TML Pam E-4012B

TML

New Product

Small Multi-channel Data Acquisition System

MULTI RECORDER TMR-300 Series

TML Tokyo Sokki Kenkyujo Co., Ltd.

Small Multi-channel Data Acquisition System

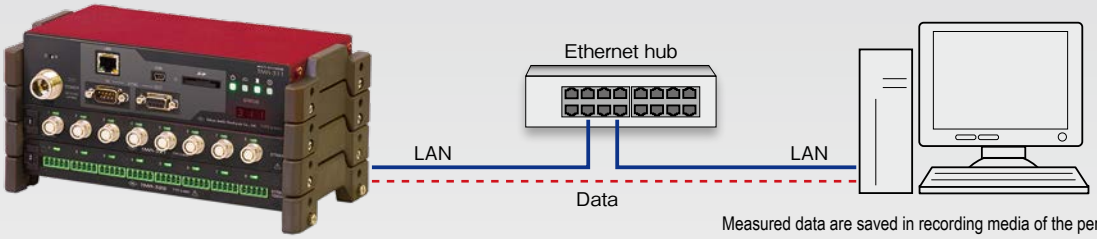
MULTI-RECORDER TMR-300 Series

Multi-recorder TMR-300 Series is a compact multi-channel data acquisition system that can combine various measurement units according to the purpose of measurement. Due to its compact size and light weight, the system can be easily installed not only on existing structures such as machines and bridges in which the installation space is restricted, but also on moving bodies such as automobiles, aircrafts and ships. For the measurement of automobiles, the system is applicable to sensors used for various purposes of tests including traveling performance, maneuverability, ride comfort and safety.
Measurement units for inputting sensors are available in several types for strain gauges, strain gauge type transducers, DC voltage or thermocouples. Control unit is used for controlling 10 measurement units (80 measurement points) at maximum and communicating with a computer. The control unit and the measurement units can be connected together and placed in a small space, or each measurement unit can be installed in the vicinity of the sensors to be inputted.
The control unit is equipped with interfaces which allow control of settings and start of measurement from a connected computer. The built-in wireless LAN enables operation and monitor display using a tablet PC. (Built-in wireless LAN is not available for overseas model.)

- Strain gauge
- Strain gauge type transducer
- DC voltage
- Thermocouple
  (by using Thermocouple adapter TA-01KT)

Continuous data output function

By connecting the control unit TMR-311 to a personal computer with a LAN cable, measured data can be recorded directly into the computer. Long time recording is possible without depending on the capacity of data memory or SD card, which makes the system suited to fatigue test.

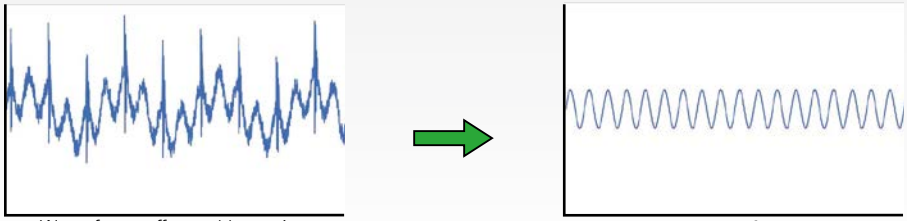


Measured data are saved in recording media of the personal computer such as HDD by using Real time data acquisition software RD-7300 (standard accessory) or RD-7640 (option)

Carrier type strain unit less affected by noise

Applicable unit: Carrier type strain unit TMR-323

Carrier type strain unit, which is less affected by noise, is available in TMR-300 series. Carrier wave bridge excitation has the advantage of not being influenced by low frequency noise such as thermal electromotive force and commercial power noise. It also shows high SN ratio and excellent stability. The carrier type strain unit enables highly accurate measurement even in a site where induction noise or commercial power noise is expected. The number of measurement points is expandable up to 80.



Waveform affected by noise

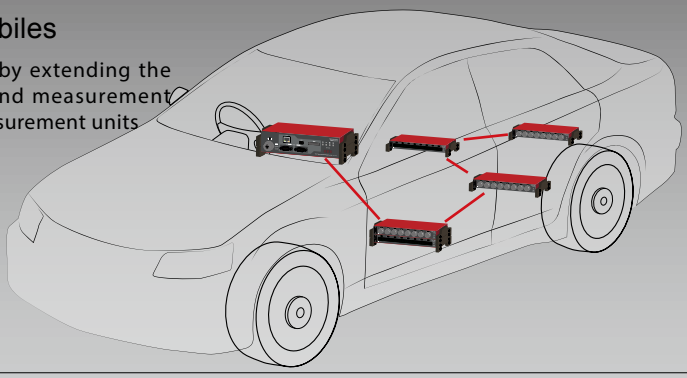
Noise reduced by the use of carrier type strain unit

Distributed connection

For measurement of automobiles

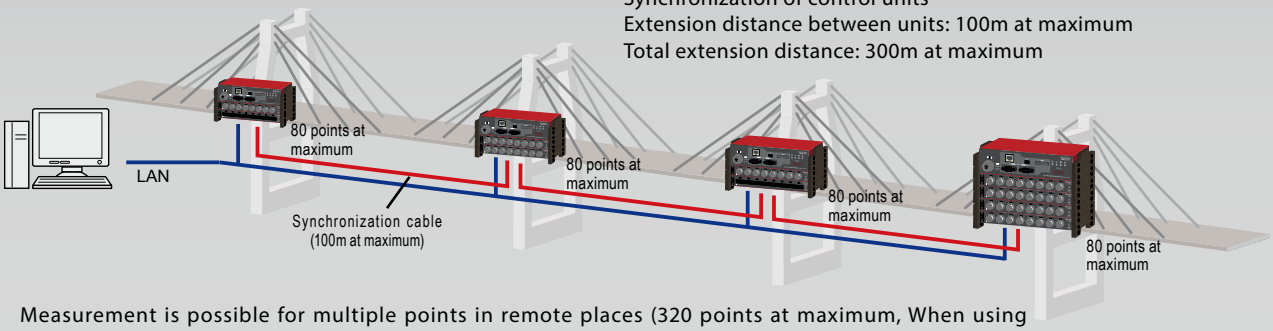
Measurement units are scattered by extending the cable between the control unit and measurement unit, and/or between adjacent measurement units

Control cable
CR-6490 (3cm) standard accessory
CR-6491 (1m)
CR-6493 (3m)
CR-6495 (5m)



For multi-point measurement of bridges

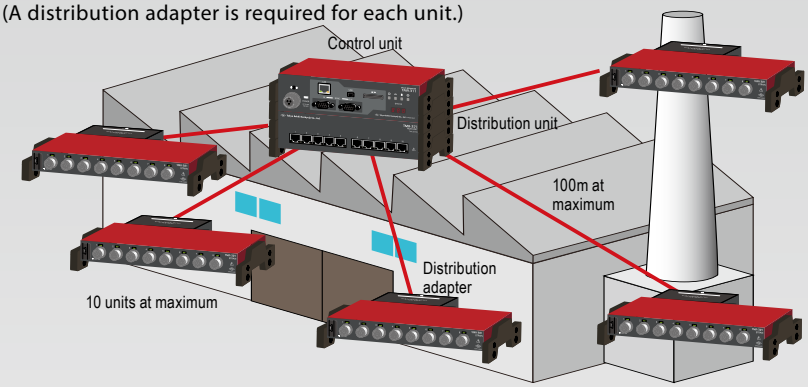
Synchronization of control units
Extension distance between units: 100m at maximum
Total extension distance: 300m at maximum



Measurement is possible for multiple points in remote places (320 points at maximum, When using Dynamic measurement software TMR-7630)

For scattered measurement points (factory, etc.)

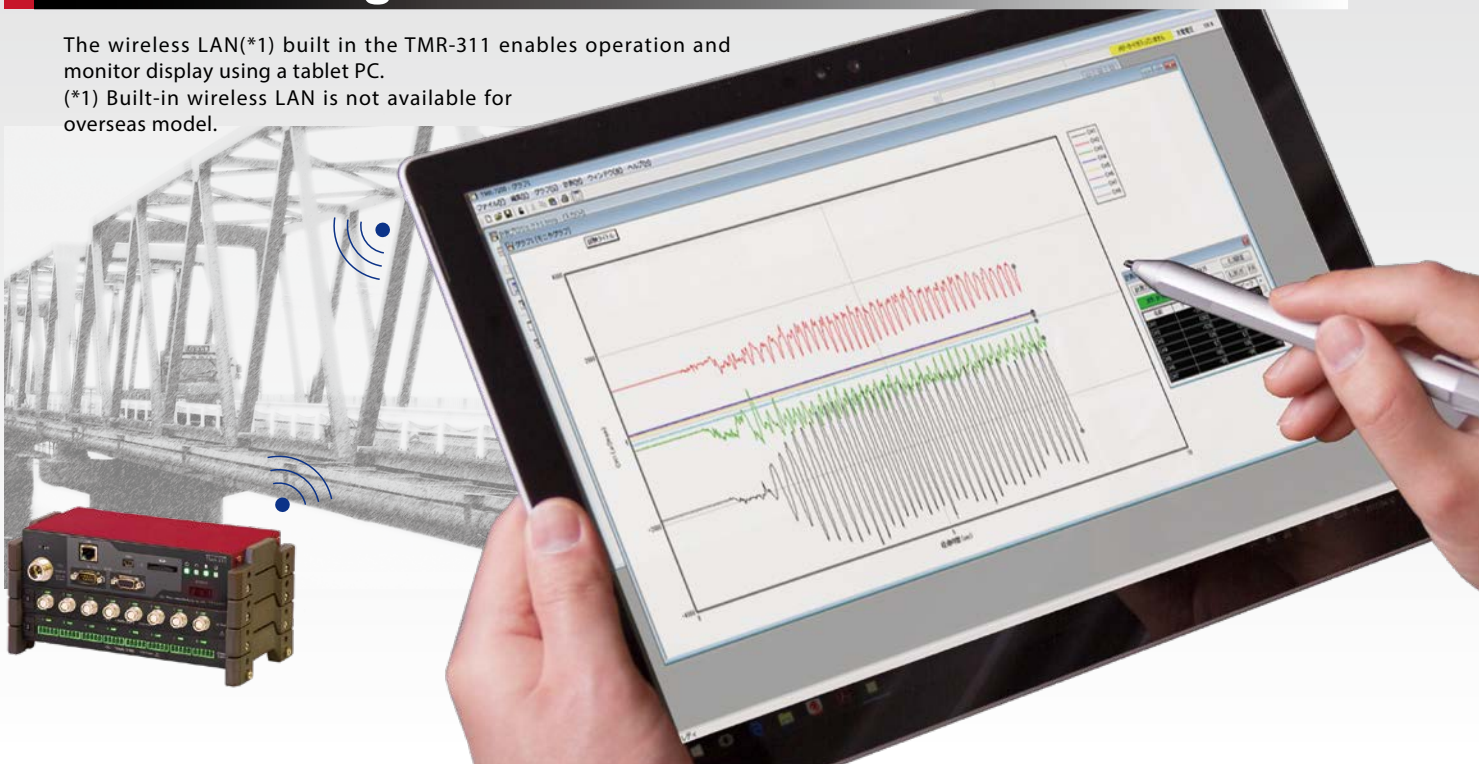
By using a distribution unit TMR-371, ten measurement units at maximum can be distributed.
(A distribution adapter is required for each unit.)



- Cabling to control unit is saved by distributing the measurement units
- As each measurement unit is placed in the vicinity of sensors, each sensor is connected to the measurement unit using a short cable. This also helps to save labour and cost for sensor cabling.

Control using a tablet PC

The wireless LAN(*1) built in the TMR-311 enables operation and monitor display using a tablet PC.
(*1) Built-in wireless LAN is not available for overseas model.



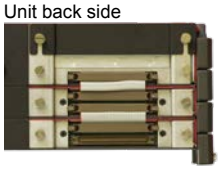
FEATURES

Combination of measurement units for various sensors is possible

Several types of measurement units can be combined according to the types of sensors and the purpose of measurement. Measurement units are connected in cascade to the control unit using supplied control cables CR-6490.

Strain
DC voltage
Temperature
Other
etc.

Unit back side



High resolution mode (0.1×10^{-6} strain) provided

Applicable unit: Strain full bridge unit, Strain 1G2G4G unit

Measurement with resolution of 0.1×10^{-6} strain is possible by setting 2000×10^{-6} strain range.

High speed sampling of 100kHz

Acquisition of time domain waveform is possible in a fast phenomenon such as shock load.

Measurement units can be arranged optionally

Depending on the number and arrangement of the sensors, measurement units can be arranged optionally using distribution units, control cables and synchronization cables. This helps to save labour and cost for sensor cabling and also to perform stable measurement.

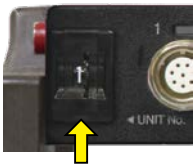
Compact size, anti-vibration and DC drive; suited to vehicle onboard measurement

Due to its compact size, light weight and vibration tolerance, multi-recorder is suited to vehicle onboard measurement. The control unit TMR-311 is driven by a DC power supply, and the power for each measurement unit is supplied from the control unit. Supply voltage range is DC 10 to 30 V.

Measurement of 80 points at maximum (320 points at maximum for synchronized measurement)

One control unit TMR-311 connects and controls up to 10 measurement units for measurement of 80 points at maximum. Furthermore, it is possible to synchronize four control units for measurement of 320 points at maximum.

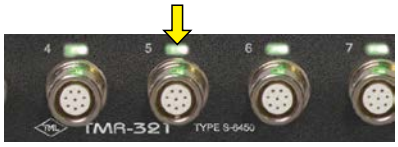
Unit numbers are easily checked and changed



Each measurement unit is equipped with a unit number setting switch on its front panel. The unit number is easily checked on the spot and it can be changed by the switch if required.

Disconnection check by channel LED

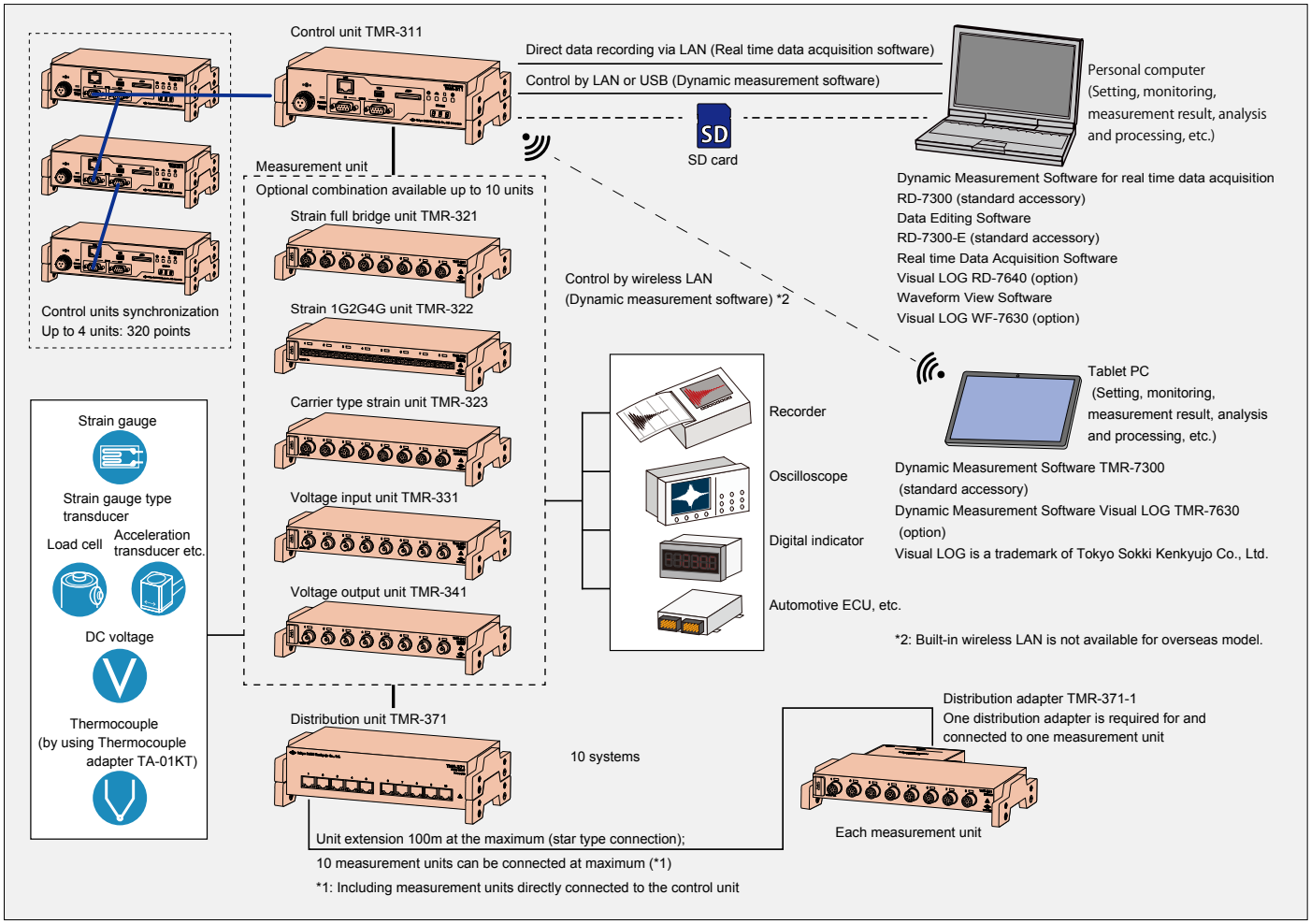
An LED indicator is provided for each channel. The LED flickers if the channel is open (the sensor is disconnected) or over (the value is over the measuring range). Sensor problem is found at a glance.



Data saving in momentary power failure and automatic restart after power recovery

Multi recorder has an UPS (uninterruptible power supply) circuit. If a momentary power failure occurs unexpectedly, measurement is stopped and data are saved in the SD card automatically before shutting down. When CONTINUE or FREE RUN is selected as the trigger mode, measurement is started again after power recovery.

System Block Diagram

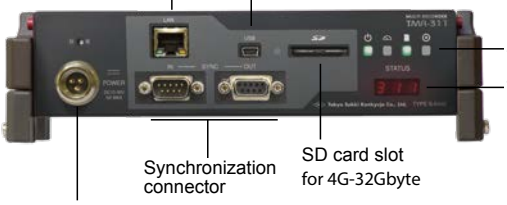


Control Unit TMR-311

Front side

LAN port
Connected to a personal computer using a LAN cable with RJ-45 connector (Use a cross cable for direct connection)

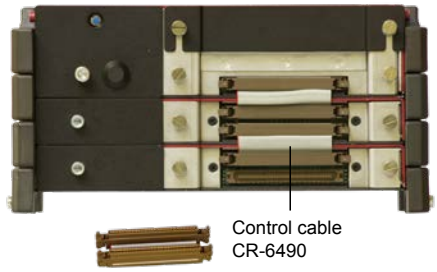
USB port
USB cable CR-6187 supplied with this instrument is connected. USB driver is installed to a personal computer from the software supplied with this instrument.



DC power connector
DC power cable supplied with this instrument is connected. Power On/Off switch is not provided. This instrument turns into operation when a power source is connected.

Rear side

A flat cable connector for cascading up to 10 measurement units is equipped on the rear side of this instrument. Control cable CR-6490 supplied with the measurement unit is used for connection.



SD card up to 32GB usable

Measured data are stored in SD card. SD card up to 32GB can be used to enable long-time data recording. It is also possible to perform recording in high speed mode of 0.01ms.

Recording time of 16GB SD card (standard accessory)

Automatic recording mode: Free-run
Sampling: 1ms

Number of channels	Recording time
8 (1 unit)	Approx. 277 hours
80 (10 units)	Approx. 27 hours

USB, LAN and wireless LAN are provided for connection to a personal computer

Control unit TMR-311 is equipped with two interfaces USB(2.0) and LAN. In addition, built-in wireless LAN is provided to perform setting, monitoring and measurement by wireless using a tablet PC with the supplied software TMR-7300 installed. *2

*2: Built-in wireless LAN is not available for overseas model.

Controls 80 input points (10 measurement units of various types) at maximum USB/LAN interface

Specifications TMR-311

Number of measuring points	80 at maximum
Sampling	0.01 ~ 0.09ms (set by every 0.01ms) 0.1 ~ 0.9ms (set by every 0.1ms) 1 ~ 1000ms (set by every 1ms) 512, 1024, 2048, 4096, 8192 Hz
Data memory	128Mword (in high speed mode and SD card not inserted) Divided by number of recording points of every 8 points When recording 8 points or less: 16Mdata/point When recording 16 points or less: 8Mdata/point When recording 32 points or less: 4Mdata/point When recording 64 points or less: 2Mdata/point When recording 80 points or less: 1.6Mdata/point
Trigger function	
Data trigger	Data of optional channel (optional input level, or relative level from start)
Command trigger	Command from interface
Timer trigger	Real time, Interval
Synchronization of multiple units	Synchronization of sampling and trigger for up to 4 units of TMR-311 (320 measurement points) Maximum extension between two units: 100m
Recording media	SD card 4GB~32GB (SDHC high speed mode class 10)
Interface	LAN, USB, Wireless LAN (AP mode, IP fixed) *2 *2: Built-in wireless LAN is not available for overseas model.
Indication	Status LED (status, IP address, etc.)
Power supply	DC 10 ~ 30V, 0.6A at maximum (when 12V supplied, single unit) AC 100 ~ 240V, 50/60 Hz, 100VA at maximum (when using optional AC adapter CR-1897)
Environment	0 ~ +50°C, 85%RH or less (no condensation)
Vibration tolerance	29.4m/s^2 (10 ~ 55Hz), 3 directions
External dimensions	200(W) × 50(H) × 100(D)mm (excluding projected parts)
Weight	Approx. 900g (including rubber protectors)

Standard accessories
- Operation manual ..... 1 copy
- DC power supply cable CR-10 ..... 1 pc.
- Ground wire CR-2020 ..... 1 pc.
- USB cable CR-6187 ..... 1 pc.
- SD card (16GB) ..... 1 pc.
- Dynamic Measurement Software TMR-7300
- Dynamic Measurement Software for real time data acquisition RD-7300
- Data Editing Software RD-7300-E (CD-ROM) ..... 1 pc.
- Software operation manual (CD-ROM enclosed)..... 3 copies

Dynamic Measurement Software TMR-7300

Dynamic measurement software TMR-7300 controls one TMR-311 for on-line and off-line measurement. It performs monitoring, acquisition, edition (listing and chart drawing) and processing of data, and also data calculation using expanded channels. In off-line measurement, free-run, data trigger and program measurement can be executed.

Dynamic Measurement Software RD-7300 for real time data acquisition

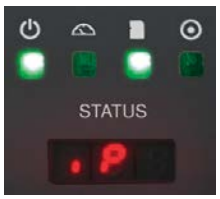
Dynamic measurement software RD-7300 is used to directly collect the data measured by TMR-300 series into a personal computer and to record them. Long-time and large-capacity recording is possible without depending on the capacity of the TMR-311 data memory or a SD card.

Data Editing Software RD-7300-E

Data editing software RD-7300-E can edit data file which is collected by the dynamic measurement software RD-7300. Its function includes merging of files, calculation, data thinning and chart display. In addition, by converting the data into text file of CSV format, it can be processed by our FFT analysis software DFA-7610.

7-segment LED of 3-digit to indicate the instrument status

Status including IP address setting and error code are indicated by the 3-digit 7-segment LED display on the front side of the TMR-311. The status of this instrument is easily checked.



Contents of indication by 7-segment LED
IP address
State of charge of UPS
Wireless LAN status
Serial number
SD card information
Power drop
Error

Strain Full Bridge Unit TMR-321

INPUT Strain gauge type transducer DC Voltage

Load cell Acceleration transducer etc.

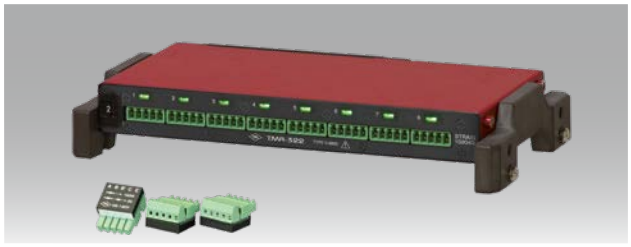
Input unit for strain gauge type transducer and DC voltage
8 measurement points per one unit

■ Specifications TMR-321

Number of measuring points	8
Input	Strain, Voltage (when using optional cable CR-4010)
[Strain measurement]	
Applicable gauge resistance	120 ~ 1000Ω
Bridge excitation	DC 0.5V, 2V
Measuring range	±20000×10^{-6} strain (bridge excitation DC 2V) ±80000×10^{-6} strain (bridge excitation DC 0.5V)
Measuring accuracy	±20000/10000/5000×10^{-6} strain range ±0.1%FS (at 23±5°C) ±2000×10^{-6} strain range ±0.2%FS (at 23±5°C)
Settable range	±20000/10000/5000/2000×10^{-6} strain range
Resolution	±20000/10000/5000×10^{-6} strain range 1×10^{-6} strain (bridge excitation 2V) 4×10^{-6} strain (bridge excitation 0.5V) ±2000×10^{-6} strain range 0.1×10^{-6} strain (bridge excitation 2V) 0.4×10^{-6} strain (bridge excitation 0.5V)
Balancing method	Electronic automatic
Balancing range	±10000×10^{-6} strain
Balancing accuracy	within ±3×10^{-6} strain
Stability on zero	±1×10^{-6} strain/°C (at maximum sensitivity)
Stability on sensitivity	±0.05%/°C (at maximum sensitivity)
[Voltage measurement] (when using optional cable CR-4010)	
Measuring range	±20 V
Measuring accuracy	±20/10/5V range: ±0.2%FS (at 23±5°C) ±2V range: ±0.3%FS (at 23±5°C)
Settable range	±20/10/5V range (1mV resolution) ±2V range (0.1mV resolution)
Frequency response	DC ~ 10kHz
Low pass filter	
Cutoff frequency	Digital filter 1Hz ~ 1kHz (settable by every 1Hz) and PASS (analog filter 10kHz) -3dB ± 1dB
Cutoff characteristics	1Hz ~ 1kHz: -12dB/oct or - 48dB/oct Butterworth filter or Bessel filter PASS (10kHz): -12dB/oct Bessel filter
High pass filter	
Cutoff frequency	Digital filter 0.2Hz, 1Hz and OFF
A/D converter	24bit
Indicator	Channel LED (open, over, etc.) Unit number setting switch
Power supply	DC 10 ~ 30V, 0.2A at maximum (12V)(supplied from TMR-311)
Environment	0 ~ +50°C, 85%RH or less (no condensation)
Vibration tolerance	29.4m/s^2 (10 ~ 55Hz), 3 directions
External dimensions	200(W) × 25(H) × 100(D)mm (excluding projected parts)
Weight	Approx. 550g (including rubber protectors)

Standard accessories
- Operation manual (A3 folded in one-eighth) ····· 1 copy
- Control cable CR-6490 ····· 1 pc.
- Sensor input cable CR-6186 ····· 8 pcs.

Strain 1G2G4G unit TMR-322



INPUT Strain gauge Strain gauge type transducer

Load cell Acceleration transducer etc.

Applicable to quarter, half and full bridge strain measurement

■ Specifications TMR-322

Number of measuring points	8
Input	Strain
[Strain measurement]	
Applicable gauge resistance	120 ~ 1000Ω
Bridge excitation	DC 0.5V, 2V
Measuring range	±20000×10^{-6} strain (bridge excitation DC 2V) ±80000×10^{-6} strain (bridge excitation DC 0.5V)
Measuring accuracy	±20000/10000/5000×10^{-6} strain range ±0.1%FS (at 23±5°C) ±2000×10^{-6} strain range ±0.2%FS (at 23±5°C)
Settable range	±20000/10000/5000/2000×10^{-6} strain range
Resolution	±20000/10000/5000×10^{-6} strain range 1×10^{-6} strain (bridge excitation 2V) 4×10^{-6} strain (bridge excitation 0.5V) ±2000×10^{-6} strain range 0.1×10^{-6} strain (bridge excitation 2V) 0.4×10^{-6} strain (bridge excitation 0.5V)
Balancing method	Electronic automatic
Balancing range	±10000×10^{-6} strain
Balancing accuracy	within ±3×10^{-6} strain
Stability on zero	±1×10^{-6} strain/°C (full bridge, at maximum sensitivity)
Stability on sensitivity	±0.05%/°C (full bridge, at maximum sensitivity)
Frequency response	DC ~ 10kHz
Low pass filter	
Cutoff frequency	Digital filter 1Hz ~ 1kHz (settable by every 1Hz) and PASS (analog filter 10kHz) -3 dB ± 1 dB
Cutoff characteristics	1Hz ~ 1kHz: -12dB/oct or - 48dB/oct Butterworth filter or Bessel filter PASS (10kHz): -12dB/oct Bessel filter
High pass filter	
Cutoff frequency	Digital filter 0.2Hz, 1Hz and OFF
A/D converter	24 bit
Indicator	Channel LED (open, over, etc.) Unit number setting switch
Power supply	DC 10 ~ 30V, 0.2A at maximum (12V)(supplied from TMR-311)
Environment	0 ~ +50°C, 85%RH or less (no condensation)
Vibration tolerance	29.4m/s^2 (10 ~ 55 Hz), 3 directions
External dimensions	200(W) × 25(H) × 100(D)mm (excluding projected parts)
Weight	Approx. 550g (including rubber protectors)

Standard accessories
- Operation manual (A3 folded in one-eighth) ····· 1 copy
- Control cable CR-6490 ····· 1 pc.
- Terminal block for full bridge ····· 8 pcs.
- Small flathead screwdriver ····· 1 pc.
- Bridge box SB-120T or SB-350T (to be selected when ordering) ····· 8 pcs.

Carrier type Strain Unit TMR-323

INPUT Strain gauge type transducer

Load cell Acceleration transducer etc.

Most suited to measurement on site where induction noise or commercial power noise is expected

■Specifications TMR-323

Number of measuring points		8
Input		Strain
[Strain measurement]		
Applicable gauge resistance		120 ~ 350Ω
Bridge excitation		0.5Vrms, 2Vrms 5kHz
Measuring range		±20000×10^{-6} strain (bridge excitation 2Vrms) ±80000×10^{-6} strain (bridge excitation 0.5Vrms)
Measuring accuracy		±0.3%FS (at 23±5°C)
Resolution		1×10^{-6} strain (bridge excitation 2Vrms) 4×10^{-6} strain (bridge excitation 0.5Vrms)
Balancing range	Resistance	±10000×10^{-6} strain
	Capacity	3000pF
Balancing method		Software method
Stability on zero		within ±0.1×10^{-6} strain/°C
Stability on sensitivity		within ±0.05%FS/°C
Frequency response		DC ~ 2.5kHz
Low pass filter		
Cutoff frequency		Digital filter 5Hz ~ 1kHz (settable by every 1Hz) and PASS (2.5kHz) -3dB ± 1dB
Cutoff characteristics		5Hz ~ 1kHz: - 48dB/oct Butterworth filter or Bessel filter PASS (2.5kHz): Butterworth filter
High pass filter		
Cutoff frequency		Digital filter 0.2Hz, 1Hz and PASS
A/D converter		18 bit
Indicator		Channel LED (open, over, etc.) Unit number setting switch
Power supply		DC 10 ~ 30V, 0.3A at maximum (12V)(supplied from TMR-311)
Environment		0 ~ +50°C, 85%RH or less (no condensation)
Vibration tolerance		29.4m/s2 (10 ~ 55Hz), 3 directions
External dimensions		200(W) × 25(H) × 100(D)mm (excluding projected parts)
Weight		Approx. 660g (including rubber protectors)

Standard accessories
- Operation manual (A3 folded in one-eighth) ····· 1 copy
- Control cable CR-6490 ····· 1 pc.
- Sensor input cable CR-6186 ····· 8 pcs.

Voltage Input Unit TMR-331

INPUT DC voltage

Measurement of DC voltage within the range of ±52V

■ Specifications TMR-331

Number of measuring points	8 (BNC connector)
Input	Voltage
Input method	Single end (unbalanced) Isolated between channels
Input impedance	Approx. 100kΩ
Measuring range	±52V
Measuring accuracy	±0.2%FS (at 23±5°C)
Settable range	±52V range (resolution 5mV) ±20V range (resolution 2mV) ±10V range (resolution 1mV) ±5V range (resolution 0.5mV) ±1V range (resolution 0.1mV)
Stability on zero	±0.1mV/°C (at maximum sensitivity)
Stability on sensitivity	±0.05%/°C (at maximum sensitivity)
Frequency response	DC ~ 10kHz
Low pass filter	
Cutoff frequency	Digital filter 1Hz ~ 1kHz (settable by every 1Hz) and PASS (analog filter 10kHz) -3dB ± 1dB
Cutoff characteristics	1Hz ~ 1kHz: -12dB/oct or - 48dB/oct Butterworth filter or Bessel filter PASS (10kHz): -12dB/oct Bessel filter
High pass filter	
Cutoff frequency	Digital filter 0.2Hz, 1Hz and OFF
A/D converter	24 bit
Indicator	Channel LED (set, over, etc.) Unit number setting switch
Power supply	DC 10 ~ 30V, 0.25A at maximum (12V)(supplied from TMR-311)
Environment	0 ~ +50°C, 85%RH or less (no condensation)
Vibration tolerance	29.4m/s^2 (10 ~ 55Hz), 3 directions
External dimensions	200(W) × 25(H) × 100(D)mm (excluding projected parts)
Weight	Approx. 550g (including rubber protectors)

Standard accessories
- Operation manual (A3 folded in one-eighth) ····· 1 copy
- Control cable CR-6490 ····· 1 pc.

Voltage Output Unit TMR-341

OUTPUT DC voltage

Conversion and output of data in analog voltage for strain, temperature, etc. measured by other units

Specifications TMR-341

Number of output points	8 (BNC connector)
Output signal	Voltage output of measured data obtained by other measurement unit (measurement point for output can be set optionally) Output of the result of accumulation or subtraction of up to 4 points
Output level	±10V, ±5V, 0 ~ +5V (5kΩ load)
Output accuracy	±0.5%FS
Calibration output	0V, Optional output within the range of output level
Output accuracy	±0.5%FS
SN ratio	50dBp-p or more (at maximum output of 10V)
Stability on zero	±0.5mV/°C
Stability on sensitivity	±0.05%/°C
Power supply	DC 10 ~ 30V, 0.3A at maximum (12V)(supplied from TMR-311)
Environment	0 ~ +50°C, 85%RH or less (no condensation)
Vibration tolerance	29.4m/s² (10 ~ 55Hz), 3 directions
External dimensions	200(W) × 25(H) × 100(D)mm (excluding projected parts)
Weight	Approx. 550g (including rubber protectors)

Standard accessories
Operation manual (A3 folded in one-eighth) ····· 1 copy
Control cable CR-6490 ····· 1 pc.

Distributed measurement system

The distribution unit TMR-371 and the distribution adapter TMR-371-1 are available to enable distribution and extension of measurement units of TMR-300 series. By connecting the distribution unit to a control unit, and also connecting the distribution adapter to a measurement unit, the distance between the control unit (distribution unit) and the measurement unit (distribution adapter) can be extended up to 100 meters.

Ten measurement units can be connected to one distribution unit at the maximum. Even if ten measurement units are distributed and extended, it is possible to apply 100 kHz sampling at the fastest which is the same as the sampling without extension. Since the power of the measurement unit is supplied through the connection cable, one connection cable functions to communicate with, synchronize, and supply power to the measurement unit.

FEATURES

Measurement units can be distributed in star-type connection

The connection between the distribution unit TMR-371 and each measurement unit (distribution adapter TMR-371-1) is made by STP cable (100 m at the maximum). Synchronized measurement of sensors scattered in a large area can be easily performed.

Power supply from distribution unit

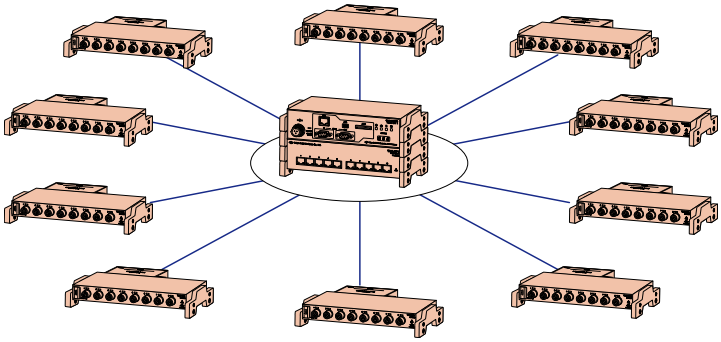
The power is supplied from the distribution unit TMR-371 to each distributed measurement unit. Additional power supply arrangement is not necessary.

Sensor cables are saved

Since the measurement unit is placed close to the sensors, small cable lengths are required for connecting sensors. Stable measurement is possible because the sensor outputs are converted into digital signals in the measurement unit and transferred beyond.

Up to 10 measurement units are connected

Ten measurement units can be connected at the maximum including measurement units directly connected to the control unit.



Advantage of using the distribution unit

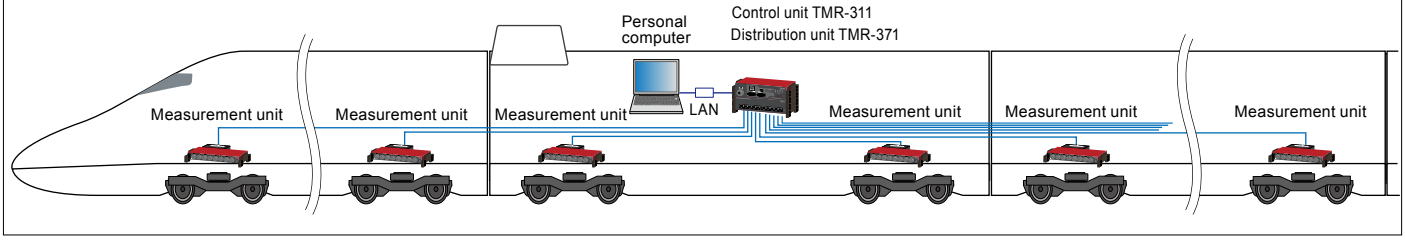
For dynamic measurement, it is required to make the length of the sensor cable as short as possible for the purpose of reducing the effect of electrical noise. Therefore, it is required to arrange a measuring instrument for each measurement point. For multi-recorder TMR-300 series, it is possible to arrange measurement units in the vicinity of the scattered measurement points (sensors) by using the distribution unit TMR-371, and fully synchronized measurement in a large area is performed.

Measurement example of railroad cars

By using the distribution unit TMR-371, measurement units can be arranged in star-type connection within a distance of 100 meters, and synchronized measurement crossing two or more cars easily becomes possible.

◎ Measurement items of cars

- Ride comfort
- Vibration stress of car body and bogie
- Contact force of pantograph
- Stress and temperature of brake disc
- Coupler force



Distribution Unit TMR-371

HUB-Unit for distributing measurement units

Specifications TMR-371

Number of connection of distribution unit	1 (for one TMR-311)
Number of connection of measurement unit	10 (including measurement units directly connected to TMR-311)
Power supply	DC 10 ~ 30V, 0.2A at maximum (12V) (supplied from TMR-311)
Environment	0 ~ +50°C, 85%RH or less (no condensation)
Vibration tolerance	29.4m/s² (10 ~ 55Hz), 3 directions
External dimensions	200(W) × 50(H) × 100(D)mm (excluding projected parts)
Weight	Approx. 800g (including rubber protectors)

Standard accessories
Operation manual (A3 folded in one-eighth) ····· 1 copy
Control cable CR-6490 ····· 1 pc.

Distribution Adapter TMR-371-1

Extension between distribution unit and measurement unit up to 100 meters Measurement unit is placed close to the sensor to save sensor cable

Specifications TMR-371-1

Number of connection of distribution adapter	10 (for one TMR-371)
Number of connection of measurement unit	1
Extension distance	100m
Environment	0 ~ +50°C, 85%RH or less (no condensation)
Vibration tolerance	29.4m/s² (10 ~ 55Hz), 3 directions
External dimensions	130(W) × 25(H) × 50(D)mm (excluding projected parts)
Weight	Approx. 150g

Standard accessories
Operation manual (A3 folded in one-eighth) ····· 1 copy

Option

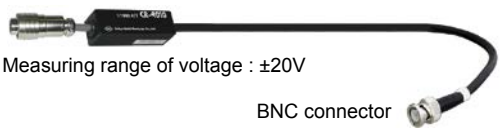
Bridge Box SB-120T / SB-350T

These are connected to the strain 1G2G4G unit TMR-322 and used to connect strain gauges in quarter bridge 3-wire or half bridge method. Eight pieces of SB-120T or SB-350T are supplied with the TMR-322 as standard accessories.

Number of measuring point	1
Applicable gauge resistance	120Ω (SB-120T) 350Ω (SB-350T)
Connection method	Quarter bridge 3-wire, Half bridge
Environment	0 ~ +50°C, 85%RH or less (no condensation)
External dimensions	20(W) × 14.5(H) × 25(D) mm (excluding projected parts)
Weight	Approx. 10g

Attenuator cable CR-4010

This is used for voltage measurement with TMR-321.



Measuring range of voltage : ±20V

BNC connector

Control cable for extension

This cable is used when extending the connection between the control unit and the measurement unit. The maximum available extension distance is 5 meters.

CR-6491

Type	Cable length
CR-6491	1m
CR-6493	3m
CR-6495	5m

Handles

These are attached to the upper sides of the control unit and used for carrying and/or fixing the combined control unit and measurement units. (Screws for attaching the handles are included.)

Brackets

These are attached to the lower sides of the bottom unit and used for the installation of the combined control unit and measurement units. (Screws for attaching the brackets are included.)

Extension cable for distribution adapter (STP cable)

This is a STP (Shielded Twisted Pair) cable used for connecting between the distribution unit TMR-371 and the distribution adapter TMR-371-1. The maximum available extension distance is 100 meters.

CR-8899

Type	Cable length
CR-8805	5m
CR-8810	10m
CR-8820	20m
CR-8850	50m
CR-8899	100m

Control unit synchronization cable (TML-Link)

When two, three or four numbers of control unit TMR-311 are used together, those control units are cascaded using this cable for synchronization. The maximum extension distance is 100meters between each two control units.

Type	Cable length
CR-872M	2m
CR-875M	5m
CR-8701	10m
CR-8702	20m
CR-8705	50m
CR-8710	100m

Option

AC adapter CR-1897

Using the AC adapter CR-1897, AC operation of TMR-311 with connected measurement units is possible.
The adapter accepts AC power source of 100 – 240V, 50/60Hz.

Related products

Thermocouple adapter TA-01KT

This adapter is designed for temperature measurement with T or K type thermocouple using a DC exciting strain meter.

Number of measuring point	1
Applicable thermocouple	K, T
Response time	20ms or less (0 to 90%)
Sensitivity	10μV/°C (at bridge excitation 2V)
Environment	0~+50°C, 85%RH or less (no condensation)
External dimensions	22(W)×41(H)×70(D)mm (excluding projected parts)
Weight	100g

Measurement software

Dynamic measurement software TMR-7300, RD-7300 and RD-7300E, which are capable of measuring up to 80 channels using one control unit, are supplied to the TMR-311 as standard accessories. Optional software programs with expanded functions are also available.

Applicable software	Standard software	Optional software
Dynamic measurement software	TMR-7300	TMR-7630 TMR-7630-H (Frequency analysis) TMR-7630-M (Video applicable)
Real time data acquisition software	RD-7300	RD-7640
Waveform view software	RD-7300-E	WF-7630

Dynamic measurement software TMR-7300 (standard software)

The dynamic measurement software TMR-7300 controls one TMR-311 for on-line and off-line measurement. Monitoring, acquisition, edition (listing and chart drawing) and processing of data, and data calculation using expanded channels are possible. In off-line measurement, free-run, data trigger and program measurement can be executed.

System	
OS	Windows Vista(SP2), 7(SP1), 8, 8.1, 10
Computer	Model recommended by the above OS with dual or more core CPU is recommended
Interface	Wireless LAN *1, LAN(100BASE-TX), USB
Memory capacity	4GB or more is recommended
HDD capacity	Free space of 5GB or more
Basic specifications	
Applicable instrument	TMR-311, TMR-211 Maximum number of connection: 1
Number of measuring points	80 channels at maximum
Expanded channel	1000 channels at maximum (four arithmetic operation, various functions and rosette analysis)
On-line measurement	Balance, Monitor, Manual, Interval, Data comparater, Free run, Data trigger, Program measurement, Alarm output
Off-line measurement	Free run, Data trigger, Program measurement
Display	Value monitor, T-Y monitor, T-Y graph, Bar monitor, Spectrum
Data format	DADiSP format Conversion to text file (CSV format) possible
Data processing	Display and print of T-Y graph, Display of value list

*1: Built-in wireless LAN is not available for overseas model of TMR-311.

Dynamic measurement software RD-7300 for real time data acquisition (standard software)

The software RD-7300 directly collects the data measured by TMR-300 series into a personal computer and records them. Long-time and large-capacity recording is possible without depending on the capacity of the TMR-311 data memory or a SD card. Data processing is possible by the software RD-7300-E which is also supplied as standard accessory.

System	
OS	Windows Vista(SP2), 7(SP1), 8, 8.1, 10
Computer	Model recommended by the above OS with dual or more core CPU is recommended
Interface	LAN(100BASE-TX)
Memory capacity	4GB or more is recommended
HDD capacity	Free space of 5GB or more
Basic specifications	
Applicable instrument	TMR-311 Maximum number of connection: 1
Number of measuring points	80 channels at maximum
Sampling clock	Setting is possible within the range of 0.1 to 0.9ms (by every 0.1ms) and 1 to 1000ms (by every 1ms) If the number of used channels is 41 or more for one instrument, the fastest sampling clock is 0.2ms
Expanded channel	1000 channels at maximum (four arithmetic operation, various functions and rosette analysis)
Measurement	Monitor measurement, Manual measurement, Data trigger measurement, Interval measurement
Display	Value monitor, T-Y monitor, T-Y graph, Bar monitor, Spectrum, Dial scale monitor, Vector monitor, Arrow monitor

Data editing Software RD-7300-E (standard software)

This software performs post-processing of data files collected by the RD-7300 such as file management, batch processing of two or more files and chart creation.

System	
Applicable data file	*.hed / *.dat (DADiSP compatible format)
OS	Windows Vista(SP2), 7(SP1), 8, 8.1, 10
CPU	Conforms to the system requirements of the above OS
Memory	Conforms to the system requirements of the above OS
Disc capacity	Free space of 5GB or more
Basic specifications	
Data file management	Processings below are applied to optionally selected two or more files File display, File rename, File move, Text conversion, Merging files
Data file processing	Re-setting of channel setting Setting of expanded channel and re-calculation Searching maximum/minimum values, Cutting out, Thinning out, Text conversion
Graph display	T-Y graph, X-Y graph, Spectrum, Label, Saving, Text saving, Copy of graph, Saving pictures

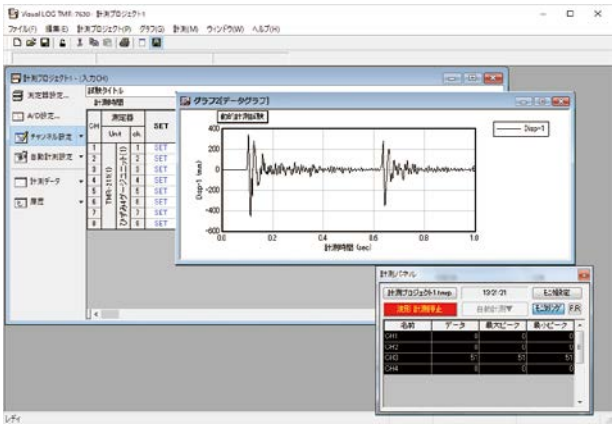
Measurement software

Visual LOG® Dynamic measurement software TMR-7630 (option)

The software TMR-7630 is for multi-channel dynamic measurement and data processing using multi-recorder TMR series. Simultaneous control of 320 channels at maximum is possible by connecting four control units TMR-311.
Measurement is possible on-line and off-line. In on-line measurement, calculation using expanded channels and monitoring measurement are available. In off-line measurement, free-run, data trigger and program measurement can be executed.

System	
OS	Windows Vista(SP2), 7(SP1), 8, 8.1, 10
Computer	Model recommended by the above OS with dual or more core CPU is recommended
Interface	Wireless LAN *1, LAN(100BASE-TX), USB
Memory capacity	4GB or more is recommended
HDD capacity	Free space of 10GB or more is recommended
Protect key	USB dongle
Basic specifications	
Applicable instrument	TMR-311, TMR-211 Maximum number of connection: 4
Number of measuring points	320 channels at maximum
Expanded channel	1000 channels at maximum (four arithmetic operation, various functions and rosette analysis)
On-line measurement	Balance, Monitor, Manual, Interval, Data comparater, Free run, Data trigger, Program measurement,Alarm output
Off-line measurement	Free run, Data trigger, Program measurement
Display	Value monitor, T-Y monitor, T-Y graph, Bar monitor, Spectrum
Data format	DADiSP format Conversion to text file (CSV format) possible
Data processing	Display and print of T-Y graph, Display of value list

*1: Built-in wireless LAN is not available for overseas model of TMR-311.



[Option]

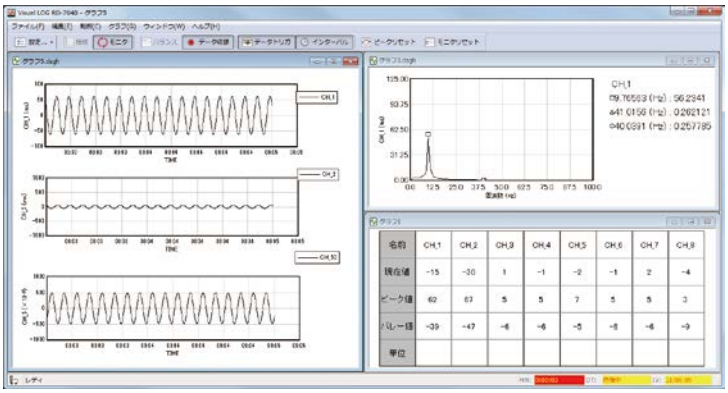
TMR-7630-H Performs frequency analysis of measured dynamic wave form in post-processing. Frequency analysis and S-N analysis of expanded channels are also possible.

TMR-7630-M Videos taken by a camera conforming to DirectX are saved linking with the measurement. The saved data are reproduced in synchronization with the video.

Visual LOG® Real time data acquisition software RD-7640 (option) NEW

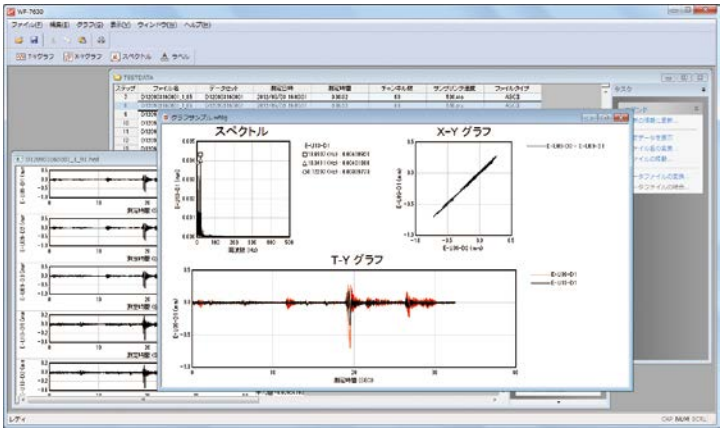
The software RD-7640 controls our instrument TMR-311, DS-50A or TFM-104 and carries out manual, data trigger, interval and monitoring measurement of 1 to 1000 measurement channels and up to 1000 numbers of expanded channels.
Data are directly inputted to a computer without transferring through the instrument's media, and processed simultaneously with the sampling speed. Data recording depends on the free space of the computer, and a large capacity (long time) recording is available. It is possible to simultaneously execute real time FFT analysis and two or more types of measurement such as manual, data trigger and interval. Waveform view software WF-7630 is used for data processing.

System	
OS	Windows Vista(SP2), 7(SP1), 8, 8.1, 10
Computer	Model recommended by the above OS with CPU of Intel Core i5 3.0GHz or higher is recommended (excluding Turbo Boost)
Interface	LAN(100BASE-TX)
Memory capacity	4GB or more is recommended
HDD capacity	Free space of 5GB or more
Protect key	USB dongle
Basic specifications	
Applicable instrument	TMR-311 Maximum number of connection: 4 In addition, this software is applicable to DS-50A and TFM-104
Sampling clock (when using TMR-311)	Setting is possible within the range of 0.1 to 0.9ms (by every 0.1ms) and 1 to 1000ms (by every 1ms) If the number of used channels is 41 or more for one instrument, the fastest sampling clock is 0.2ms
Expanded channel	1000 channels at maximum (four arithmetic operation, various functions and rosette analysis)
Measurement	Monitor measurement, Manual measurement, Data trigger measurement, Interval measurement
Display	Value monitor, T-Y monitor, T-Y graph, Bar monitor, Spectrum, Dial scale monitor, Vector monitor, Arrow monitor



Visual LOG® Waveform view software WF-7630 (option)

The software WF-7630 is for viewing DADiSP format data as data list and waveform. DADiSP format data outputted by our instrument TMR-311/TMR-211 or software RD-7640/TMR-7300/TMR-7630 and so on are acceptable. It is possible to execute re-calculation of data, merging, cutting out, thinning out and CSV conversion of data files, searching of maximum/minimum values, FFT analysis, and calculation and chart drawing (X-Y, T-Y, spectrum) of expanded channels.



System	
Applicable data file	*.hed / *.dat (DADiSP compatible format) DADiSP file of Integer format or ASCII format outputted from instrument TMR-311/TMR-211/DC-204/DC-104/DH-14A, or dynamic measurement software RD-7640/TMR-7630/TMR-7300/TMR-7200/DS-750/DC-7630/DRA-7630/DC-7004P (below referred to as data file) Note) If GPS data and/or frequency data are included in measurement data recorded by TMR-211, the measurement data cannot be read by this software.
OS	Windows Vista(SP2), 7(SP1), 8, 8.1, 10
CPU	Conforms to the system requirements of the above OS
Memory	Conforms to the system requirements of the above OS
Disc capacity	Free space of 5GB or more
Basic specifications	
Data file	Maximum number of channels: 1000 Number of expanded channels: 1000
Data file management	Processings below are applied to optionally selected two or more data files File display, File rename, File move, Text conversion, Merging files
Data file processing	Re-setting of channel setting Setting of expanded channel and re-calculation Searching maximum/minimum values, Cutting out, Thinning out, Text conversion
Graph display	T-Y graph, X-Y graph, Spectrum, Label, Saving, Text saving, Copying graph, Saving pictures

Release schedule of each unit

Unit		Will be released in
Voltage Thermocouple Unit	TMR-332	First half of 2018
TMR-200 Synchronization Unit		First half of 2018
Display Unit	TMR-381	First half of 2018
CAN-GPS Unit	TMR-351	Not fixed
IEPE sensor Input Unit	TMR-361	Not fixed

Contents of this catalog are subject to change without prior notice. Contents of this catalog are as of February 2018.

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Approval Certificate ISO9001
Design and manufacture of strain gauges, strain measuring equipment and transducers

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