# XL403D Digital Triaxial Accelerometer

## SPECIFICATIONS

- **Triaxial MEMS DC Accelerometer**
- **Smart Digital Sensor with Onboard Processing**
- **±2g to ±15g Measurement Ranges**
- **RS485 Interface, User Configurable**
- **Temperature Output Included**

The model XL403D is the first accelerometer to support SCPI-like commands, return data in engineering units, and work with an ASCII terminal emulator. It also performs basic functions such as evaluating minimum, maximum, magnitude, peak-to-peak, and tilt computations. The output is configurable by the customer and the accelerometer can be programmed to the perform the unique tasks required for each measurement application.

The sensor also contains a temperature sensor, microcontroller, and analog outputs in a small, easy-to-install package. The microcontroller takes 10-bit samples and performs temperature compensation and additional functions as programmed for output via the RS-485 interface.

The triaxial accelerometer is available in four ranges from ±2g to ±15g and has a user configurable 5-pole LP filter setting between 1Hz and 800Hz.

Each sensor output is fully temperature compensated, improving accuracy by minimizing variations due to temperature and aging effects. Each axial sensor has been tested over the -40°C to +85°C temperature range.

An on-board self-test option can simulate an acceleration to be injected into all sensor channels to verify channel integrity prior to start of test.

## FEATURES AND BENEFITS

### Built-in Analyses

The XL403D includes an on-board microcontroller to reduce the need for post-processing time and equipment, plus shrink data file sizes. Simply request minimum values, maximum values, peak-to-peak, magnitude, tilt, or threshold.

### Dynamic Customer Interface

Set and query the XL403D with SCPI-like commands such as CONFigure or MEASure. Users may select the scan rates needed and set threshold detection and actions as required. Employ start-up scripts and run multiple sensors with data synchronization.

### Flexible Output

Readouts at specified intervals can include one, two or three axes plus temperature. Choose engineering units (g, °C), or raw ADC counts at RS232 or RS485 baud rates.

### Built-in Calibration

Calibration data for each sensor is maintained in the accelerometer. All data output is fully calibrated in accordance with NIST standards.

## PERFORMANCE SPECIFICATIONS

All values are typical at +24°C and 12Vdc excitation unless otherwise stated. TE Connectivity reserves the right to update and change these specifications without notice.

### Parameters

| DYNAMIC | | | | | Notes |
|---|---|---|---|---|---|
| Dash Number | -R002 | -R005 | -R010 | -R015 | See Ordering Info |
| Range (g) | ±2 | ±5 | ±10 | ±15 | |
| Sensitivity (mV/g) | 1000 | 400 | 200 | 133; | Exact value on cal cert |
| Frequency Response, 5-pole LP (Hz) | 0-800 | 0-800 | 0-800 | 0-800 | -3dB cutoff per BYYY option |
| Non-Linearity (%FSO) | ±0.25 | ±0.25 | ±0.25 | ±0.25 | BFSL |
| Transverse Sensitivity (%) | <2 | <2 | <2 | <2 | <1% typical |
| Alignment Error (degrees) | ±0.25 | ±0.25 | ±0.25 | ±0.25 | Exact value on cal cert |
| Shock Limit (g) | ±5000 | ±5000 | ±5000 | ±5000 | 0.5msec pulse |
| Resolution B010 filter option (mg) | 0.32 | 0.32 | 0.32 | 0.32 | 10Hz -3dB cutoff |
| Resolution B100 filter option (mg) | 1.01 | 1.01 | 1.01 | 1.01 | 100Hz -3dB cutoff |
| Resolution B200 filter option (mg) | 1.43 | 1.43 | 1.43 | 1.43 | 200Hz -3dB cutoff |
| Resolution B800 filter option (mg) | 2.86 | 2.86 | 2.86 | 2.86 | 800Hz -3dB cutoff |
| Spectral Noise (µg/√Hz) | 100 | 100 | 100 | 100 | |

| ELECTRICAL | | |
|---|---|---|
| Zero Acceleration Output (V) | ±2.50 ±0.010 | Single ended |
| Excitation Voltage (Vdc) | 8.5 to 36 | |
| Excitation Current (mA) | 25 | No load, quiescent |
| Rejection Ratio (dB) | >120 | DC |
| Full Scale Output Limit (single-ended) | 0.05 to 4.95Vpk | >1MΩ load |
| Capacitive Drive Capability (pF) | 1000 | |
| Insulation Resistance (MΩ) | >100 | @100Vdc |
| Turn On Time (msec) | <50 | |
| Ground Isolation | Isolated from Mounting Surface | |

| DIGITAL | | |
|---|---|---|
| Scan Rate (scans/sec) | 0.0007 to 2500 | Default for A1, A2, A3, T1 |
| ADC Resolution | 10 bits | |
| Absolute Accuracy | ±2 LSB | |

| SELF TEST FUNCTION | |
|---|---|
| Response with self-test pin grounded | See operating manual for instructions |
| Self Test Resistance to Ground (kΩ) | 5 |

| TEMPERATURE SENSOR | |
|---|---|
| Sensitivity (mV/°C) | 6.45 |
| +25°C Bias Level (mV) | 500 |

| ENVIRONMENTAL | | |
|---|---|---|
| Thermal Zero Shift (mg/°C) | ±0.16 | -40 to +85°C |
| Thermal Sensitivity Shift (%) | ±1.0 typ (±3.0 max) | -40 to +85°C |
| Operating Temperature (°C) | -40°C to +85°C | |
| Humidity (Active Element & Electronics) | Hermetically Solder Seal | |
| Humidity (Housing) | Epoxy Sealed, IP65 | |

| PHYSICAL | |
|---|---|
| Case Material | Anodized Aluminum |
| Cable | 9x, #30 AWG Conductors, PFA Insulated, Tin Plated Shield, PFA Jacket |
| Connector | 9-pin DB9 Male Connector Installed at End of Cable |
| Weight (cable not included) | 38 grams |
| Mounting | 2x M3-0.5 Machine Screws |
| Mounting Torque | 5 lbf-in (0.56 N-m) |

| **Calibration supplied:** | CS-FREQ-0100 | NIST Traceable Calibration with Sensitivity and Offset |
|---|---|---|

| **Optional accessories:** | 35172A | Vertical Mounting Flange |
|---|---|---|
| | 35173A | Horizontal Mounting Flange |

## XL403D SET UP

Use the 35250AK0/AK1 interface kit (sold separately) to connect the XL403D to a computer with a serial port and sup-ply power (USB adapters available if needed). Use an ASCII terminal emulator of your choice to interface with the sensor (Tera Term Pro is recommended).

## XL403D SAMPLE COMMANDS

| *Set commands* | | *Query Commands* | |
|---|---|---|---|
| | | *IDN? | device identification |
| ROUT:SCAN | set channels to be scanned | ROUT:SCAN? | channels being scanned |
| | | READ? | show single scan |
| INP:FILT:FREQ | set cutoff frequency | INP:FILT:FREQ? | current cutoff filter setting |
| TRIG:SOUR:TIM | set time-based scan | TRIG:SOUR? | current trigger source |
| TRIG:COUNT | set maximum number of triggers | TRIG:COUNT? | current max number of triggers |
| INIT | begin scanning as configured | SYST:ERR? | current error status |
| OUT:FMT | format output | OUT:FMT? | current formatting |
| CONF:FNC <name> | configure function | CONF:FNC? | current function definitions |



Display engineering units (FLT), HEX values; add a scan count or CRC to each scan

## XL403D FUNCTIONS

Configure XL403D's built-in functions to execute as needed. Each unique function is performed on the scan measurements, with results maintained internally within the sensor.

MIN – tracks the minimum reading on each channel since the function was configured

MAX – tracks the maximum reading on each channel since the function was configured

MAG – calculates the magnitude of the vector sum of axes A1, A2 and A3

PTP – tracks the peak-to-peak value for each channel since the function was configured. This is equal to MAX – MIN for each channel

TLT – calculates the 2-axis tilt angle for any 2 axes that are in scan

TH1 – tracks channels readings against individual channel threshold values

TH2 – tracks MAG or TLT values against a threshold

OU1/OU2/OU3 – output functions that print the values of functions on a configurable periodic basis

When the XL403D threshold function is set, external controls can be triggered when the threshold is reached. Receive a warning, flip a switch, apply a brake - take action immediately when limits are exceeded.
For more details, download the XL403D operating manual from TE website.

## DIMENSIONS
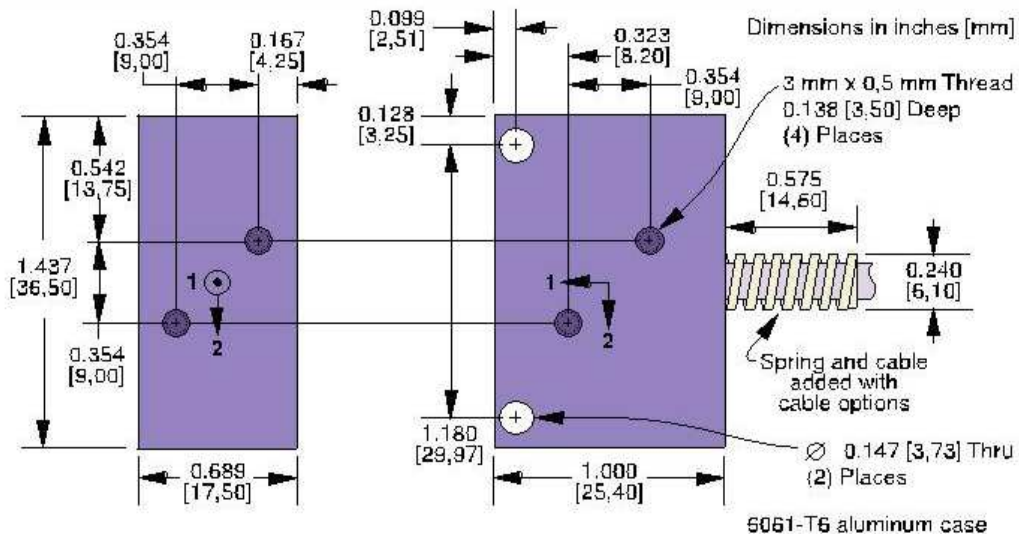


Two through holes and four 3 mm x 0.5 mm threaded holes are provided for mounting.
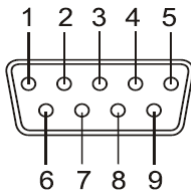
Mounting adapters
(sold separately)
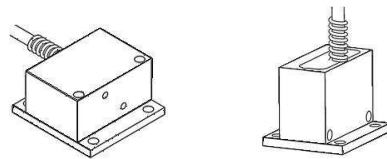


35173A Horizontal          35172A Vertical

## SCHEMATIC

**T004: DB9 Male Connector**



Pin 1: +ANALOG OUT AXIS 1 (BROWN)

Pin 2: -ANALOG OUT AXIS 2 (RED)

Pin 3: +ANALOG OUT AXIS 3 (ORANGE)

Pin 4: -SIGNAL OUT (YELLOW)

Pin 5: -RS485 (GREEN)

Pin 6: +RS485 (BLUE)

Pin 7: SELF TEST/AUX (VIOLET)

Pin 8: +EXC VOLTAGE (GREY)

Pin 9: -EXC VOLTAGE/GND (WHITE)

## ORDERING INFORMATION

| XL403D-X3 | RXXX | TZZZ |
|-----------|------|------|

**Range**
R002 = ±2g
R005 = ±5g
R010 = ±10g
R015 = ±15g

**Cable Length**
T004 = 4ft cable with DB9M connector (standard option)
TZZZ = Contact factory for custom length (ZZZ in feet)

Example;  XL403D-X3-R005-T004

Triaxial model XL403D-X3, ±5g range, 4ft cable with DB9M connector

Note: PC Interface Kit, PN 35250AK0/AK1, is required for digital sensor usage. Sold separately.