

# SPIDER-20 & SPIDER-20E

## HARDWARE SPECIFICATIONS (v1.31)

### INTRODUCTION

The Spider-20 is a compact yet powerful digital data recorder and dynamic signal analyzer. It provides four 24-bit precise high-fidelity input channels, and a unique software-selectable tachometer-input/signal-source output channel (all using conventional BNC connectors). Each input is individually programmable to accept AC or DC voltage or output from an IEPE (ICP) sensor with built-in electronics.

The Spider-20 is a diminutive 5 5/16 x 4 5/16 x 1 5/16 inch tool weighing only 18 ounces. It has only three push-button controls and five LED status indicators. This little powerhouse can run over 6 hours on its internal rechargeable battery which can be replaced in field with a backup battery. It can also record data on its built-in 4GB flash memory at the simple push of a button.

The Spider-20 communicates with the world through its built-in Wi-Fi interface. Use your iPad to setup/view or record time histories. An iPad can also be used to perform spectrum analysis, measure frequency response, and perform coherence functions. Link the Spider-20 to your laptop or tablet running Windows and enjoy the full repertoire of functionality provided by our EDM (Engineering Data Management) software, including 1/nth Octave acoustic functions, Order Tracking for rotating machinery, Shock Response Spectra for drop testing, or Digital Filtering for special purpose analysis.

Transfer measured data to a truly massive storage space using the EDM Cloud server. EDM can be used to program your Spider-20 to perform a custom measurement or measurement sequence at the touch of its START button, making it an un-intimidating and user-friendly tool. No computer, tablet or phone is required; just use your thumb and your Spider-20 operating in Black Box mode. Use our flexible Automated Schedule and Limiting software to turn the Spider-20 into an intelligent unattended monitor capable of responding to data conditions or networked instructions, notifying you of significant conditions via e-mail.

The Spider-20E is the Ethernet version of the Spider-20. The Spider-20E communicates with the world through an Ethernet interface. It requires an additional wireless router to communicate with an iPad.

The Spider-20 is the perfect solution to many applications including:

#### Machinery Diagnosis

Four inputs and a tachometer channel are the perfect size for many machinery monitoring tasks. Simultaneously measure two perpendicular proximity probes or horizontal and vertical bearing cap accelerations at both ends of a machine. Record this along with a 1/rev tachometer during startups and shutdowns to plot waterfalls and Campbell diagrams identifying resonances, critical speeds and unusual forcing functions. Use the same

signal inputs to balance the machine. Place accelerometers on either side of a coupling to aid alignment.

#### Machine/Process Monitoring

Load a custom monitoring program employing our Automated Schedule and Limiting software and leave your Spider-20 to monitor speed and four dynamic inputs. Upon detecting an alarm-level limit (in the time or frequency domain), it can send you an email reporting the finding and make an immediate recording for more detailed analysis. For longer stays, leave the accessory AC power unit plugged in. This allows Spider-20 to draw power (6 Watts, maximum) from any 100 to 240 VAC (50/60 Hz) power line. Alternatively, you can provide a battery backup of 15 VDC ( $\pm 10\%$ ) for more remote applications.

#### Modal Analysis

Four signal inputs allow you to measure a force and three accelerations. Use a fixed tri-axial accelerometer or up to 3 separate reference accelerometers and a force-transduced hammer to perform impulse studies (with redundant measurements). Alternatively, turn on the output channel and let the Spider drive a shaker with random noise while you rove a tri-axial around the structure, measuring 3 degrees of response freedom at a time. Switch the shaker drive to a sinewave at a detected resonance frequency to do a quick hand-and-ear mode shape analysis on the spot.

#### Acoustic Studies

Add an ICP microphone and your iPad or iPhone becomes a fully functioning sound level meter. Add 3 more and it becomes a multi-channel, multi-function sound level recorder and analyzer. Use it with an intensity probe for noise source localization. Take the Spider-20 on the road or in the air to record interior noise signatures during full-spectrum vehicle operation. Make and monitor pass-by measurements from the vehicle. Validate all of your recordings in-place on your tablet or laptop before returning to base.

#### Vehicle Dynamics

Record speed and four DC-coupled accelerometers to fully document chassis handling characteristics. Record any combination of acceleration, displacement, strain and sound to characterize annoying operational periods. Monitor engine and driveline vibration on your remote screen during road tests, whether you are the driver, a passenger or a standing observer.

#### Temporary Monitor

Let's face it – sometimes things just go wrong and we don't know why. This can happen in the factory or at a remote installation and occurs even with brand new products. The problem may be sonic or something shaking or breaking. The mission is always the same – find out what's causing the problem and correct it. A few simple measurements made over the course of a day or a week may provide the necessary clue to solve this annoying

mystery. The Spider-20 is ideal for such “detective work”. Through EDM it has a very flexible measurement repertoire and the ability to take various actions based upon instantaneous data conditions and other (networked) stimuli. The Spider-20 is small, silent, draws little power, and is inexpensive to replace. It’s the right kind of instrument to lock down in an unexpected place for an exploratory “look-and-see”.

A standard shipping package will include a Spider-20 unit with batteries installed, a pair of backup batteries, a battery charger, one 3ft BNC cable, an AC power adapter, CD for software, and the calibration certificate.

## HARDWARE SPECIFICATIONS

### Analog Input Channels

- Input Channels: 4
- Connector Type: isolated BNC
- Coupling: AC, DC, IEPE (ICP®)
- IEPE DC offset Voltage and Current: 21 V at 4.2 mA
- Input Type: Single-ended
- Input Range:  $\pm 0.1V$ ,  $\pm 1V$ ,  $\pm 10V$
- Input Impedance: 500 k $\Omega$
- Input Protection Voltage:  $\pm 40$  Vpk
- AC Coupling: analog high-pass filter, -3 dB @ 0.3 Hz and -0.1 dB @ 0.7 Hz
- A/D Resolutions: 24 bit
- Anti-Aliasing Filter: analog anti-aliasing low-pass filters in addition to sigma-delta converters
- Digital Filter: high-pass and low-pass filters (user programmable)
- Input Dynamic Range: 100 dBFS
- Sampling Rate: 0.48 Hz to 102.4 kHz, with 54 stages
- Maximum Useful Bandwidth: 46.08 kHz
- THD: -90 dB (DC to 1 kHz)
- Amplitude Channel Match (1 kHz, 1V input): 0.02 dB
- Channel Phase Match: better than  $\pm 1.0$  degree, up to 20 kHz
- Crosstalk: less than -100 dB
- Frequency Accuracy:  $\pm 250$  ppm (typically  $\pm 0.25$ Hz margin at 1 kHz)
- Amplitude Accuracy (1 kHz, 1V input): 0.1% or better

### Tachometer Input Channel

- Tachometer Input Channel: 1
- Connector Type: isolated BNC (shared with the Analog Output)
- Configuration: Tachometer or Output function selected by software
- Signal Type: analog or digital pulse train
- Input Range:  $\pm 10V$
- Pulses/Revolution (N): 1
- Pulse Frequency Range: 0.05 – 5,000 Hz)
- Shaft RPM Range: 3/N – 300,000/N RPM

### Analog Output Channel

- Output Channels: 1
- Connector Type: isolated BNC (shared with Tachometer Input)
- Configuration: Output or Tachometer function selected by software
- Output Waveform: sine, triangle, square, white random noise, DC, chirp, swept sine, arbitrary
- Output Range:  $\pm 10$  Volts
- D/A Resolution: 24 bit
- Sampling Rate: up to 102.4 kHz, synchronized with input channels

- Output Dynamic Range: 100 dB
- Maximum Output Current: 25 mA
- Sine Amplitude Accuracy:  $\pm 1\%$  (0.34 dB) at 1 kHz for 0.1 Vpk to 5 Vpk
- Anti-Imaging Filter: 160 dB/octave

### DC Power Input

- Connector Type: 5.5mm Jack connector (on rear panel)
- Voltage: 15 VDC ( $\pm 10\%$ )

### Ground Connector (GND)

- Connector Type: 4.0mm Jack, not standard (on rear panel)

### Control Buttons

- Power: top panel alternate action ON/OFF pushbutton
- Start: top panel push button initiates recording (or programmed function)
- Stop: top panel push button terminates recording (or programmed function)
- Reset: rear panel pin-switch

### Indicating LEDs

- Power: steady red when the unit is ON, off otherwise
- Start/Stop: flashes green when recording or process has been started, off when stopped
- Battery: 50% < charge < 100% - steady green
- 15% < charge < 50% - steady yellow
- charge < 15% - flashing yellow
- charge = 0% - off
- Wi-Fi: green when Wi-Fi is connected, off otherwise
- Charging: green when battery is being charged, off otherwise

### Network Communication

- Spider-20:
- Type: Built-in Wi-Fi router
- Compliance: IEEE 802.11b/g/n; 2.4 GHz band 802
- Transmit range: ~ 10 meters
- Spider-20E:
- Ethernet: 100Base-T, RJ45 female connector

### Power Specifications

- Power Supply: interchangeable battery with DC charger interface
- Battery Hours: 6 hours or longer in full operation
- Charging Power: AC adaptor accepts 100 to 240 VAC (50/60 Hz), DC power 15 V ( $\pm 10\%$ )
- Power Consumption: less than 6W

### Environmental Specifications

- Enclosure: 135mm x 109mm x 32.5mm
- Weight: 0.56kg
- On-Board Flash Memory: 4GB
- Internal Clock: maintains date and time
- Cooling: no cooling fan required
- Safety Standards: electromagnetic compatibility and sensitivity: EN 61326:1997+A1:1998+A2:2001, EN61000-3-2:2000, EN61000-3-3: 1995+A1:2001
- Operating Temperature: -10 °C to +55 °C
- Storage Temperature: -20 °C to +70 °C
- Shock: 50 g’s, 315 in/sec, tested at 6 sides, non-operational test
- Shock: 50g, 7ms width, operational test
- Vibration: 5 – 500 Hz, 0.3 g, tested at 3 sides, operational test
- Vibration: 5 – 500 Hz, 2.42 g, tested at 3 sides, non-operational test

- Operating System Support: Windows 7 or higher
- Operating System Type: 32-bit or 64-bit
- Minimum Processor Speed: 1.5GHz Dual-Core x86
- Minimum RAM: 4 GB
- Minimum Free Space: 10 GB
- Solid Particle and Liquid Ingress Protection: IP 53

- Real-time Sine Reduction (DSA-14-C08)
- Time Waveform Recording (DSA-20-C08)
- Automated Schedule and Limiting Test (DSA-24-C08)
- Real-time Digital Filters (DSA-25-C08)
- Shock Response Spectrum (SRS) Analysis (DSA-27-C08)
- Spider System Calibration Software (Spider-CAL)

**SUPPORTED SOFTWARE APPLICATIONS**

**EDM Dynamic Signal Analyzer DSA Mode Software (PC-based)**

- Entry-level FFT Spectral Analysis (DSA-10-C04)
- FFT Spectral Analysis (DSA-10-C08)
- Octave Analysis and Sound Level Meters (SLM) (DSA-11-C08)
- Real-time Order Tracking and Order Analysis (DSA-12-C08)
- Swept Sine Analysis (DSA-13-C08)

**EDM App - DSA mode in iOS (DSA-37) (iPad-based)**

- FFT Spectral Analysis

