Simplify data acquisition with this universal sensor I/O module

The Sciemetric EDGE 421 is a compact data acquisition module that can power and record data from many analog sensor types. When paired with an EDGE carrier its modular design allows scaling from 1 to many channels. The module contains its own processor, ensuring scalability, and can synchronize with other modules with up to six high speed digital I/O.

Highlights
- 32-bit processor with real-time operating system
- Stand-alone operation for measurement, control, analysis and data storage
- Galvanically isolated analog front end

Analog Input
- 24-bit A/D with 125 kS/s sampling
- Differential/Single ended
- Built-in anti-aliasing filter
- \(\pm 1\) V, \(\pm 5\) V, \(\pm 12\) V, \(\pm 60\) V input ranges
- 250 \(\Omega\) resistor for current loop measurements
- 12-bit analog comparator with programmable hysteresis
- AC/DC coupling (BNC option only)

Analog Output
- 16-bit 0-24 V, 0-100 mA Power Supply
- Constant current or constant voltage output
- Function generator (sine, square, ramp, etc.) or arbitrary waveform generation

Sensor Compatibility
- Amplified voltage output
- Bridge Sensors
- IEPE (ICP™)* constant current source
- RTD (4-wire resistance)
- Resistance (2-wire resistance)
- 0-20 mA or 4-20 mA with internal 250 \(\Omega\) or external shunt resistor

*ICP is a registered trademark of PCB Piezotronics

Applications:
- Discrete Manufacturing
- Process Monitoring
- Condition and machine monitoring
- Data acquisition and Measurement
**EDGE 421 Overview**

The Sciemetric EDGE 421 combines a galvanically isolated analog front end with a high-speed digital back end. The analog isolation allows low-noise measurements on signals with common mode voltages, while the back end provides handshaking, triggering, data analysis and communication when combined with other EDGE modules in an EDGE carrier.

The 24-bit analog input supports 4 voltage ranges on using the high voltage (HV) and low voltage (LV) channels of the input multiplexer (MUX), combined with a switchable gain from 1x to 5x. A fixed 34 kHz anti-aliasing filter is in front the ADC. Software decimation and filtering can provide anti-aliasing at lower frequencies. A 250 Ω current shunt (CS) is available for current loop measurements and a shunt calibration (SCAL) relay is provided for bridge sensors.

The 16-bit analog output can provide controlled voltage (CV) from 0 … 24 V or controlled current (CC) from 0 … 100 mA to the analog output (AO) pin. The analog output filter (AOF) relay can be used to add 10 µF to the AO pin for filtering. The controlled current internal relay (CCINT) can be used to apply a configurable pull-up to the analog input positive (AI+) pin.

The BNC option provides single-ended measurements for 2-wire sensors. The input is AC coupled through 1 µF and can be DC coupled using the SCAL / DC relay. When used with an IEPE or (ICP™) sensor the analog output can be used to power the sensor and readback through the AC coupling.

The 12-bit analog output filter (VMON) combined with the HV voltage divider.

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**Figure 3 - Block Diagram of 10400-0421-0M12**

**Figure 4 - Block Diagram of 10400-0421-0BNC**
Sciometric EDGE Platform

Sciometric EDGE is a universal industrial analytics platform to help you perfect your process in record time. This distributed data analytics system removes barriers to collecting data, driving productivity improvements and cost savings. Select from a variety of modules to meet your data collection needs and use the expandable carriers to build out your measurement system to the desired number of channels.

Each EDGE module features its own processing and scripting, while the carriers provide communication and real-time synchronization. With processing at the channel level, the platform can scale to meet multi-channel synchronous and asynchronous tests.

The platform performs digital signal processing and signature analysis to offer in-depth insight into the performance, reliability, and repeatability of a broad range of applications. Processing, analytics, and control functions are remotely configurable, giving you a centralized management of your distributed operations. It provides industrial operations with a sophisticated, exciting, new way to monitor a process, perform real-time pass/fail control, and gain the visibility needed to optimize and control the overall process.

Sciometric Studio Software

One Tool for Management, Setup and Analysis

Sciometric Studio offers comprehensive capabilities for monitoring and control of industrial applications. Manage Sciometric EDGE Systems through discovery, sensor calibration, application deployment, and software updates. Manage applications through configuration of tasks, features, parameters and variants. Leverage continuous improvement through data-driven insight with analytics such as feature, waveform and image trending, correlations and statistical reports.
Technical Specifications

General
- Dimensions: 32 mm x 32 mm x 128 mm
- Weight: 126 g
- Front Connector
  - 0M12: 5-pin A-code receptacle
  - 0BNC: 2-pin coaxial BNC jack
- Rear Connector
  - Samtec LSHM 40-pin, only for use in Sciemetric EDGE carriers
  - Voltage: 12 V
  - Current: 750 mA max
  - Power: 2.5 W (typical usage, does not include AO load or dissipation)
  - Ethernet: 100 Mbps
  - Sync lines: 6 bi-directional lines at up to 10 MHz
- LED status indicator: RGB
- Internal Temperature: 0 °C to 70 °C
- Operating temperature: see carrier datasheet
- Humidity: 10 to 90% RH, non-condensing (IEC 60068-2-56)
- Shock: 150 m/s² (IEC 60068-2-37 table A.2)
- Vibration: IEC 60068-2-65 spectrum A Category 3
- Ingress protection: IP65 when installed, IP20 otherwise
- Fastener screw torque: 2-4 in-lbs
- Maximum altitude: 2000 m
- Approvals: CE, cEMK0us

Processor
- CPU: 32 bit, 533 MHz
- Operating System: QNX™
- Storage: 512 MB SSD
- Memory: 512 MB DRAM
- Handshaking: EtherNet/IP
- Functions: Any Sciemetric EDGE application, measurement, control, signature analysis and data storage

Analog Input
- Channels: 1
- ADC resolution: 24-bit (± 8,388,608 counts)
- Max sample rate: 125 kS/s
- Common mode rejection ratio (DC to 60 Hz): 80 dB
- Isolation voltage: 60 V
- Over voltage protection (TYP): ±75 V
- Max sample rate: 125 kS/s
- Internal current shunt: 251.3 ± 0.5 Ω
- Input ranges
- Accuracy
  - ±0.1% FS
  - ±0.05% FS
- Input Impedance
  - (0M12 model): 2.15 MΩ (DIFF)
  - 10.8 MΩ (SE) >100 MΩ
- Input Impedance
  - (0BNC model): 187 kΩ (DC)
  - 227 kΩ (AC)
- Small signal bandwidth (≤ 3 dB)
  - 34 kHz
  - 40 kHz
- Dynamic Range
  - (0M12 model): 105 dB
  - 100 dB
- Dynamic Range
  - (0BNC model): 105 dB
  - 100 dB
- Analog Comparator (before anti-aliasing filter)
  - Resolution: 12-bit
  - Accuracy: ±0.5% FS
  - Hysteresis: 15 levels, between -16% ... +16% of Range
  - Can be routed to any sync line for triggering
  - Software decoding: Manchester data stream with zero data value synchronization pulse

Analog Output
- Channels: 1
- DAC resolution: 16-bit (65535 counts)
- Max output power: 1 W
- Slew rate: ±1.15 V/µs minimum
- Isolation: 60 V
- Default State:
  - Off
  - DACs revert to 0 V and 0 mA on power cycle or disconnect
- Protection
  - CV mode: max power can be limited
  - CC mode: max voltage and power can be limited
  - Continuous (always active)
  - 100 ms retry interval for up to 1 s before faulting
- Output functions:
  - OPCUA control
  - Application control
  - Synchronization bus input value from other modules
  - Function generator (sine, triangle, ramp, square, duty cycle, number of pulses, offset, peak to peak voltage) with 62.5 kS/s update rate

Shunt Cal Relay Function
- 0M12: Shorts pin 5 (SCAL) to pin 4 (COM) with resistance <3 Ω
- 0BNC: Provides DC coupling for the analog input

Triggering
- Triggering is performed in software based on collected data in FIFO
- FIFO depth: 10M samples
- Trigger Support:
  - Start & Stop triggering
  - Sources: immediate1, sync bus line2, analog input level
  - Edges: rising, falling, rise/fall
  - Deadband2
  - Hold-off3
  - Pre-trigger and post trigger sampling offset
  - Multi-buffer collection
  - Automatic re-arming (no missed samples in multi-buffer collection)

Internal Calibration and Diagnostics
- Internal measurements:
  - Module input power supply voltage and current
  - Processor supply voltage and current
  - Analog supply voltages
  - Faceplate temperature
- Internal input sources:
  - Ground
  - Precision voltage source

Product Specifications

4 | Sciemetric EDGE 421
**Mounting Information**

The Sciemetric EDGE 421 must be installed in an EDGE 421 Dual Carrier (10400-0412-0M12) or an EDGE 414 Quad Carrier (10400-0414-0000). Please see the EDGE Carrier datasheets for additional information and specifications. Users must provision for cable connector dimensions and cable bend radii.

![Figure 5 - 10400-0421-0M12 Dimensions](image)

![Figure 6 - 10400-0421-0BNC Dimensions](image)

**Pinout**

<table>
<thead>
<tr>
<th>Faceplate</th>
<th>Connector</th>
<th>Pin</th>
<th>Signal</th>
<th>Max Voltage</th>
<th>Mating Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12 5-pin A-code receptacle</td>
<td>1. AI+</td>
<td></td>
<td></td>
<td>60 VDC</td>
<td>10400-AC0B-0002</td>
</tr>
<tr>
<td></td>
<td>2. AI-</td>
<td></td>
<td></td>
<td></td>
<td>10400-AC0B-0005</td>
</tr>
<tr>
<td></td>
<td>3. AO</td>
<td></td>
<td></td>
<td></td>
<td>10400-AC0B-0010</td>
</tr>
<tr>
<td></td>
<td>4. COM</td>
<td></td>
<td></td>
<td></td>
<td>10400-AX0A-MA05</td>
</tr>
<tr>
<td></td>
<td>5. SCAL</td>
<td>SHELL</td>
<td>SHLD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 50 Ω BNC Jack | 1. AO/AI+ | | 75 VDC | N/A |
| | 2. COM | | | |
## Ordering Information

### Sciemetric EDGE family products

<table>
<thead>
<tr>
<th>Description</th>
<th>Connections</th>
<th>Part Number</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDGE 421 125 kS Analog Input/Output module</td>
<td>(1x) 5-pin A-Code M12 socket</td>
<td>10400-0421-0M12</td>
<td>![Image]</td>
</tr>
<tr>
<td></td>
<td>(1x) BNC jack</td>
<td>10400-0421-0BNC</td>
<td>![Image]</td>
</tr>
<tr>
<td>EDGE 422 125 MS Analog Input module</td>
<td>(1x) 5-pin A-Code M12 socket</td>
<td>10400-0422-0M12</td>
<td>![Image]</td>
</tr>
<tr>
<td>EDGE 431 5 V 4x Digital Input/Output module</td>
<td>(1x) 8-pin A-Code M12 socket</td>
<td>10400-0431-0M12</td>
<td>![Image]</td>
</tr>
<tr>
<td>EDGE 412 Dual Carrier</td>
<td>(1x) 8-pin X-code M12 socket (POE) (2x) EDGE module slots</td>
<td>10400-0412-0M12</td>
<td>![Image]</td>
</tr>
<tr>
<td>EDGE 403 Interface</td>
<td>5-pin L-code M12 plug 8-pin X-code M12 socket</td>
<td>10400-0403-0000</td>
<td>![Image]</td>
</tr>
<tr>
<td>EDGE 414 Quad Carrier</td>
<td>(4x) EDGE module slots (1x) EDGE fan slot</td>
<td>10400-0414-0000</td>
<td>![Image]</td>
</tr>
</tbody>
</table>
### Connectors

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12 5-pin L code socket field wire-able connector (screw terminal)</td>
<td>10400-APC1-0001</td>
</tr>
<tr>
<td>M12 5-pin A-code plug field wire-able connector, shielded (screw terminal)</td>
<td>10400-AX0A-MA05</td>
</tr>
<tr>
<td>M12 8-pin A-code plug field wire-able connector, shielded (screw terminal)</td>
<td>10400-AX0A-MA08</td>
</tr>
</tbody>
</table>

### Cables and Cord Sets

<table>
<thead>
<tr>
<th>Description</th>
<th>Length</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Cable - M12 5-pin A-code plug to Pigtail leads</td>
<td>2 m</td>
<td>10400-AC0B-0002</td>
</tr>
<tr>
<td></td>
<td>5 m</td>
<td>10400-AC0B-0005</td>
</tr>
<tr>
<td></td>
<td>10 m</td>
<td>10400-AC0B-0010</td>
</tr>
<tr>
<td>Sensor Cable - M12 8-pin A-code plug to Pigtail leads</td>
<td>2 m</td>
<td>10400-AC0C-0002</td>
</tr>
<tr>
<td></td>
<td>5 m</td>
<td>10400-AC0C-0005</td>
</tr>
<tr>
<td></td>
<td>10 m</td>
<td>10400-AC0C-0010</td>
</tr>
<tr>
<td>Ethernet Cable - M12 8-pin X-code plug to RJ45 plug</td>
<td>1 m</td>
<td>10400-AC0X-0001</td>
</tr>
<tr>
<td></td>
<td>5 m</td>
<td>10400-AC0X-0005</td>
</tr>
<tr>
<td>Adaptor - M12 X-code plug to M12 D-code socket for use with 10400-0412-0M12</td>
<td>0.3 m</td>
<td>10400-ACXD-0012</td>
</tr>
<tr>
<td>with 10400-0412-0M12 when upgrading from 10400-0412-000A. Not compatible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>with 10400-0403-0000.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adaptor Cable – M12 5-pin A-code to (2x) BNC jack, Analog In and Digital</td>
<td>0.15 m</td>
<td>10400-AXDI-MA05</td>
</tr>
<tr>
<td>In for use with EDGE 422 Module</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Other Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDGE 412 DIN Mounting Plate</td>
<td>10400-AM0A-000A</td>
<td><img src="image1" alt="Image" /></td>
</tr>
<tr>
<td>EDGE 412 backwards compatibility machine mount bracket to match pitch of 10400-0412-000A</td>
<td>10400-AM0A-0M12</td>
<td><img src="image2" alt="Image" /></td>
</tr>
<tr>
<td>EDGE 414 Wall Mount kit (mounts to 414 for use with 403/414 systems)</td>
<td>10400-AM01-0001</td>
<td><img src="image3" alt="Image" /></td>
</tr>
<tr>
<td>EDGE 414 Replacement Fan module</td>
<td>10400-AFAN-0000</td>
<td><img src="image4" alt="Image" /></td>
</tr>
<tr>
<td>EDGE 403 AC/DC 24 V 65 W power supply</td>
<td>10400-APSU-0065</td>
<td><img src="image5" alt="Image" /></td>
</tr>
<tr>
<td>EDGE Fieldbus Conversion Interface (DIN mount)</td>
<td>10400-AFPN-0001</td>
<td><img src="image6" alt="Image" /></td>
</tr>
<tr>
<td>Antaira 5-port industrial POE network switch, 12-36 VDC supply required</td>
<td>10400-AS0A-0005</td>
<td><img src="image7" alt="Image" /></td>
</tr>
<tr>
<td>Antaira 8-port industrial POE network switch, 12-36 VDC supply required</td>
<td>10400-AS0A-0008</td>
<td><img src="image8" alt="Image" /></td>
</tr>
</tbody>
</table>