

USER MANUAL

Sm@rtGear™ IE

Version 1.0

usa.siemens.com/smartgear

SIEMENS

Table of Contents

1. Siemens Sm@rtGear IE	2	4.9 Settings	16
1.1 Components and Features	4	4.9.1 Transfer Settings	16
1.1.1 Remote Enclosure	4	4.9.2 Source Settings	16
1.1.1.1 S71500 CPU	4	4.9.3 WL Breaker	17
1.1.1.2 Comfort Panel Display	4	4.9.4 VL Breaker	18
1.1.1.3 Network Switch	4	4.9.5 Power Meter	19
1.1.2 Switchgear	5	4.9.6 SEM3	20
1.1.2.2 VL Circuit Breaker	5	4.9.7 SEM3T	22
1.1.2.3 VA Circuit Breaker	5	4.9.8 Input Cards	23
1.1.2.4 Network Switch	6	4.10 Historical Logs	23
1.1.3 Optional	6	4.11 About	24
1.1.3.1 Power Meter	6	5. WL Monitoring Screens	25
1.1.3.2 Centralized IO Cards	6	5.1 Breaker Dashboard	25
2. Specifications	7	5.2 Metering	25
2.1 Environmental	7	5.3 Metering Trend	26
2.2 Industry Standards	7	5.4 Event/Trip Log	28
2.2.1 UL Listing	7	5.5 Statistics/Identification	28
2.2.2 Arc Resistance	7	5.6 Min/Max	29
2.2.3 Seismic Qualification	7	5.7 Protection	30
3. Quick Start Guide	8	5.8 Threshold Warnings	31
3.1 Sm@rtGear IE System Schematic Review	8	5.9 Metering Settings	32
3.2 Visual Inspection	8	5.10 Active Alarms	33
3.2.1 Locate the remote HMI display enclosure	8	5.10.1 Self-Reset Alarms	33
3.3 Equipment Installation	8	5.10.2 Latching Alarms	33
3.3.1 Ensure the Sm@rtGear IE has been installed	8	6. VL Monitoring Screens	34
3.3.2 Perform inspections and tests	8	6.1 Breaker Dashboard	34
3.3.3 Mount remote HMI enclosure	8	6.2 Metering	34
3.4 Customer Connections	8	6.3 Metering Trend	35
3.4.1 Using the Sm@rtGear IE system schematic	8	6.4 Trip Log	36
3.4.1.1 Running the #14 SIS control wire	8	6.5 Statistics/Identification	36
3.5 Customer Configuration	9	6.6 Diagnostic	37
3.5.1 Security	9	6.7 Protection	38
3.5.2 Breaker Protective Parameters	9	6.8 Active Alarms	39
3.6 Quick Start Checklist	9	6.8.1 Self-Reset Alarms	39
4. System Screens	10	6.8.2 Latching Alarms	39
4.1 System Selections Bar	10	7. Power Meter Screens	40
4.2 Elevation	10	7.1 Dashboard	40
4.2.1 Gear Diagram	10	7.2 Real Time Metering	41
4.3 One Line	11	8. Breaker Configuration	43
4.3.1 Transformer Symbol	11	8.1 Metering Settings	43
4.3.2 Breaker Icons	11	8.1.1 Primary Transformer	43
4.3.3 Mimic Bus	12	8.1.2 Primary Voltage	43
4.3.4 Meter Icons	12	8.1.3 Secondary V.T. Voltage	43
4.4 Group Maintenance Mode	13	8.1.4 Incoming Direction	43
4.5 Breaker Trending	13	8.1.5 Phase Rotation	43
4.6 Documents	15	8.2 Protective Parameters	43
4.7 CPU Health	15	8.2.1 L-Trip (IR)	43
4.8 Log Off	15	8.2.2 Time Lag Class (TR)	43

8.2.3 I4t-Curve for L	43	10.7 Optional System Capabilities	52
8.2.4 Phase Loss Sensitivity	44	10.7.1 Load Shedding and Load Prioritization	52
8.2.5 Thermal Memory	44	10.7.2 Peak Shaving	52
8.2.6 S-Trip (ISD)	44	10.8 Test Sequences	52
8.2.7 Delay Time (tsd)	44	10.8.1 Main-Tie-Main or Main-Main Configuration	52
8.2.8 I2t-Curve for S	44	10.8.1.1 Standard Main-Tie-Main or Main-Main Configuration	52
8.2.9 I-Trip (Ii)	44	10.8.1.2 Optional Main-Tie-Main or Main-Main Configuration	53
8.2.10 N-Protection (IN)	44	10.8.2 Main-Generator Configuration	53
8.2.11 Ground Fault (Ig)	44	10.8.2.1 Standard Main-Generator Configuration	53
8.2.12 Delay Time (tg)	44	10.8.2.2 Optional Main-Generator Configuration	54
8.2.13 I2t-Curve for G	44	11. Upper Level System Tie-In	55
8.2.14 Ground Fault Alarm (Ig2)	44	12. Service & Support	56
8.2.15 Load Management	44	13. Appendix	56
8.3 Protection Function Limits	44		
8.4 Threshold Alarms	45		
8.4.1 Threshold Alarms	45		
9. Optional Devices	46		
9.1 Source Metering	46		
9.1.1 Trending	46		
9.2 Surge Protective Devices (SPD)	46		
9.3 Door Monitoring	46		
9.4 Trip Coil Monitoring	46		
9.5 GPS Time Sync	46		
9.6 HRG	47		
9.7 Temperature Monitoring	48		
10. Autothrowover	49		
10.1 Autothrowover Definition	49		
10.2 Configurations	49		
10.3 System Control	49		
10.3.1 Standard Control Features	49		
10.3.2 Optional Control Features	49		
10.4 Autothrowover Components and Features	49		
10.4.1 Standard Components and Features	49		
10.4.2 Optional Components and Features	50		
10.5 Setpoints/Controls Screen	50		
10.5.1 Timer Setpoints	50		
10.5.2 Selector Switches	50		
10.5.3 Protective Relays	51		
10.5.4 Load Test	51		
10.6 Sequence of Operation	51		
10.6.1 Automatic Mode	51		
10.6.1.1 Loss of Primary	51		
10.6.1.2 Return to Primary – Standard Open Transition	51		
10.6.1.3 Return to Primary – Optional Closed Transition	51		
10.6.2 Manual Mode	52		
10.6.2.1 Standard Open Transition	52		
10.6.2.2 Optional Closed Transition	52		

1. Overview

Siemens Sm@rtGear IE

Siemens Sm@rtGear IE is preconfigured, preprogrammed and factory tested electrical distribution equipment that provides out-of-the-box remote monitoring, configuration and control of embedded intelligent devices.

The Sm@rtGear IE Central Processing Unit (CPU) communicates with the integrated and autonomous intelligent devices embedded in the electrical distribution equipment via a Human Machine Interface (HMI) touch screen panel. The embedded intelligent devices include:

- WL breakers
- VL breakers
- VA breaker
- Digital meters
- Protective relays
- Surge protection devices
- Environmental sensors
- Uninterruptible Power Supply (UPS)

The touch screen panel is mounted outside the arc flash boundary, greatly reducing the risk of arc flash injury for normal breaker operations, including open/close, racking, maintenance mode activation and configuration.

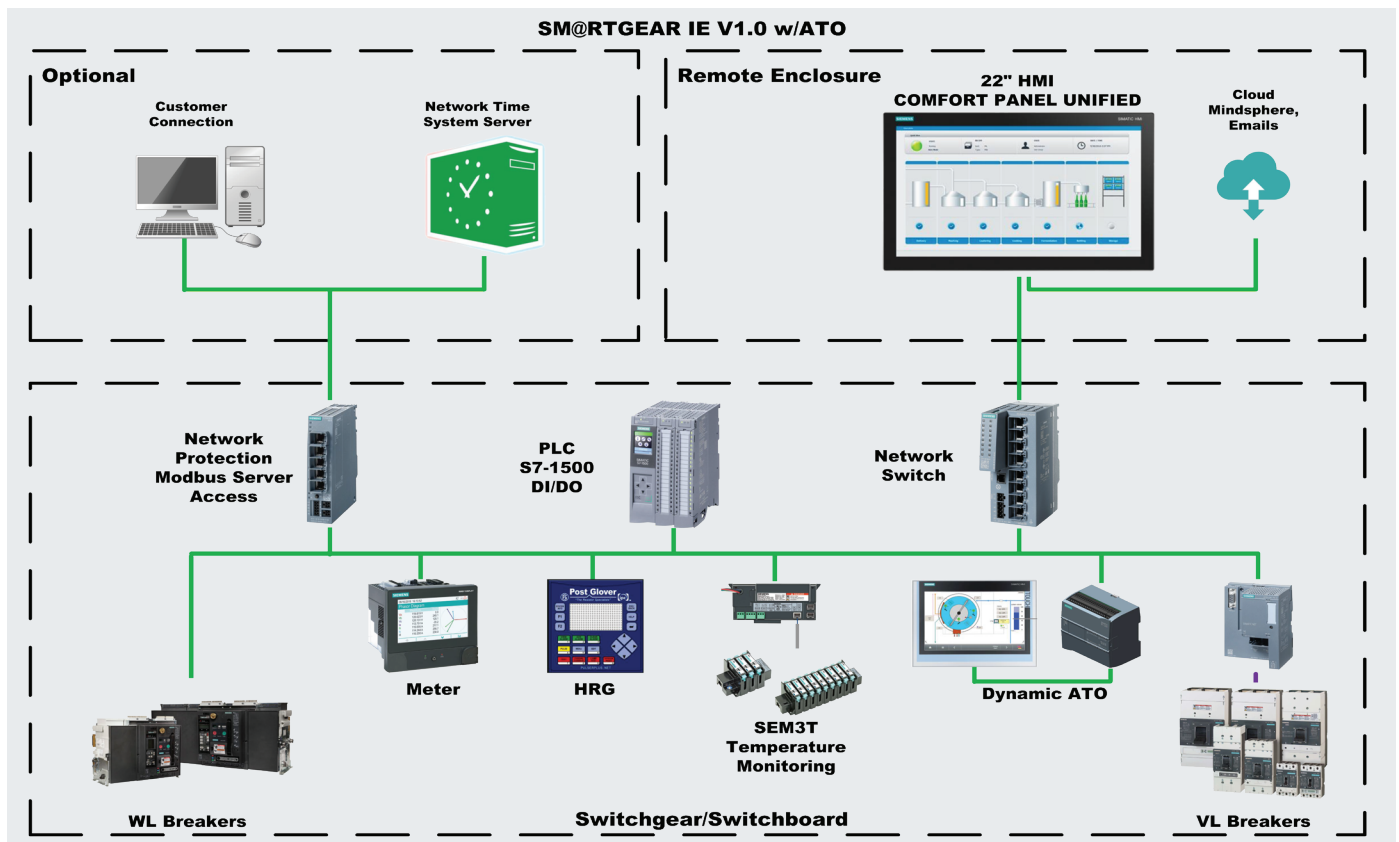
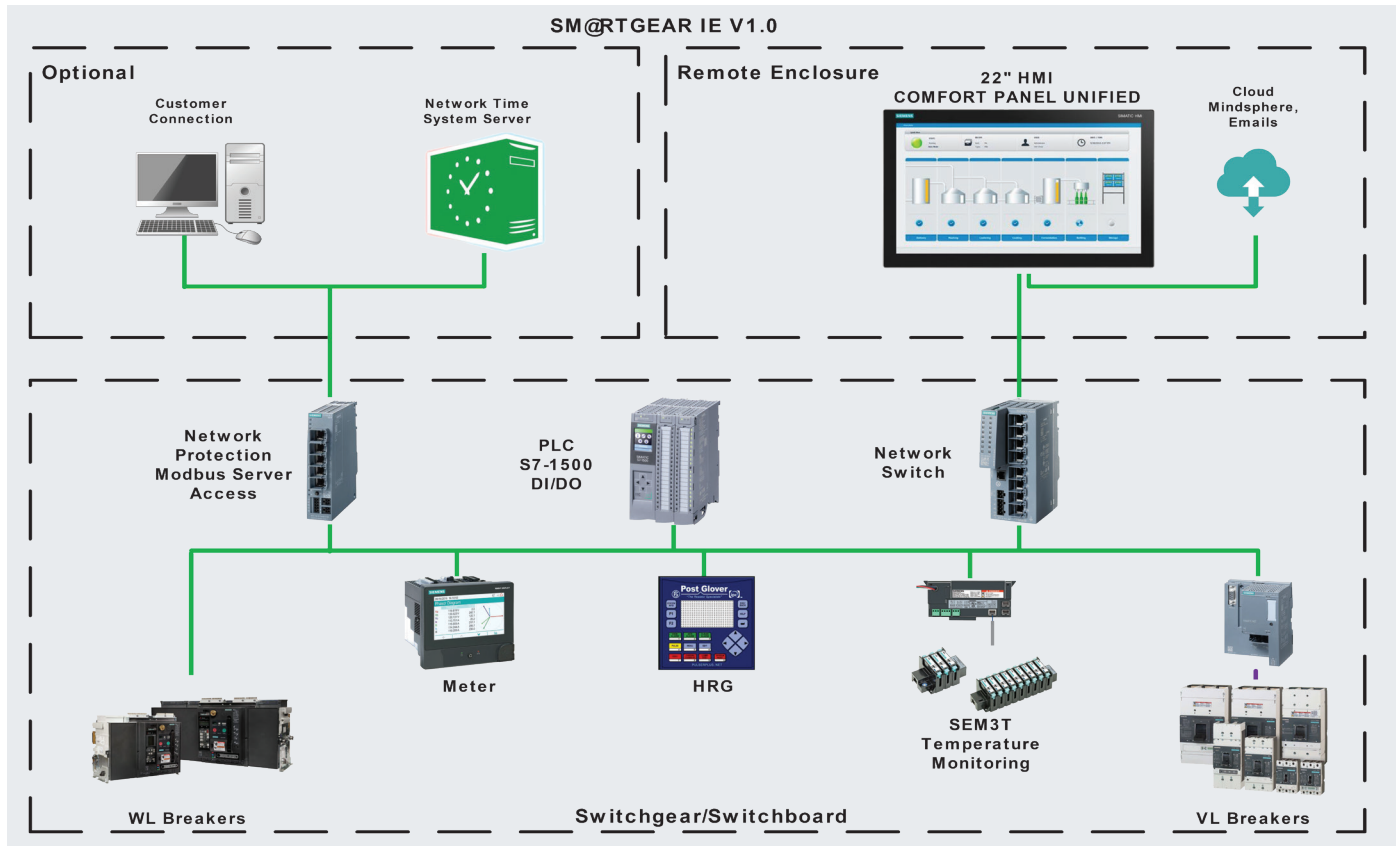
Field installation requires one communication cable and one control power cable that connect the Sm@rtGear IE to the remote HMI. The time and cost to connect multiple devices in a typical switchgear to a hardwired remote-control panel is eliminated.

The remote HMI communicates with the entire System Architecture to monitor, configure and control the Sm@rtGear IE from a safe distance outside of the arc flash boundary in the electrical room or in a control room. Just a few of the preconfigured and built-in features available with the Sm@rtGear IE include:

- Remote configuration, monitoring and control
- Self-diagnostic data
- Preventative/predictive maintenance data
- Environmental data
- Product documentation
- Maintenance/status reports that summarize data for all installed devices

The Sm@rtGear IE eliminates the need for upstream PMCS, PCS, DCS or SCADA systems. However, it is well equipped to support upstream supervisory systems using any communication protocol, including MODBUS, MODBUS TCP/IP, PROFIBUS, PROFINET and ETHERNET.

Service, parts and repairs are available seven days a week, 24 hours a day, 365 days a year. For assistance, call Siemens Industry Care Center (ICCC) at 800-333-7421.



1.1 Components and Features

1.1.1 Remote Enclosure

1.1.1.1 S71500 CPU

The S71500 CPU is pre-programmed to support remote configuration, monitoring, and control of the intelligent devices embedded in the Sm@rtGear IE.



1.1.1.2 Comfort Panel Display

The 22" touch panel HMI is pre-configured and programmed with an application specific graphical user interface (application specific elevation and one-line drawings). Energy saving LED background lighting can be dimmed up to 100 percent. The touch panel is long-lasting and luminous in brightly lit working environments.



1.1.1.3 Network Switch

The Scalance X-200 and S615 network switches offer a wide variety of functions, including PROFINET diagnostics and redundancy functions for seamless networks. The network switches consolidate all of the Ethernet-based devices into one communication connection that runs between the electrical distribution equipment and the remote HMI enclosure. It also supports SNMP network monitoring.

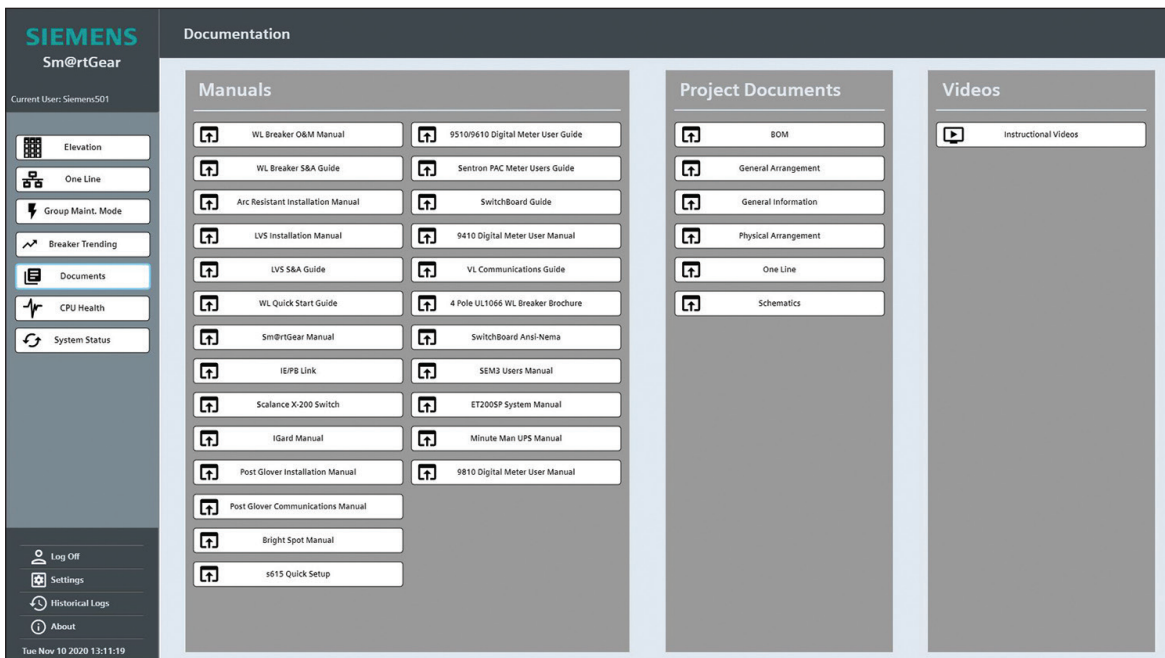


1.1.2 Switchgear

1.1.2.1 WL Circuit Breaker

Siemens WL circuit breakers offer an Extended Instantaneous Protection (patent pending) function delivering 100% of the full withstand rating of the frame and the breaker's maximum Interrupting Rating. ETU 776 trip units are installed in all breakers with Dynamic Arc Flash Sentry (DAS) to reduce arc flash incident energy. Additionally, integrated racking handles and front-mounted terminal blocks reduce installation time and errors. Safety-related features include a visible ready-to-close indicator, customizable interlocking and mechanical trip indication.

WL breakers may vary depending on the switchgear design. See the As-Built drawings within the Documentation screen for exact WL breakers installed.



1.1.2.2 VL Circuit Breaker



1.1.2.3 VA Circuit Breaker



1.1.2.4 Network Switch

The Scalance X-200 switch offers a wide variety of functions, including PROFINET diagnostics or redundancy functions for seamless networks. The network switch consolidates all of the Ethernet based-devices into one communication connection that runs between the electrical distribution equipment and the remote HMI enclosure. It also supports SNMP network monitoring.



1.1.3 Optional

1.1.3.1 Power Meter

The SENTRON PAC3200, SENTRON PAC4200, ACCESS 9510, ACCESS 9610, SIEMENS 9410 and SIEMENS 9810 power metering devices store, monitor and display all relevant low voltage power distribution parameters in single-, two- and three-phase measurements. A comprehensive, parameterizable signaling system monitors application-specific events, including limit violations and operator interventions.

1.1.3.2 Centralized IO Cards

Centralized IO Cards can be supplied into the switchgear to receive customer specific I/Os.

NOTE: For additional information on optional devices refer to section 8. For additional information on the components featured in the Sm@rtGear IE refer to Siemens Download Center

2. Specifications

2.1 Environmental

Storage Environment

- 40 to 110 degrees F
- 5 to 80% humidity (non-condensing)

Operating Environment

- 0 to 104 degrees F
- 5 to 90% humidity (non-condensing)

2.2 Industry Standards

Type WL switchgear with power circuit breakers are designed, tested and constructed in accordance with the following industry standards:

- UL 1558 – Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear
- ANSI C37.20.1 – Metal-Enclosed Low Voltage Power Circuit Breaker Switchgear
- ANSI C37.50 – Test Procedure for Low Voltage AC Power Circuit Breakers Used in Enclosures
- ANSI C37.51 – Conformance Testing of Metal-Enclosed Low Voltage AC Power Circuit Breaker Switchgear Assemblies
- NEMA SG5 – Power Switchgear Assemblies
- Applicable requirements of the National Electric Code (NEC)
- UL 1066 – Low Voltage AC and DC Power Circuit Breakers Used in Enclosures
- ANSI C37.13 – Low Voltage AC Power Circuit Breakers Used in Enclosures
- ANSI C37.16 – Preferred Ratings, Related Requirements, and
- Application for Low Voltage Power Circuit Breakers and AC Power Circuit Protectors
- ANSI C37.17 – Trip Devices for AC and General Purpose DC LowVoltage Power Circuit Breakers
- NEMA SG3 - Low Voltage Power Circuit Breakers

2.2.1 UL Listing

Underwriters' Laboratories listing mark (UL) is supplied for each vertical section provided all devices within a vertical section are UL Listed or UL Recognized and suitable for the intended use. All circuit breaker drawn-out elements are UL Listed.

Optional CSA compliance with UL labeling is available.

2.2.2 Arc Resistance

Optional Type WL arc-resistant low voltage switchgear is available and is UL-listed to ANSI/IEEE C37.20.7. Type 2B arc-resistant accessibility rating with maximum internal arcing short-circuit current rating of 100kA @508V.

2.2.3 Seismic Qualification

Seismic qualification to all major seismic construction standards (IBC, UBC, CBC, SBC, BOCA and IEEE 693) is available.

3. Quick Start Guide

This section contains instructions pertaining to the receipt, inspection, installation and testing of Siemens Sm@rtGear IE.

3.1 Sm@rtGear IE System Schematic Review

Every Sm@rtGear IE shipment includes a system schematic drawing that was created for that particular system configuration. A hard copy of the Sm@rtGear IE system schematic is located in the As-Built drawings package found in the electrical distribution equipment. An electronic copy is also located in the Documentation folder on the HMI. Attached below is a typical Sm@rtGear IE system schematic.

3.2 Visual Inspection

3.2.1

Locate the remote HMI display enclosure. Open the enclosure and identify the customer connection components - network switch and control power terminal blocks. A photo of each component is shown in Section 1.1 .

3.3 Equipment Installation

3.3.1

Ensure the Sm@rtGear IE has been installed per instruction and installation guide 11-C-9100-01 or 11-C-9887-01.

3.3.2

Perform inspections and tests necessary for the specific application to ensure the Sm@rtGear IE is safe and ready for CPU testing/setup.

3.3.3

Mount remote HMI enclosure, per industry standards, outside of the arc flash zone. Mounting is preferable in a controlled environment in view of the electrical room.

3.4 Customer Connections

3.4.1

Using the Sm@rtGear IE system schematic ensure that the following customer connections, highlighted in red circular dashes, are made:

3.4.1.1

#14 SIS control wire must be run from the control power terminal blocks in the Sm@rtGear IE to the control power terminal blocks in the remote HMI enclosure. This wire cannot occupy the same conduit as fiber optic or RJ-45 communication cables.

3.5 Customer Configuration

3.5.1 Security

Users must be added and their security level access must be defined prior to logging into the system.

3.5.2 Breaker Protective Parameters

WL breaker Protective Parameter settings must be entered. The Protective Parameter settings are usually determined by a short circuit and coordination study. An arc flash study should also be done to determine Arc Flash Maintenance Mode settings. Arc flash maintenance mode settings equate to the Parameter B breaker settings in the Sm@rtGear IE.

3.6 Quick Start Checklist

Review the following steps when commissioning Siemens Sm@rtGear IE.

- ✓ Sm@rtGear IE System Schematic Review (Section 3.1)
- ✓ Visual Inspection (Section 3.2)
- ✓ Equipment Installation (Section 3.3)
- ✓ Customer Connections (Section 3.4)
- ✓ Customer Configuration (Section 3.5)

4. System Screens

4.1 System Selections Bar

The System Selections Bar is located on the left side of the screen on the Elevation screen. It contains the Current User, Elevation, One Line, Group Maintenance Mode, Breaker Trending, Documents, CPU Health, System Status, Log Off, Settings, Historical Logs, About and system date/time.

- System date/time is synced off of the HMI date/time unless a NTP time server is used. Any changes to the HMI date/time auto-update the date/time on the PLC.
- CPU status reflects its current status.
- System Mode setting displays which system mode is currently selected (i.e. auto or manual).
- Retransfer Mode setting displays which retransfer setting option is currently selected (i.e. auto or manual).
- Transition Mode setting displays which transition mode option is currently selected (i.e. open or closed).

4.2 Elevation

The Elevation Screen shows real time status of the breakers and bus in the Sm@rtGear IE. Everything on the Elevation Screen is interactive and precisely represents the Sm@rtGear IE in real time. The bus changes colors to indicate when it is inside or outside of a parameter. Bus colors change to red when energized and healthy. Orange represents a bus if energized and unhealthy. Green indicates the bus is dead. Purple shows there is a communications failure with unknown status. The closed, open and DAS lights on the breakers also change color based on the states of the breaker and the DAS. The red light appears when the breaker is closed, and the light changes to green when open. The same view of the Sm@rtGear IE is represented in a One Line screen made up of ANSI standard symbols. The Elevation screen is a customized gear overview designed to match each individual Sm@rtGear IE. All sections, compartments and devices are represented. Below are detailed descriptions of each item typically found on an elevation.



4.2.1 Gear Diagram

The largest part of the Elevation Screen is devoted to the Gear Diagram. Below is a list of important items and data found in most diagrams.

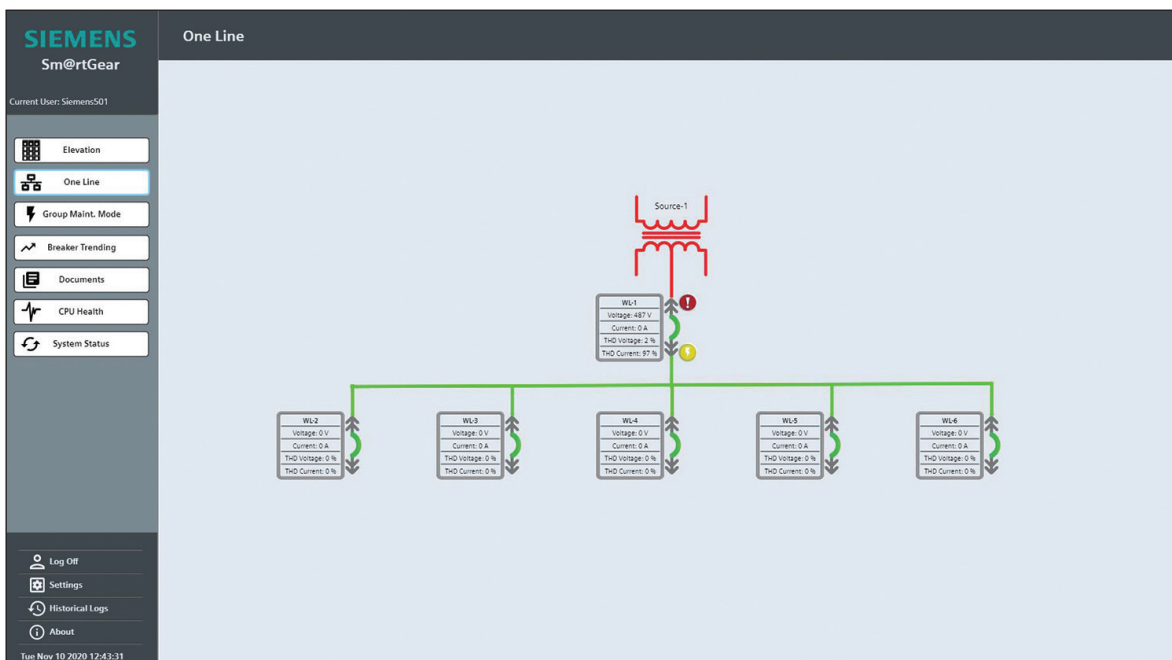
- Each meter has a picture corresponding to the physical location within the Sm@rtGear IE. Touching the picture opens a detail screen.
- Each breaker has an animated representation that corresponds to its location in the Sm@rtGear IE.
- Touching the breaker opens a detailed pull up screen.
- Open/close status and change are displayed based on the state of the breaker.
- Connect/test/disconnect/not available positions correspond with the state of the breaker.
- Each breaker has status lights that change based on the state (open/close) of the breaker.

- Each breaker has a designated nameplate. Nameplate wording can be customized. See the Settings section in this manual for additional information.
- Each HRG unit has an icon corresponding to its physical location within the Sm@rtGear IE. Touching the icon opens the detailed HRG unit screen.
- Mimic Bus is routed throughout the Sm@rtGear IE diagram. It represents the bus within the Sm@rtGear IE. As noted above, the Mimic Bus changes color reflecting different bus states:
 - Green – bus is dead (de-energized)
 - Red – bus is healthy (energized)
 - Orange – bus unhealthy (under voltage or other condition present)
 - Purple – bus status unknown (loss of communication)
- Right click on a breaker displays the Breaker Metering pop-up window. Breaker Metering displays the Breaker Name, Voltage Average, Current Average, THD Voltage and THD Current.

4.3 One Line

The One Line screen contains the same information as the Elevation Screen represented as ANSI standard symbols.

The ANSI standard symbols give a total system overview in a traditional format.



4.3.1 Transformer Symbol

The symbol changes color based on state of the component.

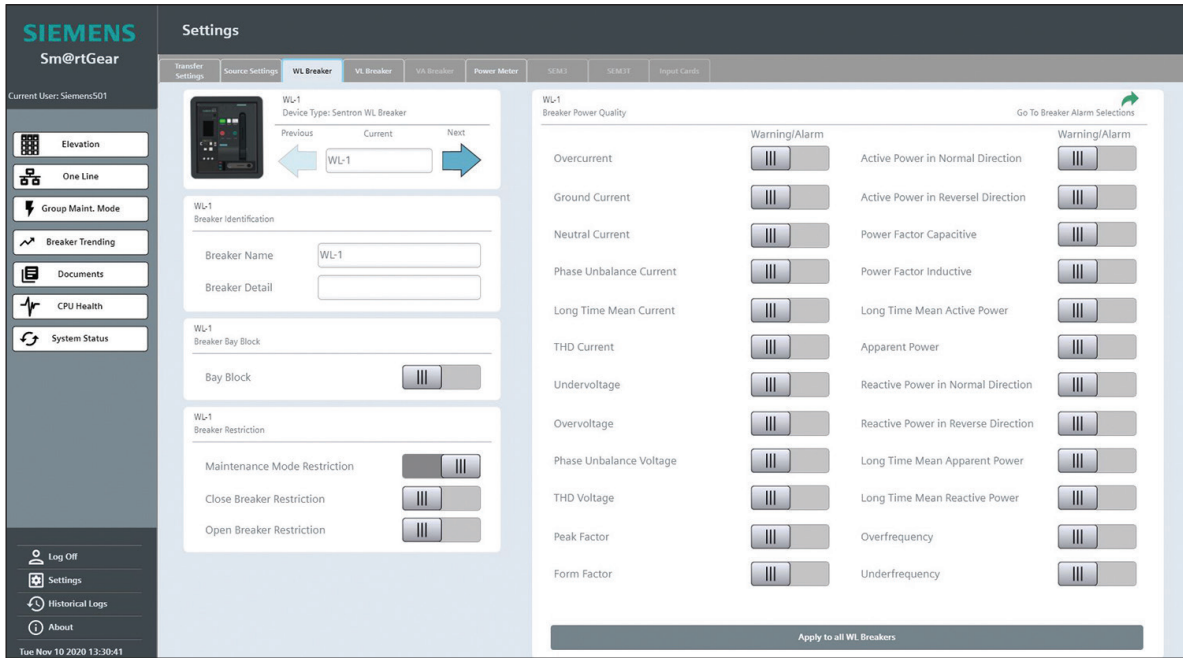
Color key:

- Green – bus is dead (de-energized)
- Red – bus is healthy (energized)
- Orange – bus unhealthy (under voltage or other condition present)
- Purple – bus status unknown (loss of communication)

4.3.2 Breaker Icons

Breaker icons show the breakers current states and nameplate information. Additional features include:

- Touching the breaker opens a detailed screen.
- Open/close status and change is displayed based on the state of the breaker.
- Connect/test/disconnect/not available positions correspond with the state of the breaker.
- Breakers can be blocked with a Bay Block feature. Reference Settings screen.
- Each breaker has a nameplate. Wording can be customized. Reference Settings screen.



4.3.3 Mimic Bus

Mimic Bus is routed throughout the One Line diagram and represents the bus within the Sm@rtGear IE. The Mimic Bus changes colors according to the state of the switchgear.

- Green – bus is dead (de-energized)
- Red – bus is healthy (energized)
- Orange – bus unhealthy (under voltage or other condition present)
- Purple – bus status unknown (loss of communication)

4.3.4 Meter Icons

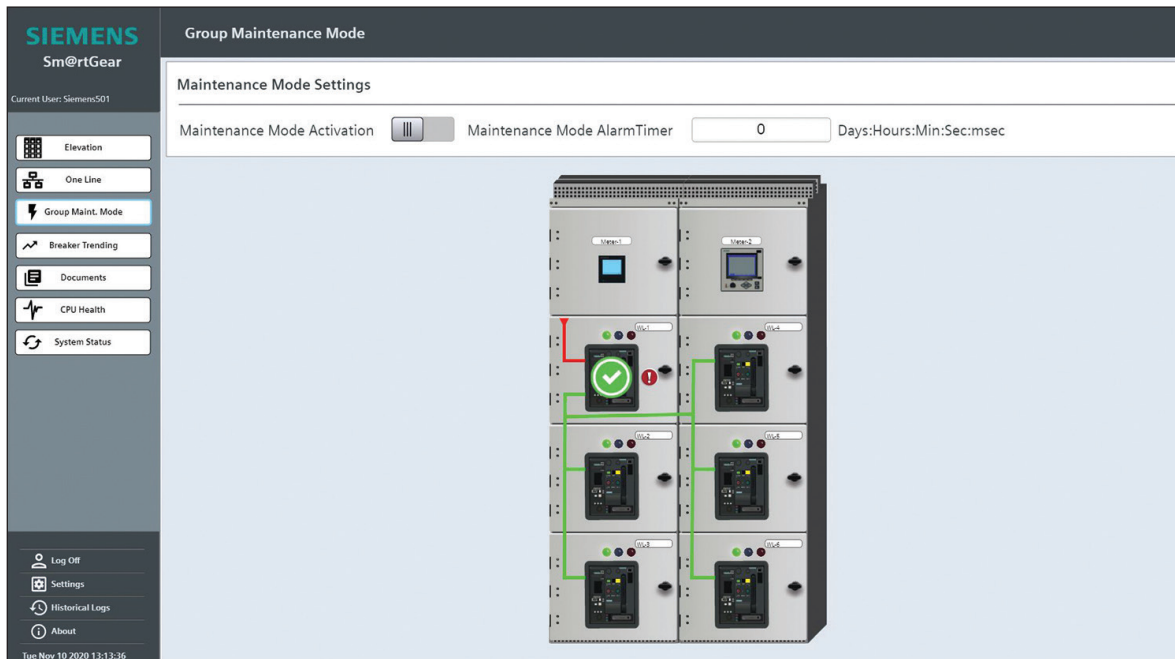
Specific meter icons are located on the One Line screen. Touching the icon opens a detailed meter screen.

4.4 Group Maintenance Mode

This screen allows the user to control the arc flash maintenance mode for one or multiple breakers using the virtual control switch.

In the gear diagram, one or more breakers can be selected by clicking the breaker, which will display a green check mark.

At the top of the screen, the maintenance mode activation switch can be used to turn on or off the maintenance mode associated with all the breakers selected in the gear diagram.



4.5 Breaker Trending

The Breaker Trending displays a trend of all historical breaker metering values. Across the top of the Breaker Trending screen, there are tabs for the WL Breaker, VL Breaker and VA Breaker.

The Current Trend section is located in the upper segment of the Breaker Trending screen. This section contains arrows which are used to toggle between breakers from the system level. Once a breaker is set, a historical trend will be displayed for up to 30 days.

There is a button bar at the bottom of the Breaker Trending which contains buttons for the following actions:

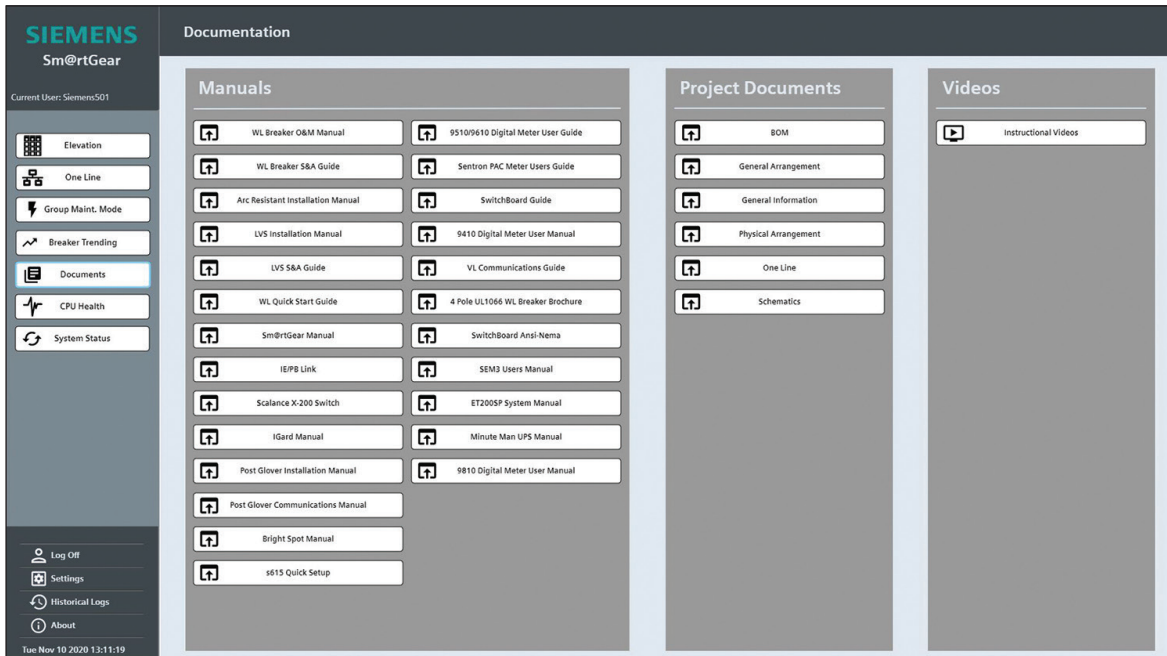
- First record
- Previous record
- Start stop
- Next record
- Last record
- Ruler
- Zoom time axis +/-
- Zoom area
- Original view
- Select time range
- Select trends
- Export

Clicking the “select trends” button calls a pop-up window which includes selections for the following values:

- Phase Unbalance Current
- Long Time Mean Current Average
- Long Time Mean Current L1
- Long Time Mean Current L2
- Long Time Mean Current L3
- Current L1
- Current L2
- Current L3
- Mean Current Average
- Neutral Current
- Ground Current
- Phase Unbalance Voltage
- L1-L2 Volts
- L2-L3 Volts
- L3-L1 Volts
- L1-N Volts
- L2-N Volts
- L3-N Volts
- L-L Volts
- L-N Volts
- Total Apparent Power
- Total Active Power
- Active Power L1
- Active Power L2
- Active Power L3
- Total Reactive Power
- Total Long Time Mean Active Power
- Long Time Mean Active Power L1
- Long Time Mean Active Power L2
- Long Time Mean Active Power L3
- Total Long Time Apparent Power
- Apparent Power L1
- Apparent Power L2
- Apparent Power L3
- Long Time Apparent Power L1
- Long Time Apparent Power L2
- Long Time Apparent Power L3
- Total Long Time Reactive Power
- Reactive Power L1
- Reactive Power L2
- Reactive Power L3
- Total Mean Value Power Factor
- Power Factor L1
- Power Factor L2
- Power Factor L3
- Frequency
- THD Current
- THD Voltage
- Cradle Temperature in Celsius
- Breaker Temperature in Celsius

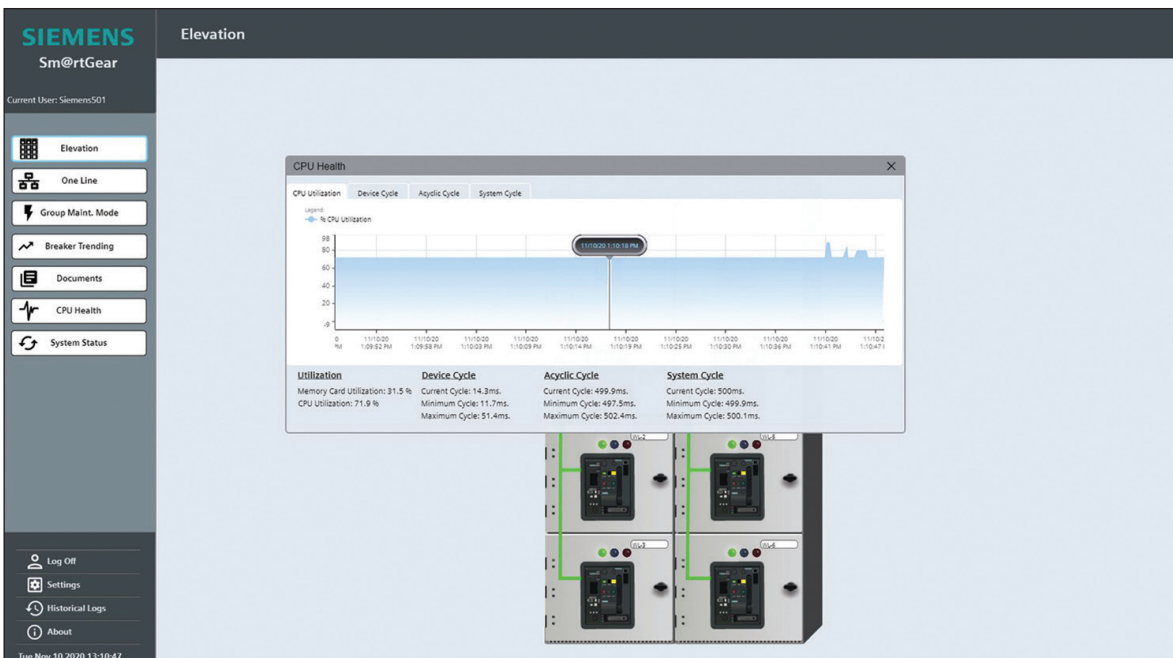
4.6 Documents

The Documentation screen includes all Siemens manuals and schematics for each Sm@rtGear IE lineup. The documentation is accessed directly on the HMI or from a designated folder on the CPU. Typical default location of files is C:/Siemens_Files/PDF. Pressing any button on the Documentation screen opens a document.



4.7 CPU Health

The CPU Health pop-up window displays the utilization of the processor and the memory card and the cycle time of the three cycle clusters which are running: device cycle, acyclic cycle and system cycle.



4.8 Log Off

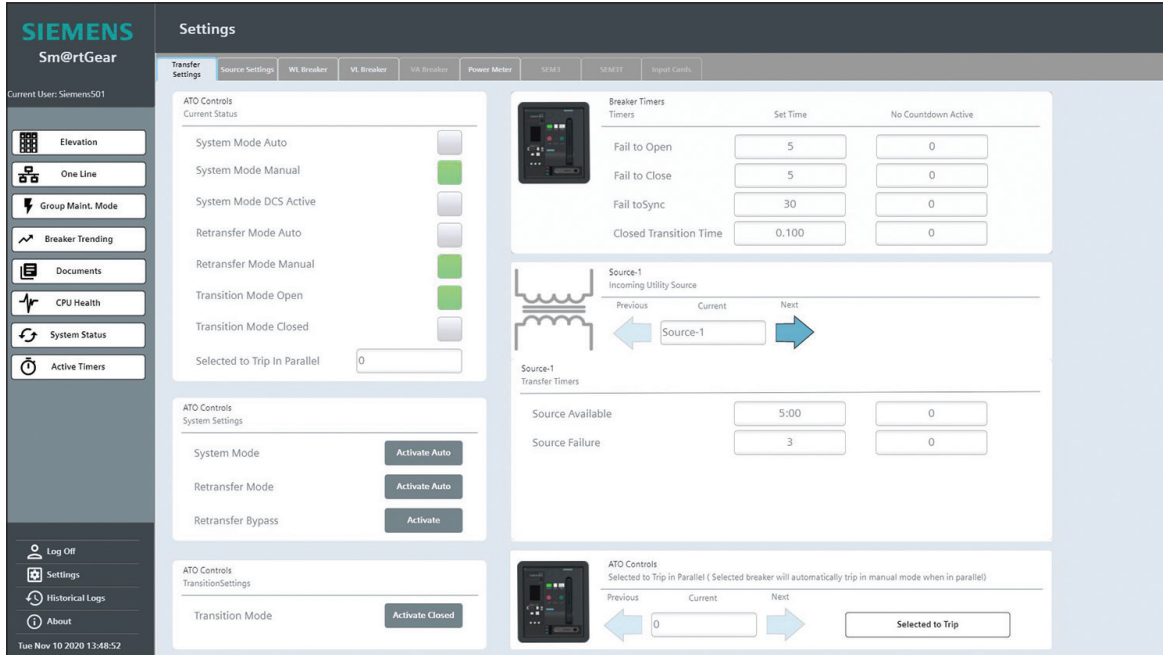
Clicking the Log Off button calls a pop-up window which displays the question "Are you sure you want to log off?" Click Cancel to go back or click Confirm to log off.

4.9 Settings

4.9.1 Transfer Settings

The ATO Controls section is located on the left of the Transfer Settings screen. This section displays a green light for System Mode Auto, System Mode Manual, System Mode DCS Active, Retransfer Mode Auto and Retransfer Mode Manual.

The Breaker Timers section is located on the right of the Transfer Settings screen. This section displays readings for Set Time and No Countdown Active for both Fail to Open and Fail to Close.



4.9.2 Source Settings

The Incoming Utility Source section is located in the upper left of the Source Settings screen. The section contains arrows which are used to toggle between Sources.

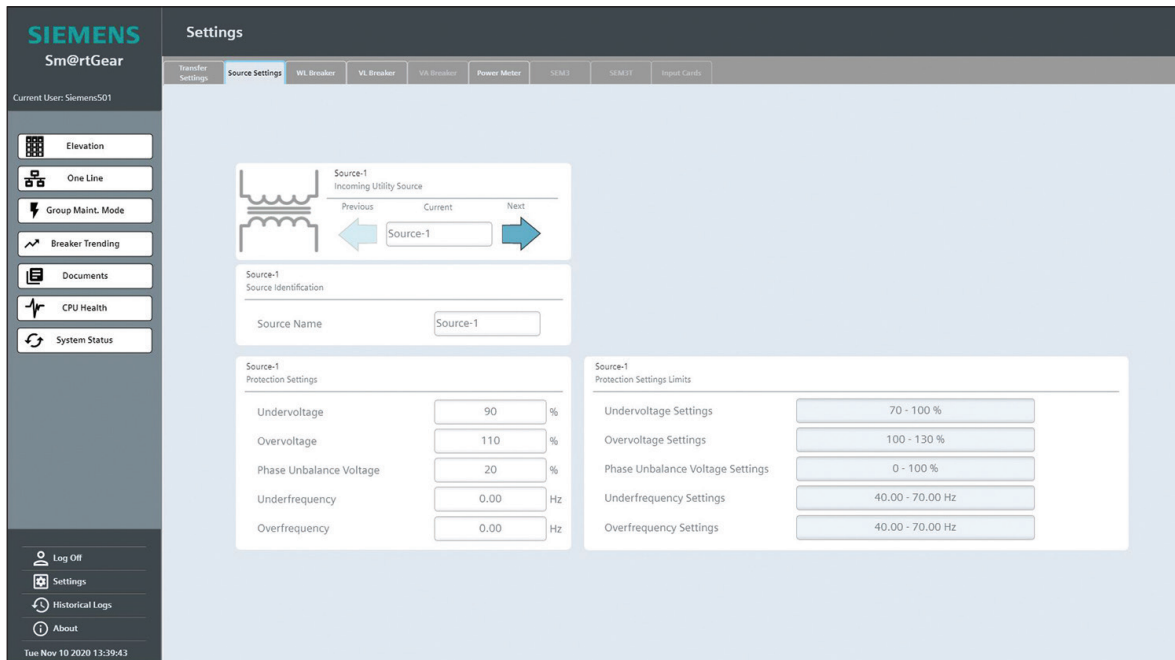
The Source Identification section is located in the mid left of the Source Settings screen. The section allows users to edit the Source Name of the selected Source.

The Protection Settings section is located in the lower left of the Source Settings screen. This section allows users to edit the following values:

- Undervoltage
- Overvoltage
- Phase Unbalance Voltage
- Underfrequency
- Overfrequency

The Protection Settings Limits section is located in the lower right of the Source Settings screen. The section displays limits for the following values:

- Undervoltage Settings
- Overvoltage Settings
- Phase Unbalance Voltage Settings
- Underfrequency Settings
- Overfrequency Settings



4.9.3 WL Breaker

The Device Type section is located in the upper left of the WL Breaker Settings screen. This section contains arrows which are used to toggle between WL Breakers.

The Breaker Identification section is located in the upper left of the WL Breaker Settings screen. This section contains the Breaker Name and Breaker Detail values. When edited, the nameplate changes are reflected on the Elevation, One Line and Network Settings screens. Nameplate length is limited to eight characters.

The Breaker Bay Block section is located in the mid left of the WL Breaker Settings screen. This section contains the Bay Block on/off switch. Bay Blocking turns off any breaker in the system. The node is no longer part of the system cycle scan and no information from the node is available on the HMI. The system does not waste time scanning a breaker until Bay Blocking is unlocked.

Note: If a Main, Tie or Generator breaker that is part of an Auto Throw Over scheme is placed into Bay Blocking, System Mode is forced into Manual Mode and Auto Operations will be allowed. This prevents unwanted system paralleling of the bus through a node with an unknown status.

The Breaker Restriction section is located in the lower left of the WL Breaker Settings screen. This section contains the Maintenance Mode Restriction, Close Breaker Restriction and Open Breaker Restriction on/off switches. A pop-up box command restricts Open, Close or DAS operations (Figure 30). If the Open box is checked for a specific breaker, the Open operation through the remote HMI is restricted and that breaker will no longer remotely open. If Close is selected, that breaker can no longer be closed through the remote HMI. Open and Close operations are still allowed when restricted from the breakers pushbuttons located on the breaker. If DAS is selected, the breaker will be locked in the current parameter and will not change from the remote interface.

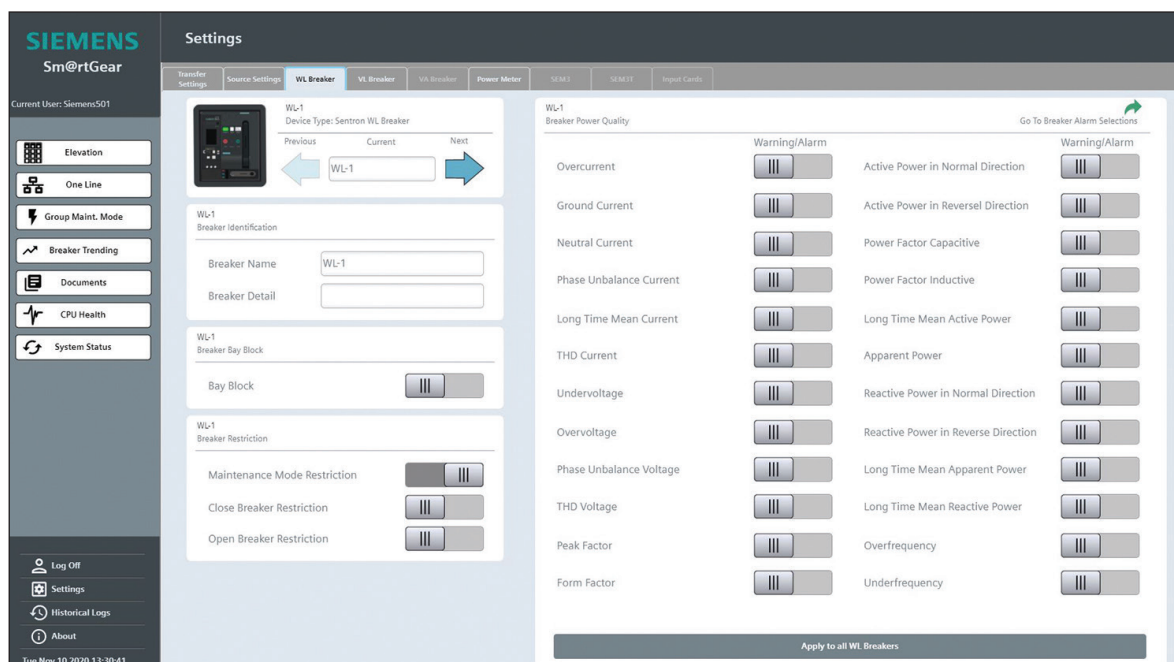
This remote electronic lockout function enhances mechanical lockout procedures and is an important extra step toward increasing personnel safety.

The System Power Quality section is located in the lower left of the WL Breaker Settings screen. This section contains the System Power Quality Warning/Alarm on/off switch.

The WL Power Quality section is located in the right of the WL Settings screen. This section contains on/off switches for the following values:

- Overcurrent
- Ground Current
- Neutral Current
- Phase Unbalance Current
- Long Time Mean Current
- THD Current
- Undervoltage
- Overvoltage

- Phase Unbalance Voltage
- THD Voltage
- Peak Factor
- Form Factor
- Active Power in Normal Direction
- Active Power in Reverse Direction
- Power Factor Capacitive
- Power Factor Inductive
- Long Time Mean Active Power
- Apparent Power
- Reactive Power in Normal Direction
- Reactive Power in Reverse Direction
- Long Time Mean Apparent Power
- Long Time Mean Reactive Power
- Overfrequency
- Underfrequency



4.9.4 VL Breaker

The Device Type section is located in the upper left of the VL Breaker Settings screen. This section contains arrows which are used to toggle between VL Breakers.

The Breaker Identification section is located in the upper left of the VL Breaker Settings screen. This section contains the Breaker Name and Breaker Detail values. When edited, the nameplate changes are reflected on the Elevation, One Line and Network Settings screens. Nameplate length is limited to eight characters.

The Breaker Bay Block section is located in the mid left of the VL Breaker Settings screen. This section contains the Bay Block on/off switch. Bay Blocking turns off any breaker in the system. The node is no longer part of the system cycle scan and no information from the node is available on the HMI. The system does not waste time scanning a breaker until Bay Blocking is unlocked.

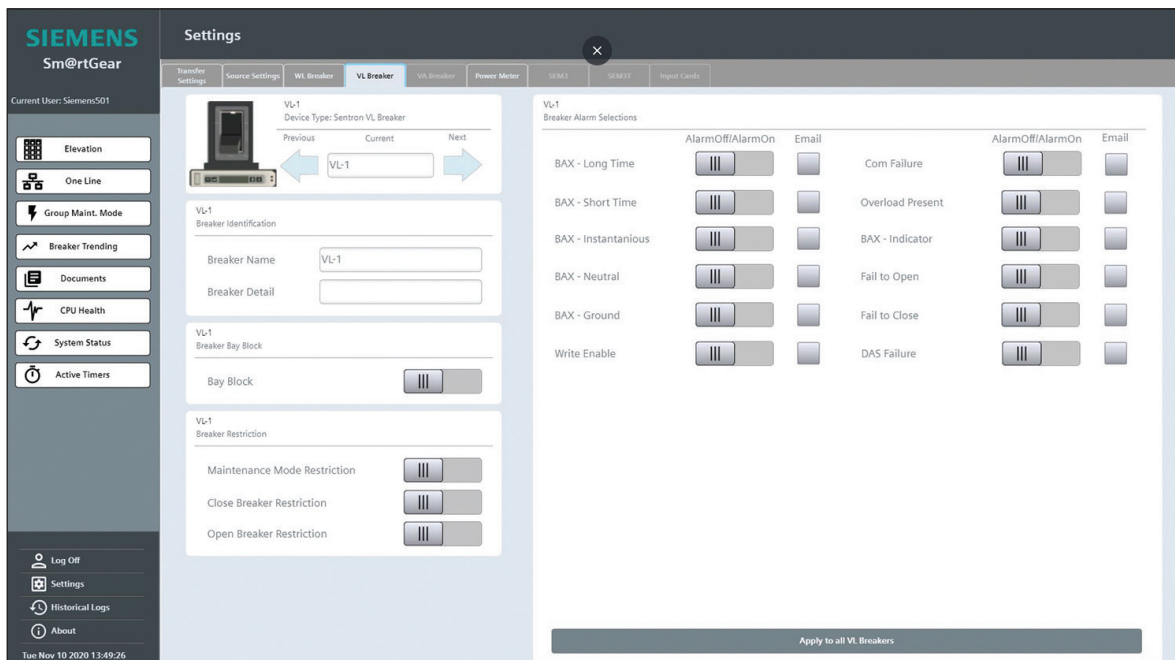
Note: If a Main, Tie or Generator breaker that is part of an Auto Throw Over scheme is placed into Bay Blocking, System Mode is forced into Manual Mode and Auto Operations will be allowed. This prevents unwanted system paralleling of the bus through a node with an unknown status.

The Breaker Restriction section is located in the lower left of the VL Breaker Settings screen. This section contains the Maintenance Mode Restriction, Close Breaker Restriction and Open Breaker Restriction on/off switches. A pop-up box command restricts Open, Close or DAS operations (Figure 30). If the Open box is checked for a specific breaker, the Open operation through the remote HMI is restricted and that breaker will no longer remotely open. If Close is selected, that breaker can no longer be closed through the remote HMI. Open and Close operations are still allowed when restricted from the breakers pushbuttons located on the breaker. If DAS is selected, the breaker will be locked in the current parameter and will not change from the remote interface.

This remote electronic lockout function enhances mechanical lockout procedures and is an important extra step toward increasing personnel safety.

The VL Power Quality section is located in the right of the VL Breaker Settings screen. This section contains on/off switches for the following values:

- Overcurrent
- Ground Current
- Neutral Current
- Phase Unbalance Current
- Long Time Mean Current
- THD Current
- Undervoltage
- Overvoltage
- Phase Unbalance Voltage
- THD Voltage
- Peak Factor
- Form Factor
- Active Power in Normal Direction
- Active Power in Reverse Direction
- Power Factor Capacitive
- Power Factor Inductive
- Long Time Mean Active Power
- Apparent Power
- Reactive Power in Normal Direction
- Reactive Power in Reverse Direction
- Long Time Mean Apparent Power
- Long Time Mean Reactive Power
- Overfrequency
- Underfrequency



4.9.5 Power Meter

The Device Type section is located in the upper left of the Power Meter Settings screen. This section contains arrows which are used to toggle between Power Meters.

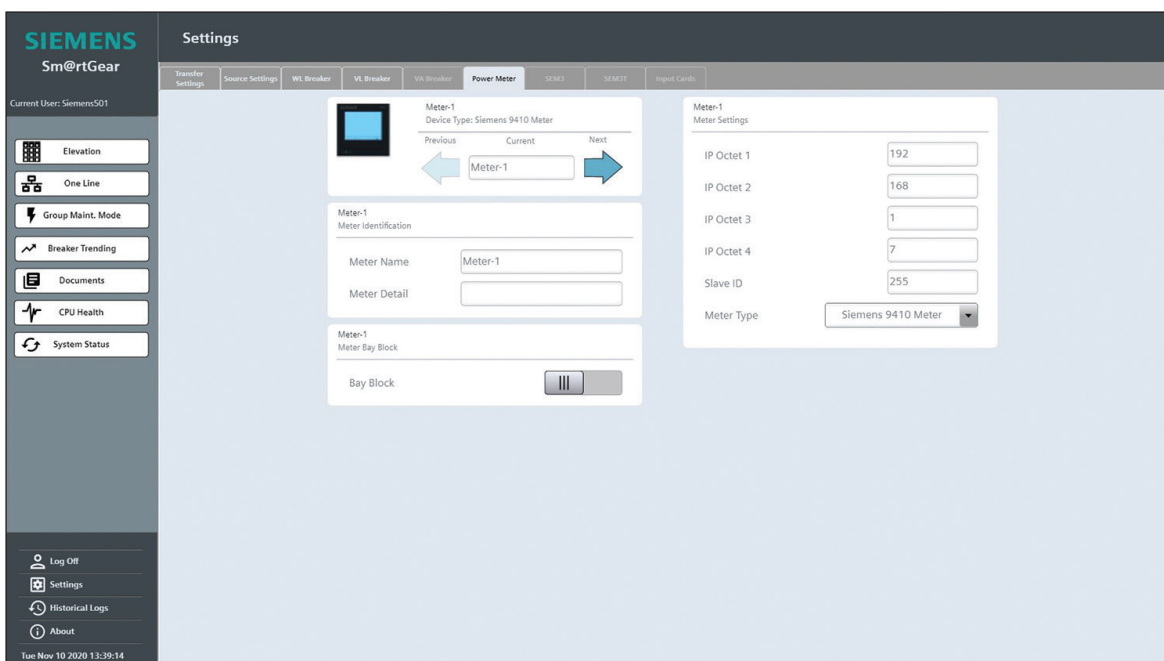
The Meter Identification section is located in the mid left of the Power Meter Settings screen. This section contains the Meter Name and Meter Detail values. When edited, the nameplate changes are reflected on the Elevation, One Line and Network Settings screens. Nameplate length is limited to eight characters.

The Meter Bay Block section is located in the lower left of the Power Meter Settings screen. This section contains the Bay Block on/off switch. Bay Blocking turns off any meter in the system. The node is no longer part of the system cycle scan and no information from the node is available on the HMI. The system does not waste time scanning a device until Bay Blocking is unlocked.

Note: If a Main, Tie or Generator breaker that is part of an Auto Throw Over scheme is placed into Bay Blocking, System Mode is forced into Manual Mode and Auto Operations will be allowed. This prevents unwanted system paralleling of the bus through a node with an unknown status.

The Meter Settings section is located in the right of the Power Meter Settings screen. This section contains following values:

- IP Octet 1
- IP Octet 2
- IP Octet 3
- IP Octet 4
- Slave ID
- Meter Type



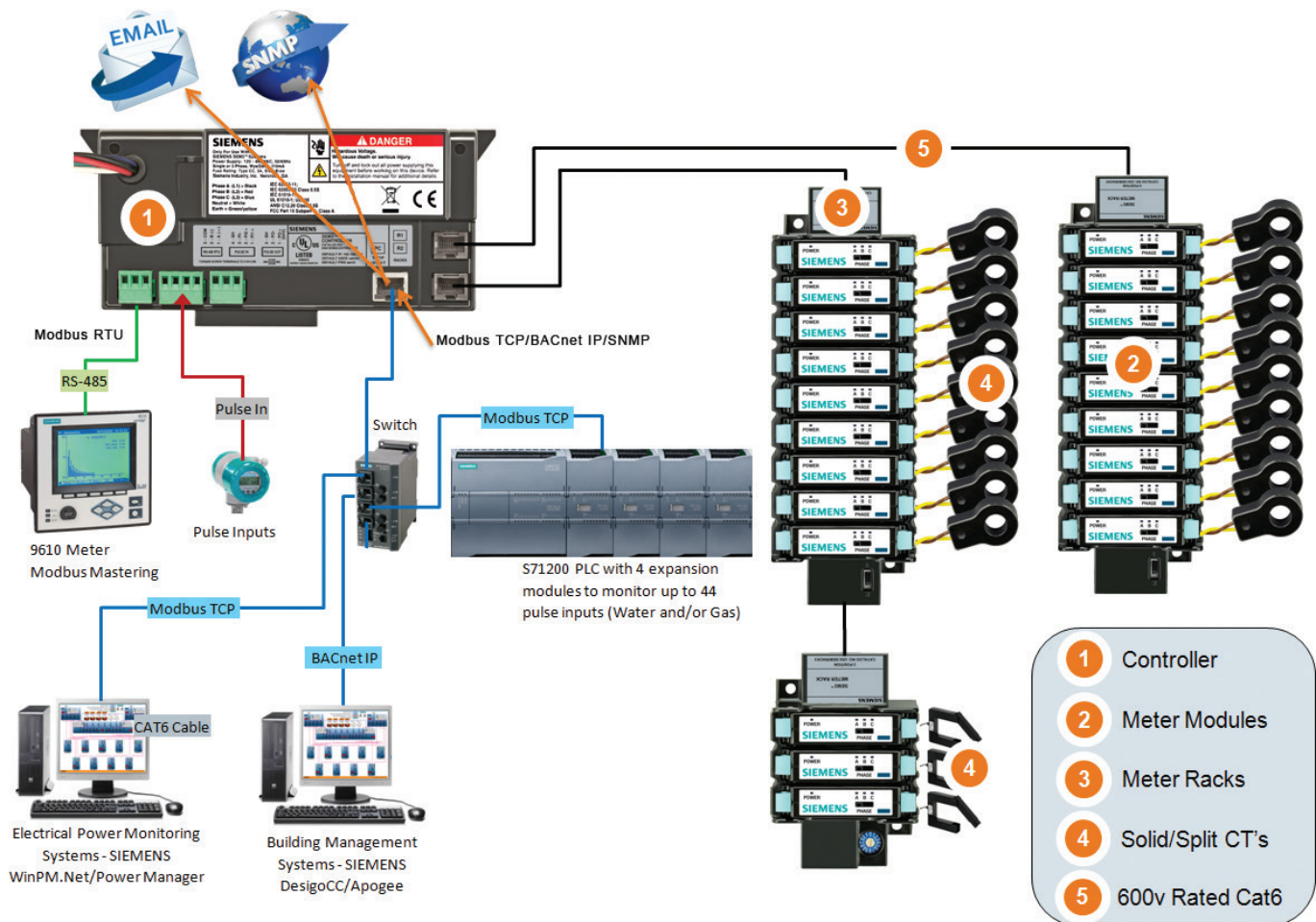
4.9.6 SEM3

Siemens Embedded Micro Metering Module (SEM3) is a modular metering solution for energy monitoring, data analysis, and sub billing applications. The flexible design allows for low, medium, and high density metering requirements to be met efficiently and economically using only a few standardized components that may be integrated into Panelboard, Switchboard, PDU, RPP, and Busplug products. SEM3 is pre-engineered to integrate into Siemens Panelboards, Switchboards, and Busplugs but is also offered for retrofit applications as well.

The SEM3, innovative and cost effective metering solution, can be incorporated into existing applications such as power monitoring, building automation, and sub-billing systems. SEM3 also has the flexibility to be installed as a standalone solution with real time data available from the controller's standard built-in web pages. This metering product has two levels of accuracy to meet the market's differing requirements and price points. This versatile system allows you to meter just the loads you need without the excess hardware and space requirements of traditional or competing solutions. SEM3 now has the ability to communicate via Modbus, BACnet, SNMP and SMTP. SEM3 web pages can also be set by the user to any of four languages (English, German, French or Spanish).

Embedded Micro Metering Module

SEM3 Sample Configuration



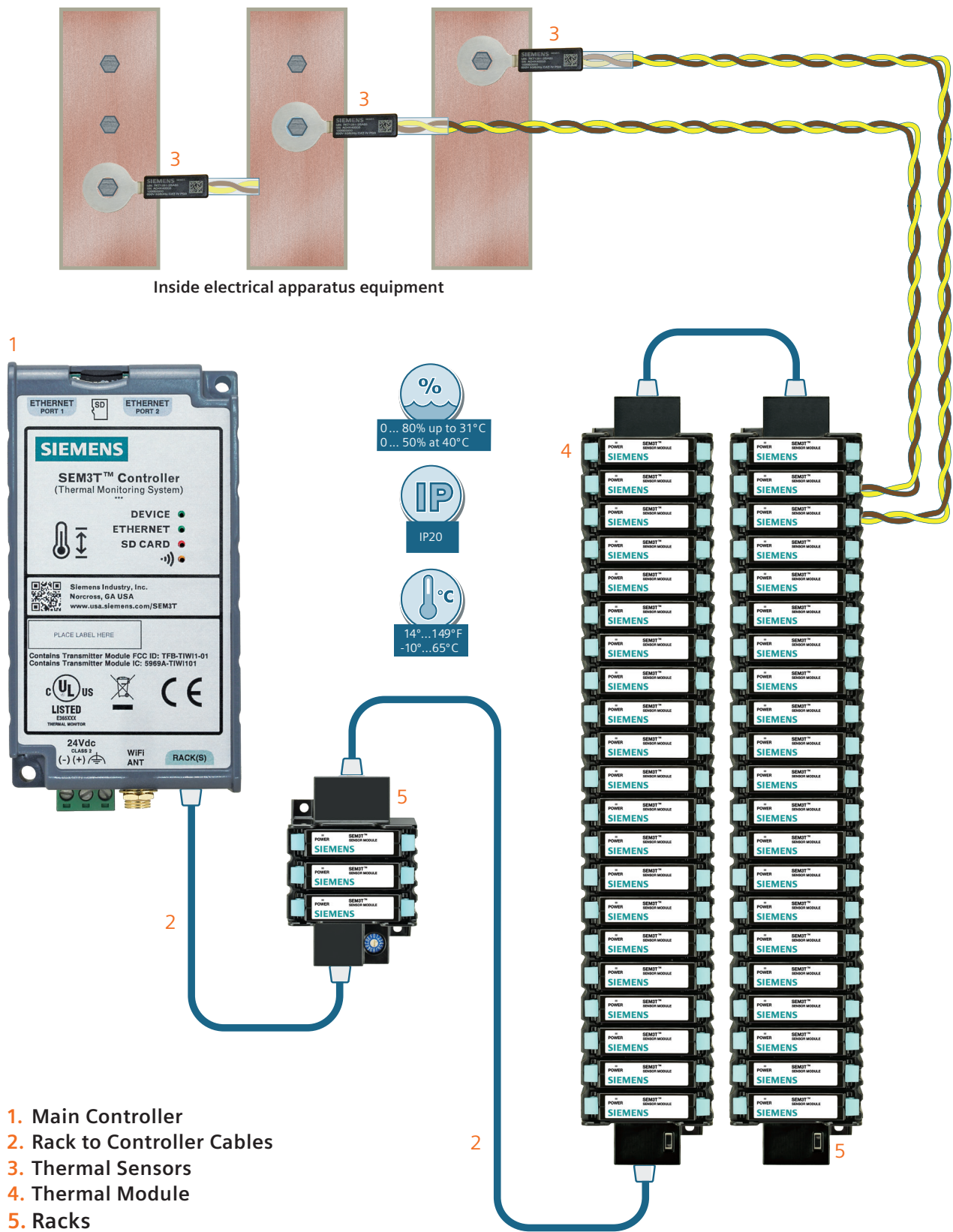
The SEM3 system is made up of the following components and options:

1. **Controller** – The controller is used to communicate the metered values to outside systems by way of a web page interface, Modbus RTU, Modbus TCP, BACnet IP, and SNMP. One controller can manage up to 45 meter modules.® The controller also has the system digital inputs for receiving pulse inputs for monitoring water and gas usage as well as a digital output for the combined KWh output of the system being metered.
2. **Meter Modules** – There are two choices or the meter modules that are differentiated by accuracy specification. The accuracies are 1% for the standard accuracy modules and $\pm 0.2\%$ for the high accuracy modules. The accuracy is tested in accordance to ANSI C12.20/0.5 by NRTL (Nationally Recognized Test Lab).
3. **Meter Racks** – The meter modules are designed to snap into the rack assemblies. The rack assemblies are sized by how many modules will fit into each and come in 3, 9, 15 and 21 module configurations.
4. **CT or Current Transformers** – The SEM3 systems have solid core CTs or split core CTs for use with the system in the following maximum amperage ranges 50, 125, 250, 400, 600, 800, 1200, 1600, and 2000 amps. These are maximum amperage ranges for normal usage but will measure accurately down to 1% of the maximum range.
5. **Communication Cables** – The communication cables are designed like CAT 5 cables but are insulated for use in systems up to 600 volts. The cables are for two way communication from the controller to the rack/meter modules.

① Some applications will allow for more than 45 poles in one enclosure by adding a second controller. Two controllers can monitor up to 90 poles.

4.9.7 SEM3T

Siemens Thermal Monitoring System (SEM3T) is a modular monitoring solution for thermal monitoring, alarm notifications, historical logging/trending, and reporting.



4.9.8 Input Cards

The Device Type section is located in the upper left of the Input Card Settings screen. This section contains arrows which are used to toggle between Input Cards.

The Input Card Identification section is located in the lower left of the Input Card Settings screen. This section contains the Input Card Name and Input Card Detail values. When edited, the nameplate changes are reflected on the Elevation, One Line and Network Settings screens. Nameplate length is limited to eight characters.

The screenshot shows the Siemens Sm@rtGear IE Settings interface. The left sidebar contains navigation links: Elevation, One Line, Group Maint. Mode, Breaker Trending, Documents, CPU Health, System Status, and Active Timers. The main content area is titled 'Settings' and 'Input Cards'. It features a 'Device Type: Input Card' section with 'Previous', 'Current', and 'Next' navigation buttons. Below this is the 'Input Card-1 Breaker Identification' section with fields for 'Input Card Name' (set to 'Input Card-1') and 'Input Card Detail'. The right side of the screen displays a list of 16 input cards, each with a 'Set Name' field and a 'Set as Alarm' toggle button.

4.10 Historical Logs

The Historical Logs screen displays the Alarm Class, Logged Alarms and Events, Time Stamp and Status.

There is a button bar at the bottom of the screen, which contains buttons for the following actions:

- Show and update logged alarms
- First line
- Previous line
- Next line
- Last line
- Show recent
- Time base setup
- Export
- Clear logs

Historical Logs

Current User: SiemensS01

	Alarm Class	Logged Alarms and Events	Time Stamp	Status
<div></div> Elevation	6	WL Breaker Alarm Section - 1 C WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:27 PM	Incoming
<div></div> One Line	7	WL Breaker Alarm Section - 1 D WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:27 PM	Incoming
<div></div> Group Maint. Mode	8	WL Breaker Alarm Section - 1 D WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:27 PM	Incoming
<div></div> Breaker Trending	9	WL Breaker Alarm Section - 2 B WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:27 PM	Incoming
<div></div> Documents	10	WL Breaker Alarm Section - 2 B WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:27 PM	Incoming
<div></div> CPU Health	11	WL Breaker Alarm Section - 2 C WL-Bell Alarm - Long Time Trip	11/3/20 1:32:27 PM	Incoming
<div></div> System Status	12	WL Breaker Alarm Section - 2 C WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:27 PM	Incoming
	13	WL Breaker Event Section - 2 C WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:27 PM	Incoming
	14	WL Breaker Alarm Section - 2 D WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:27 PM	Incoming
	15	WL Breaker Event Section - 2 D WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:27 PM	Incoming
	16	WL Breaker Alarm Section - 1 B WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:28 PM	Incoming
	17	WL Breaker Event Section - 1 B WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:28 PM	Incoming
	18	WL Breaker Alarm Section - 1 C WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:28 PM	Incoming
	19	WL Breaker Event Section - 1 C WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:28 PM	Incoming
	20	WL Breaker Alarm Section - 1 D WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:28 PM	Incoming
	21	WL Breaker Event Section - 1 D WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:28 PM	Incoming
	22	WL Breaker Alarm Section - 2 B WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:28 PM	Incoming
	23	WL Breaker Event Section - 2 B WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:28 PM	Incoming
	24	WL Breaker Alarm Section - 2 C WL-Bell Alarm - Long Time Trip	11/3/20 1:32:28 PM	Incoming
	25	WL Breaker Alarm Section - 2 C WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:28 PM	Incoming
	26	WL Breaker Event Section - 2 C WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:28 PM	Incoming
	27	WL Breaker Alarm Section - 2 D WL-Warning - Threshold Limit Exceeded	11/3/20 1:32:28 PM	Incoming
	28	WL Breaker Event Section - 2 D WL Status - Breaker Maintenance Mode Activated	11/3/20 1:32:28 PM	Incoming
	29	Source Alarms Source - 1-Underfrequency	11/3/20 1:32:28 PM	Incoming
	30	Source Alarms Source - 1-Dead Bus	11/3/20 1:32:28 PM	Incoming
	31	WL Breaker Alarm Section - 1 B WL-Warning - Threshold Limit Exceeded	11/3/20 1:33:58 PM	Incoming
	32	WL Breaker Event Section - 1 B WL Status - Breaker Maintenance Mode Activated	11/3/20 1:33:58 PM	Incoming
<div></div> Log Off	33	Source Alarms Source - 1-Underfrequency	11/3/20 1:33:58 PM	Incoming
<div></div> Settings	34	Source Alarms Source - 1-Dead Bus	11/3/20 1:33:58 PM	Incoming
<div></div> Historical Logs	35	WL Breaker Alarm Section - 1 C WL-Warning - Threshold Limit Exceeded	11/3/20 1:33:58 PM	Incoming

Clear Log

Nov 10, 2020 1:13:00 PM

Tue Nov 10 2020 13:12:59
Nov 10, 2020 1:13:00 PM

4.11 About

Clicking About calls a pop-up window which displays the Smart Version, TIA Version, PLC Firmware and WinCC Unified Runtime. Click OK to exit the About window.

SIEMENS

Sm@rtGear

Current User: SiemensS01

Elevation

One Line

Group Maint. Mode

Breaker Trending

Documents

CPU Health

System Status

Log Off

Settings

Historical Logs

About

Elevation

Smart Version: V4.0

TIA Version: V16.0

PLC Firmware: V2.8.1

WinCC Unified Runtime: V16.0

OK

View 1

View 2

View 3

View 4

Tue Nov 10 2020 12:42:38

5. WL Monitoring Screens

Clicking on a breaker from the elevation or one line screens will open the breaker display. A tab bar for the breaker monitoring screens is located along the top of the breaker display. Each device tab screen contains several sections. The active alarms for the displayed breaker can be accessed by clicking the alarm icon in the top right corner of the breaker display.

5.1 Breaker Dashboard

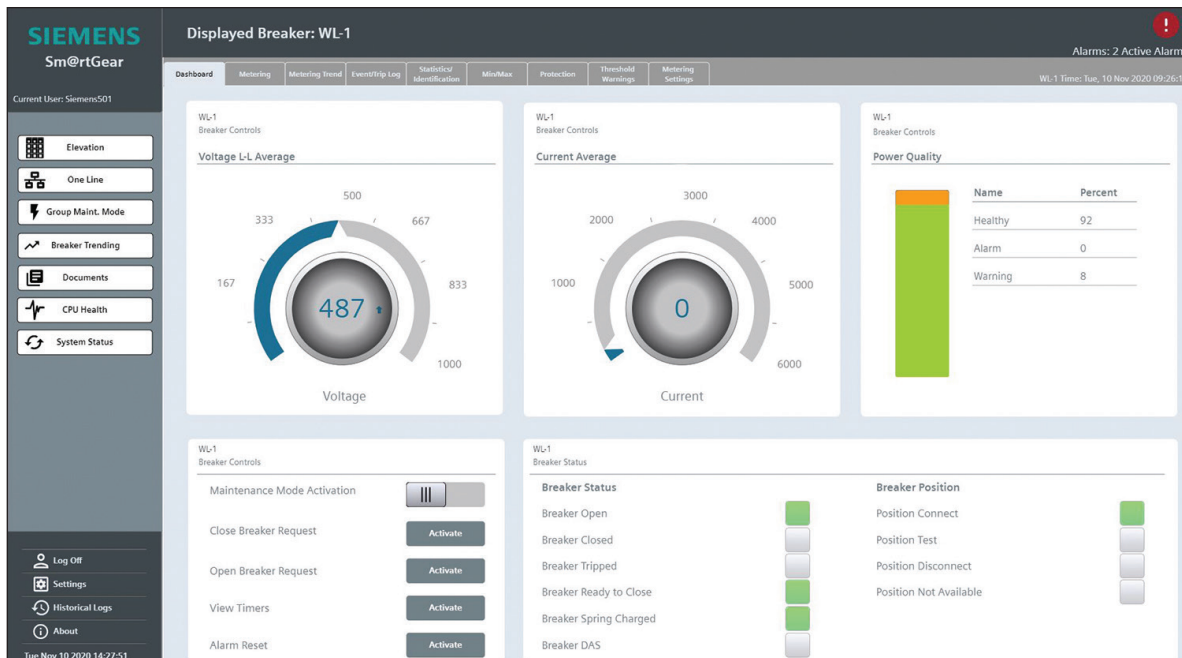
The upper left of the Breaker Dashboard screen contains two Breaker Gauge sections. The Breaker Gauge contains tags for the following values:

- Voltage L-L Average
- Current Average

The Power Quality section is located in the top right of the screen. This section contains a bar graph and percentages for three categories: Healthy, Alarm, and Warnings.

The Breaker Controls are located in the bottom left of the Breaker Dashboard. This section contains the Maintenance Mode Activation switch and “activate” buttons for Close Breaker Request, Open Breaker Request, View Timers, and Alarm Reset.

The Breaker Status section is located in the bottom left of the screen. This section status for Breaker Open, Breaker Closed, Breaker Tripped, Breaker Ready to Close, Breaker Spring Charged, and Breaker DAS. This section also displays the Breaker Position as Position Connect, Position Test, Position Disconnect, or Position Not Available. Each status and position is indicated by a green light when true or no light when false.



5.2 Metering

The Voltage section is located in the top left of the Metering screen. This section displays readings for L1-N Voltage, L2-N Voltage, L3-N Voltage, L-N Average Voltage, L1-L2 Voltage, L2-L3 Voltage, L3-L1 Voltage, L-L Average Voltage, Peak Factor, Form Factor, Phase Unbalance Voltage, and THD Voltage.

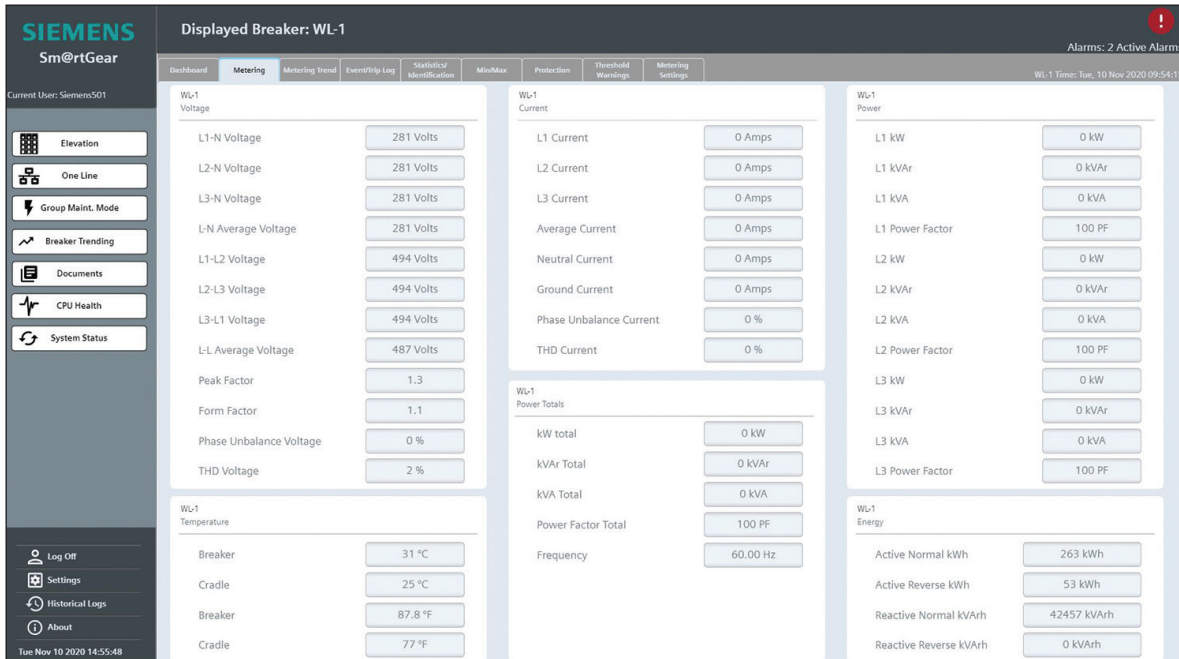
The Temperature section is located in the bottom left of the Metering screen. This section displays temperature readings for the Breaker and the Cradle in both Celsius and Fahrenheit.

The Current section is located in the upper middle of the Metering screen. This section displays readings for L1 Current, L2 Current, L3 Current, Average Current, Neutral Current, Ground Current, Phase Unbalance Current, and THD Current.

The Power Totals section is located in the lower middle of the Metering screen. This section displays readings for kW total, kVAR Total, kVA Total, Power Factor, and Frequency.

The Power section is located in the upper right of the Metering screen. This section displays readings for L1 kW, L1 kVAR, L1 kVA, L1 Power Factor, for L2 kW, L2 kVAR, L2 kVA, L2 Power Factor, for L3 kW, L3 kVAR, L3 kVA, and L3 Power Factor.

The Energy section is located in the lower right of the Metering screen. This section displays readings for Active Normal kWh, Active Reverse kWh, Reactive Normal kVarh, and Reactive Reverse kVarh.



5.3 Metering Trend

The Metering Trend displays a trend of all real time breaker metering values.

There is a button bar at the bottom of the window, which contains buttons for the following actions:

- First record
- Previous record
- Start stop
- Next record
- Last record
- Ruler
- Zoom time axis +/-
- Zoom area
- Original view
- Select trends
- Export

Clicking the “select trends” button calls a pop-up window which includes selections for the following values:

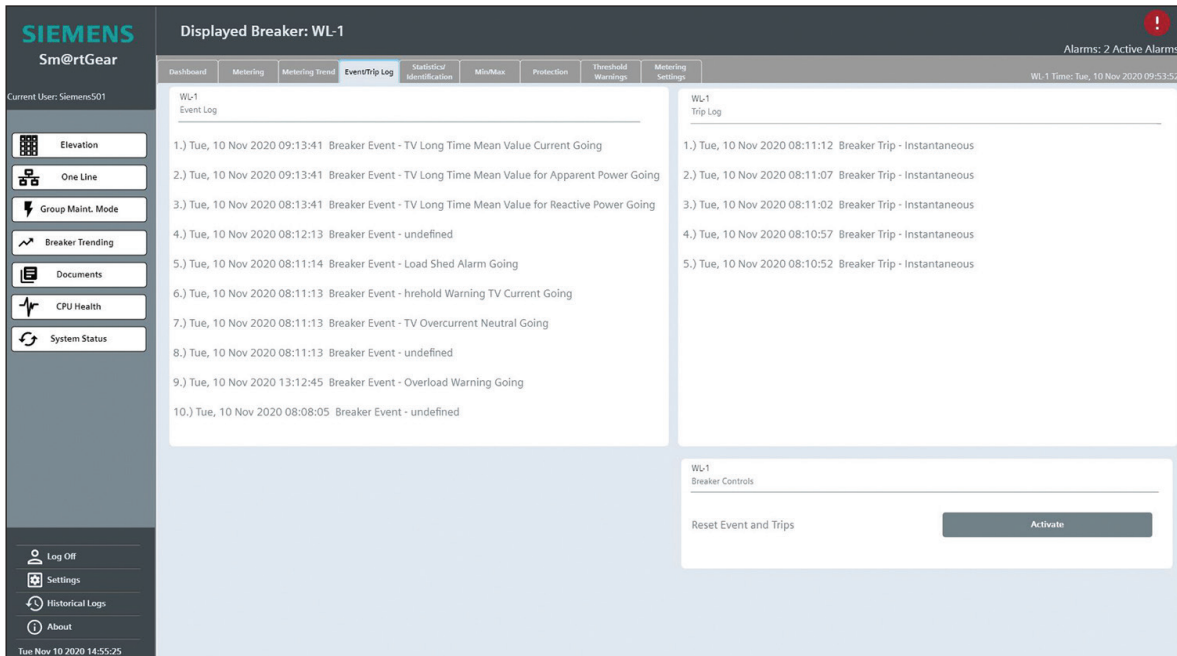
- Phase Unbalance Current
- Long Time Mean Current Average
- Long Time Mean Current L1
- Long Time Mean Current L2
- Long Time Mean Current L3
- Current L1
- Current L2
- Current L3
- Mean Current Average
- Neutral Current
- Ground Current
- Phase Unbalance Voltage
- L1-L2 Volts
- L2-L3 Volts
- L3-L1 Volts
- L1-N Volts
- L2-N Volts
- L3-N Volts
- L-L Volts
- L-N Volts
- Total Apparent Power
- Total Active Power
- Active Power L1
- Active Power L2
- Active Power L3
- Total Reactive Power
- Total Long Time Mean Active Power
- Long Time Mean Active Power L1
- Long Time Mean Active Power L2
- Long Time Mean Active Power L3
- Total Long Time Apparent Power
- Apparent Power L1
- Apparent Power L2
- Apparent Power L3
- Long Time Apparent Power L1
- Long Time Apparent Power L2
- Long Time Apparent Power L3
- Total Long Time Reactive Power
- Reactive Power L1
- Reactive Power L2
- Reactive Power L3
- Total Mean Value Power Factor
- Power Factor L1
- Power Factor L2
- Power Factor L3
- Frequency
- THD Current
- THD Voltage
- Cradle Temperature in Celsius
- Breaker Temperature in Celsius

5.4 Event/Trip Log

The Event Log section is located in the left of the Event/Trip Log screen. This section displays the date, time, and type of event in chronological order.

The Trip Log section is located in the right of the Event/Trip Log screen. This section displays the date, time, and type of trip in chronological order.

The Breaker Controls section is located in the lower right of the Event/Trip Log screen. This section contains the “Activate” button to reset events and trips.



5.5 Statistics/Identification

The Statistical Information section is located in the left of the Statistics/Identification screen. This section displays readings for the following values:

- Switching Cycle Counter
- Number of Switching Operations Under Load
- Number of Switching Operations Caused By Trips
- Number of Overload Trips
- Number of Short Circuit Trips
- Number of Ground Fault Trips
- Operation Hours
- Maintenance Information About Main Contacts
- Date of Last Parameter Change

The Breaker Details section is located in the right of the Statistics/Identification screen. This section displays readings for the following values:

- Rating Plug
- Frame Size
- Rated Voltage
- Number of Poles
- Switching Class
- Identification Number of Breaker
- Test Date of Breaker

The Breaker Controls section is located in the lower right of the Statistics/Identification screen. This section contains the “Activate” button to reset counters.

The screenshot displays the Siemens Sm@rtGear IE User Manual interface. The top navigation bar includes tabs for Dashboard, Metering, Metering Trend, Event/Trip Log, Statistical Identification (selected), Min/Max, Protection, Threshold Warnings, and Metering Settings. The left sidebar contains various system status and maintenance options. The main content area is titled 'Displayed Breaker: WL-1' and shows statistical information for the selected breaker.

Statistical Information:

Switching Cycle Counter	1
Number of Switching Operations Under Load	0
Number of Switching Operations Caused By Trips	1
Number of Overload Trips	6
Number of Short Circuit Trips	4428
Number of Ground Fault Trips	0
Operation Hours	2
Maintenance Information About Main Contacts	Perform Visual Inspection
Date of Last ParameterChange	11/10/20 3:33:40 AM

WL-1 Breaker Details:

Rating Plug	800 Amps
Frame Size	4000 Amps
Rated Voltage	690 Volts
Number of Poles	3-Pole
Switching Class	L/IntClassL
Identification Number of Breaker	4001351116032
Test Date of Breaker	11/16/15 12:36:25 PM

WL-1 Breaker Controls:

Reset Counters Activate

5.6 Min/Max

For each breaker, min/max limits are populated dynamically based on the breaker's current settings, rating plug, and frame size.

The Min/Max Frequency and THD section is located in the upper left of the Min/Max screen. This section displays the date, time, and min value or max value of voltage in chronological order.

The Breaker Controls section is located in the right of the Min/Max screen. This section contains the "Activate" button to reset min/max.

The screenshot displays the Siemens Sm@rtGear IE User Manual interface. The top navigation bar includes tabs for Dashboard, Metering, Metering Trend, Event/Trip Log, Statistical Identification, Min/Max (selected), Protection, Threshold Warnings, and Metering Settings. The left sidebar contains various system status and maintenance options. The main content area is titled 'Displayed Breaker: WL-1' and shows min/max frequency and THD data for the selected breaker.

WL-1 Min/Max Frequency and THD:

- 1.) Sat, 07 Nov 2020 20:32:55 Max Value of Frequency: 60.06 Hz
- 2.) Mon, 09 Nov 2020 12:15:31 Min Value of Frequency: 59.90 Hz
- 3.) Tue, 10 Nov 2020 04:56:22 Max Value of THD Current: 98 %
- 4.) Sat, 07 Nov 2020 20:15:54 Min Value of THD Current: 0 %
- 5.) Mon, 09 Nov 2020 22:38:14 Max Value of THD Voltage: 8 %
- 6.) Sat, 07 Nov 2020 20:15:58 Min Value of THD Current: 1 %

WL-1 BreakerControl:

Reset Min/Max Activate

5.7 Protection

All breaker protective parameters are viewed and set from the Protection screen for both A and B (maintenance) parameters. To navigate between A and B parameters, there is a "Go To Breaker A/B Parameters" button located in the Breaker Controls section in the lower left of the Protection screen.

The Long Time Settings section is located in the upper left of the Protection screen. This section contains parameters for the following values:

- Long Time Pickup (in Amps)
- Long Time Delay (in Sec.)
- I⁴t Curve for Long Time
- Phase Loss Sensitivity
- Thermal Memory

The Short Time Settings section is located in the mid left of the Protection screen. This section contains parameters for the following values:

- Short Time Pickup (in Amps)
- Short Time Delay (in ms)
- I²t Curve for Short Time

The Instantaneous Settings section is located in the mid left of the Protection screen. This section contains parameters for the following values:

- Instantaneous Pickup (in Amps)

The Ground Fault Settings section is located in the upper right of the Protection screen. This section contains parameters for the following values:

- Ground Fault Pickup (in Amps)
- Ground Fault Delay (in ms)
- I²t Curve for Ground Fault
- Ground Fault Alarm Pickup (in Amps)
- Ground Fault Alarm Delay (in ms)
- Ground Fault Transformer

The Neutral Settings section is located in the mid right of the Protection screen. This section contains parameters for the following values:

- Neutral Pickup (in Amps)

The Breaker Controls section is located in the lower left of the Protection screen. This section contains "activate" buttons for Edit Mode, Upload to Memory, Download from Memory, and Activate New Settings.

The Pickup Limits section is located in the lower right of the Protection screen. This section contains the min/max parameters for Long Time Settings, Short Time Settings, Instantaneous Settings, Neutral Settings, and Ground Fault/Alarm Settings. Min/max parameters are specific to each breaker based on frame size, switching class, and rating plug. If an out of range value is entered, the input immediately reverts back to the previous settings.

5.8 Threshold Warnings

All breaker threshold warning parameters are viewed and set from the Threshold Warnings screen.

The Voltage section is located in the upper left of the Threshold Warnings screen. This section contains parameters for the following values:

- Undervoltage
- Overvoltage
- Phase Unbalance Voltage
- THD Voltage
- Peak Factor
- Form Factor

The Current section is located in the mid left of the Threshold Warnings screen. This section contains parameters for the following values:

- Overcurrent
- Mean Value Current
- Ground Current
- Neutral Current
- Phase Unbalance Current
- THD Current

The Power section is located in the mid left of the Threshold Warnings screen. This section contains parameters for the following values:

- Active Power Normal Direction
- Active Power Reverse Direction
- Reactive Power Normal Direction
- Reactive Power Reverse Direction
- Apparent Power
- Mean Value of Apparent Power
- Mean Value of Active Power
- Mean Value of Reactive Power
- Power Factor Inductive
- Power Factor Capacitive

The Frequency section is located in the lower left of the Threshold Warnings screen. This section contains parameters for the following values:

- Underfrequency
- Overfrequency

The Breaker Controls section is located in the upper right of the Threshold Warnings screen. This section contains “activate” buttons for Edit Mode, Upload to Memory, Download from Memory, and Activate New Settings.

The Pickup Limits section is located in the lower right of the Threshold Warnings screen. This section contains the min/max parameters for Undervoltage Settings, Overvoltage Settings, Phase Unbalance Voltage Settings, THD Voltage Settings, Peak Factor, Form Factor, Overcurrent, Mean Value Current, Ground Current, Neutral Current, Phase Unbalance Current, THD Current, Active Power Normal Direction, Active Power Reverse Direction, Reactive Power Normal Direction, Reactive Power Reverse Direction, Apparent Power, Mean Value of Apparent Power, Mean Value of Active Power, Mean Value of Reactive Power, Power Factor Inductive, Power Factor Capacitive, Underfrequency, and Overfrequency. Min/max parameters are specific to each breaker based on frame size, switching class, and rating plug. If an out of range value is entered, the input immediately reverts back to the previous settings.

Breaker Power Quality Analytics

Note: Automated script runs at start up to turn all threshold settings on based on system rated voltage and breaker rating plug. This is how power quality is determined. Power quality is displayed on the breaker dashboard screen.

Only on first startup. IF you change it after that, will not override settings.

The screenshot shows the Siemens Sm@rtGear IE Threshold Warnings screen for Breaker WL-1. The interface includes a sidebar with navigation options like Elevation, One Line, Group Maint. Mode, Breaker Trending, Documents, CPU Health, and System Status. The main content area is divided into several sections:

- WL-1 Threshold Warnings - Voltage:**
 - Undervoltage: 432 Volts, 60 Sec, On
 - Overvoltage: 528 Volts, 60 Sec, On
 - Phase Unbalance Voltage: 5 %, 60 Sec, On
 - THD Voltage: 8 %, 60 Sec, On
 - Peak Factor: 2.55, 60 Sec, On
 - Form Factor: 2.55, 60 Sec, On
- WL-1 Threshold Warnings - Current:**
 - Overcurrent: 800 Amps, 60 Sec, On
 - Mean Value Current: 800 Amps, 60 Sec, On
 - Ground Current: 400 Amps, 60 Sec, On
 - Neutral Current: 400 Amps, 60 Sec, On
 - Phase Unbalance Current: 10 %, 60 Sec, On
 - THD Current: 5 %, 60 Sec, On
- WL-1 Threshold Warnings - Power:**
 - Active Power Normal Direction: 12000 kW, 60 Sec, On
 - Active Power Reverse Direction: 12000 kW, 60 Sec, On
 - Reactive Power Normal Direction: 12000 kW, 60 Sec, On
- WL-1 Breaker Controls:**
 - Edit Mode: Activate
 - Upload to Memory: Activate
 - Download from Memory: Activate
 - Activate New Settings: Activate
- WL-1 Pickup Limits:**
 - Undervoltage Settings: 100 - 1100 Volts/0 - 255 Sec.
 - Overvoltage Settings: 100 - 1100 Volts/0 - 255 Sec.
 - Phase Unbalance Voltage Settings: 5 - 50 %/0 - 255 Sec.
 - THD Voltage Settings: 3 - 50 %/5 - 255 Sec.
 - Peak Factor: 1 - 2.55/0 - 255 Sec.
 - Form Factor: 1 - 2.55/0 - 255 Sec.
 - Overcurrent: 30 - 10000 Amps/0 - 255 Sec.
 - Mean Value Current: 30 - 10000 Amps/0 - 255 Sec.
 - Ground Current: 30 - 1200 Amps/0 - 255 Sec.
 - Neutral Current: 30 - 10000 Amps/0 - 255 Sec.
 - Phase Unbalance Current: 5 - 50 %/0 - 255 Sec.
 - THD Current: 5 - 50 %/5 - 255 Sec.

5.9 Metering Settings

All breaker metering settings are viewed and set from the Metering Settings screen.

The Voltage section is located in the upper segment of the Metering Settings screen. This section contains parameters for the following values:

- Transformer Type
- Rated Primary Voltage
- V.T. Secondary Voltage
- Normal Direction of Supply
- Phase Rotation

The Long Time Mean section is located in the mid segment of the Metering Settings screen. This section contains parameters for the following values:

- Period Length for Long Time Mean
- Number of Sub Periods for Long Time Mean
- Underflow Limit

The Breaker Controls section is located in the lower segment of the Metering Settings screen. This section contains “activate” buttons for Edit Mode and Activate New Settings.

On the Metering Settings screen, pickup limits are displayed to the right of individual parameters. Pickup limits are displayed for Rated Primary Voltage in the Voltage section and Underflow Limit in the Long Time Mean section. If an out of range value is entered, the input immediately reverts back to the previous settings.

The screenshot displays the 'Metering Settings' screen for a specific breaker, 'WL-1'. The interface includes a sidebar with navigation options like 'Elevation', 'One Line', 'Group Maint. Mode', 'Breaker Trending', 'Documents', 'CPU Health', and 'System Status'. The main content area is divided into sections for 'Metering Settings - Voltage' and 'Metering Settings - Long Time Mean'. The 'Voltage' section contains settings for 'Transformer Type' (Delta), 'Rated Primary Voltage' (480 Volts), 'V.T. Secondary Voltage' (120 Volts), 'Normal Direction of Supply' (Upward), and 'Phase Rotation' (L1-L3-L2). The 'Long Time Mean' section includes 'Period Length for Long Time Mean' (60 Min.), 'Number of Sub Periods for Long Time Mean' (1 per period), and 'Underflow Limit' (6300 Amps). At the bottom, there are buttons for 'Edit Mode' and 'Activate New Settings', both labeled 'Activate'.

5.10 Active Alarms

The Alarm indication icon (upper right of all drilldown screens) appears only during an active alarm. If there is an active alarm, clicking on the Alarm Icon will open the WL Breaker Alarms screen. This screen displayed detailed information about the event, including the Alarm Class, Current Alarm, Time Stamp, and Status. Every screen on the system has the Alarm Icon capability. The screens also display clock, CPU status, CPU online status and System Modes settings.

5.10.1 Self-Reset Alarms

Alarms that automatically reset when condition is resolved.

- Withdrawn – disconnect
- Withdrawn – N/A
- Not Write Enabled
- Ready to close
- Door open
- Overload neutral
- Overload present
- Threshold exceeded
- Alarm present
- Load shedding alarm
- Trip coil monitor alarm
- Under voltage relay alarm

5.10.2 Latching Alarms

Alarms that stay active even if condition has been resolved until acknowledged/reset.

- External Trip
- Fail to Close
- Fail to Trip
- Withdrawn-Test
- Overcurrent Long Time
- Overcurrent Short Time
- Overcurrent Instantaneous
- Overcurrent Neutral
- Overcurrent Ground
- Extended Trip
- Fail to sync – if applicable

6. VL Monitoring Screens

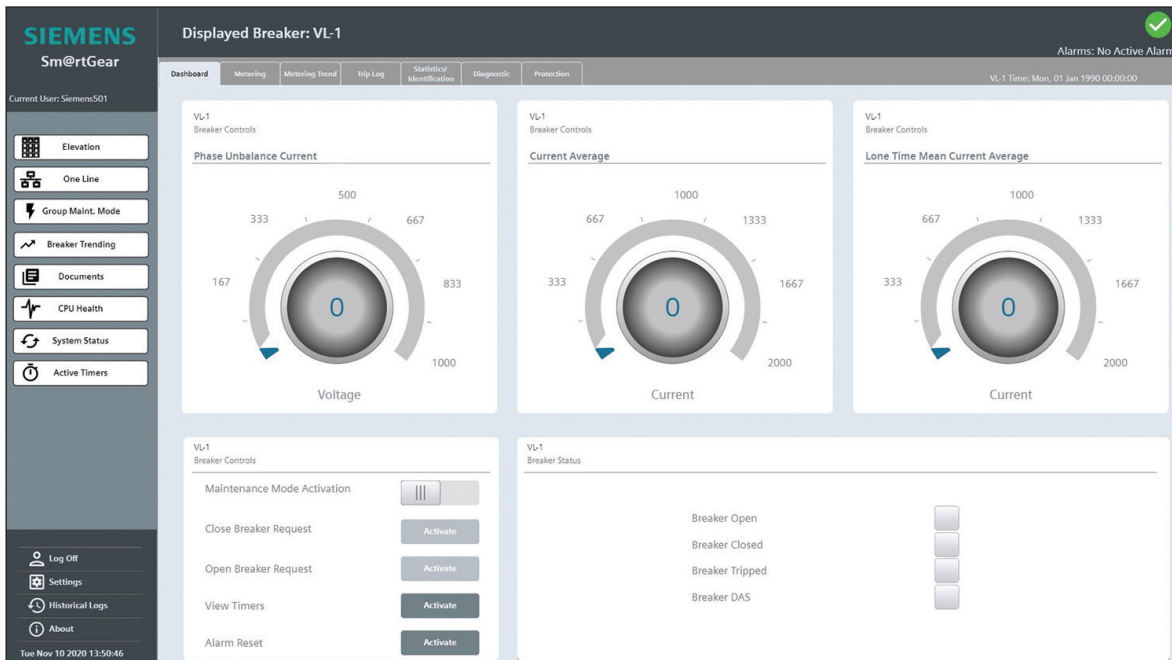
6.1 Breaker Dashboard

The upper segment of the Breaker Dashboard contains three Breaker Gauge sections. Each Breaker Gauge contains tags for the following values:

- Phase Unbalance Current
- Long Time Mean Current Average
- Current L1
- Current L2
- Current L3
- Mean Current Average
- Current in Neutral Conductor
- Current to Ground

The Breaker Controls section is located in the lower left of the Breaker Dashboard screen. This section contains the Maintenance Mode Activation switch and “activate” buttons for Close Breaker Request, Open Breaker Request, View Timers and Alarm Reset. Note: Close Breaker Request and Open Breaker Request are disabled for VL breakers.

The Breaker Status section is located in the lower right of the Breaker Dashboard screen. This section displays a green light when the following values are present: Breaker Open, Breaker Closed, Breaker Tripped and Breaker DAS.



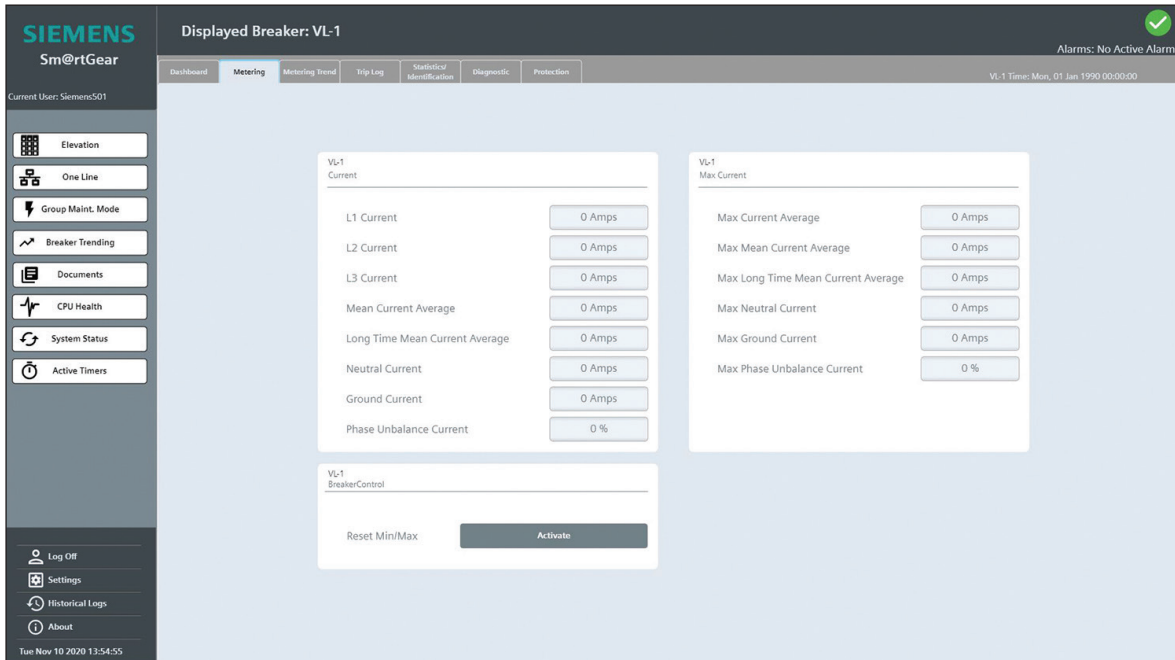
6.2 Metering

The Current section is located in the upper left of the Metering screen. This section displays readings for L1 Current, L2 Current, L3 Current, Mean Current Average, Long Time Mean Current Average, Neutral Current, Ground Current, and Phase Unbalance Current.

The Max Current section is located in the upper right of the Metering screen. This section displays limits for Max Current Average, Max Mean Current Average, Max Long Time Mean Current Average, Max Neutral Current, Max Ground Current, and Max Phase Unbalance Current.

The Breaker Control section is located in the lower left of the Metering screen. This section contains the “Activate” button to Reset Min/Max.

(Insert Figure “vIBreakerMetering”)



6.3 Metering Trend

The Metering Trend displays a trend of all real time breaker metering values.

There is a button bar at the bottom of the window, which contains buttons for the following actions:

- First record
- Previous record
- Start stop
- Next record
- Last record
- Ruler
- Zoom time axis +/-
- Zoom area
- Original view
- Select trends
- Export

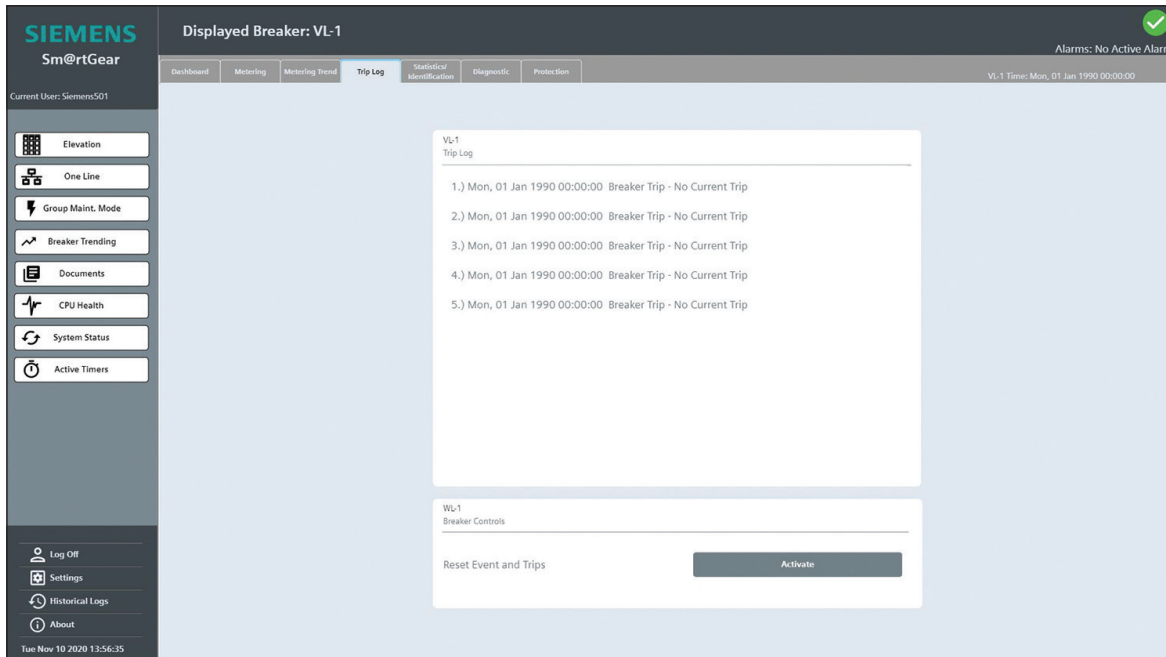
Clicking the “select trends” button calls a pop-up window which includes selections for the following values:

- Phase Unbalance Current
- Long Time Mean Current Average
- Long Time Mean Current L1
- Long Time Mean Current L2
- Long Time Mean Current L3
- Current L1
- Current L2
- Current L3
- Mean Current Average

6.4 Trip Log

The Trip Log section is located in the upper Trip Log screen. This section displays the date, time, and type of trip in chronological order.

The Breaker Controls section is located in the lower Trip Log screen. This section contains the “Activate” button to reset events and trips.



6.5 Statistics/Identification

The Statistical Information section is located in the left of the Statistics/Identification screen. This section displays readings for the following values:

- Number of Switching Operations Caused By Trips
- Number of Overload Trips
- Number of Short Circuit Trips
- Number of Ground Fault Trips
- Operation Hours

The Breaker Details section is located in the right of the Statistics/Identification screen. This section displays readings for the following values:

- Rating Plug
- Number of Poles
- Identification Number of Breaker

The Breaker Controls section is located in the lower right of the Statistics/Identification screen. This section contains the “Activate” button to reset counters.

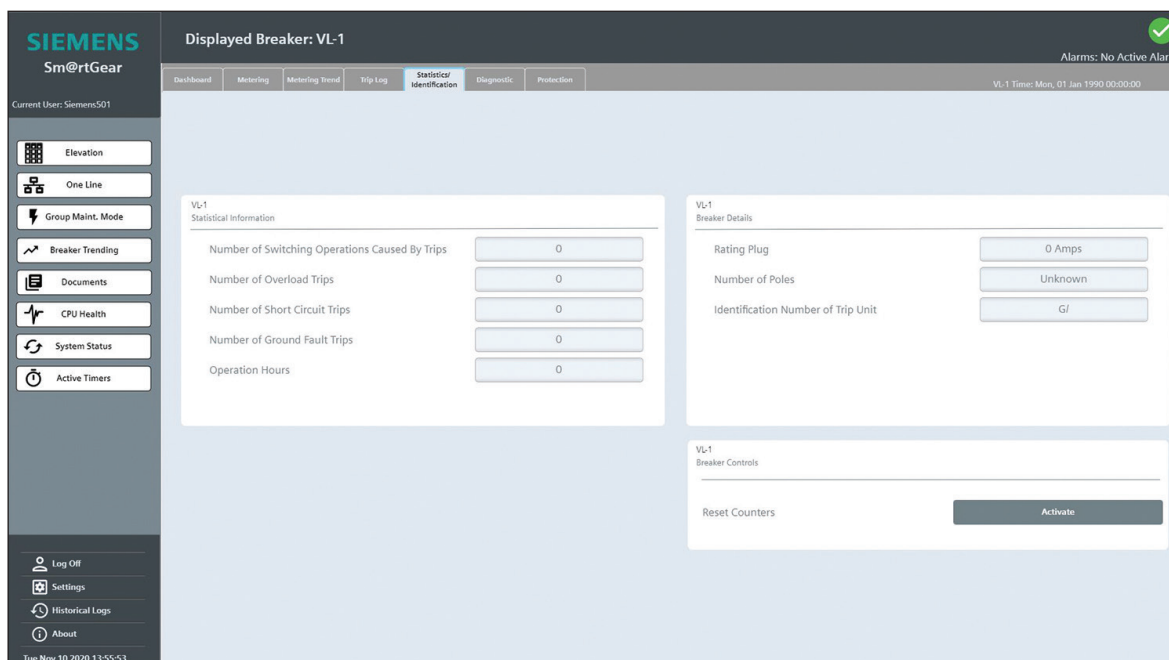
6.6 Diagnostic

The Shutdown Data section is located in the upper left of the Diagnostic screen. This section displays readings for the following values:

- Current at Shutdown
- Most Loaded Phase

The Trip Alarms Currently Active section is located in the lower left of the Diagnostic screen. This section displays a green light to indicate each of the following values:

- No Trip
- Long Time Trip
- Instantaneous Trip
- Short Time Trip
- Ground Fault



The Trip Unit Alarms Currently Active section is located in the right of the Diagnostic screen. This section displays a green light to indicate each of the following values:

- Overload Tripping Alarm
- Overload Neutral Alarm
- Load Shed Alarm
- Load Pick Up Alarm
- Phase Unbalance Current Alarm
- Microprocessor Fault
- Ground Fault Alarm
- Overtemperature Alarm
- Leading Overload Trip Alarm
- Short Time Pickup Alarm

6.7 Protection

All breaker protective parameters are viewed and set from the Protection screen. The VL Breaker has A parameters only.

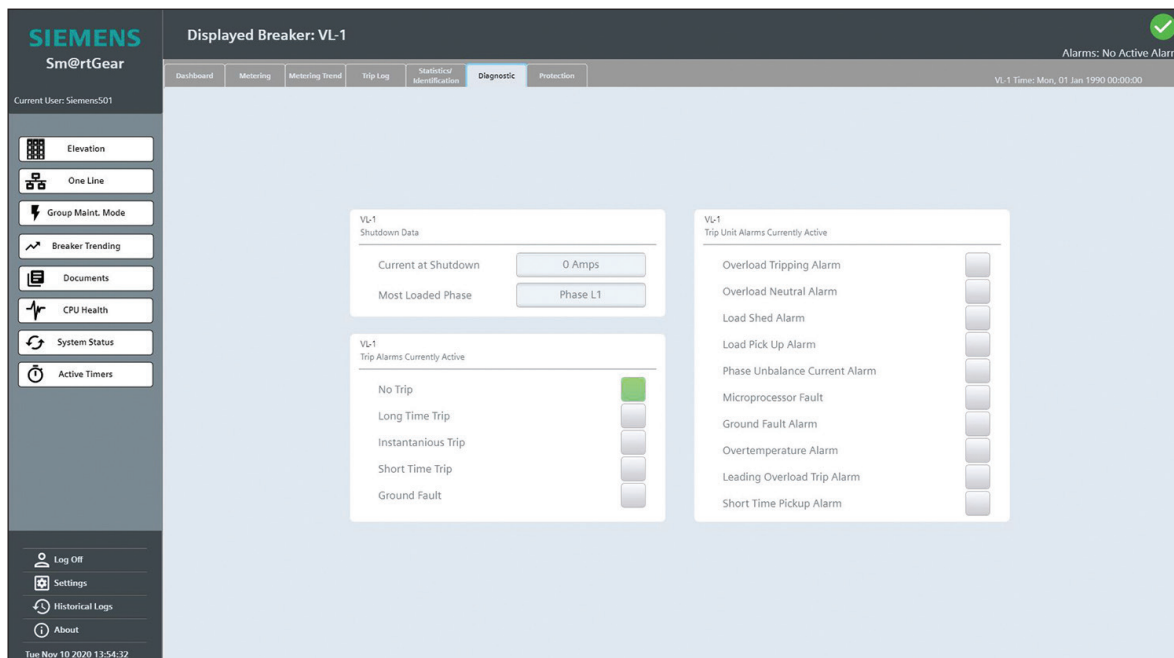
The Long Time Settings section is located in the upper left of the Protection screen. This section contains parameters for the following values:

- Long Time Pickup (in Amps)
- Long Time Delay (in Sec.)
- Thermal Memory

The Short Time Settings section is located in the mid left of the Protection screen. This section contains parameters for the following values:

- Short Time Pickup (in Amps)
- Short Time Delay (in ms)
- I²t Curve for Short Time

The Instantaneous Settings section is located in the mid left of the Protection screen. This section contains parameters for Instantaneous Pickup (in Amps). This parameter can be edited by clicking “Go To Breaker Instantaneous Settings” in the upper right of the section.



The Ground Fault Settings section is located in the upper right of the Protection screen. This section contains parameters for the following values:

- Ground Fault Pickup (in Amps)
- Ground Fault Delay (in ms)
- I²t Curve for Ground Fault
- Ground Fault Alarm Pickup (in Amps)
- Ground Fault Alarm Delay (in ms)

The Breaker Controls section is located in the lower left of the Protection screen. This section contains “activate” buttons for Edit Mode, Upload to Memory, Download from Memory, and Activate New Settings.

The Pickup Limits section is located in the lower right of the Protection screen. This section contains the min/max parameters for Long Time Settings, Short Time Settings, Instantaneous Settings and Ground Fault/Alarm Settings. Min/max parameters are specific to each breaker based on frame size, switching class, and rating plug. If an out of range value is entered, the input immediately reverts back to the previous settings.

6.8 Active Alarms

The Alarm indication icon (upper right on all drilldown screens) appears only during an active alarm. If there is an active alarm, clicking on the Alarm Icon will open the WL Breaker Alarms screen. This screen displayed detailed information about the event, including the Alarm Class, Current Alarm, Time Stamp, and Status. Every screen on the system has the Alarm Icon capability. The screens also display clock, CPU status, CPU online status and System Modes settings.

6.8.1 Self-Reset Alarms

Alarms that automatically reset when condition is resolved.

- Withdrawn – disconnect
- Withdrawn – N/A
- Not Write Enabled
- Ready to close
- Door open
- Overload neutral
- Overload present
- Threshold exceeded
- Alarm present
- Load shedding alarm

SIEMENS Sm@rtGear

Current User: Siemens501

Displayed Breaker: VL-1

Alarms: No Active Alarms

VL-1 Time: Mon, 01 Jan 1990 00:00:00

Protection

VL-1 Long Time Settings A Parameter

- Long Time Pickup: 0 Amps
- Long Time Delay: Sec.
- Thermal Memory: Off

VL-1 Short Time Settings A Parameter

- Short Time Pickup: 0 Amps
- Short Time Delay: ms
- I²t Curve for Short Time: Off

VL-1 Active Instantaneous Pickup

Instantaneous Pickup: 0 Amps

Go To Breaker Instantaneous Settings

VL-1 Breaker Controls

- Edit Mode: Activate
- Upload to Memory: Activate
- Download from Memory: Activate
- Activate New Settings: Activate

VL-1 Ground Fault Settings A Parameter

- Ground Fault Pickup: 0 Amps
- Ground Fault Delay: ms
- I²t Curve for Ground Fault: Off
- Ground Fault Alarm Pickup: 0
- Ground Fault Alarm Delay: ms

VL-1 Pickup Limits

- Long Time Settings: 0 - 0 Amps/2.5 - 30.0 Sec.
- Short Time Settings: 0 - 0 Amps/20, 100 - 500 ms
- Instantaneous Settings: 0 - 0 Amps
- Ground Fault/Alarm Settings: 0 - 0 Amps/100 - 500 ms

Log Off, Settings, Historical Logs, About

Tue Nov 10 2020 13:55:34

- Trip coil monitor alarm
- Under voltage relay alarm

6.8.2 Latching Alarms

Alarms that stay active even if condition has been resolved until acknowledged/reset.

- External Trip
- Fail to Close
- Fail to Trip
- Withdrawn-Test
- Overcurrent Long Time
- Overcurrent Short Time
- Overcurrent Instantaneous
- Overcurrent Neutral
- Overcurrent Ground
- Extended Trip
- Fail to sync – if applicable

7. Power Meter Screens

7.1 Dashboard

The upper segment of the Power Meter Dashboard screen contains three Power Meter Gauge sections. The Power Meter Gauge contains tags for the following values:

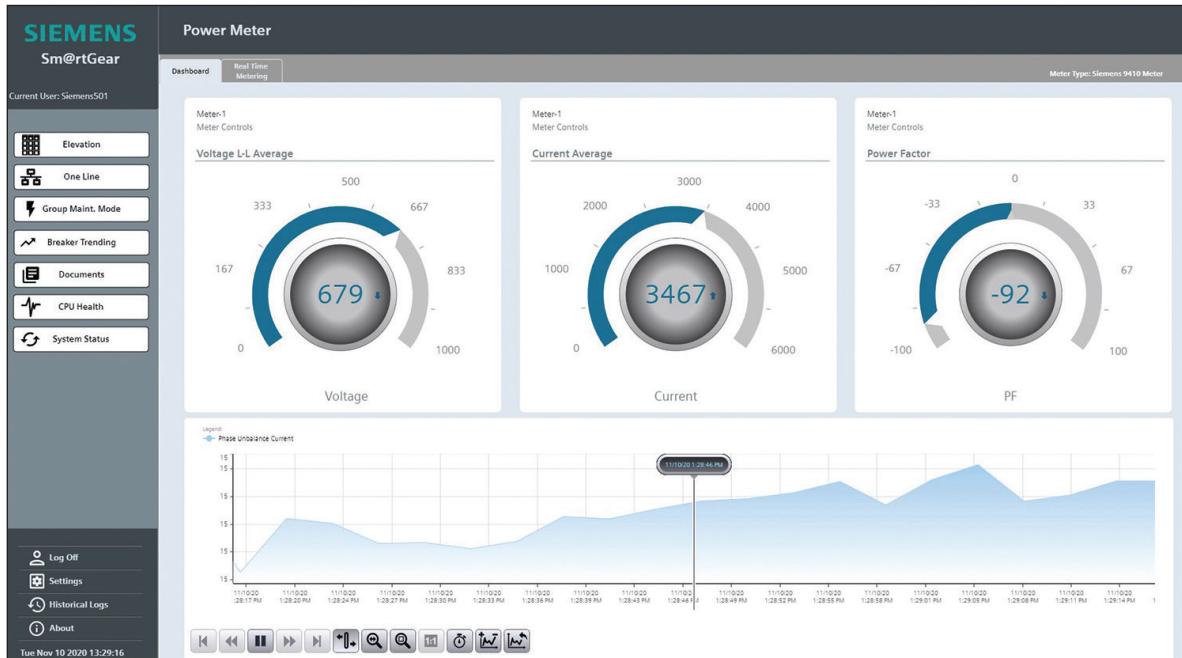
- Current Average
- Voltage L-L Average
- Average Power Factor

The lower segment of the Breaker Trending screen displays a trend of power meter historical metering values. Below the trend, there is a button bar which contains buttons for the following actions:

- First record
- Previous record
- Start stop
- Next record
- Last record
- Ruler
- Zoom time axis +/-
- Zoom area
- Original view
- Select time range
- Select trends
- Export

Clicking the “select trends” button calls a pop-up window which includes selections for the following values:

- Phase Unbalance Current
- Current Average
- Current L1
- Current L2
- Current L3
- Phase Unbalance Voltage
- A-B Volts
- B-C Volts
- C-A Volts
- A-N Volts
- B-N Volts
- C-N Volts
- L-L Volts
- L-N Volts
- Total Apparent Power
- Total Active Power
- Active Power A
- Active Power B
- Active Power C
- Total Reactive Power
- Reactive Power A
- Reactive Power B
- Reactive Power C
- Total Apparent Power
- Apparent Power A
- Apparent Power B
- Apparent Power C
- Power Factor Total
- Power Factor A
- Power Factor B
- Power Factor C
- Frequency



7.2 Real Time Metering

The Voltage section is located in the upper left of the Real Time Metering screen. This section displays readings for the following values:

- L1-N Voltage
- L2-N Voltage
- L3-N Voltage
- L-N Average Voltage
- L1-L2 Voltage
- L2-L3 Voltage
- L3-L1 Voltage
- L-L Average Voltage
- Phase Unbalance Voltage

The Current section is located in the upper middle of the Real Time Metering screen. This section displays readings for following values:

- L1 Current
- L2 Current
- L3 Current
- Average Current
- Phase Unbalance Current

The Power Totals section is located in the lower middle of the Real Time Metering screen. This section displays readings for the following values:

- kW total
- kVAr Total
- kVA Total
- Power Factor Total
- Frequency

The Power section is located in the right of the Real Time Metering screen. This section displays readings for the following values:

- L1 kW
- L1 kVAr
- L1 kVA
- L1 Power Factor
- L2 kW

- L2 kVAr
- L2 kVA
- L2 Power Factor
- L3 kW
- L3 kVAr
- L3 kVA
- L3 Power Factor

SIEMENS

Sm@rtGear

Current User: Siemens501

Elevation

One Line

Group Maint. Mode

Breaker Trending

Documents

CPU Health

System Status

Log Off

Settings

Historical Logs

About

Tue Nov 10 2020 13:29:41

Power Meter

DashboardReal TimeMeterlog

Meter Type: Siemens 9410 Meter

Meter-1

Voltage

L1-N Voltage

392.00 Volts

L2-N Voltage

392.00 Volts

L3-N Voltage

392.00 Volts

L-N Average Voltage

392.00 Volts

L1-L2 Voltage

680.00 Volts

L2-L3 Voltage

680.00 Volts

L3-L1 Voltage

680.00 Volts

L-L Average Voltage

680.00 Volts

Phase Unbalance Voltage

0.00 %

Meter-1

Current

L1 Current

3000.00 Amps

L2 Current

4000.00 Amps

L3 Current

3400.00 Amps

Average Current

3467.00 Amps

Phase Unbalance Current

15.39 %

Meter-1

Power Totals

kW total

3764.139 kW

kVAr Total

1569.397 kVAr

kVA Total

4080.244 kVA

Power Factor Total

-0.923 PF

Frequency

60.0 Hz

Meter-1

Power

L1 kW

1106.380 kW

L1 kVAr

401.515 kVAr

L1 kVA

1176.984 kVA

L1 Power Factor

-0.940 PF

L2 kW

1443.854 kW

L2 kVAr

614.927 kVAr

L2 kVA

1569.347 kVA

L2 Power Factor

-0.920 PF

L3 kW

1213.904 kW

L3 kVAr

552.955 kVAr

L3 kVA

1333.913 kVA

L3 Power Factor

-0.910 PF

42

8. Breaker Configuration

Intuitive WL breaker screens configure the WL breakers – Communications and Metering, Protective Parameters and Threshold Alarms.

When a screen is accessed, a Reading Parameters message pops up. This screen confirms the system is reading the most current values. New parameters are not allowed until the Reading Parameters text disappears. Once the Reading Parameters pop up text is gone, the Sm@rtGear IE has the latest information on the selected parameters and only then accepts new values.

Before new settings take effect, the Activate Settings button must be selected followed by a second confirmation – Are You Sure You Want to Change Settings? Yes or Cancel button options appear on the second pop up. To change settings, press Yes and the Loading Parameters pop up text message appears followed by Reading Parameters. The settings are always reviewed to ensure the current values are displayed. If, at the second confirmation, it is no longer desired to activate the input settings, press the Cancel button. The Reading Parameters pop up appears to overwrite the input values back to the current settings.

8.1 Metering Settings

The Communications and Metering screen shows communication parameters as well as basic metering information (Figure 54).

8.1.1 Primary Transformer

Selectable for Delta or Wye Transformer type – Read/Write.

8.1.2 Primary Voltage

Primary voltage of the system bus – Read/Write.

8.1.3 Secondary V.T. Voltage

Secondary voltage of the voltage transformers. Selections available are 100VAC, 110VAC, and 120VAC – Read/Write.

8.1.4 Incoming Direction

Direction of the power flow through the breaker. Selectable for Top Feed or Bottom Feed – Read/Write.

8.1.5 Phase Rotation

Phase rotation of the switchgear supply. Selectable for A-B-C and A-C-B – Read/Write.

8.2 Protective Parameters

All breaker Protective Parameters are viewed and set from the Protective Parameters screen for both A and B (maintenance) parameters. When the settings are entered, a min/max pops up for any trip value. This min/max is specific to each breaker based on frame size, switching class and rating plug to avoid entering out of range values. If an out of range value is entered, the input immediately reverts back to the previous settings.

Input the parameters to several like breakers. Instead of reentering the same information to multiple breakers; allows for input to one breaker, and then uploads it to memory.

When the Activate settings icon is selected within the Protective Parameters screen, the confirmation box in appears. This is identical for all four Monitor/Configure screens.

Protective Parameters Information includes:

8.2.1 L-Trip (IR)

The maximum continuous current the breaker can carry without tripping; Read/Write

8.2.2 Time Lag Class (TR)

The maximum duration of an overload without tripping; Read/Write

8.2.3 I4t-Curve for L

When ON, the trip unit switches from the I2t to an I4t inverse time function for overload protection. This improves overload selectivity protection in combination with fuses. Read/Write

8.2.4 Phase Loss Sensitivity

If the phase failure protection is ON, and the normal current of the lowest loaded phase is 50% lower than the normal current of the highest loaded phase, the setting IR automatically reduces to 80%. If the values of the three phase currents differ by less than 50%, the setting IR applies again. Read/Write

8.2.5 Thermal Memory

Trip units ETU745 - 776 calculate thermal processes in downstream switchgear, even if the breaker is open and the electronic system has no external power supply. An effective protection against thermal overload is guaranteed for frequent closing and opening processes. Read/Write

8.2.6 S-Trip (ISD)

Isd can be delayed by the time tsd. The setting OFF for the trip units ETU745, ETU755 and ETU776 deactivates short-time-delay short-circuit protection.

8.2.7 Delay Time (tsd)

If Zone Selective Interlocking (ZSI) is used, the setting for the time delay tsd is deactivated. If the breaker does not receive a blocking signal from a downstream circuit breaker it will trip after 50 milliseconds, regardless of the tsd setting. Read/Write

8.2.8 I2t-Curve for S

When switched ON, ETU 776 switches from a constant time delay to an I2t-characteristic. The time delay depends on the shortcircuit current, but with a constant I2tsd-value, providing better coordination with downstream fuses. Read/Write

8.2.9 I-Trip (Ii)

If the Ii current setting is exceeded, the breaker instantaneously trips. Read/Write

8.2.10 N-Protection (IN)

The ETU 776 protects the neutral conductor against overload. This requires a factory or field-installed current transformer for the neutral conductor. Read/Write

8.2.11 Ground Fault (Ig)

If the trip unit is equipped with a ground-fault protection module, loads are protected against impermissibly high ground-fault currents.

8.2.12 Delay Time (tg)

The maximum duration of a ground fault without tripping; Read/Write

8.2.13 I2t-Curve for G

The ETU 776 ground-fault protection modules switch from a constant time delay to an I2t characteristic. An inverse-time tripping characteristic with a constant I2tg value provides better ground-fault protection in systems with several grading levels. The setting possibilities for the time delay remain unchanged.

8.2.14 Ground Fault Alarm (Ig2)

The ground fault module has an additional set point for alarm only. The Ig2 signal triggers an alarm on the ETU without tripping the breaker.

8.2.15 Load Management

The ETU745 - ETU776 trip units offer additional load monitoring. Two current values, Load Shed and Load Restore, as well as one time delay, can be set. If the load falls below the Load Restore setting, or if the load exceeds the Load Shed setting, a signal is generated via the CubicleBUS after the set time delay. These signals can connect or disconnect loads, thereby preventing incoming breaker overload tripping.

8.3 Protection Function Limits

8.4 Threshold Alarms

There are 24 Threshold Alarms that can trigger an alarm if a set point is exceeded. If one parameter set exceeds the set threshold, the Alarm Icon appears. The Alarm View screen indicates the breaker has an active threshold alarm. Threshold alarms do not trip the breaker when activated.

8.4.1 Threshold Alarms

9. Optional Devices

9.1 Source Metering

If the Sm@rtGear IE is equipped with power meters, a Source Metering screen is accessed from the Elevation screen by pressing the meter graphic or from the One Line screen by pressing the VM symbol. The Source Metering screen displays all real time metering. The Metering Screen also has a button link to trending views that contain logged and real time trends. If the equipped meter is a Siemens 9610, a button link to the built in web server can be customized for specific logging tasks.

9.1.1 Trending

The trending data can be accessed from the Source Meter screen by pressing the Trending button located on the left-hand side.

Trending data is available for:

- Power Factor
- KVA
- KW
- KVAR
- AN *only on Y applications
- BN *only on Y applications
- CN *only on Y applications
- AB
- BC
- CA
- IA
- IB
- IC

A button bank on the right-hand side of the screen allows the user to select desired trending information. Once one of the items is selected, two graphs will appear. The right-side graph is for real time data. It shows a 30 second window that constantly updates from right to left. The left side graph shows logged item data. The log data graph has the ability to zoom in and out using standard magnifying glass icons located at the top of the graph. This changes the displayed trend by altering the time band displayed. The user also has the ability to move back and forth across the logged data to see graphed readings at different times in the past. This can be done by using the fast forward and rewind icons located at the top of the graph.

Trending Logs record item data upon a change in value and can hold up to 500,000 records. Once the log is full, it will start to over-write data in the FIFO format of First In, First Out ensuring extensive historical data is available for trending display.

Warning: Users must exit Runtime Mode in order to access log files. Accessing a log file during Runtime Mode or altering the file could result in loss of data. Reference Exit Runtime for procedures.

Trending Log files use .csv formatting and can be located for copying at file directory:

C:\Siemens_Files\Active_Logs\Power

Note: All Log File records include a date and time stamp based on the Sm@rtGear IE CPU date and time. If the GPS Time Server option is utilized, Sm@rtGear IE CPU date and time settings are synced to the GPS Server via IRIG-B or SNTP every 2 milliseconds.

9.2 Surge Protective Devices (SPD)

If the gear is equipped with a SPD, a detailed view of the SPD is accessed from the Elevation or One Line screens by pressing the graphic. The detail view shows the status of the SPD as either OK or General Alarm Present.

9.3 Door Monitoring

If the gear is equipped with Door Monitoring, the Alarm Icon appears and an alarm on the Alarm View screen will be present if a breaker door is open.

9.4 Trip Coil Monitoring

If the gear is equipped with Trip Coil Monitoring, the Alarm Icon appears and an alarm on the Alarm View screen will be present if a breaker trip coil is unhealthy or has a phase loss.

9.5 GPS Time Sync

Sm@rtGear IE is capable of meeting the most stringent time stamping requirements by utilizing time synchronization in accordance with IRIG-B or NTP standards. Additional cards and software can be added to allow the Sm@rtGear IE CPU to synch with an IRIG-B

signal or NTP signal from current site GPS systems. Once the Sm@rtGear IE CPU is configured, all Logging and Trending time stamping will be IRIG-B or NTP compliant. This allows for detailed and accurate sequence of events analysis. Time synchronization of downstream devices is also adjusted in the Sm@rtGear IE CPU to auto sync every 10ms.

The Sm@rtGear IE CPU is also intelligent in that it will analyze how far off its time is from the received signal and start adjusting automatically. This allows for continued accuracy even if the GPS or IRIG-B signal is lost.

In the event a GPS Time Sync is required but not available on site, Sm@rtGear IE can provide the full package. A Spectracom SecureSync Synchronization System can be provided to integrate with the Sm@rtGear IE CPU via IRIG-B or NTP. A few features of the Securesync are:

- Multi-GNSS available (GPS/GLONASS)
- SAASM available in GB-GRAM and MRU receivers
- Internal precision time-keeping via TCXO, OCXO or Rb oscillator
- Multiple, prioritized input references

Securesync can accept up to 6 additional cards provided a wide array of input/output options and through the use of prioritization settings can be set up for redundant use adding additional layers of protection to the synchronization system.

9.6 HRG

High Resistance Grounding Equipment coordinates the use of resistors and control devices, creating a high-resistance ground for a power system.

The HRG unit ships from the factory configured for use at the system voltage with the fault current tap set at 5 amps and the pulsing tap set at 10 amps. If the charging current of the system is known, this may be changed accordingly; otherwise, the system charging current can be measured via the user interface once the system is operational. The default alarm settings are as follows (unless otherwise specified):

The details of the information displayed from the HRG are as follows:

- Active Alarms
 - Voltage Alarm
 - Current Alarm
 - Phase Loss Voltage Alarm
 - Voltage Above Max Alarm
 - Voltage Below Min Alarm
 - Current Above Max Alarm
 - Current Below Min Alarm
 - Phase A Faulted
 - Phase B Faulted
 - Phase C Faulted
 - NGR Failed
 - Phase A Fault Monitor
 - Phase B Fault Monitor
 - Phase C Fault Monitor
- Communications Parameters
 - IP Address
 - Subnet
 - Gateway
 - RS-485 ID
 - RS-485 Time Out
 - RS-485 Retries
 - Baud Rate
- System Settings
 - System Rated Voltage
 - System Rated Current
 - Sensing Resistor Voltage Alarm Setting – Normal
 - Sensing Resistor Voltage Alarm Setting
 - NGR Maximum Voltage
 - NGR Minimum Voltage
 - NGR Maximum Current
 - NGR Minimum Current
 - Scaled NGR Voltage

- Scaled NGR Current
- Scaled Test Resistor Current
- Scaled Sensing Resistor Voltage
- System Charging Current
- Controls
 - Activate Pulser – Press to turn the pulser on or off
 - Set Pulse Rate
 - Ground Fault Time Delay
 - Alarm Resend Timer
 - Customer Password
 - When the Change Password button is pressed a pop up will appear with the new password and confirmation. Input the desired password (must be a value of 1000-9999) and then press the “Apply” button. If the Password change was successful a “Password Change Successful” message will appear.
- System Events
 - Number of Events Currently Stored in Log – displays the number of events that can be displayed to the user. The events are stored in rows from 1 to 200.
 - Operator Input – Select Event No. To Read – The operator inputs what event (row) that is desired to be displayed. If the most current event is to be read, the operator would input a 1 in this field and then press the “Read Selected Event” button. The event and time stamp would be displayed in the “Event Selected” field.
 - Read Selected Event History – stores the last 3 event rows that have been selected. The history is recorded in FIFO (First in First out) memory.
 - The Events that can be read are as follow:
 - Ground Faults Cleared – “Phase-to-ground faults no longer detected. Any Undetected faults may still be on system.”
 - System Charging Current – “System charging current has been calculated. View Parameters screen for calculation result.”
 - Test Resistor Connected – “Test Resistor has been connected.”
 - Voltage Within Limits – “Voltage across the NGR has returned to normal.”
 - Current Within Limits – “Current through the NGR has returned to normal.”
 - Pulse Start – “Pulsing of faulted system through NGR has started.”
 - Pulse Stop – “Pulsing of faulted system through NGR has stopped.”
 - Password Changed – “Password has been changed.”
 - Password Disabled – “Password disabled. Protection removed from system. Unauthorized user access allowed.”
 - Password Enabled – “Password enabled. Protection returned to system. Unauthorized user access not allowed.”
 - Lamp Event – “Front Panel Lamps and Horn tested.”
 - LVM Enabled – “Loss of Voltage Monitoring System has been Enabled.”
 - LVM Disabled – “Loss of Voltage Monitoring System has been Disabled.”
- System Alarms
 - Number of Alarms Currently Stored in Log – displays the vnumber of alarms that can be displayed to the user. The alarms are stored in rows from 1 to 200.
 - Operator Input – Select Alarm No. To Read – The operator inputs what alarm (row) that is desired to be displayed. If the most current alarm is to be read, the operator would input a 1 in this field and then press the “Read Selected Alarm” button. The alarm and time stamp would be displayed in the “Alarm Selected” field.
 - Read Selected Alarm History – stores the last 3 event rows that have been selected. The history is recorded in FIFO (First in First out) memory.
 - The Alarms that can be read are as follow:
 - Voltage Above Limit – “Warning!! Voltage across NGR has exceeded maximum alarm value.”
 - Voltage Below Limit – “Warning!! Voltage across NGR is below the minimum alarm value.”
 - Current Above Limit – “Warning!! Current through NGR has exceeded maximum alarm value.”
 - Current Below Limit – “Warning!! Current through NGR is below the minimum alarm value.”
 - Phase A Fault – “Warning!! A single-line-to-ground fault has occurred on Phase A.”
 - Phase B Fault – “Warning!! A single-line-to-ground fault has occurred on Phase B.”
 - Phase C Fault – “Warning!! A single-line-to-ground fault has occurred on Phase C.”
 - NGR Failure – “Warning!! An open circuit has occurred in the NGR. An ungrounded system condition may result.”

9.7 Temperature Monitoring

The Temperature Monitoring screen allows the user to remotely monitor the temperature of optional embedded temperature sensors. Typical monitoring applications are bus bar bolted connections and cable/lug connections.

10. Autothrowover

10.1 Autothrowover Definition

Autothrowover is an intelligent protection scheme used to ensure power supplied to a load or loads meets predefined power quality metrics. When a primary power source does not meet these standards, the system automatically switches to an alternate source.

Autothrowover functionality is an optional feature of Siemens Sm@rtGear IE. By adjusting autothrowover set points and controls the Sm@rtGear IE gear can autonomously detect when a utility has failed, or is at risk of failure, and transition to an alternative power source if available. These intelligent capabilities add an additional level of protection for a given application, and minimize power interruption.

Siemens Sm@rtGear IE is capable of performing all functions required for the autothrowover process. No additional system components, such as automatic transfer switches, are required as all switching functions are performed using Siemens WL breakers. This reduces overall system cost, complexity, and probability of failure.

Optional accessories (external relays) must be added to Siemens Sm@rtGear IE if closed transition retransfer is required.

10.2 Configurations

Standard power source configurations for an autothrowover system include the following two cases:

Case I: Primary and secondary utilities, typically referred to as a Main-Tie-Main configuration. The normal operating state is when both main breakers are closed and the tie is open.

Case II: Primary utility and secondary generator, typically referred to as a Main-Generator configuration. The normal operating state is when the utility breaker is closed and the emergency generator breaker is open.

Other non-standard configurations are possible. Operation of these non-standard configurations is a function of the physical system and is not described in this document. An example of a non-standard configuration would be main generator with multiple generators run in parallel.

10.3 System Control

10.3.1 Standard Control Features

Siemens switchgear autothrowover logic is controlled by a Siemens IPC427D industrial CPU running Step 7 PLC software. This controller contains all software required to monitor, configure, and control embedded intelligent and structural monitoring devices.

The autothrowover controls and settings may be accessed using either the Elevation or One Line displays via the HMI. From the Elevation screen select the autothrowover icon located on the design-specific cubicle. From the One Line display select the "27/59,81O/U,47" icon.

10.3.2 Optional Control Features

For applications requiring additional redundancy, the Siemens S7-400 hot swappable PLC is available as an additional feature. This PLC allows the user to insert and remove process controller signal modules while the system is live, resulting in increased system flexibility while minimizing downtime.

The addition of the non-standard sync check relay (25M) allows the switchgear system the ability to perform closed transfers. A closed transfer occurs when both primary and secondary sources are supplying power to the load(s). In order for the sources to be paralleled, phase (both angle and rotation), frequency, and voltage must be synchronized. Prolonged paralleling of sources can create a hazardous condition for the equipment and operator, thus the paralleling time is limited to 300 milliseconds.

10.4 Autothrowover Components and Features

10.4.1 Standard Components and Features

Standard features and components include:

- Siemens IPC427D Microbox CPU
- Programming to support required sequence of operation
- Electrically operated breakers containing shunt trip, remote closing coil, and spring charge motor
- Modbus or Profibus communication modules
- UPS to supply backup control power

- Electrical interlock
- Siemens ITC 2200 HMI with 22" touch screen

10.4.2 Optional Components and Features

Optional features and components include:

- Hot swappable S7-400 PLC for additional system redundancy
- Sync relay check 25M allowing for closed transfer
- External relays (27/59,81O/U,47)
 - If the integral WL breaker relaying capability is not utilized
- Redundant hard switches (in addition to standard HMI soft switches) for breaker control
- Redundant indicating lights
 - Source available (Preferred/Alternate)
 - Control power available (Preferred/Alternate)
 - Breaker condition (Open/Closed)
- Redundant selector switches
 - Manual/Auto mode
 - Breaker operation – in manual mode

10.5 Setpoints/Controls Screen

The setpoints screen allows the operator to define the setpoints for the system. The first column is the setpoint and the second countdown column is visible only when the timer is active. The second column is purely for countdown purposes.

Any of the setpoints can be viewed or changed; they are password protected to prevent tampering. Each setpoint has preprogrammed high and low limits to ensure that a chosen value is within an acceptable range.

The setpoints and timers that are operator configurable are shown below:

10.5.1 Timer Setpoints

TDOX – Open transition timer

TDFC – Time delay before breaker “fail to close” alarm

TDFT – Time delay before breaker “fail to trip” alarm

TDFS – Time delay for “fail to synchronize” alarm

TDOL – Maximum safety time limit for paralleling sources in Automatic mode

TDNE-M1 – Time delay on transfer from primary to secondary source in order to override momentary outages

TDEN-M1 – Retransfer time delay from secondary to primary source

TDNE-M2 – Time delay on transfer from secondary to primary source in order to override momentary outages

TDEN-M2 – Retransfer time delay from primary to secondary source

TDVF – Time delay on transfer from primary in order to override any momentary outages

TDVA – Time delay from primary. Primary voltage normalized

TDCD – Time delay to keep engine running after start signal is removed

TDVF-S2 – Time delay for generator to come up to voltage and frequency

10.5.2 Selector Switches

In addition to the operator specified timers, there are four selector switches on the autothrowover Setpoints/Control screen. The function of each selector switch is described below:

System Mode – Auto or Manual – Dictates whether protective relays or an operator controls the transition from primary to secondary sources. Auto mode requires no operator interaction with the system once timers and protective relay settings are defined. All source transfers occur automatically based on these predefined values. Manual mode gives the operator complete control of the system and disables all automatic functions.

Retransfer Mode – Auto or Manual – Dictates whether protective relays or an operator controls the transition from secondary to primary sources. Auto mode requires no operator interaction with the system once timers and protective relay settings are defined. All source transfers occur automatically based on these predefined values. Manual mode gives the operator complete control of the system and disables all automatic functions.

Transition Mode – Open or Closed – Dictates the mode of transition between sources. Note that for closed transition the optional protective relays must be installed. This selector switch will only function in systems that have the capability for closed transition; otherwise it will be locked in the open state.

10 Switch (Manual Only) – Allows the user to manually switch from one source to another when the System Mode is in the manual mode.

10.5.3 Protective Relays

The protective relays in Siemens Sm@rtGear IE are the features that make this system intelligent. The relays measure various source parameters and dictate when the autothrowover sequence is initiated.

The operator must first define the system voltage and frequency within the protective relays section on the Setpoints/Control screen. Once this is done the source settings will auto populate with settings based upon inputs. It should be noted that Siemens advises the specific voltage and frequency be measured onsite, and the preset factory parameters be modified to match the measured values in the field. This will aid in preventing nuisance trips and transfers.

Relay 27/59 is responsible for undervoltage/overvoltage sensing. Relay 81O/U is responsible for underfrequency/overfrequency sensing. Relay 47 is responsible for phase unbalance sensing. Optional relay 25M is required for closed transition transfers, and verifies source synchronization.

10.5.4 Load Test

The load test section of the Setpoints/Control screen allows the operator to conduct a transition from primary to secondary sources. The full sequence for the load test function is described below:

Push the load test pushbutton on the HMI screen. The system will initiate a generator start request, if applicable. Once the secondary source becomes available (at 90% rated voltage and frequency as indicated by the emergency source available light) the normal main breaker will open and after timer TDOX (3 seconds) expires the emergency breaker will close.

10.6 Sequence of Operation

10.6.1 Automatic Mode

10.6.1.1 Loss of Primary

When primary source metrics fall outside the threshold settings of the source monitoring relays, the system will by default delay transition to the secondary source by 5 seconds (TDNE-M1 or TDVF) to override any momentary source outages. This time delay may be adjusted to best match the system applications.

If the switchgear is in the main-tie-main configuration, the five second delay initiates the opening of the primary breaker. After the default open transition time delay of 3 seconds (TDOX) the tie breaker will close.

If the switchgear is in the main-generator configuration, the 5 second delay (TDVF) initiates the generator start request. The generator must achieve 90% the rated voltage and frequency before transition to this secondary source occurs. The time delay for the generator to reach voltage and frequency is set to a default 10 seconds (TDVF-S2).

10.6.1.2 Return to Primary – Standard Open Transition

Once the primary source has returned to an acceptable operating state, the system will by default monitor the source for 5 minutes (TDEN-M1 or TDVA) to ensure stability. After time has expired the system will initiate an open transition retransfer. Regardless of configuration, this open transfer takes by default 3 seconds (TDOX) to occur. This is the delay between one breaker opening and another closing.

If the switchgear is in the main-generator configuration, the generator start request will be removed and the cool down timer will begin once the transition has occurred. By default the generator continues to run for 5 minutes (TDGD) in a cool down state after the transition has occurred.

10.6.1.3 Return to Primary – Optional Closed Transition

Upon return of the normal source, the system will by default monitor the source for 5 minutes (TDEN-M1 or TDVA) to ensure stability. After time has expired the system will initiate a closed transition retransfer if the phase, voltage, and frequency of the primary and secondary sources are synchronized. The primary breaker will close and after a default time of 100 milliseconds (TDOL) either the tie breaker or the generator breaker will open completing the closed transition. Regardless of configuration the maximum amount of time two sources may be run in parallel is 300 milliseconds (TDOL).

For the main-generator configuration, by default the generator continues to run for 5 (TDGD) minutes in a cool down state after the transition has occurred.

10.6.2 Manual Mode

Manual operations via the breaker control switches disable all automatic operations. The transfer of sources is open (standard) or closed transition and is enabled when the selector switch is in the manual mode position. After desired transfers are complete, turn the selector switch back to auto mode to return to PLC-based automatic breaker control.

In the case of an autothrowover event, the associated breakers may only be opened or closed from the Breaker Controls screen in Manual Mode.

10.6.2.1 Standard Open Transition

Operation Steps:

- 1) Turn selector switch to manual load. The blue manual mode light will illuminate.
- 2) Verify that the secondary source is available by noting whether the source availability light is illuminated. This may also be determined using the HMI.
- 3) Upon verification use the breaker control switches to first open the primary source breaker and then close the tie breaker (main-tie-main configuration) or secondary source breaker (main-generator configuration).
- 4) To retransfer to the primary source open the tie breaker (maintie-main configuration) or the secondary source breaker (maingenerator configuration) and close the primary breaker.

10.6.2.2 Optional Closed Transition

Operation Steps:

- 1) Turn selector switch to manual load. The blue manual mode light will illuminate.
- 2) Verify that the secondary source is available by noting whether the source availability light is illuminated. This may also be determined using the HMI.
- 3) Verify that the synchronization of sources light (green) is on.
- 4) Upon verification close the tie breaker (main-tie-main configuration) or the secondary source breaker (maingenerator configuration). The two sources are now running in parallel. Prolonged paralleling of sources can create a hazardous condition for the equipment and operator. It is recommended that paralleling be removed immediately after the transfer.
- 5) Open the primary source breaker to complete the transfer to the secondary power source.

10.7 Optional System Capabilities

10.7.1 Load Shedding and Load Prioritization

Load shedding consists of the required controls to prioritize downstream loads, supplying power to these loads based upon source availability. This added functionality allows the user to pick and choose which downstream loads are critical to the specific application. Load shedding requirements must be specified during the order process for the system to be constructed with the required control scheme.

10.7.2 Peak Shaving

Peak shaving, in the main-generator configuration, is the process of switching power sources from the utility to the generator during peak usage times, avoiding elevated utility costs. Peak shaving is most effective if the following conditions are met:

- 1) System is in the main-generator configuration and has closed transition capability.
- 2) Generator is adequately sized so as to provide power for all normal facility operations.

If these conditions are met the end user may increase power source flexibility, with the potential for significant utility cost savings.

10.8 Test Sequences

10.8.1 Main-Tie-Main or Main-Main Configuration

10.8.1.1 Standard Main-Tie-Main or Main-Main Configuration

Start Transfer Test – Source 1 – Open Transition

Press the Start Source 1 Test button on the control screen of HMI. The system will initiate an open transition transfer, the normal main breaker 1 will open, and after timer TDOX (3 sec) expires the tie breaker will close.

Stop Transfer Test – Source 1 – Open Transition Mode (Retransfer from Normal 2 to split bus)

Press the Stop Source 1 Test button on the control screen of HMI. The system will initiate an open transition transfer, the Tie breaker will open and after timer TDOX (3 sec) expires the normal main breaker 1 will close.

Start Transfer Test – Source 2 – Open Transition Mode

Press the Start Source 2 Test button on the control screen of HMI. The system will initiate an open transition transfer, the normal main breaker 2 will open and after timer TDOX (3 sec) expires the tie breaker will close.

Stop Transfer Test – Source 2 – Open Transition Mode (Retransfer from Normal 1 to split bus)

Press the Stop Source 2 Test button on the control screen of HMI. The system will initiate an open transition transfer, the Tie breaker will open and after timer TDOX (3sec) expires the normal main breaker 2 will close.

10.8.1.2 Optional Main-Tie-Main or Main-Main Configuration**Start Transfer Test – Source 1 – Closed Transition Mode**

Press the Start Source 1 Test button on the control screen of HMI. The system will initiate a closed transition retransfer, (if, the phase, voltage and frequency of sources are in synchronization). The tie breakers will close after timer TDOL (100 milliseconds) expires the main breaker 1 will open.

Stop Transfer Test – Source 1 – Closed Transition Mode (Retransfer from Normal 2 to split bus)

Press the Stop Source 1 Test button on the control screen of HMI. The system will initiate a closed transition retransfer, (if, the phase, voltage and frequency of sources are in synchronization). The normal main breaker 1 will close and after timer TDOL (100 milliseconds) expires the tie breaker will open.

Start Transfer Test – Source 2 – Closed Transition Mode

Press the Start Source 2 Test button on the control screen of HMI. The system will initiate a closed transition retransfer, (if, the phase, voltage and frequency of sources are in synchronization). The tie breakers will close and after timer TDOL (100 milliseconds) expires the main breaker 2 will open.

Stop Transfer Test – Source 2 – Closed Transition Mode (Retransfer from Normal 2 to split bus)

Press the Stop Source 2 Test button on the control screen of HMI. The system will initiate a closed transition retransfer, (if, the phase, voltage and frequency of sources are in synchronization). The normal main breaker 2 will close and after timer TDOL (100 milliseconds) expires the tie breaker will open.

10.8.2 Main-Generator Configuration**10.8.2.1 Standard Main-Generator Configuration****No Load Test**

Push the no load test pushbutton on the HMI screen. The system will initiate a generator start request. To stop test, push the no load test pushbutton on HMI screen.

Load Test – Open Transition Mode

Push the load test pushbutton on the HMI screen. The system will initiate a generator start request. Once the emergency system becomes available (at 90% rated voltage and frequency as indicated by the emergency source available light) the normal main breaker will open and after timer TDOX (3 seconds) expires the emergency breaker will close.

Return from Load Test – Open Transition Mode (Retransfer from Emergency to Normal)

Push the load test off pushbutton on the HMI screen. The system will initiate an open transition retransfer, the emergency main breaker will open and after timer TDOX (3 seconds) expires the normal main breaker will close. Once retransfer has occurred, the generator start request will be removed and the cool down timer will begin timing (5 minutes).

Load Test (Exerciser On) – Open Transition Mode

Per the time and day set points on the HMI touch screen. The Exerciser will turn on and be on for the duration set point on the HMI screen. The system will initiate a generator start request. Once the emergency system becomes available (at 90% rated voltage and frequency as indicated by the emergency source available light) the normal main breaker will open and after timer TDOX (3 seconds) expires the emergency breaker will close.

No Load Test (Exerciser On)

Per the time and day set points on the HMI touch screen. The Exerciser will turn on and be on for the duration set point on the HMI screen. A start signal will be sent to the generator.

Return from No Load Test (Exerciser Off)

Per the time and day set points on the HMI touch screen. The Exerciser will turn off after the duration time set point has expired. The generator start request will be removed and cool down timer will begin timing (5 minutes).

Retransfer Inhibit (Maintain Emergency)

To inhibit retransfer, push the inhibit pushbutton on the control screen of HMI. The home and control screen will indicate retransfer is inhibited. The system will remain on emergency system until the bypass pushbutton on the HMI is pressed or until retransfer mode is put back into auto by pressing auto pushbutton on the control screen of the HMI.

10.8.2.2 Optional Main-Generator Configuration**Load Test – Closed Transition Mode**

Push the load test pushbutton on the HMI screen. The system will initiate a closed transition retransfer, (if, the phase, voltage and frequency at generator are in synchronization with that of utility) the emergency breaker will close after timer TDOL (100 milliseconds) expires and the normal main breaker will open. Return from Load Test – Closed Transition Mode (Retransfer from Emergency to Normal).

Push the load test off pushbutton on the HMI screen. The system will initiate a closed transition retransfer, (if, the phase, voltage and frequency at generator are in synchronization with that of utility) the normal main breaker will close after timer TDOL (100 milliseconds) expires and the emergency breaker will open. Once retransfer has occurred, the generator start request will be removed and cool down timer will begin timing (5 minutes).

Load Test (Exerciser On) – Closed Transition Mode

Per the time and day set points on the HMI touch screen. The Exerciser will turn on and be on for the duration set point on the HMI screen. The system will initiate a closed transition retransfer, (if, the phase, voltage and frequency at generator are in synchronization with that of utility) the emergency breaker will close and after timer TDOL (100 milliseconds) expires the normal main breaker will open.

Return from Load Test – Closed Transition Mode (Exerciser Off)

Per the time and day set points on the HMI touch screen. The Exerciser will turn off after the duration time set point has expired. The system will initiate a closed transition retransfer, (if, the phase, voltage and frequency at generator are in synchronization with that of utility) the normal main breaker will close after timer TDOL (100 milliseconds) expires and the emergency breaker will open. Once retransfer has occurred, the generator start request will be removed and cool down timer will begin timing (5 minutes).

Return from Load Test – Open Transition Mode (Retransfer from Emergency to Normal)

Per the time and day set points on the HMI touch screen. The Exerciser will turn off after the duration time set point has expired. The system will initiate an open transition retransfer, the emergency main breaker will open and after timer TDOX (3 seconds) expires the normal main breaker will close. Once retransfer has occurred, the generator start request will be removed and cool down timer will begin timing (5 minutes).

11. Upper Level System Tie-In

Option 1:

Siemens PC tie in to control room PC via http web server. This option makes HMI completely visible to upstream PC in control room. Reference Smart@ccess manual, located on the documentation screen, for more information.

Option 2:

The Sm@rtGear IE system is equipped with remote mode. This is an upper level system equipped with a Siemens driver that will serve to control downstream devices.

Option 3:

Upper level system can access Sm@rtGear IE breakers via Modbus server using ModBus mapping data listed below.

Sm@rtGear IE V3.0 Modbus Mapping Data Upper Level System Integration

Troubleshooting

- Password Lockout:
If a password to access the protected screens is entered incorrectly three times, the protected screens will be locked out. If this happens, power must be cycled to the HMI to unlock the screens.
- Data on the HMI not updating:
If the HMI data is not current with the actual status of the Sm@rtGear IE, look in the upper right-hand corner of the HMI. If the CPU and the HMI are connected, it shows CPU: Online. This means all data on the HMI should be current. If it shows CPU: Offline then check the Ethernet cable that runs from the HMI to the CPU. Ensure the cable is connected and not damaged. Also make sure the CPU is in Run Mode indicated by a green light on the CPU next to the word Run. If the CPU is on Stop Mode, indicated by an orange light on the CPU next to the word Stop, place the CPU in Run Mode using the toggle switch on the CPU.
- Breaker time incorrect:
When the CPU is placed into Run Mode a system Time Sync operation is performed. After this operation, if a breaker communications module lost power, then the breaker clock would reset. To re-sync, touch the breaker from the One Line or Elevation and press the Sync Time button.
- PROFIBUS Failure Alarm:
If a PROFIBUS Failure alarm is displayed on the Alarm Screen for a PROFIBUS device, check the PROFIBUS connection. If it is a WL Breaker, look at the Com 15 module on the breaker to see if both the lights are green. If both lights are green, then the module is communicating normally. If the top light is red and the bottom light is green, then the Com 15 is not sending data to the CPU. If the PROFIBUS connection is good, check the on/off resistor switch on the PROFIBUS connector. All resistor switches should be turned off. If the top light is green but the bottom light is red and the breaker is connected in the cell, then there is an internal communications error.
- Fail to Close/Trip Alarms:
If an attempt to close or trip a breaker fails, a Fail to Close/Trip alarm will be displayed on the Alarm Screen. This alarm indicates there is hardware or wiring issue/logic blocking the operation. This alarm takes place if the signal is sent out of the CPU. Check the breaker Close/Trip relay located to the right of the breaker. Make sure the relay is installed, is the correct coil voltage (24VDC) and that the relay coil picks up when the Close/Trip button is pressed. It is also important to note that the Fail to Close/Trip alarm are latching alarms. Once an alarm is present, the system will not attempt the operation again until the Reset button is pressed on the Alarm Screen.
- Software Updates:
Software updates are sent via Pack and Go email. All that is required is a windows laptop and an Ethernet port.

12. Service & Support

Support, service, parts and repairs are available seven days a week, 24 hours a day, 365 days a year. Call Siemens Industry Customer Care Center (ICCC) at 800-333-7421.

13. Appendix

13.1 How to Access the Siemens Download Center

<http://w3.usa.siemens.com/powerdistribution/us/en/resources/Pages/DownloadCenter.aspx>

Notes:

[illegible]

Legal Manufacturer

Siemens Industry, Inc.
3617 Parkway Ln
Peachtree Corners, GA 30092
United States of America
Telephone: +1 (800) 333-7421
www.usa.siemens.com/smartgear
Order No. LVSA-MLVSG-1121

This document contains a general description of available technical options only, and its effectiveness will be subject to specific variables including field conditions and project parameters. Siemens does not make representations, warranties, or assurances as to the accuracy or completeness of the content contained herein. Siemens reserves the right to modify the technology and product specifications in its sole discretion without advance notice.