Multi-Channel Dynamic Strainmeter **DS-50A**
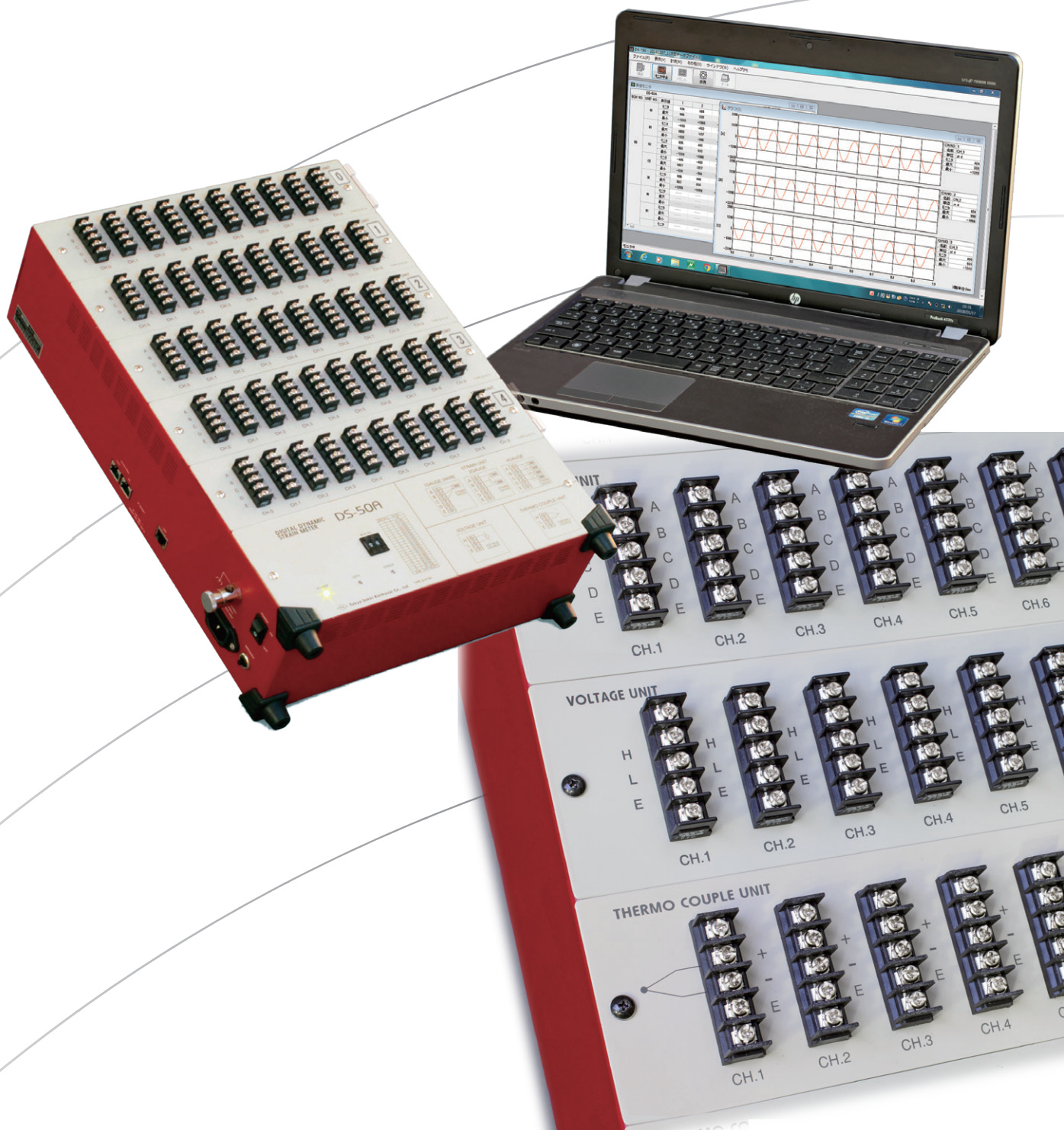
Measurement software	DS-750
Dynamic Measurement Software *Visual LOG* ®	RD-7640

Tokyo Measuring Instruments Laboratory Co., Ltd.

Multi-channel dynamic data acquisition system with DS-50A

This is a dynamic data acquisition system configured at a lower cost compared to our conventional systems for similar purpose. It measures strain gauges, strain gauge type transducers, DC voltage and thermocouples.

Measurement is made using standard software DS-750 supplied with the DS-50A or optional Dynamic measurement software *Visual LOG*® RD-7640. The DS-750 can measure up to 100 points, while the RD-7640 is a measurement software that can measure up to 1000 points and also provides trigger, interval, and alarm measurements, as well as calculation functions. Recorded data files can be displayed as waveforms with software that can read DADiSP format files, but our waveform display software Visual LOG WF-7630 is required to display extended channel data.
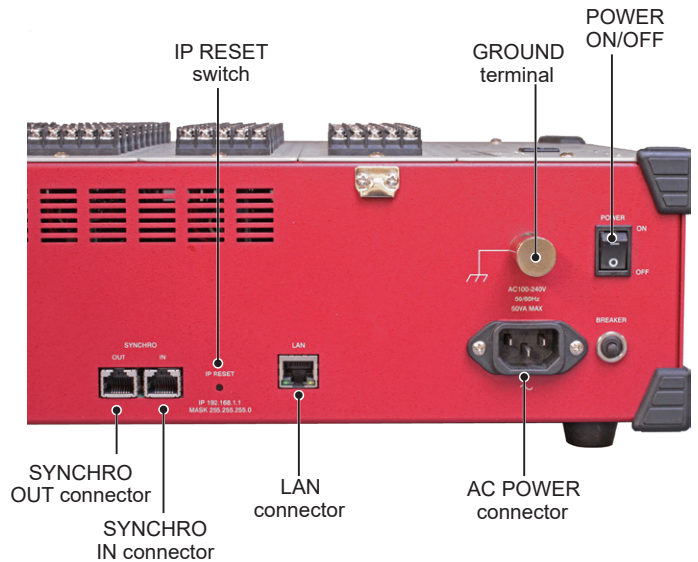
The number of measurement channels is 50 with one set of DS-50A. When the standard software DS-750 is used, measurement of two sets of DS-50A (100 channels) is available at the maximum. This software is suited for carrying out simple measurements and data savings with comparatively small numbers of measurement points. When the optional software RD-7640 is used, 20 sets of DS-50A (1000 channels) can be measured at the maximum. This software features many functions applicable to tests in various fields.

Visual LOG is a registered trade mark of Tokyo Measuring Instruments Laboratory Co., Ltd.
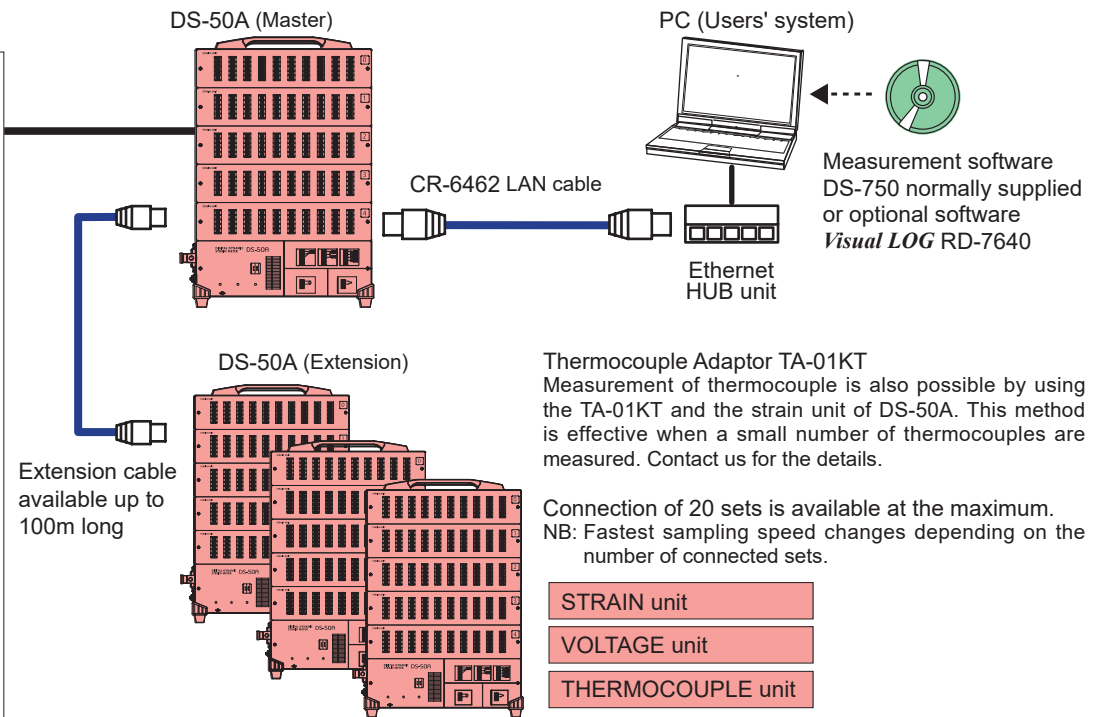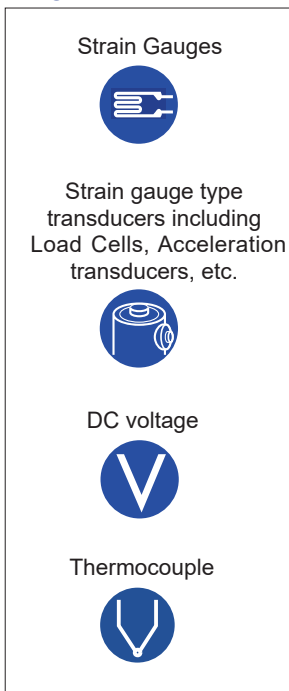
FEATURES

- 1kHz sampling at the fastest when 1 set is used.
- Simultaneous measurement of 20 sets (1000 channels) is available at the maximum using software RD-7640.
- One set of DS-50A consists of five measurement units. One measurement unit has 10 channels. Three types of measurement units are available; strain unit, voltage unit and thermocouple unit. Any combination of these three types is available which should be specifi ed when ordering.
- Bridge box is built in for each channel of strain unit. It accepts strain gauge connection with quarter bridge(120/350 ohm switchable), half bridge and full bridge.
- The distance between two adjacent DS-50A can be extended up to 100 meters using an exclusive cable.
- Long term measurement is possible because data can be stored directly on a PC.

CONTROL PANEL

IP RESET switch — GROUND terminal — POWER ON/OFF — SYNCHRO OUT connector — SYNCHRO IN connector — LAN connector — AC POWER connector

SYSTEMATIC DIAGRAM

INPUTS

Strain Gauges

Strain gauge type transducers including Load Cells, Acceleration transducers, etc.

DC voltage

Thermocouple

DS-50A (Master)

PC (Users' system)

CR-6462 LAN cable

Ethernet HUB unit

Measurement software DS-750 normally supplied or optional software *Visual LOG* RD-7640

DS-50A (Extension)

Extension cable available up to 100m long

Thermocouple Adaptor TA-01KT
Measurement of thermocouple is also possible by using the TA-01KT and the strain unit of DS-50A. This method is effective when a small number of thermocouples are measured. Contact us for the details.

Connection of 20 sets is available at the maximum.
NB: Fastest sampling speed changes depending on the number of connected sets.

STRAIN unit
VOLTAGE unit
THERMOCOUPLE unit

NB: Extension cable available with CR-6462 or STP LAN cable (straight through).

Specifications DS-50A

DS-50A Multi-channel Dynamic Strainmeter

Number of channels	Maximum 50 channels
	Strain, Voltage and Thermocouple units can be mixed. 10 channels / 1 unit
Synchronization	Maximum 20 sets (1000 channels.)
Sampling speed	1~10000 ms (Settable by 1ms.) 1 ms is added to sampling speed per additional connection of 1 set
Interface	LAN (100 BASE-TX)
Operating environment	0~+50°C,85%RH or less (No condensation)
Power supply	Rated voltage 100~240V ac 50/60Hz Allowable voltage 90~264V ac 50/60Hz Miximum power consumption 50VA
Dimensions	420(W)×110(H)×298(D)mm (excluding projected parts)
Weight	5 kgs.
Standard accessory	Operation Manual 1 pc. AC power supply cable 3m (CR-01) 1 pc. LAN cable 3m (CR-6462) 1 pc. Measurement software DS-750 1 pc. Phillips screwdriver 1 pc.

Strain unit

Number of channels	10 channels
Gauge resistance	Quarter bridge 3-wire 120Ω,350Ω Half bridge 120~1,000Ω Full bridge 120~1,000Ω
Bridge excitation	DC 2V
Measuring accuracy	±0.05%FS (at 23±5°C)
Measuring range	±25,000×10⁻⁶ strain
Resolution	1×10⁻⁶ strain
Balancing type	Electronic automatic
Balancing accuracy	±3×10⁻⁶ strain or less
Balancing range	±10000×10⁻⁶ strain
Frequency response	DC~100Hz
Lowpass filter	
Cutoff frequency	Digital filter 1~100Hz (Settable by 1Hz) -3dB±1dB
Cutoff characteristics	-48dB/oct. Butterworth filter
Highpass filter	Digital filter
Cutoff frequency	0.2Hz, 1Hz or OFF

Voltage unit

Number of channels	10 channels
Input format	Single end (unbalanced)
Input impedance	100kΩ
Measuring range	±20V
Measuring accuracy	±0.5%FS (at 23±5°C)
Resolution	1mV
Frequency response	DC~100Hz
Lowpass filter	Digital filter
Cutoff frequency	1~100Hz (Settable by 1Hz) -3dB±1dB
Cutoff characteristics	-48dB/oct. Butterworth filter
Highpass filter	Digital fi lter
Cutoff frequency	0.2Hz, 1Hz or OFF

Thermocouple unit

Number of channels			10 channels	
Measuring range			T : -250 ~+400°C K : -210 ~+1370°C J : -200 ~+1200°C	
Measuring accuracy	Internal RJC	T	-250 ~ -200°C	±(0.5%rdg+6°C)
			-200 ~ -100°C	±(0.5%rdg+3°C)
			-100 ~ +400°C	±(0.5%rdg+2°C)
		K	-210 ~ 0°C	±(0.5%rdg+3°C)
			0 ~+1370°C	±(0.5%rdg+2°C)
		J	-200 ~ 0°C	±(0.5%rdg+3°C)
			0 ~+1200°C	±(0.5%rdg+2°C)
	External RJC		±(0.5%rdg+1°C)	
Resolution			0.1°C	
Frequency response			DC~10Hz	

Specifications DS-750

DS-750 Measurement software standard
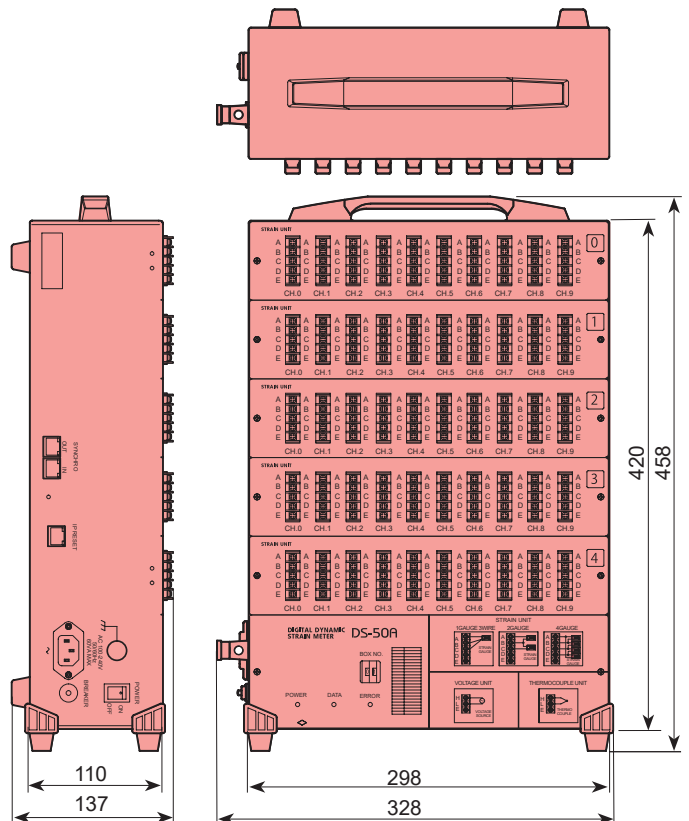
System	
OS	Windows 7(SP1)/8.1/10/11
Computer	Equipped with CPU for the above OS, CPU of dual core or later is recommended
Interface	LAN (100BASE-TX)

Basic Specifications	
Compatible instru-ment	DS-50A
Connections	Maximum 2 sets
Measurement	Balance measurement, Monitor measurement, Manual measurement
Display	Numerical value monitor, T-Y monitor, T-Y graph
Data File	DADiSP compatible format
File conversion	CSV format
Data Processing	T-Y graph display and printing of data file Display of numerical values of data file

Option

Measurement software
- **Real-time data recording software _Visual LOG_ RD-7640**
  Measurement software that controls up to 20 DS-50A units and performs monitoring, manual, data triggering, and interval measurement of 1 to 1000 measurement channels and up to 1000 expansion channels. It is also compatible with our measuring instrument TMR-311.
  A video capture version, RD-7640-M, is also available, which can record waveform data and video in tandem.

- **Real-time data recording software _Visual LOG_ RD-7640-WF**
  Waveform display software WF-7630 is bundled with the RD-7640 for data processing in this value-priced package.

- **Waveform View Software _Visual LOG_ WF-7630**
  Software for post-processing data files recorded by RD-7640. Frequency processing version WF-7630-H enables frequency analysis of waveform data by setting frequency analysis conditions.

Outerview

UNIT : mm

Specifications RD-7640

Real-time data recording software *Visual LOG* ® RD-7640(Option)

Supported measuring instruments	DS-50A maximum 1000 points (when 20 units are synchronized)
Sampling clock	Set within the range of 1 to 10,000 msec Fastest sampling time varies as "1msec x number of units" depending on the number of measuring instruments.
Measuring time	Choice of recording for a set number of data or ending measurement at an arbitrary time. Maximum number of data is "1 billion divided by the number of channels".
Channel Conditions	
Name	Set the name of the measurement data
Factor	Set coefficients
Rated output	Set the rated output of the sensor
Capacity	Set sensor capacity
Offset	Value to be added to the measured value multiplied by the coefficient
Format	Set display format
Unit	Set unit of measure
Alarm	Set upper and lower limits, display set values as lines or colors on graphs, and generate alarm sounds
Sensor mode	1G3W 120Ω, 1G3W 350Ω, 2GAGE, 4GAGE 2.0V, voltage, thermocouple T, K, J
Reference contact	Set reference contact (RJC) internal (ON) and external (OFF) when using thermocouple unit
Low pass filter	PASS and 1Hz to 100Hz (1Hz increments) However, 100Hz is indicated as PASS
High pass filter	OFF, 0.2Hz, 1Hz
Extended channel	Up to 1000 CH (four arithmetic operations, various functions and rosette analysis)
Setting item	Name, function, unit, format, alarm
Voltage output	Voltage output unit (TMR-341) can be used to output the measured value of any input channel as a voltage value
Setting item	Input ch., output voltage, input value, rated output, calibration value
Setting file	Exporting measurement conditions and methods, creating and reading setting files to restore measurement conditions
IP address of the instrument	IP address and port number of the instrument can be changed
Upgrading of measuring instruments	DS-50A instrument firmware update
Measurement method	Monitor measurement, manual measurement, data trigger measurement, interval measurement (all can be performed simultaneously)
Alarm output	List display, alarm sound
Data File	Record raw data measured and coefficients, names, etc. Extended channels record formulas in addition to names
Recording destination	Folders can be specified arbitrarily
Recording format	DADiSP compatible format
File capacity	The capacity of a data file is obtained by the following equation Number of data x number of channels x 2 bytes If a measurement is performed without specifying a measurement time, the file is divided by the capacity calculated by the above formula.
Graph	Displays the current value obtained from the monitor measurement
Graph sheet	Multiple windows can be displayed at the same time with freely arranged objects such as various graph monitors, numeric monitors, images, and drawings
Overwrite	Multiple plotting lines can be superimposed on a single graph.
Graph file	Graph sheets can be saved individually to a file
Save Layout	Save the display position of all displayed graph sheets to a file, and load that file to reproduce the display layout.
Object type	Numerical monitor, T-Y monitor, X-Y monitor, bar monitor, spectrum, circle monitor, vector monitor, arrow monitor, image file, label
Data File Processing	

The recorded data files are processed by our WF-7630 waveform display software.
Files in DADiSP and TAFFmat formats can also be processed with commercially available software that supports these formats (with some limitations).

About automatic return

If the computer is turned off during measurement, measurement resumes automatically after restart.
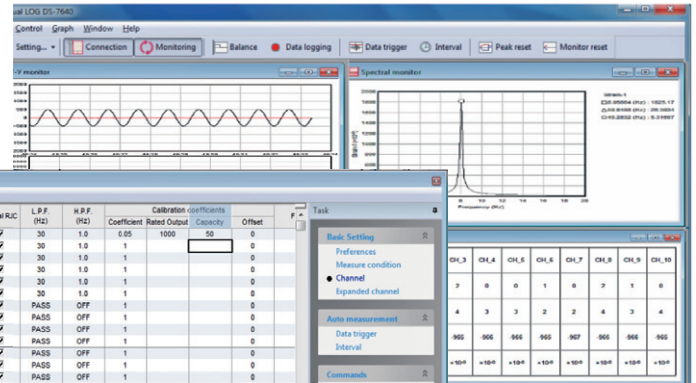
Specifications WF-7630

Waveform View Software *Visual LOG* ® WF-7630(Option)

System	
Applicable data file	*.hed, *.dat (DADiSP compatible format)
OS	Windows 7(SP1)/8.1/10/11
CPU	Conforming to system requirements for the above OS
Memory	Conforming to system requirements for the above OS
Disk capacity	Free capacity 5 GB or more
File processing	
Cut out	File is cut out from the range that is arbitrarily selected from data file to create a new data file.
Thin out	Data file is thinned out from the range that is arbitrarily selected from existing data file to create a new data file.
Merge file	The data files divided by long time measurement are merged.
Conditions	The number of channel is same. Sampling speed is same. File type is same. The number of data per channel is 1G (1,073,741,824) or less after the merging.
CSV file conversion	Converts into standard CSV format or CSV format which can be read by DFA-7610 (FFT analysis software).
Division	Data file is converted into multiple CSV files with a specified number of data for each file. Data files are saved in original file format when they are saved.
Category of window	
List of data file	Arbitrary folder is specified and data file list in the folder is displayed.
Data file	Information on data file is displayed as set channel, data list, and graph list.
Graph Display	T-Y, X-Y and spectrum graphs
List of data files	
Category of displayed information	Name, data set, measurement date and time, number of channels, sampling speed, file type
Maximum display	50000 files
Sort	Sorted by measurement date and time.
Updating	Whenever information in the folder is updated (ex. a file is moved by explorer), the list is updated by user operation.
Rename	File name is changed. It is possible to be set sequence number if you select multiple files.
Movement of file	A selected file is moved to other folder.
Data files	
Channel setting	
Channel Maximum	Edits name, coefficient, offset, unit, and format 1000 points
Expanded channel Maximum	Edits name, function, unit, and format 1000 points
Updating	Whenever channel information is changed, updated by user operation and recalculation.
Unit	Unit is set arbitrarily by user.
Format	Index and coefficient are set.
Function	Edited using the edit window with help function.
Data list	Displays measurement data of each channel as value.
MAX/MIN search	Maximum/Minimum data are emphatically displayed.
Graph list	Displays measurement data of each channel as T-Y graph.
MAX/MIN search	Maximum/Minimum data are emphatically displayed.
Graphs	
T-Y graph	This graph is displayed with X-axis for time and Y-axis for physical quantity.
X-Y graph	For both of X and Y-axes, an arbitrary combination of channel is displayed.
Spectrum	FFT analysis is carried out for an arbitrarily selected channel and the spectrum is displayed as graph by power or amplitude spectrum.
Window	Multiple graphs can be displayed in a single window.
Scale	Graph scale is changed by directly inputting into keyboard or by mouse operation.
Copy	Copies graph displayed on clipboard.
Data processing	
Statistical processing	Maximum/Minimum and average value, standard deviation in an arbitrarily selected area are displayed.
FFT analysis	FFT analysis is carried out for an arbitrarily selected area(with some restrictions). The result is converted into CSV format.
Type	Linear spectrum or power spectrum is selected.
Window function	Rectangle, hamming, or hanning is selected.

MEASUREMENT SOFTWARE *Visual LOG®* RD-7640

The RD-7640 software can control up to 20 sets of DS-50A to enable monitor, manual-start, data trigger and interval time measurement for 1000 channels and expanded 1000 channels at the maximum.

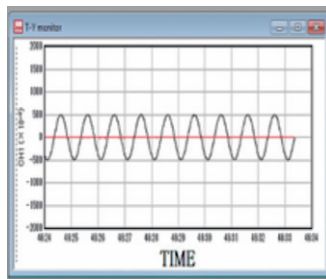Measurement

Setting

Expanded channels

Features

· Long-term logging is possibe.
· Measurement of 3 types can be logged simultaneously.
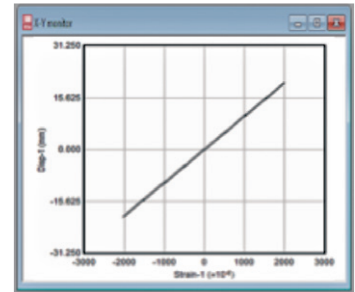· Performs arithmetic operations and rosette analysis among channels.

GRAPHS AND OBJECTS

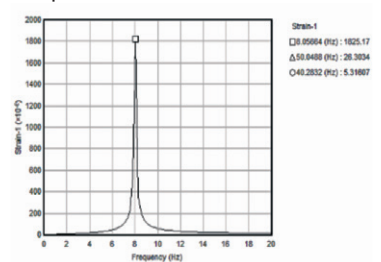· Numerical value monitor

· T-Y monitor

· X-Y monitor

· Bar graph
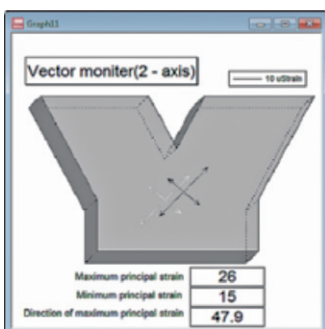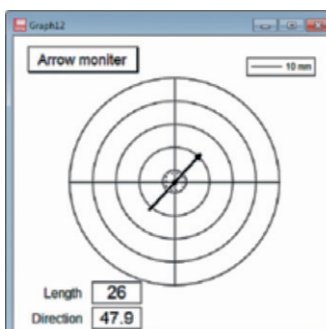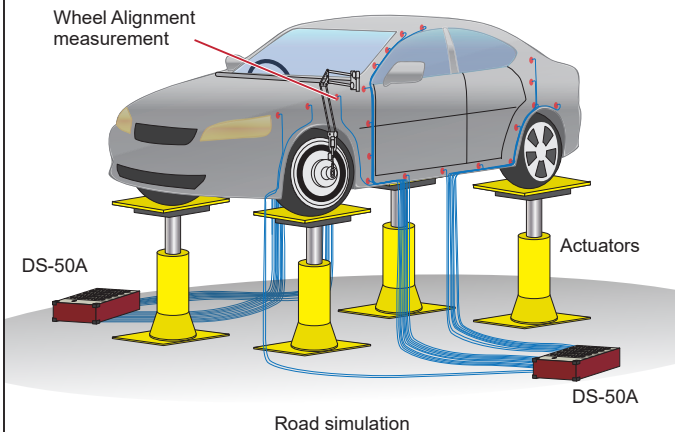

· Circle monitor
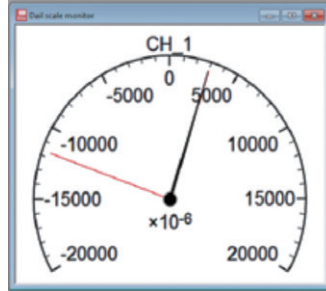
· Spectrum monitor

· Vector monitor

· Arrow monitor

4

AUTOMOTIVE

Multi-axis road simulation of dynamic stress states

Wheel Alignment measurement

DS-50A

Actuators

DS-50A

Road simulation

In automobile industries, replication tests are carried out using 3-element rosette strain gauges for the purpose of verifying the results of approximate solutions of multi-axial road simulation technique. The DS-50A system accepts various inputs including strain gauges, 6-component wheel force transducers and acceleration transducers. By using the system, input values can be monitored on FFT display. It is also possible to make stress analysis in real time using strain data obtained by 3-element rosette strain gauges, and to show magnitude and direction of each principal stress as a vector in its vector monitor display.

ALTERNATIVE ENERGY

Monitoring Wind Power Generation Facilities
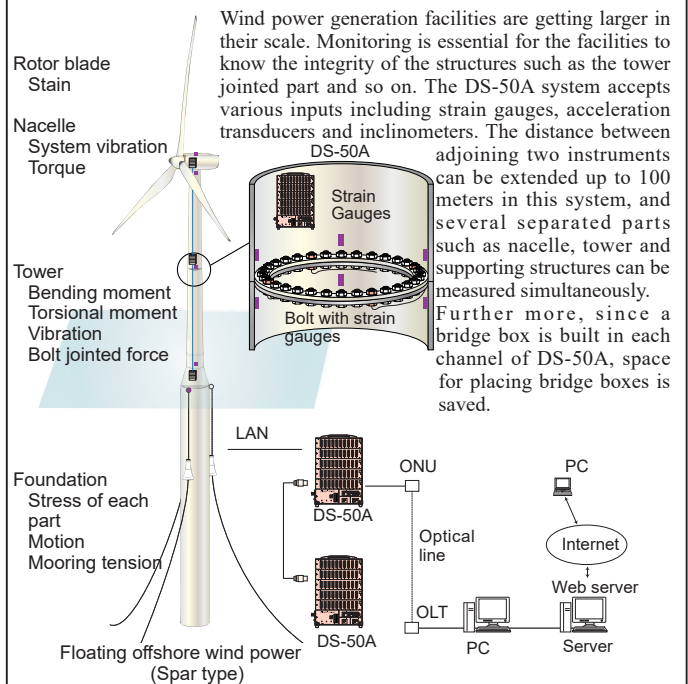
Wind power generation facilities are getting larger in their scale. Monitoring is essential for the facilities to know the integrity of the structures such as the tower jointed part and so on. The DS-50A system accepts various inputs including strain gauges, acceleration transducers and inclinometers. The distance between adjoining two instruments can be extended up to 100 meters in this system, and several separated parts such as nacelle, tower and supporting structures can be measured simultaneously. Further more, since a bridge box is built in each channel of DS-50A, space for placing bridge boxes is saved.

Rotor blade
  Stain

Nacelle
  System vibration
  Torque

DS-50A

Strain Gauges

Bolt with strain gauges

Tower
  Bending moment
  Torsional moment
  Vibration
  Bolt jointed force

LAN

Foundation
  Stress of each part
  Motion
  Mooring tension

DS-50A

ONU

Optical line

PC

Internet

Web server

OLT

DS-50A

PC

Server

Floating offshore wind power (Spar type)

AEROSPACE

Various aircraft structure testing

Various loading tests and fatigue tests are needed to verify that the structure and strength of an airplane which has been designed and manufactured according to the requirements provided in the Airworthiness standards. The DS-50A system accepts input of crack gauges in addition to measurement of strain gauges, load cells, displacement transducers and so on, and is capable of simultaneous sampling of 1000 points at the maximum. Since the measured data are stored directly in a connected PC, it is suited to a longterm multi-point measurement. In addition, high/low alarm can be set for every measurement point.
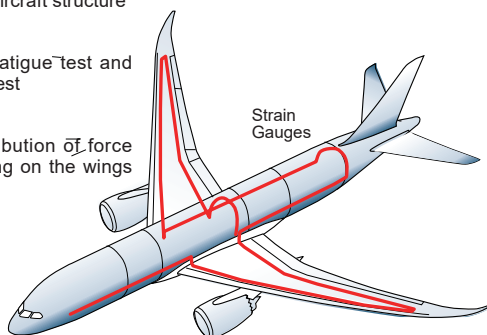
Dynamic load testing
  Load test to check the strength and rigidity of the aircraft structure

Fatigue testing
  Partial structural fatigue test and all aircraft fatigue test

Load distribution
  To know the distribution of force and pressure acting on the wings and body.

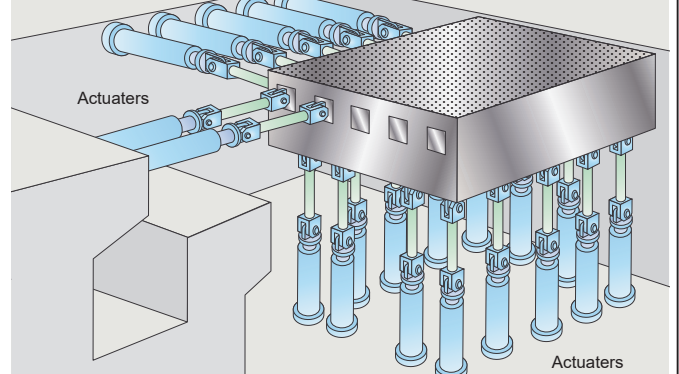Strain Gauges

CONSTRUCTION

Vibration experiments for large structures

In order to verify the earthquake resistance of structures, alternating loading tests and shaker vibration tests are made. The DS-50A system accepts various inputs including strain gauges, load cells and displacement transducers. Since the system performs simultaneous multipoint measurement in high speed, it can precisely capture the behavior of the structure even during destruction.
It can compose several visual monitor screens combining pictures with various graphs and value monitors, in addition to a fundamental function of data acquisition and calculation.

Sensors
  Displacement transducers
  Acceleration transducers

Actuaters

Actuaters

Real size 3D shaking table