

# SCM7B34/34N



## Isolated Linearized 2- or 3-Wire RTD Input Modules

### Description

Each SCM7B34/34N RTD input module accepts a single channel of 100Ω Platinum ( $\alpha = 0.00385$ ) or 120Ω Nickel ( $\alpha = 0.00672$ ) RTD input and produces an input voltage in response to a low-level current excitation. The input signal is filtered, isolated, amplified, linearized, and converted to a high-level analog voltage for output to the process control system (Figure 1).

These modules incorporate a five-pole filtering approach to maximize both time and frequency response by taking advantage of both Thomson (Bessel) and Butterworth characteristics. One pole of the filter is on the field side of the isolation barrier; four are on the process control system side.

In response to the low-level current excitation signal, the RTD input signal is chopped by a proprietary chopper circuit and transferred across the transformer isolation barrier, suppressing transmission of common mode spikes and surges. The signal is then reconstructed and filtered for process control system output.

Linearization is achieved by creating a non-linear transfer function through the module itself. This non-linear transfer function is configured at the factory and is designed to be equal and opposite to the specific RTD non-linearity. Lead compensation is achieved by matching two current paths thus cancelling the effects of lead resistance.

Modules accept a wide 14 - 35VDC power supply range (+24VDC nominal). Their compact packages (2.13"x1.705"x0.605" max) save space and are ideal for high channel density applications. They are designed for easy DIN rail mounting using any of the "-DIN" backpanels.

### ► Features

- Interfaces to 100Ω Platinum or 120Ω Nickel RTDs
- Provides 250μA RTD Excitation Current
- Linearizes RTD Signal Response
- Provides High-Level Voltage Outputs
- 1500Vrms Transformer Isolation
- Accuracy, ±0.05% to ±0.15% of Span Typical
- Nonconformity, ±0.025% to ±0.07% of Span Typical
- ANSI/IEEE C37.90.1 Transient Protection
- Input Protected to 120Vrms Continuous
- Noise, 500μVp-p (5MHz), 250μVrms (100kHz)
- 160dB CMRR
- 85dB NMR at 60Hz, 80dB at 50Hz
- Easy DIN Rail Mounting
- CSA C/US Certified
- CE and ATEX Compliant

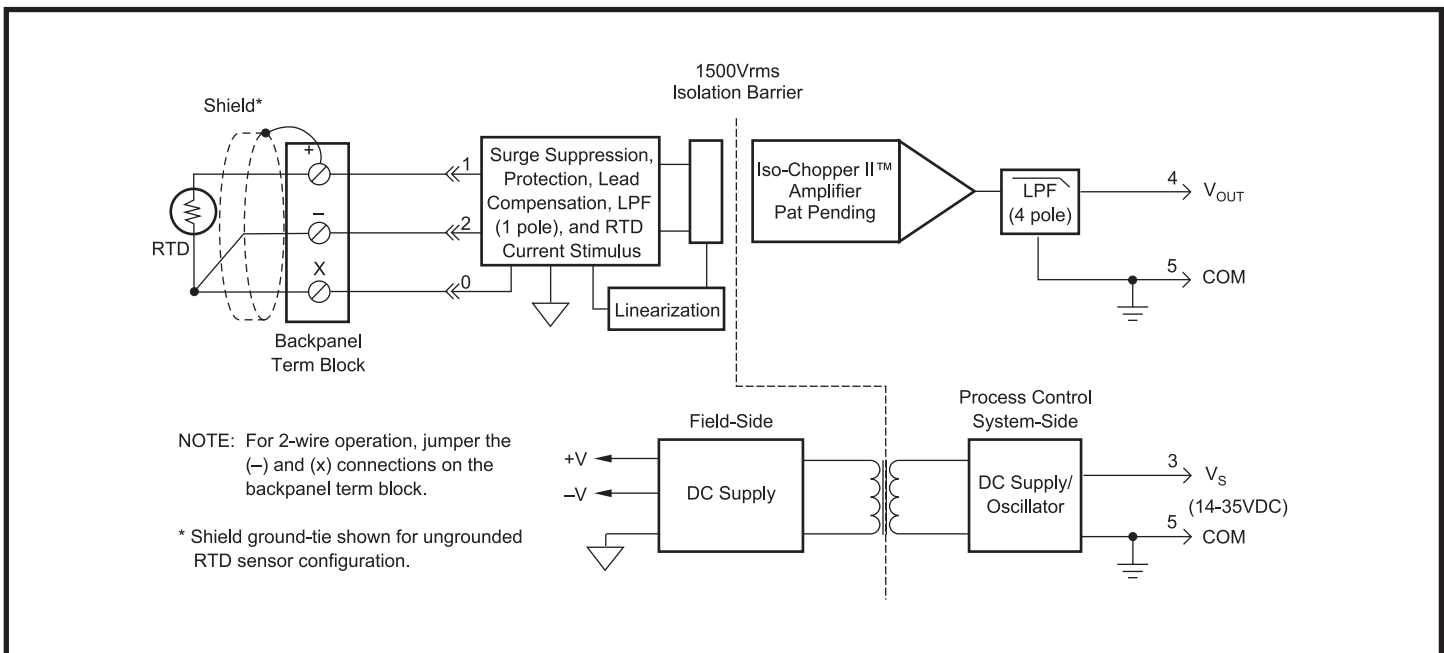


Figure 1: SCM7B34/34N Block Diagram

**Specifications** Typical\* at 25°C and +24VDC

| Module                                   | SCM7B34  | SCM7B34N    |
|--|--|-------------|
| Input Signal Range                       | 100Ω Pt RTD<br>See Ordering Information                        | 120Ω Ni RTD |
| Protection                               |  | *           |
| Continuous                               | 120Vrms max  | *           |
| Transient                                | ANSI/IEEE C37.90.1   | *           |
| Sensor Excitation Current <sup>(1)</sup> | ≈250μA   | *           |
| Lead Resistance Effect                   | ±0.02°C/Ω max  | *           |
| Output Signal Range <sup>(2)</sup>       | †  | †           |
| Effective Available Power <sup>(2)</sup> | 40mW   | *           |
| Resistance                               | <1Ω  | *           |
| Protection                               | Continuous Short-to-Ground                                     | *           |
| Voltage/Current Limit                    | ±12V, ±14mA  | *           |
| CMV (Input-to-Output)                    |  |             |
| Continuous                               | 1500Vrms   | *           |
| Transient                                | ANSI/IEEE C37.90.1   | *           |
| CMRR (50 or 60Hz)                        | 160dB  | *           |
| Accuracy <sup>(3)</sup>                  | See Ordering Information                                       | *           |
| Nonconformity <sup>(4)</sup>             | See Ordering Information                                       | *           |
| Stability (-40°C to +85°C)               |  |             |
| Gain                                     | ±60ppm/°C  | *           |
| Input Offset                             | ±1μV/°C  | *           |
| Zero Suppression                         | ±0.002%(R <sub>Z</sub> /R <sub>SPAN</sub> ) <sup>(5)</sup> /°C | *           |
| Output Offset                            | ±0.002% Span/°C  | *           |
| Noise                                    |  |             |
| Peak at 5MHz B/W                         | 500μV  | *           |
| RMS at 10Hz to 100kHz B/W                | 250μV  | *           |
| Peak at 0.1Hz to 10Hz B/W                | 1μV RTI  | *           |
| Open Input Response                      |  |             |
| '+' Lead                                 | Upscale  | *           |
| '-' Lead                                 | Non-deterministic  | *           |
| 'x' Lead                                 | Downscale  | *           |
| Open Input Detection Time                | <5s  | *           |
| Frequency and Time Response              |  |             |
| Bandwidth, -3dB                          | 3Hz  | *           |
| NMR (50/60Hz)                            | 80/85dB  | *           |
| Step Response, 90% Span                  | 250ms  | *           |
| Supply Voltage                           | 14 to 35VDC  | *           |
| Current <sup>(2)</sup>                   | 12mA   | *           |
| Sensitivity                              | ±0.0001%/V <sub>S</sub>  | *           |
| Mechanical Dimensions (h)(w)(d)          | 2.13" x 1.705" x 0.605" max<br>54.1mm x 43.3mm x 15.4mm max    | *           |
| Environmental                            |  |             |
| Operating Temperature Range              | -40°C to +85°C   | *           |
| Storage Temperature Range                | -40°C to +85°C   | *           |
| Relative Humidity                        | 0 to 95% Noncondensing   | *           |
| Emissions EN61000-6-4                    | ISM, Group 1   | *           |
| Radiated, Conducted                      | Class A  | *           |
| Immunity EN61000-6-2                     | ISM, Group 1   | *           |
| RF                                       | Performance A ±0.5% Span Error                                 | *           |
| ESD, EFT                                 | Performance B  | *           |

**NOTES:**

\* Contact factory or your local Dataforth sales office for maximum values.

\* Specification same as preceding model.

(1) Sensor excitation current is model dependent.

 (2) Output Range and Supply Current specifications are based on minimum output load resistance. Minimum output load resistance is calculated by  $V_{OUT}^2/P_E$ , where  $P_E$  is the output Effective Available Power that guarantees output range, accuracy, and conformity specifications.

(3) Accuracy includes the effects of repeatability, hysteresis, and conformity.

(4) Nonconformity is calculated using the best-fit straight line method.

 (5) R<sub>Z</sub> is the value of the RTD resistance at the lowest measurement point. R<sub>SPAN</sub> is the change in resistance over the measurement span.

**Ordering Information**

| Model             | Input Range                            | Accuracy <sup>(2)</sup> |                    | Nonconformity <sup>(3)</sup> |                    |
|-------------------|--|-------------------------|--------------------|------------------------------|--------------------|
|                   |  | Typical                 | Max                | Typical                      | Max                |
| <b>100Ω Pt **</b> |  |                         |                    |                              |                    |
| SCM7B34-01        | -100°C to +100°C<br>(-148°F to +212°F) | ±0.075%<br>(0.15°C)     | ±0.15%<br>(0.30°C) | ±0.025%<br>(0.05°C)          | ±0.05%<br>(0.10°C) |
| SCM7B34-02        | 0°C to +100°C<br>(+32°F to +212°F)     | ±0.10%<br>(0.10°C)      | ±0.2%<br>(0.20°C)  | ±0.025%<br>(0.025°C)         | ±0.05%<br>(0.05°C) |
| SCM7B34-03        | 0°C to +200°C<br>(+32°F to +392°F)     | ±0.075%<br>(0.15°C)     | ±0.15%<br>(0.30°C) | ±0.025%<br>(0.05°C)          | ±0.05%<br>(0.10°C) |
| SCM7B34-04        | 0°C to +600°C<br>(+32°F to +1112°F)    | ±0.05%<br>(0.30°C)      | ±0.1%<br>(0.60°C)  | ±0.025%<br>(0.15°C)          | ±0.05%<br>(0.30°C) |
| SCM7B34-05        | -50°C to +350°C<br>(-58°F to +662°F)   | ±0.05%<br>(0.20°C)      | ±0.1%<br>(0.40°C)  | ±0.025%<br>(0.1°C)           | ±0.05%<br>(0.20°C) |
| <b>120Ω Ni **</b> |  |                         |                    |                              |                    |
| SCM7B34N-01       | 0°C to +300°C<br>(+32°F to +572°F)     | ±0.15%<br>(0.45°C)      | ±0.3%<br>(0.90°C)  | ±0.06%<br>(0.18°C)           | ±0.12%<br>(0.36°C) |
| SCM7B34N-02       | 0°C to +200°C<br>(+32°F to +392°F)     | ±0.15%<br>(0.30°C)      | ±0.3%<br>(0.60°C)  | ±0.07%<br>(0.14°C)           | ±0.14%<br>(0.28°C) |

**SCM7B**
**†Output Ranges Available**

| Output Range | Part No. Suffix | Example     |
|--------------|-----------------|-------------|
| +1 to +5V    | NONE            | SCM7B34-01  |
| 0 to +5V     | A               | SCM7B34-01A |
| 0 to +10V    | D               | SCM7B34-01D |

**\*\*RTD Standards**

| Type    | Alpha Coefficient | DIN       | JIS             | IEC     |
|---------|-------------------|-----------|-----------------|---------|
| 100Ω Pt | 0.00385           | DIN 43760 | JIS C 1604-1989 | IEC 751 |
| 120Ω Ni | 0.00672           |           |                 |         |