Spider-20 Series Hardware Specifications

Spider-20HE (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-20HE is a small scale (5 ⁵/16 x 4 ⁵/16 x 1 ⁵/16 inch) device weighing only 18 ounces. This handheld unit features three push-button controls and five LED status indicators. The Spider-20 can operate for over 6 hours on its internal rechargeable battery and is operable in the field with a backup battery.

The compact battery-less Spider 20i version with an industrial grade enclosure is suitable for deployment in rugged industrial environments. Without any buttons, it can operate in remote locations with operations and monitoring enabled 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-20HE 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° 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 being connected to a host PC.

The circular buffer option on the Spider-20 series of products serves two additional purposes. Continuous recording to the circular buffer automatically overwrites the old data and always keeps the most recent data. Circular buffer can also be used to record a long pre-trigger for events initiated through time domain triggers.

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

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

SPECIFICATIONS

Part Numbers

- **Spider-20HE:** S20HE-P02 or S20HE-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:** ±20 V, ±2 V, ±0.2 V
- **Input Impedance:** 165 kΩ
- **Input Protection Voltage:** ±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
- **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):** ±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:** ±25 ppm (typically ±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:** ±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:** ±10 V
- **Output Impedance:** 50 Ω
- **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:**
  - ±0.3 dB at 1 kHz for 200 µV to 10 V
  - ±1 dB at 1 kHz for 200 µV to 10 V
- **Anti-Imaging Filter:** 160 dB/octave

Input Power Specifications:

Spider-20HE:

- **Connector Type:** 4 pin LEMO connector (on rear panel)
- **Voltage:** 15 V_{DC} (±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 V_{AC}

(50/60 Hz), DC power 15 V (±10%)

- **Power Consumption:** less than 6 W

Spider-20i:

- **Connector Type:** 3Pins DIN connector
- **Voltage:** 12-24 V_{DC} (±10%)
- **Power Supply:** external DC power
- **External DC Power:** AC adaptor accepts 100 to 240 V_{AC} (50/60 Hz), DC power 12 V (±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-20HE:

- **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-20HE:

- **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-20HE and Spider-20i:

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

Memory / Recording Specifications

- **On-Board Flash Memory:** 4 GB
- **Memory usage**: Recording time streams, Saving signals, circular buffer recordings of time streams.
- **Continuous Data Recording Speed:** Up to 256 kHz/ channel
- **Circular buffer:** Use configurable duration for continuous recording with pre-trigger settings

RTC: Real Time Clock (Spider 20-HE)

- **RTC Function:** Allows for scheduled power OFFs and power ON (Allows auto recovery during un-attended deployment in case of an abrupt power shutdown of Spider-20HE)
- **Scheduled Options:** Power ON, Power OFF
- **Recurrence Settings:** Hourly, Daily, Weekly or Monthly
- **Scheduled Actions:** Run selected Black box test
- **Clock Accuracy:** ±3.5ppm
- **Independent Battery life:** 10 years (Rated)

Environmental Specifications

- **Enclosure:**135mm x 109mm x 32.5mm (Spider-20HE)
- **Industrial:** 155 mm x 109.6 mm x 30.7 mm (Spider-20i)
- **Weight:**
  - 0.56 kg (Spider-20HE)
  - 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

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