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 (α = 0.00385) or 120Ω Nickel (α = 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

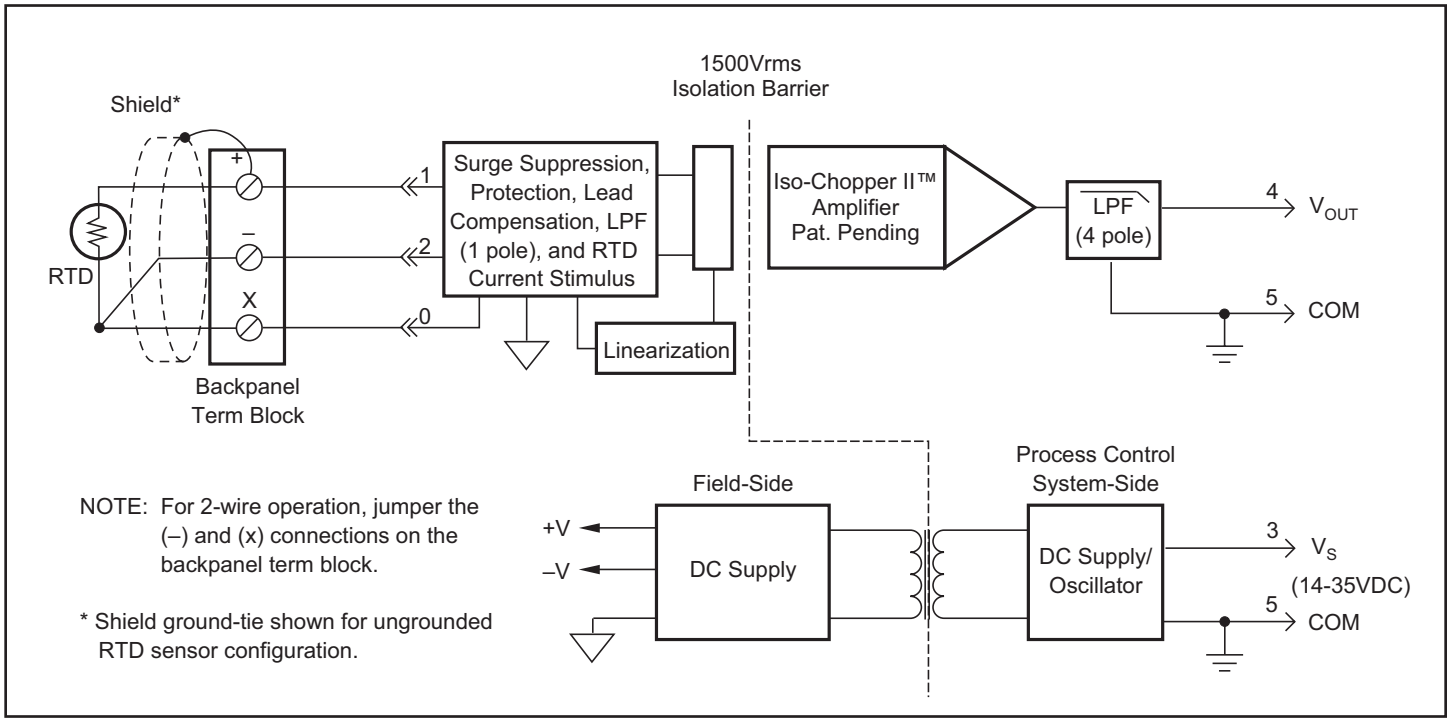

Figure 1: SCM7B34/34N Block Diagram

Specifications

Typical* at 25°C and +24VDC

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

NOTES:
*Contact factory or your local Dataforth sales office for maximum values.
(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_Z is the value of the RTD resistance at the lowest measurement point. R_{SPAN} is the change in resistance over the measurement span.
(6) RTI = Referenced to Input.

Ordering Information

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

†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			