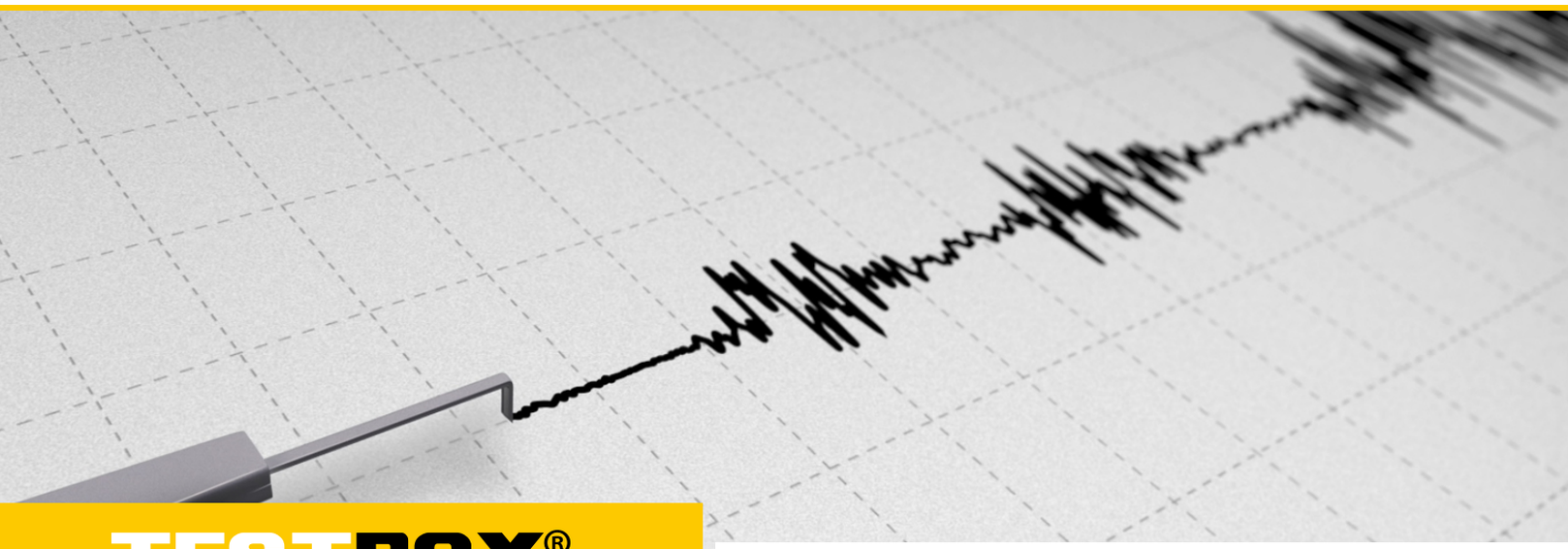
TDG

structural health monitoring



TESTBOX® 2010-FIELD

24-BIT MULTI-CHANNEL FIELD TYPE DIGITIZER

"Crystal Clear Data Recording"

CE ISO 9001 TURKMALI ®

www.tdg.com.tr

TESTBOX2010-FIELD is a high-resolution (24 Bit) mobile, high-protection class data acquisition device (DAQ/Digitizer) designed for outdoor (field) usage and laboratory tests. This device is compatible with a wide range of sensors such as accelerometers, strain gauge-based sensors, displacement transducers, tiltmeters, load cells, etc., for both dynamic and static data logging. Due to this sensor compatibility, TESTBOX2010-FIELD is preferred for different applications such as seismic monitoring or load, stress, strain and displacement measurements among the main field of application, Structural Health Monitoring. Although this digitizer is very practical for temporary measurements and short-period tests, it also suits well to long-term/permanent monitoring & data logging applications.

Developed %100 in TDG Laboratories

Features

- Maximum Resolution (24 Bit ADC)/ High Dynamic Range
- 8 / 16 Channel Versions
- Simultaneous Sampling
- Suitcase Enclosure Design for the Mobility in Field Tests
- Wide Sensor Compatibility: Accelerometers, strain gauges, tiltmeters, displacement sensors, weather stations
- "State of Art" Signal Processing and Filtering Technology
- Real-time multi-channel data recording
- Proven technology at huge monitoring projects
- Shock-Proof / Water-Resistant / Special Protection Class Enclosure
- Long-term stability
- Prevents Data Loss / Secures the Data: Self buffering capability since first-time power on & special security technologies to prevent data loss
- Embedded Linux: Stand-alone functionality
- Fully compatible with National / International Codes & Regulations

Applications

- STRUCTURAL HEALTH MONITORING MEASUREMENTS
- FIELD TESTS- SHORT PERIOD HEALTH MONITORING-REAL-TIME MONITORING
- OPERATIONAL MODAL ANALYSIS
- BRIDGES / MODAL FREQUENCIES / TMD (TUNED-MASS-DAMPERS) TESTS
- VIBRATION / ACCELERATION / IMPACT MEASUREMENTS
- SEISMIC MONITORING
- DATA ACQUISITION (DAQ)
- LABORATORIES
- ENERGY & UNDERGROUND RESOURCES EXPLORATION

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Ideal for Temporary Field Test & Labs – Durability + Mobility

Shock-proof suitcase design of TESTBOX2010-FIELD data acquisition system offers durability and mobility for the testing teams & researchers. Data logging reaches to the perfect performance with unmatched specific features of this digitizer in both field and laboratory testing. Temporary Structural Health Monitoring Applications, Vibration & Blast Measurement, Operational Modal Analysis, Civil Engineering Tests both in field laboratories are now simplified with this integrated and powerful device, developed by TDG. Furthermore, TESTBOX2010-FIELD provides the practical approach for geological, geophysics tests, mining, underground & energy resources exploration. Stand-alone design and embedded operating system easily handle any kind of configuration, warning, storage and data transfer functionality.

Wide Sensor Compatibility / High Number of Sensors

While being compatible to different type of accelerometers, this special design is also compatible with strain-based sensors, load cells, dynamic/static strain gauges, displacement & position transducers, crack-meters, tiltmeters, environmental sensors and virtually any sensor type. This saves the user from the burden of using separate digitizers or modules for different sensor types. The mostly used model has 8/16 channels and system offers extension simultaneous with simultaneous sampling in single or multiple locations.

Precision Power Supply and Sensor Excitatation

TESTBOX2010 incorporates a specially designed, precise, ultra-low noise bipolar linear power supply, which offers an integrated solution to precise supply requirement of the sensors used in Structural Health Monitoring. This design creates a major advantage to many general-purpose data acquisition systems which only offer analog inputs by eliminating all the problems related to isolation, noise & grounding issues suffered when an external power supply is used.

High Dynamic Range – Maximum Resolution

Having 24 bits ADC resolution, this device offers very high dynamic range as high as 145 dB. This allows data record even from the lowest noise Force Balance Accelerometers, without any loss due to digitizer self-noise. This way, the maximum resolution and precision required for Structural Health Monitoring is provided.

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Dynamic and Static Sampling Rates

This device is designed to acquire up to 2000 samples per second (2 kHz sampling rate). The default sampling rate is 200 Hz which conforms the interested frequency range in Structural Health Monitoring, which is below 100 Hz. The frequency bandwidth of SHM sensors is also adjusted to this range, so that they allow identification of the first modal frequencies of the structures, which can be lower than 1 Hz.
TESTBOX 2010 incorporates analog and digital anti-aliasing filtering in combination with oversampling features to provide excellent performance at the frequency range of interest (DC – 100 Hz). It is also possible to set the sampling rate to seconds, minutes or hours to monitor static and quasi-static parameters. Moreover, user can create special scenarios which includes a flexible combination of recording at specified hours of the day, triggered recording, averaging for static measurements and etc.

Simultaneous Sampling – Precise GPS Timing

One of the most important features of the system is providing simultaneously sampled data from all of its channels. This provides full conformity to Operational Modal Analysis studies. Every input channel of TESTBOX 2010 has a separate ADC with 24 Bits resolution, which share a common clock signal and an advanced mechanism is used to keep the conversions synchronized. Devices also offer sub microsecond level synchronization with GPS satellite timing. With this innovative approach, system offers the best timing performance of its class. When GPS synchronization is not available or practical, NTP or PTP options are also available.

High Dynamic Range-Maximum Resolution

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Electrical Protection / Standards

The system complies with Low-Power-Directive(2014/35/EU) and EMC Directive (2014/30/EU) and comes with a CE marking. In addition, the device is equipped with surge protectors and fuses to minimize the damage to itself and the attached sensors in case of an electrical shock.
The device is in full conformity with AFAD (Turkish Disaster and Emergency Management Presidency)-Structural Health Monitoring Guidelines (10/01/2020-76388967-15.20.1-111) and Turkish Building Earthquake Code (2019). It has quickly been the primary choice in the most demanding and reputable Structural Health Monitoring applications.

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Technical Specifications

CHANNELS

Number of Channels	4, 8, 12, 16 per Chassis
Extention	128 Channel (Wired Sync.) Unlimited (w/ GPS, NTP & PTP Sync.)
Input Range	±15.5mV (Minimum) ±34mV, ±68mV, ±137mV, ±275mV, ±550mV, ±1.1V, ±2.2V, ±4.4V, ±8.8V, **±15.5V (Maximum)**
Input Type	Differential
Gain Selection	Independent Programmable Gain for Each Channel 11 levels from 0.125x to 128x

DIGITIZATION

ADC	24 Bit, Delta-Sigma Oversampling, Filtering
Sampling Rate	2 kHz / Channel (Standard) 2000, 1000, 500, 200, 100Hz Selectable (Up to 16 kHz* for 4 channel version available up on request)
Sampling Rate	Simultaneous
Dynamic Rate	145 dB
Filtering	Analog Anti-Aliasing Filter: Fc = 1 kHz Digital FIR Kasier Filter Adjusts with Sampling Rate: Fc = 31.25 Hz @100 sps 62.5 Hz @200 sps 125 Hz @500 sps 250 Hz @1000 sps 500 Hz @2000 sps

EMBEDDED SYSTEM

Real Time Micro Controller	32 Bit ARM Cortex-M3 100 MHz
Linux Micro Controlelr	ARM Cortex-A8 1 GHz
RAM	512 MB
Operating System	GNU/LINUX Debian

TIMING

GPS Synchronization	Direct ADC Clock Synchranization with GPS Disciplined Oscillator
GPS Receiver	65 Channel, QZSS, SBAS WAAS, EGNOS, MSAS Capable
GPS 1 PPS Accuracy	< 8 ns
GPS Holdover Stability	<±50us (Over 3 Hours Period)
NTP, PTP	Available up on request

INTERNAL RECORDING AND TRIGGERING

Triggering Options	Level Triggering Time Triggering Periodic Record (As low as 1 sps)
Storage	4 GB internal SD Card 64 GB internal USB drive (Optional) External USB Drive (Optional)
Pre Trigger Time	30 s

COMMUNICATION

Ethernet	TCP/IP, FTP, SCP, SSH Ethernet 10/100BaseT
Data Transfer	Standalone remote data transfer Seedlink server support Multi-client support Smart data transfer algorithm to prevent data loss
Serial	USB Serial Port (Optional)
Configuration	Remote Configuration Support

SENSOR COMPATIBILITY

Compatible Sensor Types	Accelerometers (FBA, MEMS, DC, Strain Gauge Based) Load Cells LVDT (DC Type) Position/Displacement Sensors (Potentiometers, DC Type, Strain Based) Voltage Output Sensors Full-Bridge Type Sensors Strain Gauges (Quarter/Half w Q-Cable) IEPE / ICP (w IEPE-Cable) Thermocouples (w TC Connection Box) RTDs (w RTD-Cable)
Sensor Excitation (Supply) Options	5 VDC, +12 V DC, -12V DC at Each Channel

POWER

Power Input	220 VAC (Standard) 9 - 18 V DC (Optional)
Power Consumption	40W Max.

INPUT / OUTPUT INTERFACES

Channel Inputs	IP67 Push Pull IP67 Metal Connector
Power	C14 Connector (IEC Power Cable, Computer Type)
Ethernet	RJ45 Socket (IP67, w/ Protective Cap)
GPS Antenna	Female BNC
Led Displays	Power, GPS, Ready, Status

PHYSICAL & ENVIRONMENTAL

Dimensions	410 x 340 x 205 mm (8,16 Kanal) 305 x 270 x 194 mm (4 Kanal)
Operating Temperature	-20 C° ... + 60 C°
Storage Temperature	-30 C° ... + 80 C°
Enclosure	Shock Proof IP67 Hard Case

ACCESSORIES

TESTBOX Q-Cable	120 or 350 Ohm Quarter / Half Bridge Completion Cablel
TESTBOX IEPE Cable	ICP / IEPE Sensor Conditioning Cable
TESTBOX RTD Cable	RTD Conditioning Cable
Thermocouple Connection Box	Multi-channel Thermocouple Inputs with Cold Junction Compensation Sensor

CERTIFICATION

CE	LVD (2014/35/EU) EMC (2014/30/EU)
Local Regulations	Home (Inland) Produce Certification AFAD - Structural Health Monitoring Guideline (10.01.2020-76388967-15.20.1.-111) Full compatibility
Calibration	TDG Calibration Lab. Factory Calibration

SOFTWARE

TDG Software	MONSTER EASYTEST NETWORK EASYTEST SHAKE TABLE

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