

FDI2056: TECHNICAL SPECIFICATIONS

DIGITIZER PERFORMANCE

Parameter	Conditions	Min	Typ	Max	Unit
ADC RESOLUTION				18	bit
ANALOG INPUT					
Differential voltage range (full-scale FS)	±5 V on each input leg ±10 V on each input leg		±10 ±20		V V
External trigger source f_t	$f_{ADC} \geq 2 \cdot f_t$	1		250000	Hz
ADC sampling rate f_{ADC}	8 programmable values	1		500000	S/s
Gain	13 programmable values	0.1		100	
DC					
Digitizer Differential Nonlinearity	FS = ± 10 V, ± 2 σ		1.5		LSB
Integrator Integral Nonlinearity	30 min, 27°C – 36°C		± 7		ppm
Integrator stability	24 h, 30°C		± 3		ppm
Integrator repeatability	30 min, 30°C		± 1		ppm
Gain error	30 min, 27°C – 36°C		0.2		%
	24 h, 30°C		0.2		%
Offset error	30 min, 27°C – 36°C		17		ppm
	24 h, 30°C		7		ppm
AC					
Digitizer Signal-to-Noise and Distortion	$f_{ADC} = 500$ kS/s, OSR = 100, $f_{in} = 10$ Hz		97		dB
Digitizer Signal Non Harmonic Ratio			103		dB
Digitizer Total Harmonic Distortion			-99		dB
Integrator Signal-to-Noise and Distortion			108		dB
Integrator Signal Non Harmonic Ratio			118		dB
Integrator Total Harmonic Distortion			-109		dB
TIMER RESOLUTION			50		ns
THROUGHPUT RATE cPCI/PXI bus				1	MB/s



SYSTEM CONFIGURATION

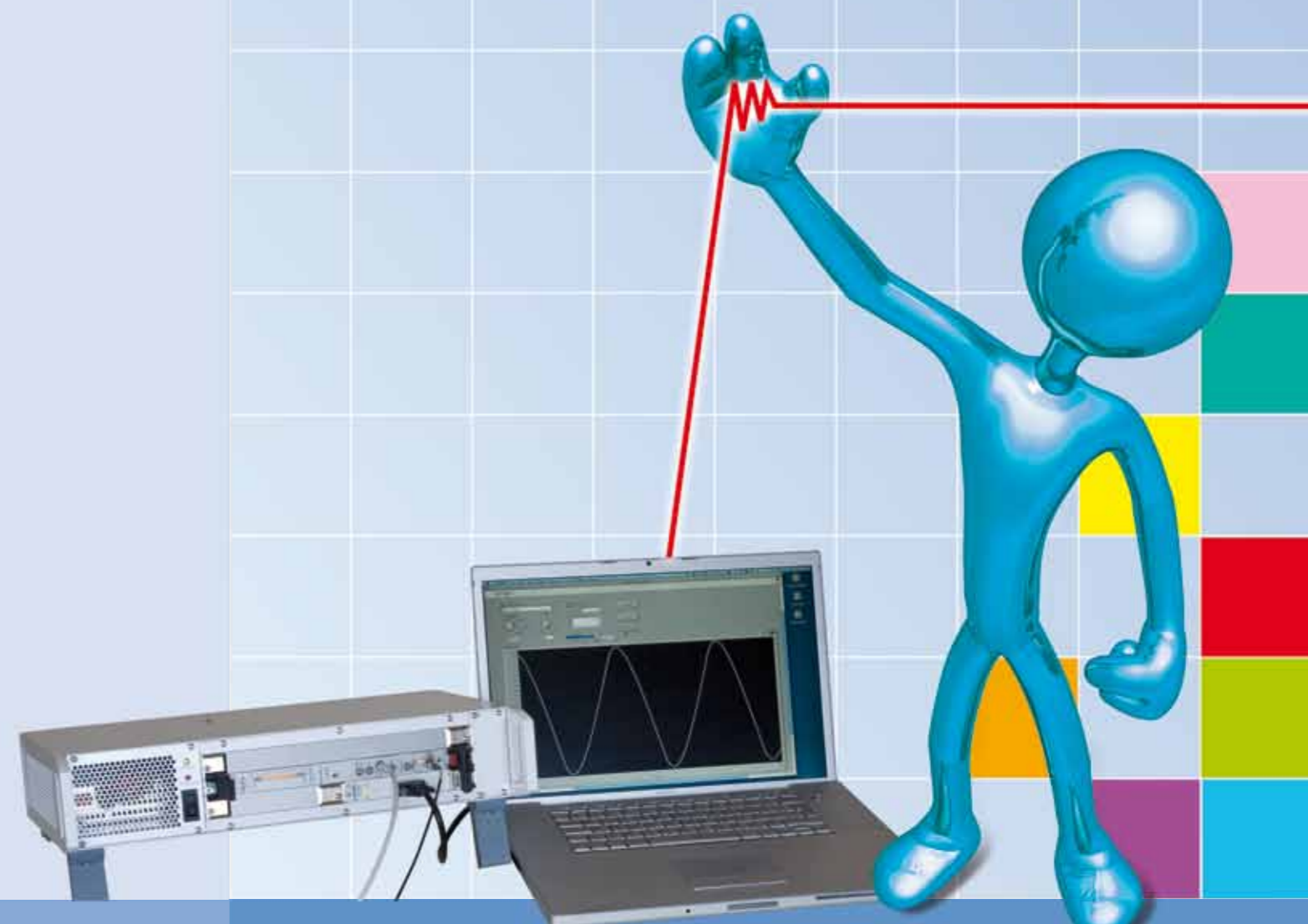
System bus	Compact Peripheral Component Interconnect (cPCI) or PCI eXtensions for Instrumentation (PXI)
Card size	6U
Standard crate configurations	19", 3-slot cPCI (one slot required for controller), 200 W max
Standard crate controller	PCI Bridge to host computer: cPCI/PXI to PCI, PCI Express, ExpressCard or CardBus/PCMCIA
Software support	- Turnkey software to acquire, display and save data - LabVIEW Application Programming Interface (API) on host computer, using NI-VISA
Supported operating systems	Windows, Mac OS X (Linux not tested)

For detailed specifications,
please see <http://www.metrolab.com>.

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Specifications subject to change

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FDI2056: THE ONLY READY-TO-USE SOLUTION TO QUANTIFY MAGNETIC FIELD TRANSIENTS

The Fast Digital Integrator FDI2056 is the world's fastest & most sensitive voltage integrator. Plug in a sense coil: for the first time it is possible to measure fast, low-level magnetic field disturbances such as eddy currents in a switched magnet.

- Speed 100 times faster than today's best standard integrator
- Resolution 100 times greater than today's best standard integrator
- Outstanding linearity and noise performance
- Wide range of input voltages
- High accuracy and stability
- Automatic internal recalibration of the instrument
- Data acquisition in real time

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EDDY CURRENTS – DECAY & SNAPBACK - MULTIPOLE COMPONENTS

ANALOG TO DIGITAL CONVERTER

This high-performance ADC combines speed (500 kSPS) and resolution (true 18-bit) with outstanding linearity and noise performance. High input voltages (± 20 V max) minimize the effect of noise, and a programmable input range reduces the number of gain steps required in the PGA.

ADC

- Capture rapid transient signals: more than 100 times faster than the previous generation! Integrator speed: up to 250,000 integrals/second.
- Capture low-level disturbances: 40 dB better than the previous generation! Integrator resolution: typical integrator Signal-to-Noise and Distortion (SINAD) of 108 dB.
- Integrator stability: ± 3 ppm (24 h, 30°C).

PROGRAMMABLE-GAIN AMPLIFIER

amplifies the input voltage by a software-selectable gain, ranging from 0.1 to 100.

PGA

- Input voltages from 200 mV to 200 V (p-p) without losing precision.
- High-precision, high-stability components.

CALIBRATION REFERENCE VOLTAGE

The software can instruct the instrument to recalibrate itself at any time, without manual intervention or external instrumentation.

CRV

- Reduce long-term drift errors to an absolute minimum.
- Minimize incoherencies between different gain settings.

DISPLAY

Integrator status, gain and input signal levels.

DISPLAY

- Quickly check system status.
- Easily find the right gain.
- No software required.

CLOCK

A 20 MHz Oven-Controlled Crystal Oscillator (OCXO), calibrated to better than ± 10 ppb accuracy and with a specified stability of better than ± 4 ppm over 10 years.

CLK

- Control the exact timing of the analogue-to-digital conversion.
- Precisely measure the arrival time of the trigger pulse.
- Minimize jitter and drift.

Initially developed by the European Organization for Nuclear Research (CERN) and the University of Sannio (Italy), the Fast Digital Integrator is used to monitor the dipole magnets of the Large Hadron Collider (LHC), together with a fast rotating-coil system. Manufacturing the FDI card under license, Metrolab offers a complete system, including standard sense coils, crate, computer interface, software, documentation, and support with continuing firmware and hardware upgrades.

DIGITAL SIGNAL PROCESSOR

computes the partial integral of the voltage between two trigger pulses, using a trapezoidal approximation. At the beginning and end of the partial integral, the exact arrival time of the trigger pulse is used to interpolate between ADC samples.

DSP

- Speed: up to 250,000 partial integrals per second with an ADC sample rate of 500 kSPS.
- Accuracy: despite the high ADC sample rate, all data is interpolated.
- Upgradeability. For example: real-time computation of multipole components.

FIELD-PROGRAMMABLE GATE ARRAY

performs a wide range of functions essential to the performance of the integrator, such as trigger signal timing, PXI bus interface control, and calibration process control.

FPGA

- Upgradeability on all levels – hardware, firmware and software – ensures that the FDI2056 will be able to evolve to face new research challenges.
- Long-term investment protection.

PXI BUS (PCI EXTENSIONS FOR INSTRUMENTATION)

A modern high-speed instrumentation standard.

PXI BUS

- High-speed data transfers (1 MB/s max). Real-time data acquisition at any trigger rate.
- Simple register-based interface. Metrolab's LabVIEW Application Programming Interface (API) further simplifies programming.
- Compatibility and interoperability with other instruments on the mechanical, electronic and software levels.
- Compatibility with your computer via the universally accepted PCI bus. At the software level, LabVIEW supports PXI under Windows, MacOS or Linux.
- Flexibility. Select suitable crates, crate controllers and bridge interfaces from Metrolab or from major suppliers such as Agilent and National Instruments.

