Accuracy
Typical Accuracy: Within +/- 0.2%
Starting Watts: 12W @ 240V, 6W @ 120V
Typical Watt Loss: 0.7 Watts

Rating
Voltage: 120 V -240 V
Current: Class 100, Class 200, Class 320, Class 20
Frequency: 50 or 60 Hz

Cover Options
Polycarbonate cover with molded sunshield
- Plain cover without RESET OR "D" ring
- With Optocom "D" ring
- With RESET latch and Optocom "D" ring

Operating Range
Voltage: +/- 20%
Operates over a broad temperature range (-40°C through +85°C)

Available Models
ANSI Form 1S, 2S, 3S, 4S, 12S, 25S
CL 20, CL100, CL200, CL320

Applicable Standards
Performance meets or exceeds industry standards
ANSI C12.19
ANSI C12.1
ANSI C12.10
ANSI C12.20
ANSI C37.90.1

I-210+

Basic Functions
Basic function as electronic single phase Revenue Meter
Four Energy options (Delivered, Received, Delivered+Received, Delivered-Received)
Tamper detect capability
Broad communication module options
Network applications
Models available for 120 or 240 volt CL 20, CL 100, CL 200, CL 320 applications.
50 or 60 Hz operation.

Optional Functions
Factory integrated Service Switch Capability
- Soft Switch Functions
- AMR/AMI Communications (AMR/AMI Interface formats include quadrature pulse, PSEM, SPI Format-1 data, SPI Format-2 Data)
- Display AMR calculated Demand value shown on the lower 3 LCD digits
- Simple Voltage Event monitoring in addition to RMS momentary voltage display

Accuracy
Typical Accuracy: Within +/- 0.2%
Starting Watts: 12W @ 240V, 6W @ 120V
Typical Watt Loss: 0.7 Watts

Rating
Voltage: 120 V -240 V
Current: Class 100, Class 200, Class 320, Class 20
Frequency: 50 or 60 Hz

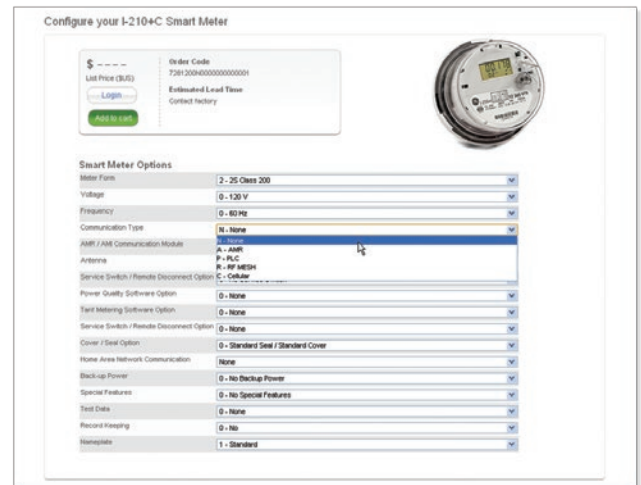
Cover Options
Polycarbonate cover with molded sunshield
- Plain cover without RESET OR "D" ring
- With Optocom "D" ring

Operating Range
Voltage: +/- 20%
Operates over a broad temperature range (-40°C through +85°C)

Available Models
ANSI Form 1S, 2S, 3S, 4S, 12S, 25S
CL 20, CL100, CL200, CL320

Applicable Standards
Performance meets or exceeds industry standards ANSI C12.1
ANSI C12.10
ANSI C12.20
ANSI C37.90.1
ANSI C12.20
ANSI C37.90.1

A wide range of product solutions available for online ordering



This foregoing document was electronically filed with the Public Utilities

Commission of Ohio Docketing Information System on

7/2/2019 5:19:55 PM

in

Case No(s). 18-1832-EL-CSS

Summary: Exhibit AEP Opt-Out Meter (GE I-210+C) electronically filed by Mr. Aaron Young on behalf of YOUNG, THAAH AND AARON