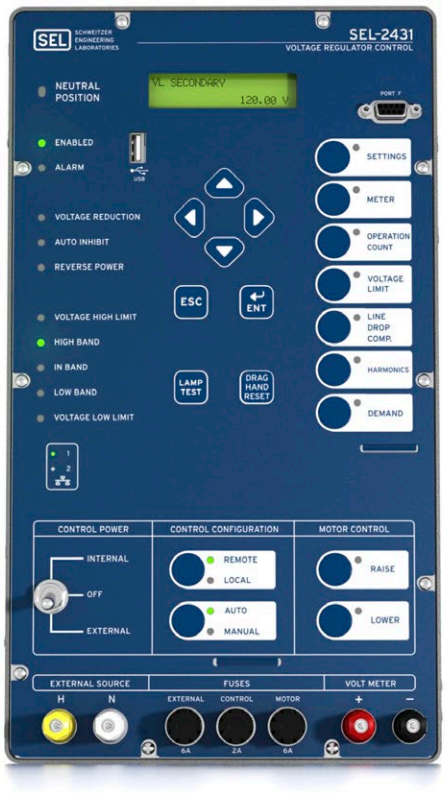
SEL-2431

Voltage Regulator Control



Improve Efficiency and Optimize System Voltage

- Standardize with a single control to simplify installation, reduce training, and minimize operator errors.
- Choose standalone programmable operation or integrate with communications and control systems to improve system efficiency.
- Configure different modes of operation to support voltage regulation in systems with Automatic Network Reconfiguration schemes and distributed energy resources (DERs).

Key Features

Plug-In Voltage Regulator Compatibility

The SEL-2431 can be used with many different voltage regulators, including Cooper, GE, Howard Industries, Siemens, and Toshiba 32-step single-phase voltage regulators.

- Siemens/Allis-Chalmers or Howard Industries Type A with both a source- and a load-side PT.
- Siemens/Allis-Chalmers Type A single-phase voltage regulator with only a source-side PT.
- General Electric or Cooper/McGraw Edison Type A.
- Siemens/Allis-Chalmers, GE, Howard Industries, Cooper/McGraw Edison, or Toshiba CR-3 Type B.

Built-In Reliability, Ten-Year Warranty

Reduce maintenance and repair costs with a voltage regulator control designed and tested to relay standards. Mounted in a rugged cast-aluminum housing, the SEL-2431 Voltage Regulator Control includes the SEL worldwide, ten-year, no-questions-asked warranty.

Easy Application Settings

Accelerate installation and commissioning with application-specific settings. Regulate voltage while applying advanced metering and event-recording capabilities with fewer than 20 settings.

Simple and Flexible Communications

Quickly integrate the SEL-2431 into Ethernet or serial communications networks with DNP3, SEL, and synchrophasor protocols. Both the serial and Ethernet ports are available with copper and fiber-optic connection options.

Quickly Retrieve Data

Event reports, tap change history, load profile data, and Sequential Events Recorder (SER) data are all available through the USB port or other communications interfaces. You may also use a USB flash drive to quickly transfer settings, upgrade firmware, and expand onboard storage capacity.

Applications

Optimize System Voltage

Control the system voltage with directional voltage profiles and detailed tap change event reports.

Install Into Multiple Power System Types

Apply locked-forward, locked-reverse, idle-reverse, bidirectional, cogeneration, or FlexDG operating modes. FlexDG mode detects whether reverse power flow is coming from cogeneration/DERs or the traditional power source. It can use the change in voltage following a tap and the direction of current in deciding which side to regulate. Bias mode can be applied together with FlexDG, cogeneration, and bidirectional modes to improve voltage regulation in low-current conditions.

Track Tap Position Accurately

Know your tap position with the SEL-2431. Monitor the motor current and holding switch status for accurate tap position tracking.

Monitor Motor Current

Monitor and troubleshoot your voltage regulator with recorded tap change motor current waveforms. The SEL-2431 monitors and records the motor current and lets you quickly review and analyze tap-change waveform reports for better visibility into the condition of your voltage regulator.

Operate in Harsh Environments

Rely on the SEL-2431 for control applications, even in harsh environments. SEL designs and tests the SEL-2431 to meet and exceed utility industry requirements. An operating temperature range of −40° to +85°C (−40° to +185°F) and optional conformal coating mean this control will provide years of reliable service.

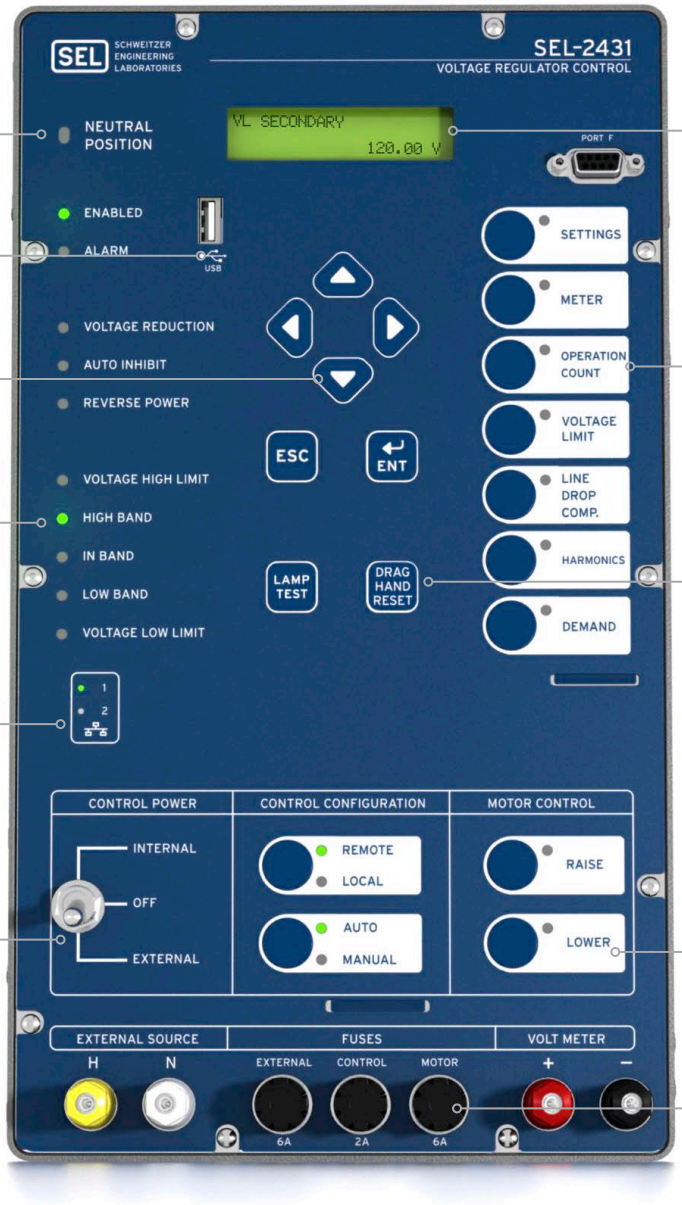
Easily Monitor Your Network

Identify the connected phase of downstream voltage regulators by coordinating with synchrophasor measurements in the substation. Access system values for wide-area monitoring and control using IEEE C37.118 synchrophasors, available at up to 60 messages per second. Detect a potential cascading voltage collapse before it happens.

Connect to Your Distribution Automation System

The SEL-2431 integrates seamlessly into your system and is ideal for centralized and distributed intelligent control for volt/VAR optimization. Integrated SELOGIC® device control capability adds flexibility for custom and advanced control applications.

Product Overview



Neutral Position Indicator

USB Flash Drive Port

Simple Menu Navigation

System Status Indicators

Ethernet Link Indication

Internal/External Power Switch

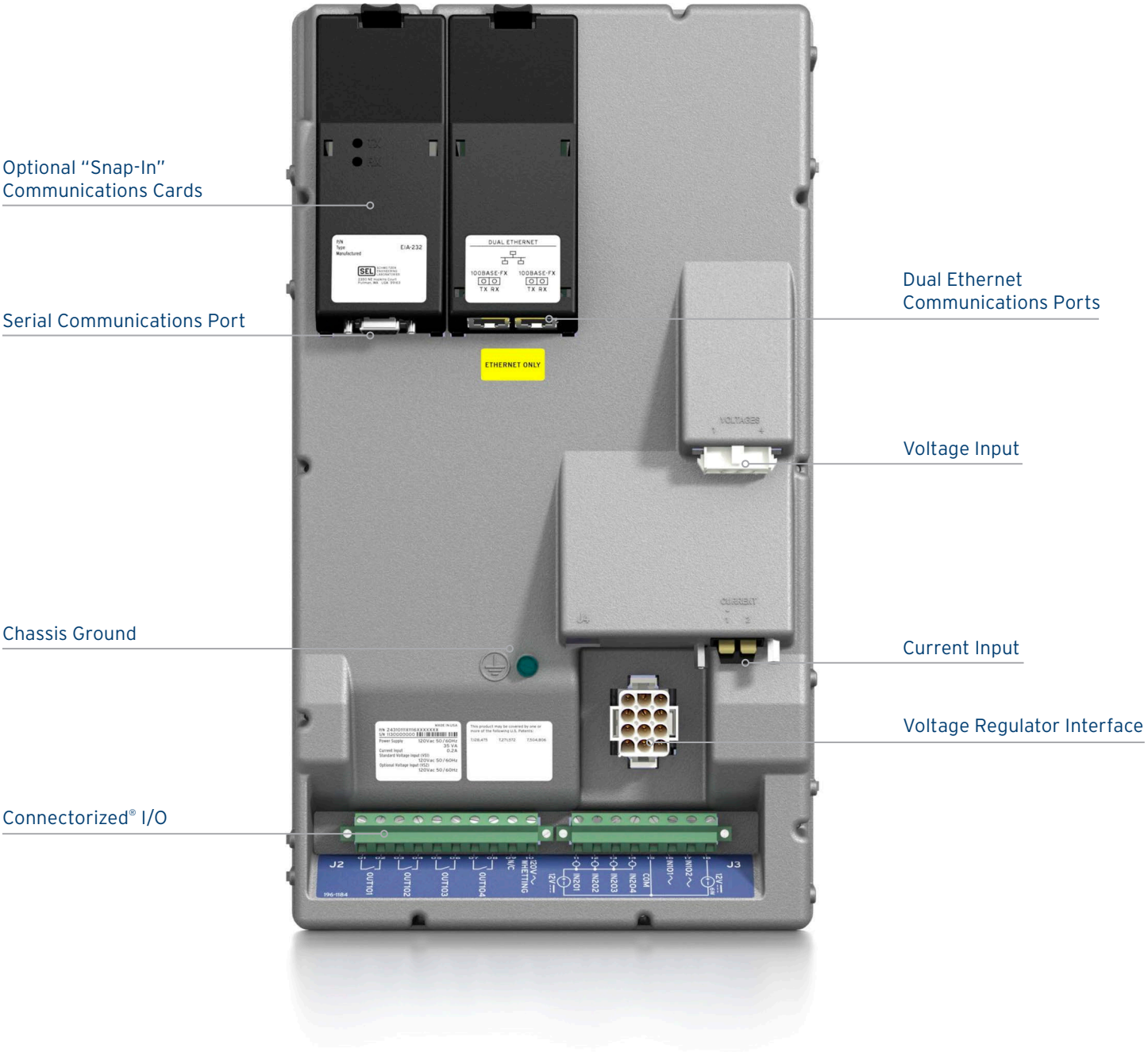
Configurable Display Points

Seven Configurable Pushbuttons and LEDs

Drag Hand Reset

Raise/Lower Pushbuttons or Toggle Switch

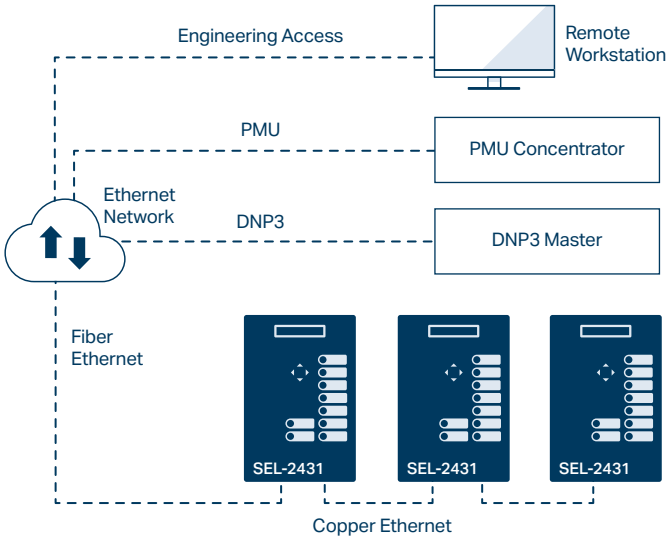
Separate Fuses to Protect the Controller and the Motor Operator


Optional "Snap-In" Communications Cards
Serial Communications Port
Chassis Ground
Connectorized® I/O
Dual Ethernet Communications Ports
Voltage Input
Current Input
Voltage Regulator Interface
EIA-232
DUAL ETHERNET
100BASE-FX
TX RX
ETHERNET ONLY
VOLTAGE
CURRENT
J2
J3
OUT101
OUT102
OUT103
OUT104
IN201
IN202
IN203
IN204
COM
IN101
IN102

Flexible Communications

Dual Ethernet Connectivity

Eliminate the need for a local Ethernet switch device with the built-in switched dual Ethernet ports that integrate the SEL-2431 into fiber or copper networks. Simultaneously support several DNP3 sessions, a Telnet session for engineering access, and a synchrophasor session.



Flexible connectivity for your network.

Serial Communications Configurations

The SEL-2431 supports both star and daisy-chain communications configurations. In a star configuration, the information processor or remote terminal unit (RTU) connects directly to each SEL-2431. In the event that one fiber-optic cable is damaged, communication is retained with the remaining voltage regulator controls.

In daisy-chain communications configurations with the fiber-optic communications card accessory in "echo" mode, the control automatically forwards messages from the information processor to the next control. Responses are echoed in similar fashion back to the information processor. Reduce equipment costs and communicate to multiple voltage regulator controls through one serial port.

Stay Connected to Your System, Even Without a Network

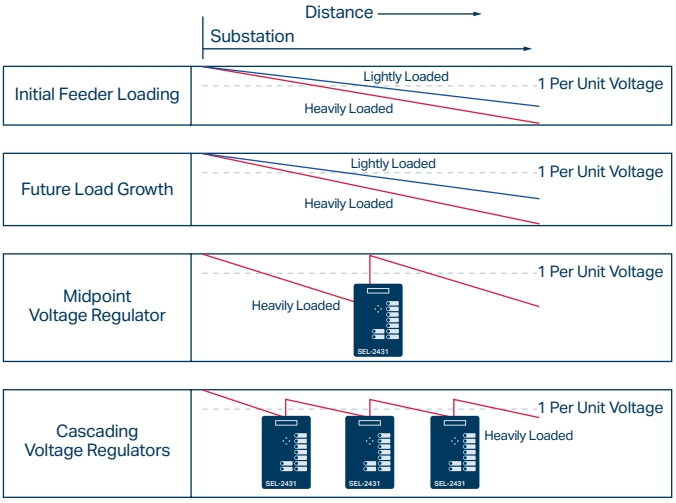
In addition to voltage regulator control, use the SEL-2431 to capture system events through oscillography, profile the load, trend the tap history, and provide other system information. Quickly retrieve data using the USB flash drive when a network connection is unavailable.

Oscillographic event reports and load profile reports provide valuable information about the condition of your system. Tap history, motor current oscillography, and Sequence of Events (SOE) reports contain valuable data about the state of your voltage regulator. Together, these data enable you to stay connected for troubleshooting, analysis, and planning.

Application Overview

Creating the Optimum Profile

Apply the SEL-2431 to your single-phase voltage regulators to optimize your voltage profile both now and in the future. After initial construction, feeder load growth causes drastic, unplanned voltage deviations. Single-phase voltage regulators installed at the midpoint or cascaded throughout the feeder can dramatically flatten the voltage profile.



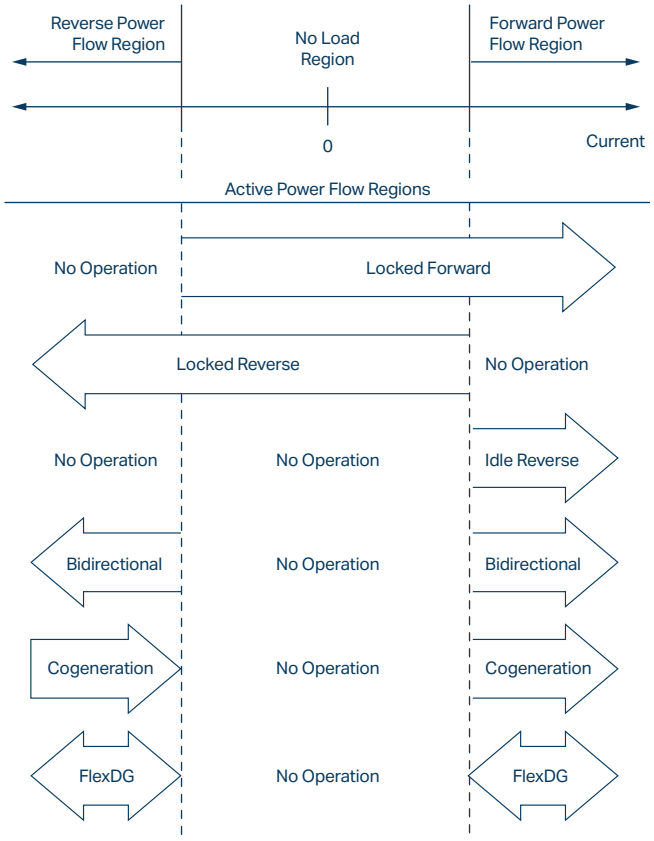
Apply voltage regulators to level your voltage profile.

Modes of Operation

Program the SEL-2431 quickly and easily for your application-specific installation. With configurable modes of operation, you can apply the SEL-2431 in locked-forward, locked-reverse, bidirectional, idle-reverse, cogeneration, or FlexDG modes.

For example, for systems configured with traditional radial feeders, use the locked-forward mode. For looped systems where current can flow in either direction, use the bidirectional mode where voltage regulation direction can dynamically change based on direction of current.

For systems with DER sources, where current can flow in multiple directions, use cogeneration mode. When it's also necessary to distinguish cogeneration/DER power flow from a tie point switching closed, use FlexDG mode.



Choose the mode of operation that meets your needs.

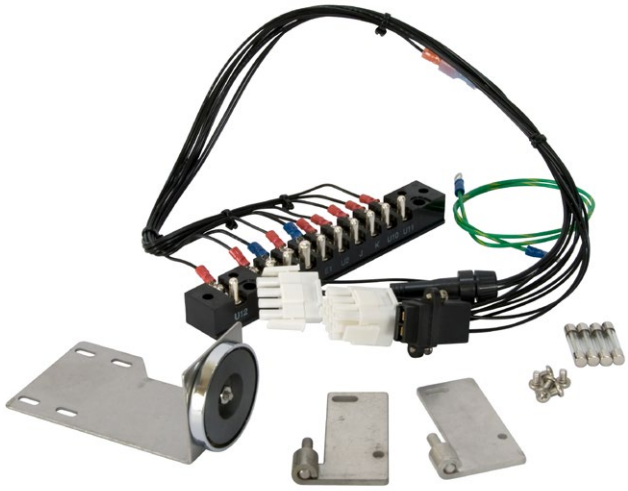
Programming Made Easy

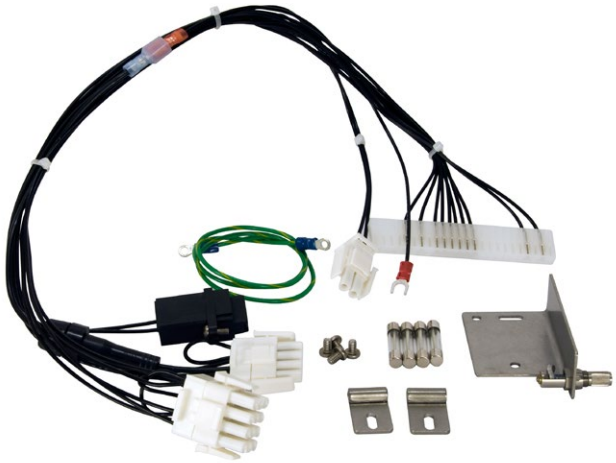
Use powerful ACSELERATOR QuickSet® SEL-5030 Software to quickly and easily program the SEL-2431. Compatibility with QuickSet makes traditional regulator applications requiring limited settings quick and easy to commission and service. Hide common or unused settings, and further simplify the commissioning process.

Available Retrofit Kits

Quickly upgrade existing voltage regulator controls with the SEL-2431 direct replacement mounting and wiring kits. These kits provide all the parts needed to easily replace existing controls with the SEL-2431.

Direct Replacement Mounting/Wiring Kit	Part No.
Generic Fork Terminals for Siemens/ Allis-Chalmers/Howard/GE	9253001
Generic Fork Terminals for Cooper/ McGraw-Edison	9253055
Siemens/Allis-Chalmers: 10-Position Polarized Disconnect Switch (PDS) Interface	9253002
Howard Industries: 10-Position Connector Terminal Strip (CTS) Interface	9253003
Cooper/McGraw-Edison: 18/10-Position Fanning Strip (traditional interface)	9253004
Cooper: 20-Position Connector (dead-front interface)	9253005
GE: Fork-Terminal Connections (traditional interface to cabinet NN terminals)	9253006
GE: 24-Position Connector (power disconnect interface)	9253007





Install easily with complete retrofit kits.

Specifications

General	
Operating Temperature	−40° to +85°C (−40° to +185°F)
Power Supply	**120 Vac** Range: 88–132 Vac Burden: ≤35 VA Interruption: ≤50 ms at 120 Vac per IEC 60255-11 **120 Vac Whetting Source** Range: 88–132 Vac Rated current: 6 A (motor fuse) **12 Vdc Auxiliary Output Source** Range: 11–14 Vdc Output power: 6 W at 12 Vdc
Metering Accuracy	Load current: ±0.3% ±500 µA (0.001–2.000 A) and 0.5° (0.020–2.000 A) Harmonics (2nd–15th) for current: ±5% of fundamental (0.02–0.64 A) Voltages: ±0.3% and ±0.5° (80–145 Vac)
Synchrophasor Accuracy	Maximum data rate in messages per second (IEEE C37.118 protocol): 60 (nominal 60 Hz system); 50 (nominal 50 Hz system) IEEE C37.118 accuracy: Level 1 at maximum message rate when frequency-based phasor compensation is enabled Nominal current: 450 mA Current range: 45 to 540 mA Frequency range: ±5 Hz of nominal (50 to 60 Hz) Voltage range: 80 to 145 V (Voltage range is limited by power supply ratings.) Phase angle range: −180° to +180°

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