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# 9410 Selection and Application Guide

Power Quality and Analysis metering

# Compact power, energy and power quality meters

The Siemens 9410 series power meter combines accurate, 3-phase energy and power measurement with data logging, power quality analysis, e-mail, alarming, Modbus Mastering, Waveform capture and extensive I/O capabilities not typically available in a compact meter.

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## Typical power and energy management applications using the 9410 Meter



Financial management including accounting and billing



Facility and energy management



Supports operations management planning and procedures



Power generation transmission and distribution



Service entrances and onsite generation



Power mitigation and main power distribution equipment



PDUs and RPP's



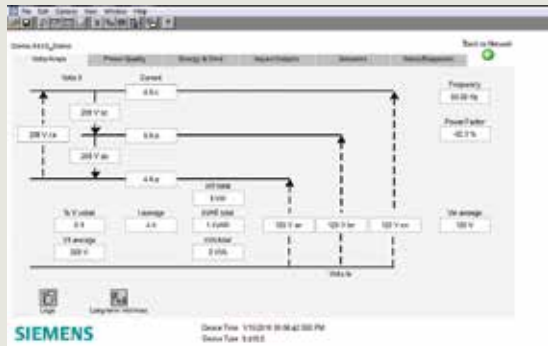
Tenants, departments or subcontractors



Processes, lines, machines or equipment

# 9410 Meter

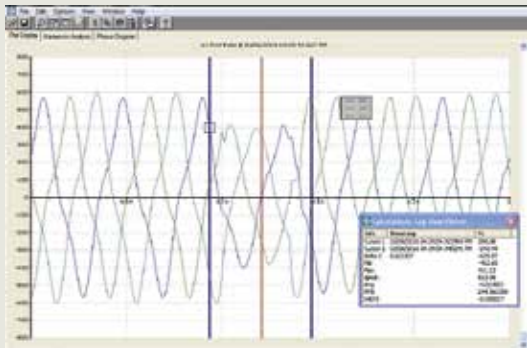
## Features and benefits



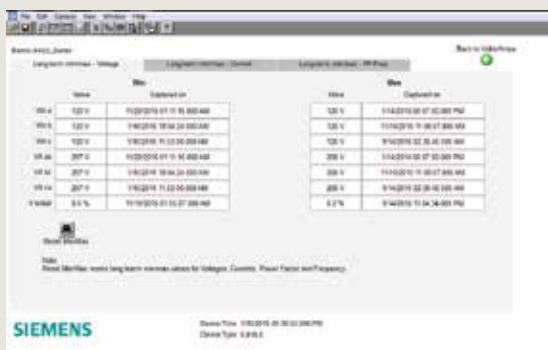
Main real time values



Power quality main screen



Waveforms



Min / max

The 9410 series meters are ideally suited to local and remote monitoring of low or high voltage electrical installations in industrial facilities, commercial buildings, utility networks or critical power environments. Facility and operations personnel will benefit in energy-related costs while avoiding power quality conditions that can reduce equipment life and productivity.

The 9410 series meter is easy to install and use, offering integrated or remote high-visibility displays. A range of expansion modules help match features to the application and support field-upgrading of meters as required. Serial and Ethernet communication enable the meter to be used within a WinPM.Net power management system or with third-party management systems.

### Benefits

- Maximize profits by providing high output with the least amount of risk to availability.
- Improve availability and reliability of electrical systems and equipment.
- Monitor power quality (PQ) for compliance and to prevent problems.
- Meters fully supported by WinPM.Net.

### Typical applications

#### Industrial, commercial, and critical power

- Energy savings
  - Measure efficiency, reveal opportunities and verify savings
  - Sub-bill tenants for energy costs
  - Allocate energy costs to departments or processes
  - Reduce peak demand surcharges
  - Reduce power factor penalties
  - Leverage existing infrastructure capacity and avoid over-building
  - Support proactive maintenance to prolong asset life
- Energy availability and reliability
  - Validate that power quality complies with the energy contract
  - Verify the reliable operation of equipment
  - Improve response to power quality-related problems

#### For electrical infrastructure

- Energy availability and reliability
  - Improve transmission and distribution network reliability
  - Enhance substation metering to reduce field service time
  - Maximize the use of existing infrastructure
- Power quality
  - Verify compliance with new power quality standards
  - Analyze and isolate the source of power quality problems



Panel-mount meter with integrated display



DIN-rail mounted meter with remote display option, including adapter, cable and display

### Cost-effective, modular design

Standard features include a range of 3-phase power and energy measurements, total harmonic distortion (THD) metering, one RS-485 Modbus communication port, Dual-port Ethernet port, three digital inputs, one KY-type digital output, and alarming on critical conditions. The 9410 meter has custom logging and power quality analysis capabilities, while expansion modules offer additional I/O.

### Easy installation

Mounts into panel cutouts using two clips with no tools required. Directly connects to circuits up to 600V AC, eliminating the need for voltage (potential) transformers.

### High-Visibility COLOR display

Integrated or remote LCD offers multi-phase measurements, summary screens, bar charts, intuitive navigation and selectable languages.

### High accuracy measurements

IEC 62053-22 class 0.2S and ANSI C12.20 0.2S real energy accuracy for sub-billing and cost allocation. For reactive energy Class 0.5S (IEC62053-24)

### Power quality analysis

Reveal and understand power quality conditions with the 9410 meter capabilities:

- Dip and Swell detection
- Waveform capture - 256 samples per cycle (Pre and Post)
- Disturbance direction and detection
- Trending and forecasting
- Compliant PQ standards
  - IEC6100-4-30 Class S
  - IEC 62586
  - EN50160

### Extensive data logging, trending and forecasting

Non-volatile on-board logging of min/max values, energy and demand, maintenance data, alarms, and any measured parameters. Trending and short-term forecasting of energy and demand.

### Custom alarming with time stamping

Triggers alarms on over 50 definable power or I/O conditions. Use boolean logic to combine up to four alarms.

### Expandable I/O

A wide choice of standard or optional digital and analog inputs and outputs for pulse counting, demand metering for other utilities (pulse inputs from water, air, gas electricity or steam meters), equipment status/position monitoring, demand synchronization, triggering conditional energy metering, equipment control or interfacing.

### Serial and Ethernet Communications

Up to two simultaneous Modbus communications ports. Use the RS-485 port on the base meter unit or the Dual-Port Ethernet for daisy-chaining via Ethernet. The Ethernet port will allow up to 8 supervisory systems to link to the meter at the same time and provide email-alarms and Modbus master functionality.

# 9410 Meter

## Measurements

### PQ compliance reporting and basic PQ analysis.

- Monitors and logs parameters in support of international PQ standards,
- IEC 61000-4-30 Class S
- IEC 62586 PQI-S
- EN 50160
- Generates onboard PQ compliance reports accessible via onboard web pages:
  - Basic event summary and pass/fail reports, such as EN 50160 for power frequency, supply voltage magnitude, supply voltage dips, short and long interruptions, temporary over voltages, voltage unbalance and harmonic voltage.
  - ITIC (CBEMA) and SEMI curves, with alarm categorization to support further analyses.
  - NEMA Motor Derating curve.
  - Basic meter provides EN 50160 but can be configured to provide IEEE 519.
  - Harmonic analysis:
    - THD on voltage and current, per phase, min/max, custom alarming.
  - Individual harmonic magnitudes and angles on voltage and current, up to the 63rd harmonic.

- High resolution waveform capture: triggered manually or by alarm, captured waveforms available directly from the meter via FTP in a COMTRADE format.
- Disturbance detection and capture: sag/swell on any current and voltage channel, alarm on disturbance event, waveform capture with per-event information.
- Patented disturbance direction detection: provides indication of the captured disturbance occurring upstream or downstream of the meter; time stamped results provided in the event log, with degree of certainty of disturbance direction.

### Used with WinPM.Net , provides detailed PQ reporting across entire network:

- EN 50160 report.
- IEC 61000-4-30 report.
- PQ compliance summary.
- ISO 50001.
- Display of waveforms and PQ data from all connected meters.
- Onboard data and event logging.
- 512MB of standard non-volatile memory. 10 MB of standard non-volatile memory dedicated to capture billing data, events, and waveforms.



Front panel display showing function selection buttons and 3-phase voltage, current and power summary display

### Front panel display

The unique, anti-glare backlit white LCD can be easily read in extreme lighting conditions or viewing angles. An intuitive navigation with self-guided menus make the meter easy to use. Multilingual operation can be user-configured for English, Spanish, French, Italian, German, Portuguese, Chinese, and Russian.

The large 6-line display offers summary screens that simultaneously presents up to 4 concurrent values, including power and energy values, I/O conditions or alarm status. For example, all three voltage or current phases plus neutral can be quickly reviewed at one time. Bar chart displays graphically represent system loading and I/O conditions. Historical and active alarms are displayed with time stamping. Active alarms can be Color coded for quick indication of alarm severity.

The 9410 displays can also be customized to show any metering point or imported data point from Modbus RTU/ TCP connected devices, making this a unique central display for critical information.

## Installation

### Installation – Mounting options

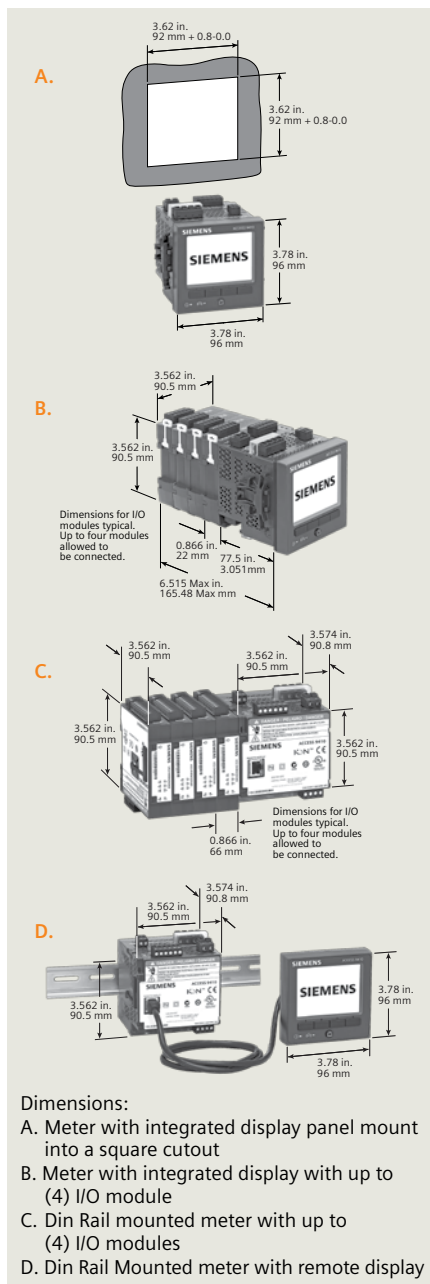
A meter with integrated display, or a remote display module, can be panel mounted through a square cutout ( 92 x 92 mm) or remote display retrofitted through an existing round meter hole using an adapter. A small panel footprint and shallow depth make the meters suitable for low voltage switchboards, shallow cable compartments or on standalone machines. The meter unit (without display) is DIN rail compatible.

Meters with the optional integrated display can be door panel mounted when voltage connections are within the

local regulation limits. When voltage exceeds regulation limits, the meter unit can be mounted inside the electrical cabinet with an optional remote display connecting via a display adapter and cable. A single remote display can be transferred between any meter units.

### Circuit and control power connections

Compatible with low and high voltage 4-wire wye and 3-wire delta systems. Direct connect inputs up to 690 V AC line-to-line or use voltage (potential) transformers for higher voltage systems. All models offer a universal AC or DC power supply.



## Electrical Characteristics

Type of measurement		True rms to 256 samples per cycle
Measurement accuracy	Current and voltage	Class 0.2 as per IEC 61557-12
	Active power	Class 0.2 as per IEC 61557-12
	Power factor	Class 0.5 as per IEC 61557-12
	Frequency	Class 0.2 as per IEC 61557-12
	Active energy	Class 0.2S IEC 62053-22 (In=5A) Class 0.2 IEC 61557-12, ANSI C12.20 Class 0.2
	Reactive energy	Class 0.5S IEC 62053-24
Data update rate	1/2 cycle or 1 second	
Input-voltage characteristics	Specified accuracy voltage	57 VLN/100 VLL TO 400 VLN/690 VLL
	Impedance	5MΩ per phase
	Specified accuracy frequency	42 to 69Hz (50/60Hz nominal)
	Limit range of operation -frequency	20 to 450Hz
Input-current characteristics	Rated nominal current	1A (0.55), 5A (0.25), 10A (0.2ANSI)
	Specified accuracy current range	Starting Current: 5mA Accurate Range: 50mA-10A
	Permissible overload	200A rms for 0.5s non-recurring
	Impedance	0.0003Ω per phase
	Burden	0.024 VA at 10A
Power supply	AC	90-415V AC ±10% (50/60Hz ± 10%)
	DC	120-300V DC ±10%
	Ride-through time	100 ms (6 cycles at 60Hz) min., any condition 200 ms (12 cycles at 60Hz) typ., 120V AC 500 ms (30 cycles at 60Hz) typ., 415V AC
	Burden	Meter Only: 18 VA max at 415V AC, 6W at 300V DC Fully optioned meter: 36 VA max at 415V AC, 17W at 300 V DC
	Input/outputs	Meter Base Only
Optional		Digital - 6 form A digital inputs (30V AC/60V DC) 8 A at 250V AC or 5A at 24V DC Analog - 4 analog inputs (4-20mA, 0-30V DC) + 2 analog outputs (4-20mA 0-10V DC)

## Mechanical Characteristics

Weight	Integrated display module 9.58 1 kg DIN rail mounted Model 0.528 kg IO modules 0.140 kg Remote display 0.300 kg	
IP degree of protection	IP 54, UL type 12: Panel mount and Remote display, front. IP 30: Panel mount rear, DIN rail mount, I/O modules.	
Dimensions	Panel mount model	96 x 96 x 77.5 mm
	DIN model	96.6 x 90.5 x 90.8 mm
	IO modules	90.5 x 90.5 x 22 mm
<b>Environmental conditions</b>		
Operating temperature	-25°C TO + 70°C	
Remote Display Unit	-25°C TO + 60°C	
Storage temperature	-40°C TO + 85°C	
Humidity rating	5% to 95% non-condensing	
Installation category	III	
Operating altitude (maximun)	3000m above sea level	

# 9410 Meter

## Functions

### Alarm and control functions

Over 50 definable alarm conditions with 1 second response time can be used to log critical events or to perform control functions. Trigger on over or under conditions on any measured parameters, phase unbalance, digital input changes and more.

Multiple alarms can be defined, with each alarm individually configured with pickup setpoint, dropout setpoint and delay. Each alarm can be assigned one of four priority classes. Assign multiple alarms to a single quantity to create alarm levels. Assign different actions based on the severity level of the alarm. Use alarms to trigger waveform recording, data logging or to control digital outputs.

Boolean alarm logic with the 9410 meter increases flexibility by allowing the combination of up to four other alarms using NAND, AND, OR, NOR and XOR functions.

### Communications

Multiple simultaneously operating communication ports allow the meters to be used as part of a power and energy management system and interface with other automation systems. Captured waveforms, alarms, billing data, and more can be uploaded to WinPM.Net 6.0 or later for viewing and analysis. Option modules offer a choice of communications standards.

- Standard RS-485 port (on meter unit): 2-wire connection, up to 38.4 kbaud, Modbus (ASCII and RTU) or JBUS protocol.

- A dual port 10/100 Base-T UTP port supporting ModbusTCP/IP, DNP3 and IEC 61850 communications. Full-function embedded web server provides standard web browser access to meter data, and the ability to email on an alarm from the host meter. RS-485/232 port, 2- or 4-wire, Modbus (ASCII and RTU) master port providing Ethernet-to-serial line gateway or Modbus master functionality.

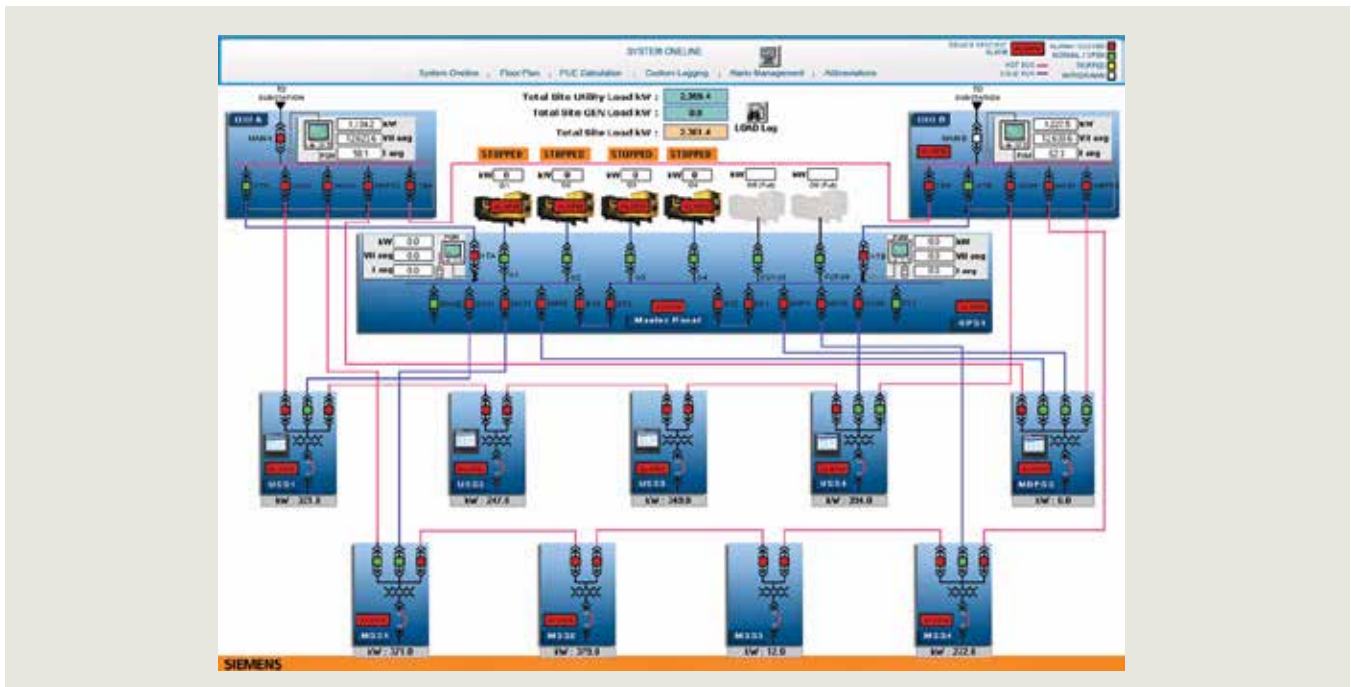
### Software integration

Integration with the WinPM.Net system software allows for automatic retrieval of the meters real-time and on-board data logs. Modbus compatibility and register-based logged data supports integration and data access by building automation, SCADA and other third-party systems.

### Special features

Hour counter: load running time in days, hours and minutes.

Upgradeable Firmware – Your meters can be upgraded with the latest firmware. Contact your local Siemens representative for details.



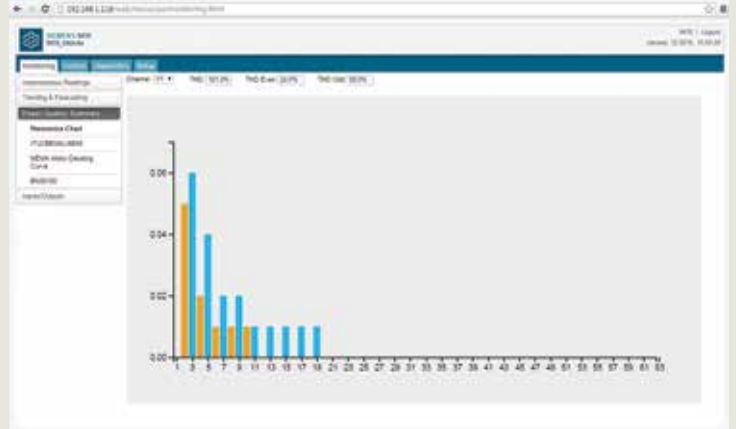
Example screen from WinPM.Net software showing electrical system diagram with multiple real-time metering points.



## 9410 Built-In Web Pages



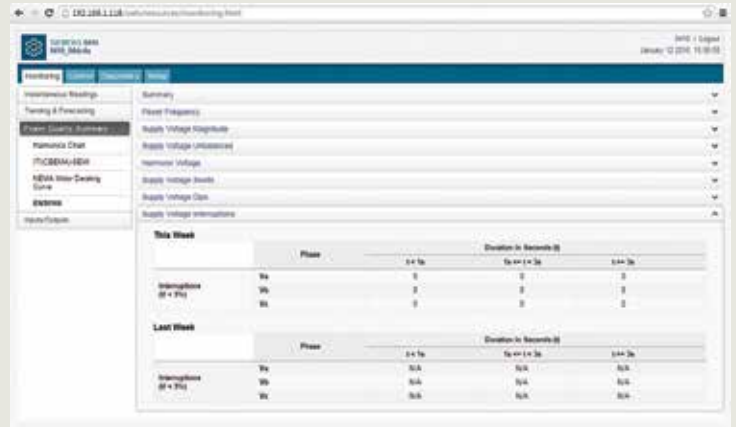
Realtime web page



Harmonics web page



Phasor web page



Power Quality web page

The 9410 comes with many standard HTML web pages showing the meters data, but additional custom web pages can be designed to display other Modbus serial or Modbus TCP connected devices like power meters, trip units, flow meter information, and more!

# 9410 Meter

## Applications and benefits

- Maximize profits by providing high output with the least amount of risk to availability.
- Improve availability and reliability of electrical systems and equipment.
- Monitor power quality (PQ) for compliance and to prevent problems.
- Meters fully supported by WinPM.Net Power Monitoring Software.

### Main characteristics

- Precision metering:
  - IEC 61557-12 PMD Sx K70 3000m 0.2 (performance measuring and monitoring functions).
  - Class 0.2S accuracy IEC 62053-22, ANSI C12.20 Class 0.2 (active energy).
  - Industry leading Class 0.5S\* accuracy for reactive energy (IEC 62053-24).
  - Cycle-by-cycle RMS measurements updated every ½ cycle.
  - Full 'multi-utility' WAGES metering support.
  - Net metering.
  - Anti-tamper protection seals.
  - PQ compliance reporting and basic PQ analysis.
  - Monitors and logs parameters in support of international PQ standards
    - IEC 61000-4-30 Class S
    - IEC 62586 PQI-S

### Digital and analog inputs and outputs

The 9410 meter provides a three digital status/counter input and digital (KY type) output. A wide range of optional field-installable expansion modules will add more digital and analog I/O as required. Up to four expansion modules can be installed per meter (including logging or communication modules).

Digital output relays can act in response to internal alarms, external digital input status changes, or commands over communications. Digital inputs can be used to trigger alarms, trigger logging, and synchronize to a demand pulse or control conditional energy accumulation. Both models offer five channels for metering of water, air, gas, electricity or steam utilities through the digital input pulse counting and consumption/ demand calculation capabilities of the meter. Pulses from multiple inputs can be summed through a single channel communications. Up to 27 total digital inputs can be logged in the 9410 with millisecond time stamping for critical information like detailed sequence of event recording.

Type	Input/Output	Specifications
Standard (Meter Unit)	1 digital KY	6 to 220V AC $\pm 10\%$ or 3 to 250V DC $\pm 10\%$ 100 mA maximum at 25 °C, 1350 V rms isolation
	3 digital input	20 to 150V AC/DC $\pm 10\%$ , <5 mA maximum burden
9410 (US2:94 8M2D O6DI)	2 digital relay outputs	6 to 240V AC or 6 to 30V DC, 2 A rms, 5 A maximum for 10 second/hour
	6 digital inputs	20 to 150V AC/DC, 2 mA max., 24V internal supply: 20 to 34V DC, 10 mA maximum (feeds 6 inputs)
9410 US2:94 8M2AO 4AI)	Analog I/O module (4 analog inputs & 2 analog outputs)	
	4 analog inputs (4-20mA; 0-30 V). 2 analog outputs (4-20mA; 0-10 V) for interfacing with building management sensors and systems.	



Attachment of logging, I/O, or Ethernet expansion modules to meter unit



Bottom view of 9410 meter unit, showing dual Ethernet port and RS-485 communication port connectors, configuration switches and 4x expansion I/O modules.

## Ordering information

Please contact your local sales representative for ordering information.

Visit [www.usa.siemens.com/pds](http://www.usa.siemens.com/pds) for more information on other PDS products, applications and system solutions.

Catalog Numbers	Description
<b>9410 Series Meter</b>	<b>Description</b>
US2:9410DC	DIN96 Panel mount meter (Integrated color display, 1 DO, 3 DI, dual port Ethernet)
US2:9410TC	DIN rail mount meter without display (1 DO, 3 DI, dual port Ethernet)
US2:9410RC	DIN rail mount meter packaged with remote display (Includes 3 meter cable)
<b>Accessories</b>	<b>Description</b>
US2:948DISP96	Remote display, 3 meter cable, mounting hardware for 30mm hole (nut and centering pin), mounting hardware for DIN96 cutout (92x92mm) adapter plate
US2:948M2DO6DI	Digital I/O Module (2 relay outputs & 6 digital inputs - wetted)
US2:948M2AO4AI	Digital I/O Module (2 analog outputs (4 - 20 mA, 0- 10V DC) and 4 analog inputs (4 - 20 mA, 0 - 30V DC))
US2:948DCAB10	Remote display cable, 10 meters

Electromagnetic compatibility	
Product standards	IEC 62052-11 and IEC 61326-1
Immunity to electrostatic discharge	IEC 61000-4-2
Immunity to radiated fields	IEC 61000-4-3
Immunity to fast transients	IEC 61000-4-4
Immunity to surges	IEC 61000-4-5
Immunity to conducted disturbances	IEC 61000-4-6
Immunity to power frequency magnetic fields	IEC 61000-4-8
Immunity to conducted disturbances, 2-150kHz	CLC/TR 50579
Immunity to voltage dips and interruptions	IEC 61000-411
Immunity to ring waves	IEC 61000-412
Conducted and radiated emissions	EN 55022, EN 55011, FCC part 15, ICES-003
Surge withstand Capability (SWC)	IEEE C37.90.1

The contents of this 9410 Selection and Application Guide Manual shall not become part of or modify any prior or existing agreement, commitment, or relationship. The sales contract contains the entire obligation of Siemens respecting the products. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

Firmware characteristics	
Advanced security	Up to 16 users with unique access rights. Perform resets, time sync, or meter configurations based on user privileges.
Memory	512MB (10MB for programming and interval logging).
Firmware update	Update via the communication ports.
<b>Display characteristics</b>	
Integrated or remote display	320x240 (1/4 VGA) Color LCD, configurable screens, 5 buttons and 2 LED indicators (alarm and meter status).
Languages	English, French, Spanish, Russian, Portuguese, German, Italian, Chinese.
Notations	IEC, IEEE.
<b>The HMI menu includes</b>	
Alarms	Active alarms, historic alarms.
Basic reading	Voltage, current, frequency, power summary.
Power	Power summary, demand, power factor.
Energy	Energy total, delivered, received.
Events	Timestamped verbose event log.
Power quality	EN 50160, harmonics, phaser diagrams.
Inputs/Outputs	Digital inputs, digital outputs, analog inputs, analog outputs.
Nameplate	Mode, serial and FW version.
Custom screens	Build your own metrics.
Setup menu	Meter setup, communications setup, display setup, date/time/clock setup, alarm setup, language setup, time of use setup, resets, password setup.

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