

# Spider-20 Series Hardware Specifications

*Spider-20E (Ethernet) & Spider 20i (Industrial)*



## INTRODUCTION

The Spider-20 series of products are compact yet powerful data acquisition and dynamic measurement systems. These units provide four 24-bit precise high-fidelity input channels, and a unique software-selectable tachometer-input/signal-source output channel. Each input is individually programmable to accept AC or DC voltage or output from an IEPE (ICP) sensor with built-in electronics. Input channels can be programmed to sample up to a rate of 256 kHz.

The Spider-20E is a small scale ( $5 \frac{5}{16} \times 4 \frac{5}{16} \times 1 \frac{5}{16}$  inch) device weighing only 18 ounces. This handheld unit features 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 the field with a backup battery.

The compact battery-less version with industrial grade enclosure makes the Spider-20i suitable for deployment in rugged industrial environments. Without any buttons, it is suitable to be deployed in remote locations enabling operation and monitoring entirely through software applications.

The Spider-20 series of products communicates with the world through an Ethernet interface. Link the Spider to your laptop or tablet running Windows and enjoy the full suite of functionality provided by our EDM (Engineering Data Management) software, including spectral analysis and frequency response functions, 1/nth octave acoustic functions, order tracking for rotating machinery, shock response spectra for drop testing, or digital filtering for special purpose analysis.

The Spider-20E can chain systems together to construct a high channel count system with up to 256 input channels while simultaneously sampling all input data. Crystal Instruments' unique PTP (Precision Time Protocol) technology ensures better than  $1^\circ$  phase match for up to 20 kHz.

The Spider-20 series of products are equipped with built-in 4 GB of flash memory. Raw time signals can be recorded with sampling rates of up to 256 kHz with a push of a button or through an automated schedule. It is also capable of periodically saving processed time and frequency signals. A unique Black Box mode enables Spiders to run without

requiring a connection to a host PC.

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

A standard shipping package for the Spider-20i will include a Spider-20i unit, one 3-foot BNC cable, an AC power adapter, CD for software, and the calibration certificate.

## SPECIFICATIONS

### Part Numbers

- **Spider-20E:** S20E-P02 or S20E-P04
- **Spider-20i:** S20i-P02 or S20i-P04

### Analog Input Channels

- **Input Channels:** 4 (expandable to 256 inputs)
- **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:**  $\pm 20$  V,  $\pm 2$  V,  $\pm 0.2$  V
- **Input Impedance:** 165 k $\Omega$
- **Input Protection Voltage:**  $\pm 40$  V
- **AC Coupling:** Analog high-pass filter (-3 dB @ 0.375 Hz and -0.1 dB @ 2.45 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:** 120 dBFS (20 V range); 110 dBFS (2 V range); 100 dBFS (0.2 V range)
- **Sampling Rate:** 0.48 Hz to 256 kHz, with 58 stages
- **Maximum Useful Bandwidth:** 115.2 kHz
- **Continuous Data Recording Speed:** Up to 256 kHz/channel
- **THD:**
  - -87 dB at 1 kHz, 17.83 V (-1 dBFS)
  - -97 dB at 1 kHz, 4 V (-14 dBFS)
- **Amplitude Accuracy (1 kHz, 1 V):**  $\pm 0.04$  dB
- **Amplitude Channel Match (1 kHz, 1 V):** < 0.04 dB
- **Channel Phase Match:** < 1.0 degree up to 20 kHz
- **Crosstalk:** less than -90 dB
- **Frequency Accuracy:**  $\pm 25$  ppm (typically  $\pm 0.025$  Hz

margin at 1 kHz)

### 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:**  $\pm 10$  V
- **Sampling Rate:** up to 256 kHz, synchronized with input channels
- **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 noise, pink noise, DC, chirp, swept sine, arbitrary
- **Output Range:**  $\pm 10$  V
- **D/A Resolution:** 24-bit
- **Maximum Output Sampling Rate:** 102.4 kHz, synchronized with input channels
- **Output Dynamic Range:** 120 dB
- **Maximum Output Current:** 25 mA
- **Sine Amplitude Accuracy:**
  - $\pm 0.3$  dB at 1 kHz for 200  $\mu$ V to 10 V
  - $\pm 1$  dB at 1 kHz for 200  $\mu$ V to 10 V
- **Anti-Imaging Filter:** 160 dB/octave

### Input Power Specifications:

#### Spider-20E:

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

**Spider-20i:**

- **Connector Type:** 3Pins DIN connector
- **Voltage:** 12-24 VDC ( $\pm 10\%$ )
- **Power Supply:** external DC power
- **External DC Power:** AC adaptor accepts 100 to 240 VAC (50/60 Hz), DC power 12 V ( $\pm 10\%$ )/1A
- **Power Consumption:** less than 6 W

**Ground Connector (GND)**

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

**Control Buttons****Spider-20E:**

- **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****Spider-20E:**

- **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
- **Ethernet:** green when Ethernet is connected, off otherwise
- **Charging:** green when battery is being charged, off otherwise

**Spider-20i:**

- **Power:** steady red when the unit is ON, off otherwise

**Network Communication****Spider-20E and Spider-20i:**

- **Ethernet:** 100Base-T, RJ45 female connector

**Memory Specifications**

- **On-Board Flash Memory:** 4 GB

**Environmental Specifications**

- **Enclosure:** 135mm x 109mm x 32.5mm (Spider-20E)

- **Industrial:** 155 mm x 109.6 mm x 30.7 mm (Spider-20i)
- **Weight:**
  - 0.56 kg (Spider-20E)
  - 0.52 kg (Spider-20i)
- **Internal Clock:** maintains date and time
- **Operating Temperature:** -10 °C to +55 °C
- **Storage Temperature:** -20 °C to +70 °C
- **Cooling:** no cooling fan required
- **Shock:** 50 g's, 315 in/sec, tested at 6 sides, non-operational test
- **Shock:** 50 g, 7 ms 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
- **Solid Particle and Liquid Ingress Protection:** IP 53
- **Safety Standards:** electromagnetic compatibility and sensitivity: EN 61326:1997+A1:1998+A2:2001, EN61000-3-2: 2000, EN61000-3-3: 1995+A1:2001

**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)
- 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)

**EDM – Modal (experimental Modal Analysis) (PC-based)**

- Geometry/ODS/Animation (EMA-01)
- Hammer Impact Modal Testing (EMA-02)
- SIMO FRF Modal Testing (EMA-03)
- SIMO Stepped Sine Modal Testing (EMA-05)
- SIMO Swept Sine Modal Testing (EDMA35)

- Operational Modal Testing (EMA-08)

#### **EDM Remote Condition Monitoring Software (PC-based) (DSA-40)**

- Monitor multiple Spider systems simultaneously
- Monitor Spider systems deployed remotely using public IP address

#### **EDM – Time Data Acquisition (PC-based) (TDA-10)**

Acquiring raw time data continuously or Capturing specific events in time domain

#### **EDM Cloud support (Cloud based Monitoring)**

Live data / status view on Crystal Instruments' cloud service  
Monitor and adjust settings through Cloud

#### **Python API (Cross platform utility)**

Supports API for Linux, Mac OS, Android and iOS

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

FFT Spectral Analysis

#### **LabVIEW Driver**

Supports setup and operation through LabVIEW interface

#### **Post Analyzer (PC-based post processing software)**

Post processing software for signal conditioning and signal analysis functions

ANALOG  
DIGITAL



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