

ภาคผนวก ก

ภาคผนวก ก. คุณสมบัติทางกลและส่วนผสมทางเคมีเหล็กกล้าผสม SCM440

ตารางส่วนผสมทางเคมีเหล็กกล้าผสม SCM440(wt. %)

เกรด	C	SI	Mn	P	S	Cr	Mo	Ni	Cu
SCM440	0.38	0.15	0.60	Max.	Max.	0.90	0.15	Max.	Max.
	0.43	0.35	0.85	0.030	0.030	1.20	0.30	0.25	0.30

ตารางคุณสมบัติทางกลเหล็กกล้าผสม SCM440

สมบัติทางกล	
ความแข็ง	235-578 HBN
ความต้านแรงดึงสูงสุด	806-1730 MPa.
ความต้านแรงดึงครากตัว	689-900 MPa .
การยืดตัว	11-25 %
โมดูลัสยืดหยุ่น	210 GPa.
โมดูลัสการเฉือน	
อัตราส่วนพัชของ	0.3
ความสามารถตัดเฉือน	66 (AISI 1112 = 100)

ภาคผนวก ข. ข้อมูลจำเพาะ DAQ Card

High-Speed M Series Multifunction DAQ 16-Bit, up to 1.25 MS/s, up to 32 Analog Inputs

NI M Series – High-Speed

- NI recommends high-accuracy M Series for 5X more measurement sensitivity and lowpass filtering
- 16 or 32 analog inputs at 16 bits, 1.25 MS/s (1 MS/s scanning)
- Up to 4 analog outputs at 16 bits, 2.8 MS/s (2 μ s full-scale settling)
- 7 programmable input ranges (± 100 mV to ± 10 V) per channel
- Up to 48 TTL/CMOS digital I/O lines (up to 32 hardware-timed at 10 MHz)
- Two 32-bit, 80 MHz counter/timers
- Analog and digital triggering
- NI-MCal calibration technology for improved measurement accuracy
- 6 DMA channels for high-speed data throughput
- 3-year warranty

Operating Systems

- Windows 2000/NT/XP
- Mac OS X
- Linux

Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio

Other Compatible Software

- SignalExpress
- VI Logger
- Visual Studio .NET
- C/C++

Measurement Services Software (included)¹

- NI-DAQmx driver software
- Measurement & Automation Explorer configuration utility
- VI Logger Lite data-logging software



¹Mac OS X and Linux users must download NI-DAQmx Base driver

Family	Bus	Analog Inputs	Analog Input Resolution (bits)	Analog Outputs	Output Resolution (bits)	Max Output Rate (MS/s)	Max Analog Output Range (V)	Digital I/O	Correlated (clocked) DIO
NI 6250	PCI, PXI	16	16	0	–	–	–	24	8, up to 10 MHz
NI 6251	PCI, PXI	16	16	2	16	2.8	±5	24	8, up to 10 MHz
NI 6254	PCI, PXI	32	16	0	–	–	–	48	32, up to 10 MHz
NI 6259	PCI, PXI	32	16	4	16	2.8	varies	48	32, up to 10 MHz

Table 1. High-Speed M Series Selection Guide

Portable, Shielded SCC Module Carriers

NI SC-2345 Series

- Shielded carriers for up to 20 SCC modules
- Portable, low-profile packaging
- Cables directly to an E Series or Basic multifunction DAQ device
- Powered by DAQ device (additional power options available)

SC-2345 Connector Block

- Strain relief for signal wiring
- Hinged lid for easy access

SC-2345 Carrier with Configurable Connectors

- Panellets for sensor connectivity
- Panellets for control and display
- Blank panellets for filler

Operating Systems

- Windows 2000/NT/XP

Recommended Software

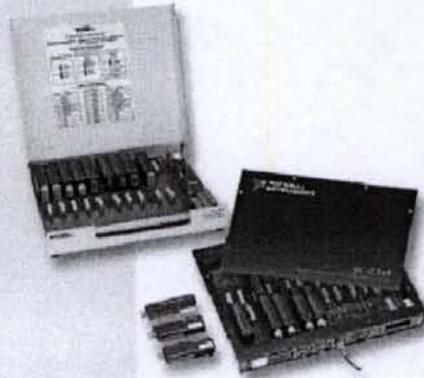
- LabVIEW
- LabWindows/CVI
- Measurement Studio
- Lookout
- VI Logger

Other Compatible Software

- Visual Basic
- C/C++, C#

Driver Software (Included)

- NI-DAQ 7



Portable, Modular Signal Conditioning Modules

NI SCC-ACC01 Accelerometer Input



The National Instruments SCC-ACC01 is a single-channel module that accepts Integrated Electronic Piezoelectric (IEPE) compatible sensors such as accelerometers and microphones. The NI SCC-ACC01 has an amplifier with a gain of two, a 0.1 Hz high-pass filter, and a 10 kHz 3-pole Bessel low-pass filter. The maximum input range is 16 V. In addition, this module has a 4 mA current source to power an accelerometer or microphone.

When you install the SCC-ACC01 into the SC-2345, the carrier routes the single output voltage to one input channel of the multifunction DAQ device, channel x , where x is 0 through 7. For example, if installed into the 0 slot of the SC-2345, the output voltage is routed to input channel 0 of the DAQ device.

Specifications

SCC-ACC01

Analog Input

Number of input channels	1 differential
Input range	± 5 VAC (fixed gain of 2)
Input coupling	AC
-3 dB cutoff frequency	0.8 Hz
Filter type	Lowpass 3-pole Bessel
-3 dB cutoff frequency	10 kHz
Passband flatness	± 0.2 dB, 10 Hz to 5 kHz ± 1 dB, 5 Hz to 10 kHz
Maximum working voltage	Each input should remain within ± 12 V of ground
Overvoltage protection	± 40 VAC + DC (powered on or off)
Input impedance	5 M Ω in series with 0.39 μ F (powered on or off)
System noise	130 μ V _{rms} (referred to input)

Transfer Characteristics

Gain	2
Gain error	$\pm 1\%$
Gain error temperature coefficient	± 10 ppm/ $^{\circ}$ C
Offset error	± 3 mV (referred to input)
Offset error temperature coefficient	± 1 μ V/ $^{\circ}$ C
Nonlinearity	10 ppm of full scale
Recommended warm-up time	5 minutes

Amplifier Characteristics

CMRR	80 dB at 60 Hz
Output range	± 1 DV

Excitation

Number of channels	1
Constant-current source	4 mA
Maximum voltage level without losing regulation	24 V
Drift	± 27 ppm/ $^{\circ}$ C

Environment

Operating temperature	0 to 50 $^{\circ}$ C
Relative humidity	5 to 90% noncondensing

Power Requirements

Analog	89 mW
Digital	420 mW



PCB PIEZOTRONICS™

Model 352C03

Product Type: Accelerometer, Vibration Sensor

General purpose, ceramic shear ICP® accel., 10 mV/g, 0.5 to 10k Hz, 10-32 side conn.

PERFORMANCE	ENGLISH	SI
Sensitivity (± 10 %)	10 mV/g	1.02 mV/(m/s ²)
Measurement Range	± 500 g pk	± 4900 m/s ² pk
Frequency Range (± 5 %)	0.5 to 10,000 Hz	0.5 to 10,000 Hz
(± 10 %)	0.3 to 15,000 Hz	0.3 to 15,000 Hz
Resonant Frequency	≥ 50 kHz	≥ 50 kHz
Broadband Resolution (1 to 10,000 Hz)	0.0005 g rms	0.005 m/s ² rms [1]
Non-Linearity	≤ 1 %	≤ 1 % [2]
Transverse Sensitivity	≤ 5 %	≤ 5 % [3]
ENVIRONMENTAL		
Overload Limit (Shock)	± 5000 g pk	± 49,000 m/s ² pk
Temperature Range (Operating)	-65 to +250 °F	-54 to +121 °C
Temperature Response	See Graph	See Graph
Base Strain Sensitivity	0.003 g/με	0.029 (m/s ²)/με [1]
ELECTRICAL		
Excitation Voltage	18 to 30 VDC	18 to 30 VDC
Constant Current Excitation	2 to 20 mA	2 to 20 mA
Output Impedance	≤ 100 ohm	≤ 100 ohm
Output Bias Voltage	7 to 12 VDC	7 to 12 VDC
Discharge Time Constant	1.0 to 2.5 sec	1.0 to 2.5 sec
Spectral Noise (10 Hz)	25 μg/√Hz	245 (μm/s ²)/√Hz [1]
(100 Hz)	8 μg/√Hz	78 (μm/s ²)/√Hz [1]
(1 kHz)	4 μg/√Hz	39 (μm/s ²)/√Hz [1]
PHYSICAL		
Sensing Element	Ceramic	Ceramic
Sensing Geometry	Shear	Shear
Housing Material	Titanium	Titanium
Sealing	Hermetic	Hermetic

Weight	0.20 oz	5.8 gm	[1]
Electrical Connector	10-32 Coaxial Jack	10-32 Coaxial Jack	
Electrical Connection Position	Side	Side	
Mounting Thread	10-32 Female	10-32 Female	
Mounting Torque	10 to 20 in-lb	113 to 226 N-cm	
SUPPLIED ACCESSORIES:			
Model 080A Adhesive Mounting Base (1)			
Model 080A109 Petro Wax (1)			
Model 081B05 Mounting Stud (10-32 to 10-32) (1)			
Model ACS-1 NIST traceable frequency response (10 Hz to upper 5% point).			
Model M081B05 Mounting Stud 10-32 to M6 X 0.75 (1)			
OPTIONAL VERSIONS			
J - Ground Isolated			
Frequency Range (5 %)	9 kHz	9 kHz	
(10 %)	14 kHz	14 kHz	
Resonant Frequency	≥ 40 kHz	≥ 40 kHz	
Electrical Isolation (Base)	>10 ⁸ ohm	>10 ⁸ ohm	
Size - Hex x Height	0.44 in x 0.67 in	11.2 mm x 17.0 mm	
Weight	0.21 oz	6.0 gm	
T - TEDS Capable of Digital Memory and Communication Compliant with IEEE P1451.4			
Temperature Range (Memory Access)	-10 to +250 °F	-23 to +121 °C	
Output Bias Voltage	7.5 to 13 VDC	7.5 to 13 VDC	
TLA - TEDS LMS International - Free Format			
Temperature Range (Memory Access)	-10 to +250 °F	-23 to +121 °C	
Output Bias Voltage	7.5 to 13 VDC	7.5 to 13 VDC	
TLB - TEDS LMS International - Automotive Format			
Temperature Range (Memory Access)	-10 to +250 °F	-23 to +121 °C	
Output Bias Voltage	7.5 to 13 VDC	7.5 to 13 VDC	
TLC - TEDS LMS International - Aeronautical Format			
Temperature Range (Memory Access)	-10 to +250 °F	-23 to +121 °C	
Output Bias Voltage	7.5 to 13 VDC	7.5 to 13 VDC	
W - Water Resistant Cable			
Electrical Connector	Sealed Integral Cable	Sealed Integral Cable	
Electrical Connection Position	Side	Side	

All specifications are at room temperature unless otherwise specified.

NOTES:

- [1] Typical.
- [2] Zero-based, least-squares, straight line method.
- [3] Transverse sensitivity is typically $\leq 3\%$.
- [4] See PCB Declaration of Conformance PS023 for details.

CE [4]

