SEL-2440 Discrete Programmable Automation Controller

Complete System for Control and Monitoring

Major Features and Benefits

Fast and Powerful I/O
➤ Utilize an exceptional and compact combination of inputs, outputs, and communications.
➤ Analyze system events with inputs and other events timed to the microsecond.
➤ Synchronize control with outputs that are synchronized to IRIG-B time.
➤ Perform actions quickly with a processing interval of 2 ms.
➤ Program new features with logic, latches, timers, counters, edge-triggers, and math functions.
➤ Ensure safe operation by using an input with logic programmed for local/remote control.

Convenient Maintenance and Support
➤ LEDs provide status for every I/O point and communications port.
➤ Removable terminal blocks make installation and replacement quick and efficient.
➤ Positive retention connectors ensure that connections are not lost due to sagging cables.
➤ Front-panel management port makes device management convenient.

Flexible Communications and Integration
➤ Communicate with DNP3, Modbus®, and IEC 61850 protocols over Ethernet and serial connections. Direct and select-before-operate (SBO) outputs are supported.
➤ Automate systems with flexible communication options that provide easy integration with SCADA.
➤ Configure easily with preprogrammed register or object maps and front-panel DIP switches.
➤ Alternatively, configure with ACSELERATOR QuickSet® SEL-5030 Software.

SEL Quality, Standards, and Global Support
➤ Designed and tested for harsh physical and electrical environments.
➤ Designed and tested to operate with dc grounded batteries and capacitive loads, and to trip breakers and interrupt inductive loads.
➤ Superior specification compliance, high reliability, low price, and worldwide, ten-year warranty.
Product Summary

The SEL-2440 Discrete Programmable Automation Controller (DPAC) withstands harsh physical and electrical environments and is built and tested to meet mission-critical IEEE and IEC protective relay standards. Apply the DPAC to satisfy stand-alone or distributed input, output, and communications needs. Figure 1 shows the DPAC functionality.

Functional Diagram

Figure 1  Functional Diagram

Configuration

➤ Easy Mode. Set address and communications parameters with DIP switches.
➤ Flexible Mode. Access additional flexibility using QuickSet software, shown in the following figure.

Inputs/Outputs

DPAC devices can be ordered with different I/O and input voltage ratings as shown in the following tables.

<table>
<thead>
<tr>
<th>I/O Quantity Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs</td>
</tr>
<tr>
<td>Standard</td>
</tr>
<tr>
<td>Option 1</td>
</tr>
<tr>
<td>Option 2</td>
</tr>
<tr>
<td>Option 3</td>
</tr>
<tr>
<td>Option 4</td>
</tr>
<tr>
<td>Option 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>I/O Input Voltage Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Input Rating</td>
</tr>
<tr>
<td>24 Vac/Vdc</td>
</tr>
<tr>
<td>48 Vac/Vdc</td>
</tr>
<tr>
<td>110 Vac/Vdc</td>
</tr>
</tbody>
</table>

Communication and Time

Many communications ports and protocols are provided.

Figure 3  Rear-Panel Communications and IRIG-B Ports

<table>
<thead>
<tr>
<th>Port</th>
<th>Port Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORT F</td>
<td>USB 2.0 physical interface, serial port (e.g., COM1) software interface</td>
</tr>
<tr>
<td>PORT 1</td>
<td>Ethernet with switch/failover (copper or fiber)</td>
</tr>
<tr>
<td>PORT 2</td>
<td>Serial (EIA-232, EIA-485, or ST fiber)</td>
</tr>
<tr>
<td>PORT 3</td>
<td>Serial (EIA-232)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Serial</th>
<th>Ethernet</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNP3</td>
<td>Yes</td>
</tr>
<tr>
<td>Modbus</td>
<td>Yes</td>
</tr>
<tr>
<td>IEC 61850</td>
<td>Yes</td>
</tr>
<tr>
<td>MIRRORED BITS®</td>
<td>Yes</td>
</tr>
<tr>
<td>SEL Fast Message</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Input/Output Features

Inputs (Status and Alarms)

Use digital inputs to monitor critical alarms or status points and time-stamp to the microsecond.

SEL inputs are designed and tested to ensure they operate correctly for dc battery grounds and capacitive discharges.

The bold line in Figure 6 shows how an earth fault completes the battery path through the input, bypassing the output. If the input is rated for 125 Vdc, the 65 Vdc that the fault causes across the input will assert the input. SEL level-sensitive inputs are designed so that they do not operate for this condition.

The bold line in Figure 7 shows a discharge path from the wiring capacitance through the input when a knife switch is closed. This discharge can cause a temporary assertion of an input. SEL inputs are designed with debounce timers so that they do not operate for this condition.

Outputs (Relays)

Outputs are rated for 30 A make and inductive interrupt applications such as trip and close operations and motor control. See the Output specifications for more details.
Power

The POWER terminals on the rear panel must connect to 120–230 Vac or 24–250 Vdc with the proper polarity. These terminals are isolated from chassis ground. Extra terminals are provided so power can be daisy-chained from DPAC to DPAC.

IRIG-B

A demodulated IRIG-B input and output are provided so this signal can be daisy-chained between DPAC devices.

Connectors

Removable terminal block connectors make installation and replacement quick and efficient but can result in intermittent or lost connections if positive retention means aren’t provided. The following diagram shows one of the pluggable connectors used on the DPAC and points out the retention screws that ensure connections remain in place.

Conformal Coating

The optional conformal coating protects the DPAC printed circuit board from moisture and corrosive elements found in harsh installations. This conformal coating option conforms to Mil-1-46058C Type UR conformal coating requirements.

Communications Ports

A rich collection of communications ports and protocols are available with the DPAC as shown in the following figure, which also includes connection examples.
Analyze Sequence-of-Events

Record sequence-of-events with the Sequential Events Recorder (SER) function. With this function, you can analyze assertions and deassertions of digital inputs and outputs—as many as 512 state changes to the microsecond for as many as 96 different digital points. The function also captures when the device powers up and a settings change occurs.

Combine SER data from individual SEL-2440 DPAC devices into a system-wide log. Synchronize the system with IRIG-B time code and the report data will align perfectly.

Figure 9 Sample SER Report

Combine SER data from individual SEL-2440 DPAC devices into a system-wide log. Synchronize the system with IRIG-B time code and the report data will align perfectly.

Figure 10 Combine SER Data From Multiple SEL-2440 DPAC devices for a System-Wide Log and Display
Automation Features

Flexible Control Logic and Integration Features

Eases Configuration
The DPAC does not require special communications software. Use any system that emulates a standard terminal system for engineering access to the device.

Simplifies Communications
The SEL-2440 is equipped with three independently operated serial ports. Establish communication by connecting computers, modems, protocol converters, printers, an SEL Communications Processor, SCADA serial port, and an RTU for local or remote communication. Apply an SEL communications processor as the hub of a star network, with point-to-point fiber or copper connection between the hub and the SEL-2440.

Supports Standard Protocols
As with most SEL devices, the DPAC comes standard with the communications protocols listed below.

- DNP3
- Modbus
- SEL ASCII
- SEL Compressed ASCII
- SEL Fast Meter
- SEL Fast Operate
- SEL Fast SER
- SEL Fast Message
- SEL MIRRORED BITS

Simplifies SCADA
SEL devices provide proprietary but open, binary “fast” protocols. These protocols are self-describing and are interleaved with ASCII protocols on the same port. Simplify configuration, minimize communications wiring, and improve performance between the DPAC and other devices (e.g., communications processors) with these protocols.

Provides Annunciation
Indicators (LEDs) provide annunciation of I/O status for each input and output. In addition, device status and port activity indicators simplify commissioning and troubleshooting.

Performs Logic and Math
Eliminate PLCs with Boolean logic, rising/falling edge triggers, and math (+, -, *, /).

Replaces Traditional Latching Relays
Replace as many as 32 traditional latching relays for such functions as “remote control enable” with latches. Program latch set and latch reset conditions with SELogic® control equations. Set or reset the nonvolatile latches using optoisolated inputs, Remote Bits, latches, or any programmable logic condition. The latches retain their state when the device loses power.

Eliminates External Timers
Eliminate external timers for custom protection or control schemes with 32 general purpose SELogic control equation timers. Each timer has independent time-delay pickup and dropout settings. Program each timer input with any desired element. Assign the timer output to trip logic, transfer trip communications, or other control scheme logic.

Eliminates External Counters
Eliminate external counters for custom control schemes with 32 counters, updated every 2 ms processing interval. Each counter element consists of five inputs (preset value; load preset value, count up, count down, and reset to zero) and three outputs (counter value; count as many as preset reached, count down to zero reached).

Eliminates RTU-to-Device Wiring
Eliminate RTU-to-Device wiring with 32 Remote Bits. Set, clear, or pulse Remote Bits using serial or Ethernet port commands. Program the Remote Bits into your control scheme with SELogic control equations. Use Remote Bits for SCADA-type control operations such as trip, close, and settings group selection.
Communications Architectures

Figure 13 Typical Ethernet and EIA-485 Communications Architectures

Figure 14 Typical EIA-232 and Fiber-Optic Communications Architecture

Additional Ordering Options

The following options can be ordered for any SEL-2440 model (see the SEL-2440 Model Option Table for details):

<table>
<thead>
<tr>
<th>Port 2 Physical Interface</th>
<th>Mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIA-232</td>
<td>Rack</td>
</tr>
<tr>
<td>EIA-485</td>
<td>Panel</td>
</tr>
<tr>
<td>ST fiber</td>
<td>Surface</td>
</tr>
</tbody>
</table>
High-current interrupting outputs are polarity sensitive. This is indicated with a + next to the contact on the overlay to indicate the positive side of the contact.
Figure 19  High-Current Interrupting Option Rear-Panel Drawing

Figure 20  Port 2 EIA-485 and Fiber-Optic Ethernet Option Rear-Panel Drawing

Figure 21  48DI Option Rear-Panel Drawing

Figure 22  16 Input, 16 Standard Output, and 10 Fast High-Current Output Rear-Panel Drawing

Figure 23  32 Input and 10 Fast High-Current Output Rear-Panel Drawing
Dimensions

RACK-MOUNT CHASSIS

PANEL-MOUNT CHASSIS

SURFACE-MOUNT CHASSIS

LEGEND

In

(mm)
Specifications

Compliance
Designed and manufactured under an ISO 9001 certified quality management system
UL Listed to U.S. and Canadian safety standards (File E220228; NRAQ, NRAQ7)
Note: DC output ratings not evaluated by UL61010.
CE Mark
RCM Mark
Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

General
Operating Temperature Range
−40° to +85°C (−40° to +185°F)
(not applicable to UL installations. UL rated 40°C)
When Powered by 24 V, the SEL-2440 Supports the Following Conditions:
70°C: Operate 32 outputs and 2.5 W max on +5 V pin (Port 2/3)
Conformal Coated: Derate operating temperature by 10°C.

Operating Environment
Pollution Degree: 2
Overvoltage Category: II
Insulation Class: 1
Relative Humidity: 5%–95%, noncondensing
Maximum Altitude: 2000 m

Weight
2.0 kg (4.4 lb)

Inputs
Optoisolated Control Inputs
When Used With DC Control Signals:
250 V ON for 200–275 Vdc OFF below 150 Vdc
220 V ON for 176–242 Vdc OFF below 132 Vdc
125 V ON for 100–135.5 Vdc OFF below 75 Vdc
110 V ON for 88–121 Vdc OFF below 66 Vdc
48 V ON for 38.4–52.8 Vdc OFF below 28.8 Vdc
24 V ON for 15–30 Vdc OFF below 5 Vdc
When Used With AC Control Signals:
250 V ON for 170.6–275 Vac OFF below 106 Vac
220 V ON for 150.3–264 Vac OFF below 93.2 Vac
125 V ON for 85–150 Vac OFF below 53 Vac
110 V ON for 75.1–132 Vac OFF below 46.6 Vac
48 V ON for 32.8–60 Vac OFF below 20.3 Vac
24 V ON for 14–27 Vac OFF below 5 Vac
Current Draw at Nominal DC Voltage: 2–4 mA (except for 24 V, 8 mA)

Outputs
Mechanical Durability
10 M no-load operations
DC Output Ratings
Standard Output Option
Rated Operational Voltage: 24–250 Vdc
Rated Voltage Range: 19.2–275 Vdc
Rated Insulation Voltage: 300 Vdc
Make: 30 A @ 250 Vdc per IEEE C37.90
Continuous Carry: 6 A @ 70°C; 4 A @ 85°C
Thermal: 50 A for 1 s
Contact Protection: 360 Vdc, 40 J MOV protection across open contacts
Operating Time (Coil Energization to Contact Closure, Resistive Load):
Breakdown Capacity
24 V 0.75 A L/R = 40 ms
48 V 0.50 A L/R = 40 ms
125 V 0.30 A L/R = 40 ms
250 V 0.20 A L/R = 40 ms
Cyclic Capacity
24 V 0.75 A L/R = 40 ms
48 V 0.50 A L/R = 40 ms
125 V 0.30 A L/R = 40 ms
250 V 0.20 A L/R = 40 ms
High-Current Interrupting Output Option
Rated Operational Voltage: 24–250 Vdc
Rated Voltage Range: 19.2–275 Vdc
Rated Insulation Voltage: 300 Vdc
Make: 30 A
Carry: 6 A continuous carry at 70°C
4 A continuous carry at 85°C
1 s Rating: 50 A
MOV Protection: 330 Vdc/145 J
Pickup Time: Less than 5 ms
Dropout Time: Less than 8 ms, typical
Breakdown Capacity (10,000 Operations):
24 V 10 A L/R = 40 ms
48 V 10 A L/R = 40 ms
125 V 10 A L/R = 40 ms
250 V 10 A L/R = 20 ms
Cyclic Capacity (4 Cycles in 1 Second, Followed by 2 Minutes Idle for Thermal Dissipation):
24 V 10 A L/R = 40 ms
48 V 10 A L/R = 40 ms
125 V 10 A L/R = 40 ms
250 V 10 A L/R = 20 ms
Fast High-Current Interrupting Output Option
Rated Operational Voltage: 24–250 Vdc
Rated Voltage Range: 19.2–275 Vdc
Rated Insulation Voltage: 300 Vdc
Make: 30 A @ 250 Vdc per IEEE C37.90
Continuous Carry: 6 A @ 70°C; 4 A @ 85°C
Continuous Carry (UL/CSA Derating With All Outputs Asserted): 5 A @ <60°C; 2.5 A @ 60 to 70°C
Thermal: 50 A for 1 s
Contact Protection: 330 Vdc, 145 J MOV protection across open contacts
Operating Time (Coil Energization to Contact Closure, Resistive Load):
Pickup Time: ~16 µs at 250 Vdc, 22 µs at 125 Vdc, 85 µs at 19.2 Vdc typical (results with 100 kΩ resistive load)
Dropout Time: <8 ms typical
Inductive Breaking Capacity (100,000 Operations) per IEC 60255-0-20:1974

- 24 Vdc: 10 A, L/R = 40 ms
- 48 Vdc: 10 A, L/R = 40 ms
- 125 Vdc: 10 A, L/R = 40 ms
- 250 Vdc: 10 A, L/R = 20 ms

Cyclic Capacity (4 Cycles/Second Followed by 2 Minutes Idle Thermal Dissipation) per IEC 60255-0-20:1974

- 24 Vdc: 10 A, L/R = 40 ms
- 48 Vdc: 10 A, L/R = 40 ms
- 125 Vdc: 10 A, L/R = 40 ms
- 250 Vdc: 10 A, L/R = 20 ms

AC Output Ratings

Standard Output Option
- Rated Operational Voltage: 110–240 Vac
- Rated Voltage Range: 19.2–264 Vac
- Rated Insulation Voltage: 270 Vac
- Rated Frequency: 50/60 ± 5 Hz
- Utilization Category: AC-15 (control of electromagnetic loads >72 VA)
- Contact Rating Designation: B300 (B = 5 A, 300 = rated insulation voltage)
- Contact Protection: 270 Vac, 40 J
- Continuous Carry: 6 A @ 70°C, 4 A @ 85°C
- Continuous Carry (UL/CSA Derating With All Outputs Asserted): 5 A @ <60°C, 2.5 A 60–70°C
- Operating Time (Coil Energization to Contact Closure): Pickup/Dropout Time: ≤8 ms
- Electrical Durability Make VA Rating: 3600 VA, cosφ = 0.3
- Electrical Durability Break VA Rating: 3600 VA, cosφ = 0.3

Fast High-Current Output Option
- Rated Operational Voltage: 110–240 Vac
- Voltage Range: 19.2–250 Vac
- Rated Insulation Voltage: 250 Vdc
- Rated Frequency: 50/60 ± 5 Hz
- Make: 30 A @ 240 Vac
- Utilization Category: AC-15 (control of electromagnetic loads >72 VA)
- Contact Rating Designation: B300 (B = 5 A, 300 = rated insulation voltage)
- Continuous Carry: 6 A @ 70°C, 4 A @ 85°C
- Continuous Carry (UL/CSA Derating With All Outputs Asserted): 5 A @ <60°C, 2.5 A 60–70°C
- Operating Time (Coil Energization to Contact Closure, Resistive Load): Pickup Time: ~16 µs at 250 Vac, 22 µs at 125 Vac, 85 µs at 19.2 Vac typical (results with 100 kΩ resistive load)
- Dropout Time: ≤8 ms typical

Note: Making rating per IEEE C37.90-1989.

Time-Code Input (Demodulated IRIG-B)
- On (1) State: Vih ≥ 2.2 V
- Off (0) State: Vil ≤ 0.8 V
- Input Impedance: 2 kΩ
- Accuracy: microsecond

Time-Code Input (SNTP)
- High-Priority Server
  - Accuracy: ±5 ms
- Low-Priority Server
  - Accuracy: ±25 ms

Time-Code Output (Demodulated IRIG-B)
- On (1) State: Voh ≥ 2.4 V
- Off (0) State: Vol ≤ 0.8 V
- Load: 50 Ω

Communications

Communications Ports
- USB 2.0 Port: Port F; front-panel port
- Ethernet Ports: Port 1A, 1B; rear-panel 10/100BASE-T or 100BASE-FX ports
- Optional Port: 300–115200 bps Port 2; rear panel available as:
  - EIA-232 with IRIG-B
  - EIA-485 with IRIG-B
  - ST fiber with IRIG-B
- EIA-232 Port: 300–115200 bps Port 3; rear-panel port with IRIG-B

Fiber-Optic Ports Characteristics
- Port 1 (or 1A, 1B) Ethernet
  - Wavelength: 1300 nm
  - Data Rate: 100 Mbps
  - Optical Connector Type: LC
  - Fiber Type: Multimode
Schweitzer Engineering Laboratories, Inc. SEL-2440

DPAC Data Sheet

- **Link Budget:** 16.1 dB
- **Typical TX Power:** –15.7 dBm
- **Min RX Sensitivity:** –31.8 dBm
- **Fiber Size:** 50–200 µm
- **Approximate Range:** ~6.4 km
- **Typical Fiber Attenuation:** –2 dBm/km

**Port 2 Serial ST (SEL-2812 Compatible)**

- **Baud Rate:** 300–115200 bps
- **Wavelength:** 850 nm
- **Optical Connector Type:** ST
- **Fiber Type:** Multimode
- **Link Budget:** 16 dBm
- **Min TX Power:** –13 dBm
- **Max TX Power:** –3 dBm
- **Min RX Sensitivity:** –29 dBm
- **Fiber Size:** 50–200 µm
- **Approximate Range:** ~4 km with 62.5 µm
  ~1 km with 200 µm
- **Typical Fiber Attenuation:** –4 dBm/km

**Communications Protocols**

- Modbus Slave (TCP and RTU)
- DNP3 Level 2 Outstation (LAN/WAN and Serial)
- IEC 61850 communications
- FTP
- Telnet
- SEL MIRRORED BITS

**Maximum Concurrent Connections**

- Modbus Slave: 2
- DNP3 Level 2 Outstation: 5
- Ethernet FTP: 2
- Telnet: 2

- **Power Supply**
  
  **Input Voltage**
  
  - **Rated Voltage:** 24–250 Vdc
  - **Voltage Range:** 19.2–275 Vdc
  - **Inrush Current:** <20 A pk

  **Power Consumption**
  
  - **AC:** <50 VA
  - **DC:** <20 W

  **Interruptions:**
  
  - 10 ms @ 24 Vdc
  - 25 ms @ 48 Vdc
  - 125 ms @ 125 Vdc
  - 160 ms @ 120 Vac
  - 600 ms @ 250 Vdc
  - 1000 ms @ 230 Vac

  **Fuse Rating:**
  
  3.15 A, high breaking capacity, time lag T,
  250 V (5 x 20 mm, T3.15AH 250 V)

  **Processing Specifications**
  
  - **Processing Interval:** 2 ms

**Product Standards**

- **Electrical Equipment for Measurement, Control, and Laboratory Use:**
  - IEC 61010-1:2013
  - UL 508:2018
  - C22.2 No. 61010-1:12
  - IEC 61010-2-201:2013
  - UL 61010-2-201:2017
  - C22.2 No. 61010-2-201:14

- **Measuring Relays and Protection Equipment:**
  - IEC 60255-26:2013
  - IEC 60255-27:2013

**Type Tests**

- **Note:** To ensure good EMI and EMC performance, type tests were performed using shielded copper Ethernet cables with the shield grounded at both ends of the cable. Double-shielded cables are recommended for best EMI and EMC performance.

**Environmental Tests**

  - IP4X Front
  - IP2X Product

- **Vibration Endurance:** Class 2
- **Response:** Class 2
- **Shock Withstand:** Class 1
- **Response:** Class 2
- **Bump Withstand:** Class 1
- **Seismic Response:** Class 2
- **Cold:** IEC 60068-2-1:2007
  - –40°C, 16 hours
- **Damp Heat, Steady State:** IEC 60068-2-78:2001
  - 40°C, 93% relative humidity, 4 days
- **Damp Heat, Cyclic:** IEC 60068-2-30:2005
  - 25°C–55°C, 6 cycles,
    95% relative humidity
- **Dry Heat:** IEC 60068-2-2:2007
  - 85°C, 16 hours

**Power Interruption Tests**

- **AC Power:** 61000-4-11:2004
- **DC Power:** 61000-4-29:2001

**Dielectric Strength and Impulse Tests**

- **Dielectric (HiPot):** IEC 60255-27:2013
  - IEEE C37.90-2005
  - 3.6 kVdc on power supply
  - 2.5 kVac on contact I/O
  - 1.5 kVac on Ethernet/IRIG IN

- **Impulse:** IEC 60255-27:2013
  - 5 kV on power supply, contact I/O
  - 2.2 kV on Ethernet

**RFI and Interference Tests**

- **EMC Immunity**
  - **Electrostatic Discharge:** IEC 61000-4-2:2008
  - **Severity Level:**
    - 2, 4, 6, 8 kV contact discharge
    - 2, 4, 8, 15 kV air discharge
  - **Radiated RF Immunity:**
    - IEEE C37.90.2-2004, 20 V/m
  - **Fast Transient, Burst**: IEC 61000-4-4:2012
    - 4 kV @ 5 kHz on power supply and contact I/O
    - 2 kV @ 5 kHz for communication ports
  - **Surge Immunity:**
    - IEC 61000-4-5:2005
    - 1 kV on power supply, contact I/O
    - 2 kV on power supply, contact I/O, Ethernet and serial ports, IRIG
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Severity Level:</td>
<td>Power supply and contact I/O</td>
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<tr>
<td></td>
<td>2.5 kV peak common mode</td>
</tr>
<tr>
<td></td>
<td>1.0 kV peak differential mode</td>
</tr>
<tr>
<td>Communications ports</td>
<td>1.0 kV peak common mode</td>
</tr>
<tr>
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<td>IEEE C37.90.1-2012</td>
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<tr>
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<td>2.5 kV oscillatory, 4 kV fast transient</td>
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<tr>
<td>Conducted RF Immunity:</td>
<td>IEC 61000-4-6:2013</td>
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<td>10 Vrms</td>
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<td>Power Frequency Magnetic Field:</td>
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<td>1000 A/m for 3 s</td>
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<td>100 A/m for 1 min</td>
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