Measuring Instruments

TML

PRODUCT CATALOG

2025-2026

STRAIN GAUGES
STRAIN GAUGE TRANSDUCERS
MEASURING INSTRUMENTS

Tokyo Measuring Instruments Laboratory Co., Ltd.

A Constant Pioneer in the Field of Measurement

Since its establishment, Tokyo Measuring Instruments Laboratory Co., Ltd. has consistently contributed to society as a comprehensive provider of strain measurement solutions. Centered on strain gauges, our development and provision of measuring instruments and software reflect our enduring commitment to innovation and excellence. Over the years, we have cultivated rich creativity and amassed sophisticated technological capabilities through dedicated research and development.

In 1956, the company achieved a global first by successfully developing a polyester strain gauge. This breakthrough significantly enhanced moisture resistance compared to conventional paper gauges, thereby expanding the practical applications of strain measurement. Leveraging the advanced technologies cultivated through strain gauge development, we have subsequently introduced a wide array of related products, including transducers, measuring instruments, and software, further advancing the field of strain measurement.

In an era marked by increasing diversity and a growing emphasis on harmony with the global environment, manufacturing that supports sustainable societies has emerged as a central theme. The evolution of the Internet of Things (IoT), spanning from production to logistics systems, is now fostering the creation of next-generation industries. Amidst these developments, we remain committed to delivering highly reliable measurement solutions even under the most demanding conditions, and to the ongoing development of advanced technologies and products.

Panoramic View of Kiryu Plant (Photographed in 2016)

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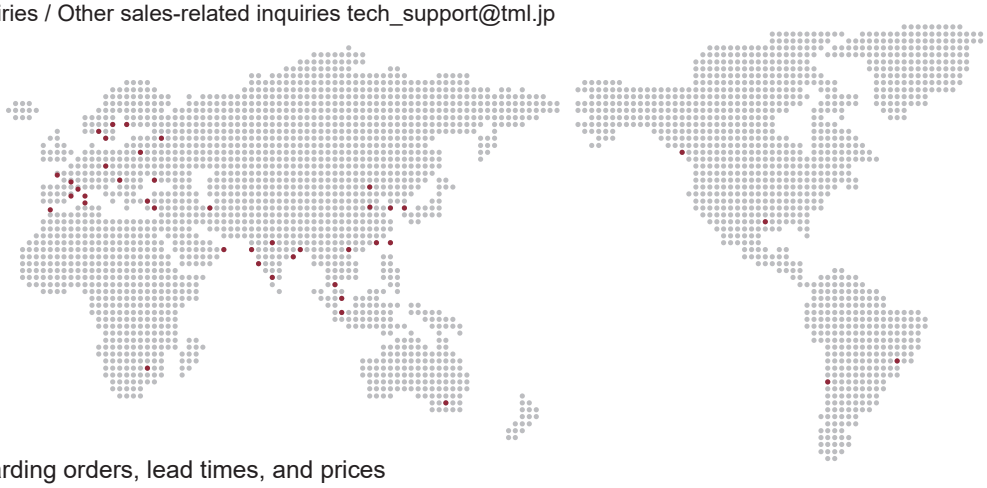

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Measuring Instruments

INTRODUCTION

Since the change in the resistance of a strain gauge is so small, electrical means are required to measure it. A strainmeter is prepared for this purpose, converts the change in the resistance of the strain gauge into a change in voltage, and the change is amplified to extract it as digital or analog data.

In addition, transducers that use strain gauges inside, such as load cells and displacement meters, are also connected to a strainmeter to perform measurements. Many models of strainmeters can also perform voltage measurements and temperature measurements using thermocouples and platinum resistance temperature detectors.

STATIC AND DYNAMIC STRAIN

Strain that is considered not to change over time is called static strain, while strain that changes over time is called dynamic strain. There are two types of strainmeters: static strainmeters intended to measure static strain and dynamic strainmeters intended to measure dynamic strain.

Refer to page 194 for detail.

CHANGES TO THE CATALOG

Changes to this catalog due to product improvements may occur without prior notice.

DIMENSIONS

All dimensions are given in millimeters unless otherwise stated.

PRICES

This catalog does not list product prices. Customers must request a price list separately.

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Instrument

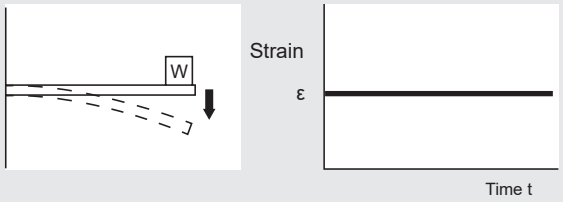
Static Strain and Dynamic Strain

Strain that is considered not to change over time is called static strain, while strain that changes over time is called dynamic strain. There are two types of strainmeters: static strainmeters intended to measure static strain and dynamic strainmeters intended to measure dynamic strain.

The data loggers introduced in this catalog are representative of static strainmeters. Dynamic strainmeters are digital-type instruments in addition to standard analog-type instruments. There are also measuring instruments such as histogram recorders that measure histograms, or frequency distributions, of dynamic phenomena.

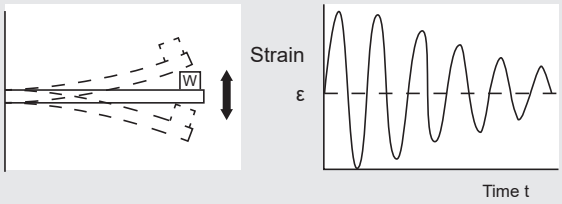
Static strain

When the amount of strain measured does not change with time or changes slowly.



Dynamic strain

When the amount of strain measured changes quickly with time.
This also includes vibration phenomena that vary sinusoidally at a certain frequency.



Classification of Strainmeters

In this catalog, strainmeters are divided into the following product groups according to their intended uses and functions.

- **Data Loggers / Static Strainmeters**

  Since static strain can be considered not to change during measurement, it is possible to measure a large number of measuring points using a single measuring instrument by switching the points sequentially. The strain is obtained as a digital value. By combining the unit with a switch box, multi-point automatic switching measurements can be performed. Recently, performance has been further improved, such as faster measuring speed and fulfilling processing functions in particular.

- **Dynamic Strainmeters**

  Since dynamic strain changes over time, it is amplified and output as an analog signal, and the signal is recorded on a separately provided recorder for measurement. Basically, one measuring instrument and one recorder are required for each measuring point. Recently, there are digital dynamic strainmeters that can digitize analog signals at high speed, record them in internal memory, and then transfer them to a PC.

- **Multi-recorders**

  This equipment is a compact multichannel data recording system that can be freely combined with a variety of measuring units according to the purpose. In addition to analog input units for temperature using strain gauges, strain gauge type transducers, DC voltage, or thermocouples, distribution units that enable widespread distributed allocation of voltage output units and measurement units are also available.

- **Histogram Analysis**

  The histogram (frequency) of the forces generated in a member is obtained by frequency analysis of dynamic waveform data recorded by dynamic strainmeters, such as a multi-recorder system. It is effective to understand the magnitude and trend of dynamic phenomena occurring in vehicles, bridges, and other facilities or structures.

- **Indicators**

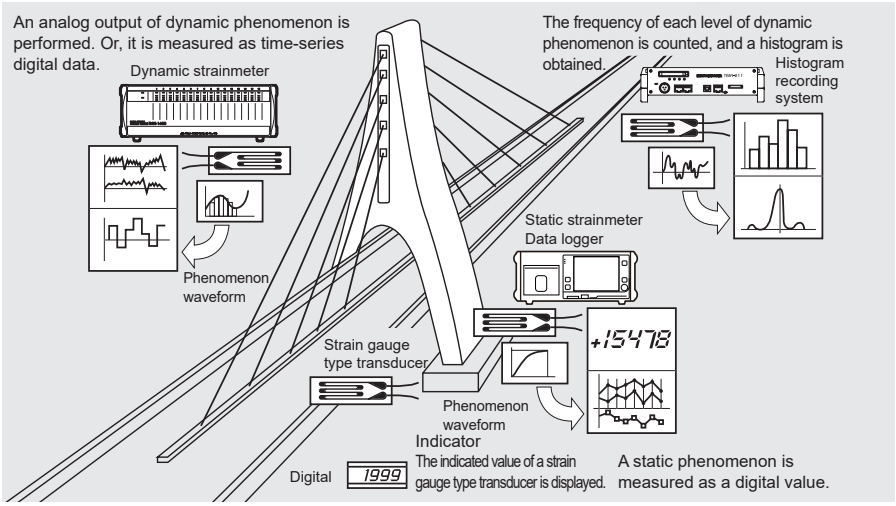
  Indicators are available as measuring instruments dedicated for strain gauge type transducers, such as load cells, displacement meters, and pressure meters. For industrial use, panel mountable models and models with upper and lower limit setting functions are available.

- **Strain Checker**

  A strain checker is also available for operation checks and sensitivity calibrations of measuring instruments.

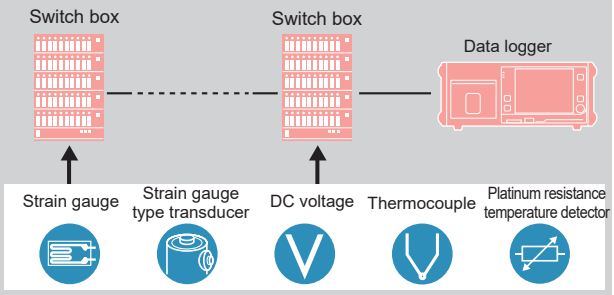
- **Other**

  Connection cables between devices, power cables, printer paper, and various connectors are also available.

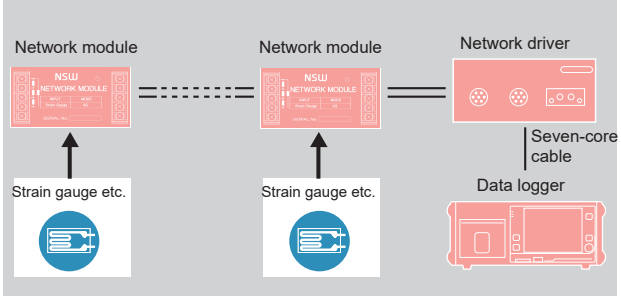


Data Logger and Network Measuring System

The combination of a data logger and a switch box is a widely used system for static measurements. Sensors, such as strain gauges and transducers, are connected to the switch box via sensor cables. The switch box and the data logger are connected via a switch box extension cable. When there are two or more switch boxes, it is possible to connect them sequentially via a single cable (cascade connection), such as between the data logger and the first switch box, between the first and second switch boxes, and so on. Even if the cable between the data logger and the switch box is extended, there will be no influence on the characteristics as long as the cable length is within the specifications.



On the other hand, the network measuring system is a completely new method of automatic measurement for multiple points. A network module is installed near each of the sensors such as strain gauges and transducers. The network modules are connected sequentially (cascade connection) via 2-core cables. Each network module is a so-called small digital strainmeter equipped with such functions as amplification and A/D (analog-digital) conversion to transmit measurement data via a cable according to a command from the network controller. Therefore, data from the sensors connected to the network can be freely obtained on the controller. By connecting a network driver to the data logger, it can be used as a controller.



Explanation of function identification marks for measuring instruments

The functions of the same measuring instrument may differ depending on the version. In such cases, the applicable functions are displayed using the following function identification marks.

This mark is attached to a measuring instrument with the default setting of the complete compensation method of strain.

This mark indicates a measuring instrument that supports the complete compensation method of strain.

This mark indicates a measuring instrument equipped with wireless LAN.

Instrument

Main Terms of Measuring Instruments

The main terms used in this chapter of this catalog are shown below. For the terms of data loggers and dynamic strainmeters, also refer to pages 199 and 275.

- **Number of Measuring Points**

  The number of points that can be measured using a measuring instrument. For a static strainmeter, such as a data logger or switch box, the number of points that can be switched for measurement is indicated. For a dynamic strainmeter, the number of points (channels) that can be measured at the same time is indicated.

- **Applicable Gauge Resistance**

  This is the measurable resistance value of a strain gauge (or strain gauge type transducer).

- **Bridge Excitation**

  For a power supply applied to a bridge circuit in strain measurement, distinctions between voltage and current and between DC and AC are indicated. For a measuring instrument that applies bridge excitation in pulsed form, the pulse width is indicated. In addition, when the bridge excitation is AC, the frequency is also indicated.

- **Switching Speed**

  The time required to measure 1 point using a data logger is indicated.

- **Scanning Speed**

  The time required to perform one measurement using a data logger is indicated.

- **Measuring Speed**

  The time to complete one measurement using a data logger is indicated. (This includes the time required for calculation and recording processing.)

- **Sampling Speed**

  The speed at which a phenomenon is continuously digitized using a dynamic digital measuring instrument is indicated.

- **Balancing Range**

  The range of initial unbalance value that can be adjusted by a measuring instrument.

  For a carrier type measuring instrument using AC for the bridge excitation, the capacity value is also indicated in addition to the resistance value.

- **Balancing Accuracy**

  The accuracy of the balancing operation. The value converted into an input strain value or the like is indicated.

- **Measuring Range**

  The range in which measurements can be performed while meeting the specifications.

- **Storage range of Initial value**

  The range of initial value that can be stored.

- **Sensor Mode**

  The distinction and setting of a measuring object, such as the measuring method (one-gauge method, four-gauge method, etc.) when measuring strain or the type of thermocouple when measuring temperature, is indicated.

- **Response Frequency Range**

  The frequency range in which the output can respond to a sinusoidally changing input while meeting the specifications. The frequency where the output becomes -3 dB (approximately 70% of the output) is indicated.

- **Measuring Mode**

  The processing method of measurement value in a data logger is indicated. The measuring modes include initial measurement, direct measurement, and measure measurement.

  Initial measurement:
  In strain measurement, there is an initial unbalance value (also called initial value) even in an unloaded state. This value is measured and stored.

  Direct measurement:
  A measured value (which includes the initial unbalance value and is called direct value) is measured as is.

  Measure measurement:
  The stored initial value is subtracted from the direct value and the resulting value is output. Therefore, the change from the initial value is measured.

- **Accuracy**

  The limit value of error under specified conditions.
  It is expressed as a percentage (% rdg or %FS) of the indicated value or measuring range. Here, rdg = reading (indicated value) and FS = full scale (measuring range).

- **Resolution**

  The smallest amount of change that can be measured.

- **Non-linearity**

  The maximum deviation of a measurement curve from a straight line connecting the base point and the maximum value of output, such as in the output of an amplifier or the indicated value of an indicator. It is expressed as a percentage of the maximum measurement value.

- **Stability**

  The change in zero point or sensitivity due to a change in temperature, time, etc.

- **Signal to Noise Ratio**

  The ratio of specified output to noise at a set sensitivity. It is expressed in decibels (dB).

$$\text{Decibel} = 20 \log_{10} \frac{2 \times \text{Output voltage}}{\text{Noise voltage}}$$

- **Sensitivity**

  The output (voltage, current, indicated value, etc.) for an input under specified conditions.

- **Operating Temperature and Humidity Range**

  The temperature and humidity ranges in which the measuring instrument can be used while meeting the specifications.

Data Loggers / Static Strainmeters

A data logger can be configured as a system according to the number of measuring points and has such functions as calculation, recording, and processing of measurement values.

The measuring objects are not limited to strain because the voltage and temperature can also be measured. Please select the most suitable model based on the number of measuring points, switching speed, processing functions, and other factors.

Data Loggers: Measuring time at maximum number of measuring points

Data logger	Measurement box	Number of Measuring Points	Measuring speed [Measuring interval]
T-ZACCS9 TS-963/-960 data logger	T-ZACCS BOX EX-50H	1000	Data update rate: Display and record measurement value updating cycle: 0.1 sec
	TS-963 built-in unit	30	
	TS-960 built-in unit	10	
Data logger	**Switch box**	**Number of Measuring Points**	**Scanning speed [Measuring time]**
T-ZACCS5 TS-560 data logger	IHW-50G	1000	0.4 sec/1000 points (0.04 sec/point) (1 sec)
	ISW-50G	1000	2 sec/1000 points (0.04 sec/point) (3 sec)
T-ZACCS3 TS-360 portable data logger	AU-10 AU-10-05	1000	80 sec/1000 points (0.08 sec/point) (80 sec)
	SSW-50D	1000	80 sec/1000 points (0.08 sec/point) (80 sec)
TDS-540 data logger	IHW-50G	1000	0.4 sec/1000 points (0.04 sec/point) (1 sec)
	ISW-50G	1000	2 sec/1000 points (0.04 sec/point) (3 sec)
	SSW-50D	1000	80 sec/1000 points (0.08 sec/point) (80 sec)
	Built-in (High-speed type)	30	0.4 sec/30 points (0.04 sec/point) (1 sec)
	Built-in (Standard type)	30	1.2 sec/30 points (0.04 sec/point) (2 sec)
TDS-150 portable data logger	FSW-10	50	4 sec/50 points (0.08 sec/point) (4 sec)
	FSW-10L	50	4 sec/50 points (0.08 sec/point) (4 sec)
TC-37K handheld data logger	CSW-5B	5	0.4 sec/5 points (0.08 sec/point) (1 sec)
	Main body itself	1	0.08 sec/1 point (0.08 sec/point) (0.1 sec)
TC-32K handheld data logger	CSW-5B	5	0.4 sec/5 points (0.08 sec/point) (1 sec)
	Main body itself	1	0.08 sec/1 point (0.08 sec/point) (1 sec)

Model List

Model name Measurement item	TS-963/-960	TS-560	TS-360	TDS-540	TDS-150	TC-37K	TC-32K
Strain	◎	◎	◎	◎	◎	◎	◎
DC voltage	◎	◎	◎	◎	◎	◎	◎
Thermocouple	◎	◎	◎	◎	◎	◎	◎
Platinum resistance temperature detector	◎	◎	—	◎	◎	◎	◎
Max. number of measuring points	1000	1000	1000	1000	100	5	5
Max. number of built-in boxes	TS-963 : 30 TS-960 : 10	—	50	30	50	1	1
Display	9-inch TFT LCD 800 x 480 dots Touch panel Japanese / English switchable	Color LCD 320 x 240 dots Touch panel Japanese / English switchable	Monochrome LCD 255 x 160 dots Japanese / English switchable	Color LCD 320 x 240 dots Touch panel Japanese / English switchable	Monochrome LCD 255 x 160 dots Japanese / English switchable	Monochrome LCD 255 x 160 dots Japanese / English switchable	Monochrome LCD 255 x 160 dots Japanese / English switchable
Interface	LAN、USB、RS-232C	LAN、USB、RS-232C	LAN、USB、RS-232C	LAN、USB、RS-232C Wireless LAN (Options)	USB、RS-232C、 LAN (Options)	USB、RS-232C	USB、RS-232C
Data recording	Built-in memory, SD card	Built-in memory, SD card USB memory	Built-in memory, SD card	Built-in memory, SD card USB memory, built-in printer	Built-in memory CF card	Built-in memory, SD card	Built-in memory, CF card
Data processing	Coefficient calculation Function calculation Rosette analysis, etc.	Coefficient calculation	Coefficient calculation	Coefficient calculation	Coefficient calculation	Coefficient calculation	Coefficient calculation
Other functions	High-speed mode, high-accuracy mode, interval measurement, comparator measurement, alarm, sampling measurement, sequence control, high-resolution mode, strain and temperature simultaneous measurement, graphic monitor, 1000-point 0.1 second high-speed measurement, sensor ID, analog output (optional), external printer (optional)	Interval timer, quick interval, monitor comparator, high-resolution mode, strain and temperature simultaneous measurement, remote data logger, sensor ID, TEDS compatible	Interval timer, monitor comparator, battery powered, long-term unmanned measurement, TML-NET compatible, external printer (optional), alarm unit	Interval timer, quick interval, monitor comparator, high-resolution mode, strain and temperature simultaneous measurement, remote data logger, sensor ID, TEDS compatible	Interval timer, monitor comparator, battery powered, long-term unmanned measurement, switch box TML-NET Drive board (optional), alarm unit (optional), wireless module (optional), external printer (optional), concrete sensor mode, TEDS compatible	Interval timer, battery powered, long-term unmanned measurement, handheld, TEDS compatible	Interval timer, battery powered, long-term unmanned measurement, handheld, TEDS compatible
Page	202	223	227	235	252	253	259

Main Features of Data loggers

● Coefficient calculation

This function multiplies the measurement value by a coefficient when compensating the gauge factor of a strain gauge or converting the output of a strain gauge type transducer into a physical quantity. For data loggers, a gauge factor of 2.00 is the standard, and the value measured under this condition is multiplied by a coefficient. Therefore, a coefficient of 1 corresponds to a gauge factor of 2. For gauge factor compensation, set 2 / (gauge factor of the strain gauge used). In the case of a direct reading measurement of a transducer, the calibration coefficient is set, in principle. (Details vary depending on the data logger.) The voltage is measured by direct reading when the coefficient is 1. In the data logger specifications, the measuring range, resolution, and other elements are shown with a coefficient of 1. Since the coefficient is multiplied by a digitized value, it is not possible to change the substantial resolution and measuring range by the coefficient setting.

● Function calculation

The TS-963/-960 has a function for calculation processing of measurement values of 2 or more points. It is possible to perform calculations using four arithmetic operations and specified functions, and arithmetic expressions can be set arbitrarily. In addition, since they have programs for rosette analysis and horizontal displacement measurements using a multistage inclinometer, calculation results can be obtained simultaneously with the measurement by setting the channel number and other conditions.

● Interface

The RS-232C, LAN, and USB interfaces for controlling the data logger and transferring measurement data using a PC are provided. (Details vary depending on the model). Everything from the settings to data processing can be performed from a PC.

● Interval timer

This function performs an automatic measurement at regular time intervals. The time interval and number of auto starts can be set for each step with 10 to 100 steps depending on the model. In addition, the TS-963/-960 is equipped with timer tables of 10 systems, each of which can be used as an independent interval timer.

● Monitor comparator (Data comparator)

This function performs automatic measurements based on changes in the monitor value. As an example, it is possible to perform automatic measurements by monitoring the load value in a static load test.

● Alarm measurement

The TS-963/TS-960/TS-360/TDS-150/MD-111 models are equipped with a function that performs automatic measurements of all points when either the monitor value or measurement value exceeds a set value. In addition, the TDS-150 and MD-111 can output an external contact signal when an alarm occurs (optional for the TDS-150).

TS-360 can also output external contact signals when connected to the AL-360.

● Application method of bridge excitation

There are two methods of applying bridge excitation during strain measurements. The constant voltage method, which keeps the voltage constant, and the constant current method, which keeps the current constant. The constant voltage method is characterized by the wide range of bridge resistance values that can be connected, and is the method used in strain measurement mode unless otherwise specified. However, with this method, a reduction in sensitivity occurs because of the resistance of the extension cable beyond the switch box, so compensation by calculation may be required. With the constant current method, the loss of sensitivity due to cable resistance is extremely small, but the bridge resistance value that can be connected is limited.

● Remote measuring system

This is a system that performs data collection by connecting a measuring instrument installed in a remote location using a wired or wireless modem. To perform long-term measurements using batteries, the main power supply for the measuring instrument can be controlled by a dedicated remote power controller. Therefore, in addition to automatic measurements at regular time intervals, data can be obtained at any time.

● Sensor ID

This indicates the sensor related setting items (sensor mode, coefficient, unit and display digits) and can be managed by an arbitrary sensor ID number. By calling a saved sensor ID from the recording media, the setting for the sensor to be used can be easily reflected in the channel setting.

The function related to sensor ID can be used with the TS-963/TS-960/TS-560/TDS-540/MM-014 models.

● Network measuring system

A network module is installed near each sensor, such as a strain gauge or transducer, and the modules are connected sequentially with a two-core cable to form a network. The module digitizes the measurement data and sends it over the network, where it is collected by a network controller. This is a completely new measuring system that differs from ordinary data loggers. By connecting a network driver to the data logger, it can be used as a controller.

● Complete compensation method of strain

Our data loggers are equipped with a complete compensation method of strain using a Wheatstone bridge. This is a strain measuring method that eliminates the influence of the initial unbalance value and the bridge nonlinearity error.

For details on the complete compensation method of strain, refer to page 201.

● Reading of TEDS sensor

The Transducer Electronic Data Sheet (TEDS) has sensor information stored on an IC chip inside the sensor. This function allows a TEDS-compatible measuring instrument to automatically recognize a sensor by reading the parameters from this information.

Compatible measuring instruments

TS-560, TDS-540, TDS-150, TC-37K, TC-32K, TD-30L, MM-014, MM-014L,TD-96A

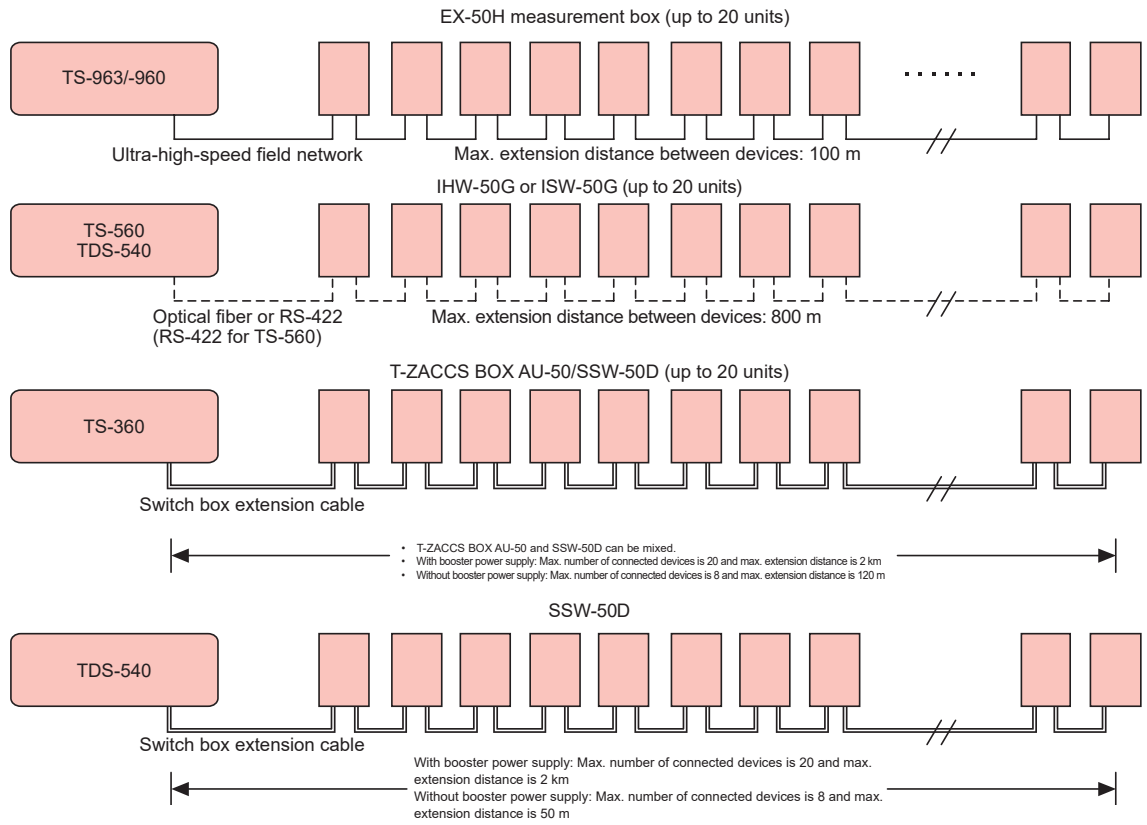
Data Loggers / Static Strainmeters

Operational Functions by Combination of Data Logger and Switch Box

Data logger	Switch box	Number of points/unit	one-gauge method four-wire type	Strain	Strain constant current	High-resolution mode	DC voltage	Thermocouple	Platinum resistance temperature detector	Strain and temperature simultaneous	Connector combined use	Connection
T-ZACCS9 TS-963/-960	T-ZACCS BOX EX-50H*5	50	—	○	○	○*2	○	○	○	○	○	Ultra-high-speed field network
	T-ZACCS+EI-01P, IHW-50G	50	○	○	○	○	○	○	○	○	○*3	Ultra-high-speed field network, RS-422
	TS-963 built-in unit	30	—	○	○	○*2	○	○	○	○	○	—
	TS-960 built-in unit	10	—	○	○	○*2	○	○	○	○	○	
T-ZACCS5 TS-560	IHW-50G	50	○	○	○	○	○	○	○	○	○*3	RS-422 (Optical fiber can be used between switch boxes)
	ISW-50G	50	○	○	○	○	○	○	○	○	○*3	
T-ZACCS3 TS-360	AU-10	10	—	○	○	—	○	○	—	—	—	Connector connection
	AU-10-05	10	—	○	○	—	○	○	—	—	○	
	SSW-50D	50	○	○	○	—	○	○	—	—	○*3	Switch box extension cable
TDS-540	IHW-50G	50	○	○	○	○	○	○	○	○	○*3	Optical fiber or RS-422
	ISW-50G	50	○	○	○	○	○	○	○	○	○*3	
	SSW-50D	50	○	○	○	○	○	○	—	—	○*3	Switch box extension cable
	Built-in	30	○*4	○	○	○	○	○	○	○	○	—
TDS-150	FSW-10	10	○	○	○	—	○	○	○	—	○	Connector connection
	FSW-10L	10	○*1	○	○	—	○	○	○	—	—	
T-ZACCS3 TC-37K	CSW-5B	5	○*1	○	○	—	○	○	○	—	○*3	Dedicated cable
	Main body only	1	○	○	○	—	○	○	○	—	○	—
TC-32K	CSW-5B	5	○*1	○	○	—	○	○	○	—	○*3	Dedicated cable
	Main body only	1	○	○	○	—	○	○	○	—	○	—

*1: A sensor cable can only be connected with loose tip wires.
*2: Strain high-resolution mode cannot be used in high-speed mode.
*3: Connector combined use is only compatible with the “-05”.
*4: This requires a one-gauge, four-wire unit (optional).
*5: Measurement box

Switch Box Connection Examples and Extension Distances



Complete Compensation Method of Strain Using Wheatstone Bridge

In strain measurements, an initial unbalance value almost always occurs. Conventionally, this initial unbalance value was considered an initial strain and was subtracted from the measurement value when strain occurred to obtain the strain. In addition, since the relationship between the bridge output voltage and strain was not proportional, compensation of the nonlinearity was required for any large strain value. Recent technological advances have been rapid, and high-speed, high-accuracy, and high-resolution measurement instruments with a wide measurement range have been developed for strain measurements. As a result, it is now possible to perform severe analysis and processing of measurement data as well, making it possible to see unnatural points that would previously not have been issues or could not be seen. These include measured strain that differed depending on the magnitude of the initial unbalance value, that although compensation of apparent strain was performed, there was somehow a lack of continuity in the strain data, and when measuring large strain, the strain gauge was replaced midway through, but continuity was still questionable. In addition, in multipoint measurements using the one-gauge method, three-wire type, the lead wires at all measuring points are made the same length in order to simplify compensation for decreased sensitivity due to the lead wires. For this reason, the lengths of the lead wires should be adjusted to match that of the measuring point with the longest length, and the space to store the excess lead wires is enormous. In addition, this also increases the cost.

Our complete compensation method of strain is a revolutionary strain measuring method that eliminates the influence of the initial unbalance value and reduces the bridge nonlinearity error to zero, thereby resolving all of the above-mentioned questions. Its features are as follows.

(1) The measurement error due to initial unbalance value is zero. (One-gauge method, one-gauge method, three-wire type, two-gauge common dummy method)
It is not influenced by the resistance values of the strain gauge and lead wires that cause the occurrence of the initial unbalance. In addition, the resistance values can be any values as long as they are within the initial unbalance value range of the measuring instrument.

(2) The bridge nonlinearity error is zero. (One-gauge method, one-gauge method, three-wire type, two-gauge common dummy method)
Conventional nonlinearity compensation is subject to a condition where the initial imbalance value is zero. For the complete compensation method of strain, there is no such condition.

(3) In the one-gauge method, three-wire type, reduced sensitivity due to the lead wires is compensated automatically.
The lead wire at each measuring point may only be of the minimum necessary length, and this results in a significant cost reduction.

(4) Complete compensation of apparent strain by the temperature of the strain gauge (one-gauge method, one-gauge method, three-wire type, two-gauge common dummy method)
Apparent strain is data in a strain-free state, not data when strain occurs. Compensation according to the strain is required. This is particularly effective in cases of large apparent strain.

(5) Compensation of error occurring when replacing the strain gauge (one-gauge method, one-gauge method, three-wire type, two-gauge common dummy method)
For large strain measurements, the strain gauge is replaced to measure further strain. In that case, accurate strain cannot be calculated unless the amount of strain at the time of replacement is used, and then the measured strain is compensated.

As an example, the graphs show the measurement results when a constant strain is generated using strain gauges with different resistance values. Figure 1 shows the conventional measurement results, and Figure 2 shows the measurement results using the complete compensation method of strain. The difference is clearly visible. (Features (1) and (2): [Comet-A])
Additionally, in the past, for decreased sensitivity due to lead wire resistances, the compensation calculation was performed on the measurement results (Figure 3). In contrast, for a data logger that adopts the complete compensation method of strain, automatic compensation is performed, and the influence of decreased sensitivity due to the lead wire resistances is eliminated as shown in Figure 4. (Features (1), (2) and (3): [Comet-B])

●Influence of Difference in Resistance Values of Strain Gauges on Sensitivity

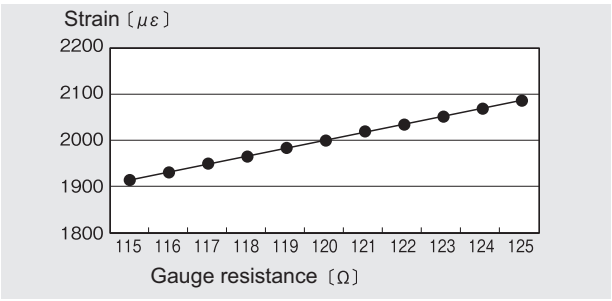


Figure 1. Conventional Measurement Results

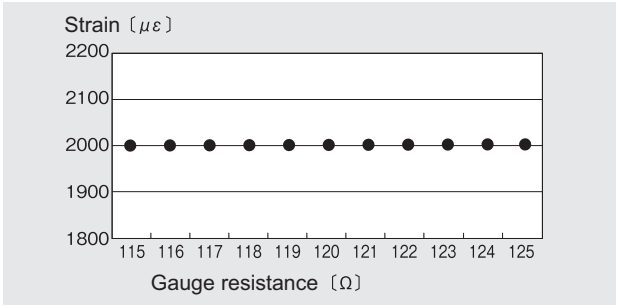


Figure 2. Measurement Results by Complete Compensation Method of Strain

●Influence of Lead Wire Resistances on Sensitivity

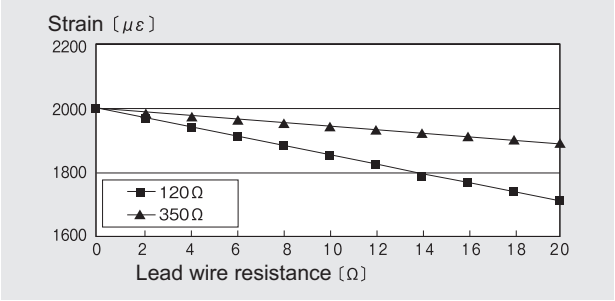


Figure 3. Conventional Measurement Results

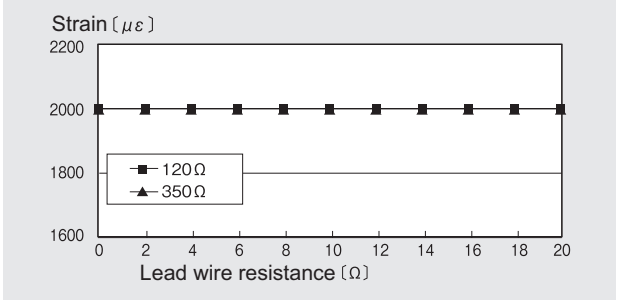


Figure 4. Measurement Results by Complete Compensation Method of Strain

TS-963/TS-960 (High-speed, High-accuracy, High-functionality) T-ZACCS 9

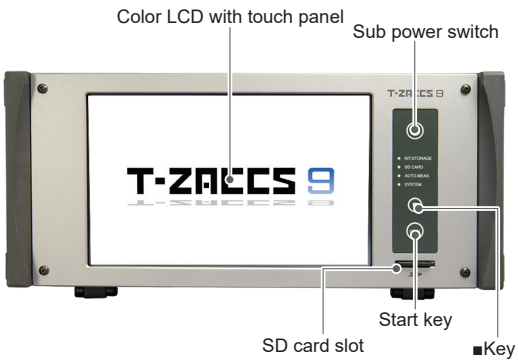
- Up to 1000 points (+ 1000 channels of strain gauge with temperature measurement function + 100 channels of expansion CH)
- Our unique next-generation A/D method that achieves both high accuracy and high stability and high-speed measurement realizes high-precision, high-stability and high-speed measurement.
- High-speed measurement with a maximum interval of 0.1 seconds
- Secure data retention by robust built-in data memory and UPS circuit
- Realization of stable interval measurement with a clock accuracy of ±1 second per day
- Collective setting of coefficient, unit, decimal point and sensor type by Sensor ID
- Equipped with high-resolution (0.1 x 10^{-6} strain) mode
- Equipped with Complete Compensation Method of Strain (Comet)
- Various check functions can be performed automatically by a timer.
- Equipped with a 9-inch-wide LCD touch panel, the wide screen and easy-to-use screen configuration allow for comfortable operation.
- Supports Japanese and English displays
- Fulfilling monitor functions that can display various numerical values and graphs in five tables and four frames.
- Equipped with DVI output for display on an external display (our recommended product)
- Automatic measurement (interval measurement, comparator measurement, alarm, sequence measurement, and sampling measurement)
- Equipped with an expansion channel function that performs calculations in real time based on the calculation formula set by the user.
- By using the expansion channel function, various calculations including inter-channel calculations, logical calculations, and rosette analysis can be performed.
- Equipped with a remote data logger function, the data logger can be operated from a Web browser.

T-ZACCS9 TS-960 high-speed, high-accuracy, high-functionality data logger

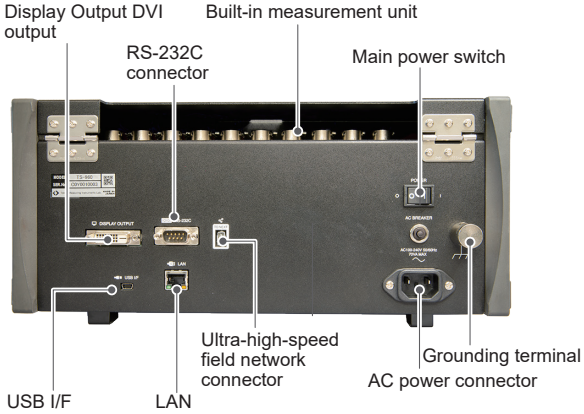
T-ZACCS9 TS-963 high-speed, high-accuracy, high-functionality data logger

This equipment is a data logger of the T-ZACCS9 series that combines high speed, high accuracy, and high functionality. This equipment allows you to measure strain gauges, strain gauge type converters, thermocouples, platinum resistance temperature detectors, DC voltages, and other equipment. The number of measuring points of the TS-963 is 30 points for its built-in measurement unit and that of the TS-960 is 10 points for its built-in measurement unit. By using external measurement boxes, it is possible to measure up to 1000 points, making it possible to measure measurements of any scale. By adopting our unique next-generation A/D method that achieves both high accuracy and high stability and high-speed measurement, and an ultra-high-speed field network based on Ethernet, various thermo-electromotive forces, zero movement of the amplifier, and commercial power supply noise are eliminated, and high-precision and high-stability measurements are realized. At the same time, regardless of the number of measurement points, the high-speed mode measures at 0.1-second intervals and the high-precision mode measures at 0.4-second (50 Hz) intervals, achieving stress-free operability, and a wide range of phenomena from static phenomena to quasi-dynamic phenomena can be measured. Various monitors, various automatic measurements, and various calculations are possible without using a PC. Using an external analog output unit, voltage output can be linked to the measurement value and/or the calculation result of an expansion channel.

Front Panel (TS-960)



Back Panel (TS-960)



Equipped with built-in measurement unit

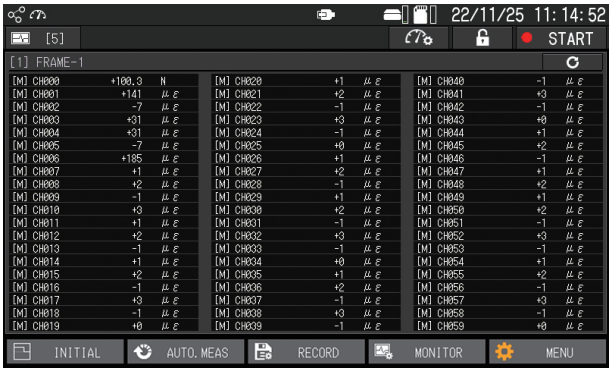
TS-960 data logger comes standard with 10 built-in measurement units, while the TS-963 comes standard with 30 built-in measurement units.

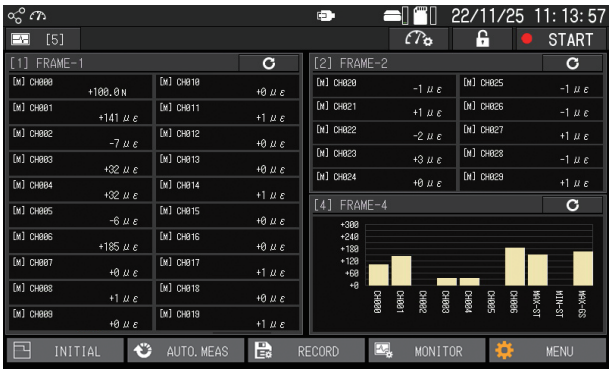
No delay in measuring intervals due to an increase in the number of measuring points

The built-in measurement unit of the TS-963/-960 and the EX-50H measurement box and the EU-10H measurement unit can measure every 0.1 sec in high-speed mode. The TS-963/-960 is capable of recording the measurement values and displaying the monitor in a manner that completely tracks the measurement. There is no delay in measuring intervals due to an increase in the number of measuring points. It is now possible to monitor and record the measurement value closer to real time.

Fulfilling monitor display functions

On the monitor display screen, the measurement data can be checked in real time with the measurement value updated every 0.1 sec.
Taking advantage of the 9-inch-wide screen, up to 60 points of the measurement data can be displayed at the same time.

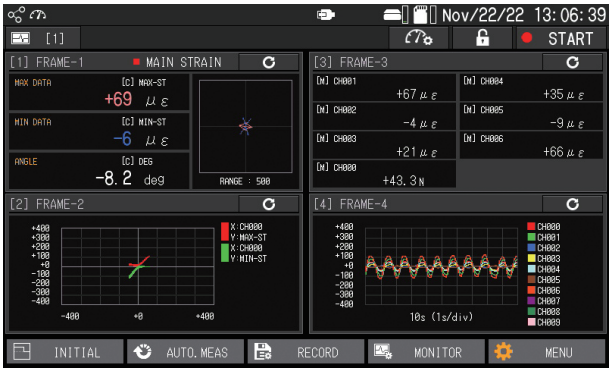




The TS-963 can monitor 30 channels of the built-in measurement unit.
The display format can be selected according to your purpose from the numeric monitor, max / min display, and graph display (Y-T graph, X-Y graph, bar graph, vector graph).

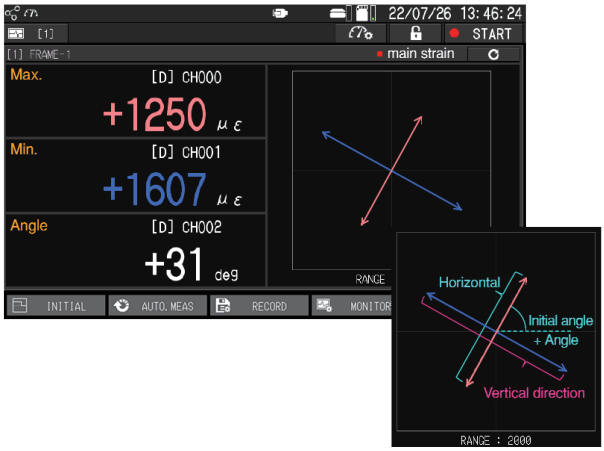
Switching of monitor display settings

It is possible to have up to five tables of display settings for the monitor, and the settings can be switched seamlessly.



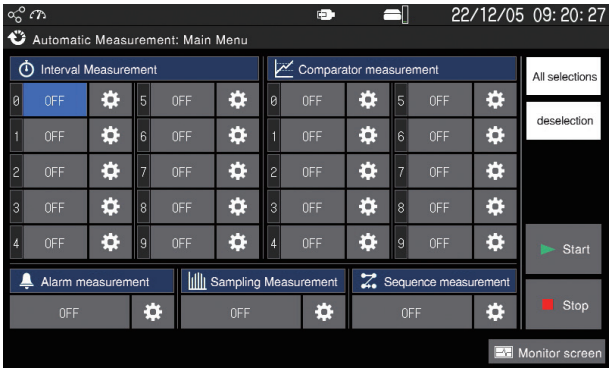
Vector display function

Up to three channels are assigned to the horizontal component, vertical component, and angle to display as a vector. Combined with the rosette analysis using extended channel calculations, multi-axis phenomena can be grasped intuitively.



Automatic measurement

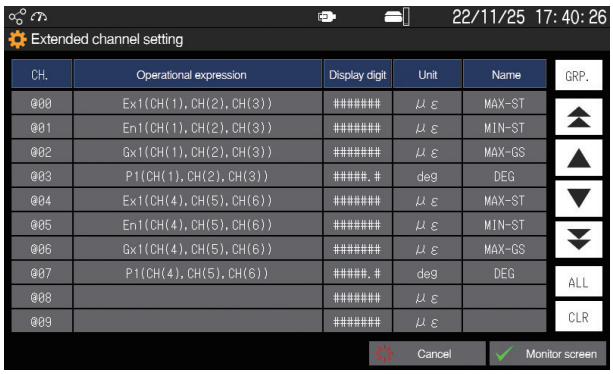
Equipped with interval measurements of 10 systems x 100 steps, comparator measurements of 10 systems x 100 steps, alarms, and sampling measurements, it is possible to execute multiple automatic measurements at the same time.
In addition, it is also equipped with sequence measurements that control and execute a series of measurements by combining the various functions and conditions in sequence.

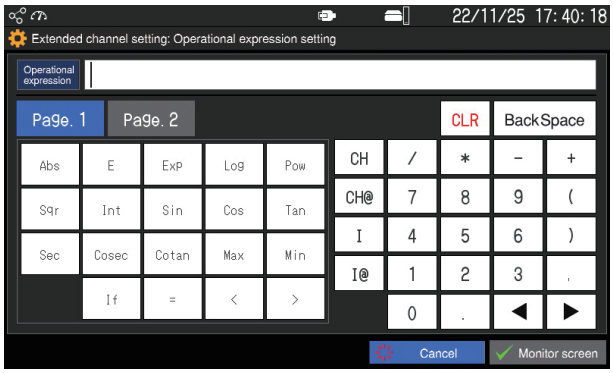


TS-963/TS-960 (High-speed, High-accuracy, High-functionality)

Expansion channel function

The expansion channel function performs a calculation in real time based on the calculation formula set by the user. The calculation result can be displayed, recorded, and output to an interface as with normal measurement values. In addition, the function also supports the judgment condition of automatic measurement and analog output.
For the calculation formula, it is possible to combine constants, measurement values, four arithmetic operations, and functions with various calculation functions. Since logical operations (IF statement, max, min) can be used as functions, it is possible to obtain calculation results according to the conditions, which allow for highly flexible settings compatible with various measurement systems.





Recording

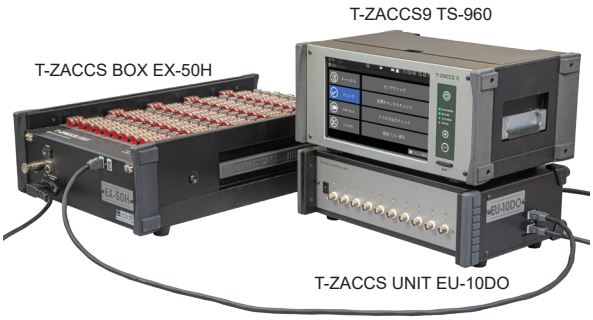
The TS-963/-960 has a built-in memory with a storage capacity of 4 GB, allowing recording of even multi-point, long-term, and high-frequency measurement. It is also possible to perform recording corresponding to measurements at 100 ms intervals and multipoint high-speed recording is possible in CSV format (with header information). In addition, a standard SD card is adopted as external memory, so the data can be checked easily.

Analog output

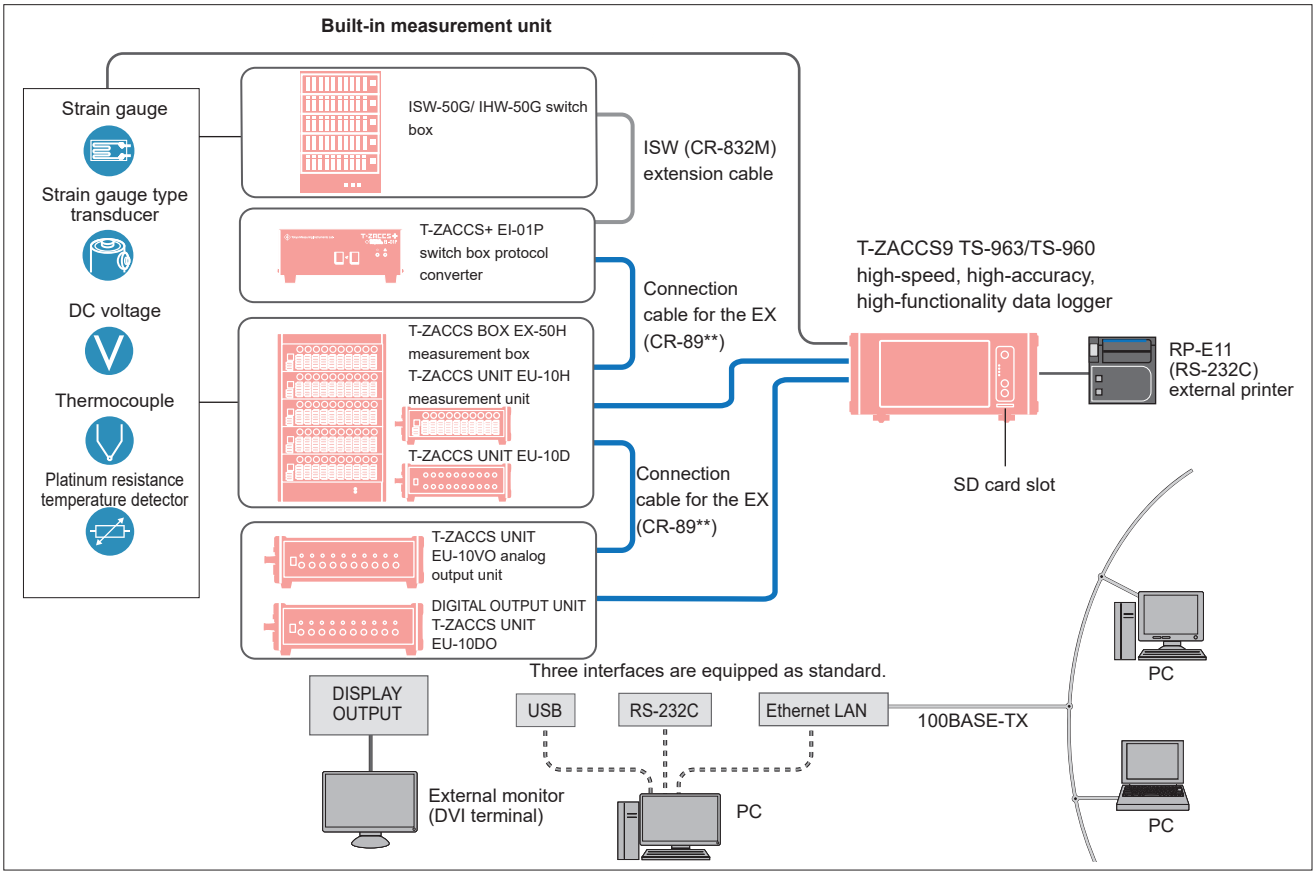
By connecting the EU-10VO analog output unit, the TS-963/-960 can perform analog output of the value of any measuring point and expansion channel with high resolution.

Digital output

By connecting the dedicated EU-10DO digital output unit, it is possible to output up to 10 points of the TTL/LVTTL level digital signals at the same time based on the trigger and alarm conditions set on the TS-960/TS-963.

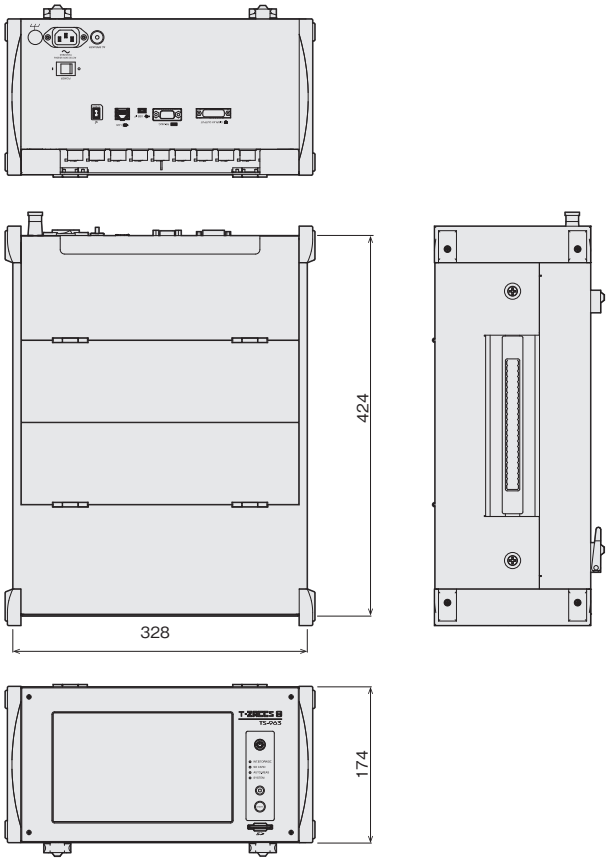


System Block Diagram

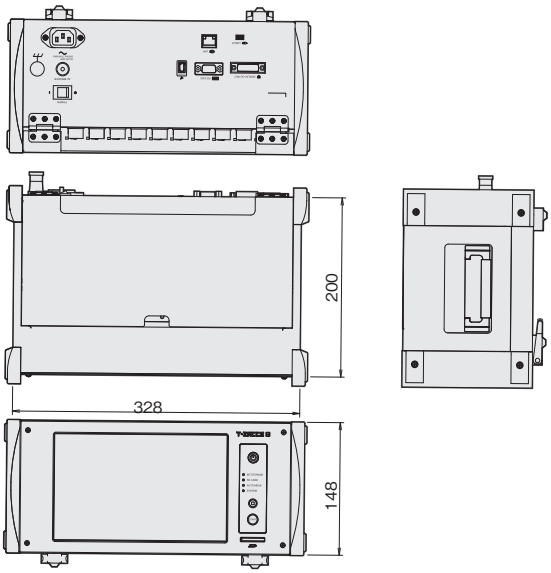


External Dimensions

TS-963



TS-960



TS-963/TS-960 (High-speed, High-accuracy, High-functionality)

Specifications

Measurement capabilities		
Number of measuring points	When using a box connection	Up to 1000 points (Up to 2000 points when using gauge with temperature measurement function)
	When using a box connection built-in measurement unit in combination	
	Built-in measurement unit	TS-963: 30 points (Up to 60 points when using gauge with temperature measurement function)
		TS-960: 10 points (Up to 20 points when using gauge with temperature measurement function)
Measuring speed	Data update rate	Display / record measurement value updating cycle: 0.1 sec
Measuring mode		Initial, direct, measure (For temperature measurement, direct only)
Simple measure		Coefficient 1 Unit Interlocked with sensor mode Decimal point Interlocked with sensor mode
Compensation mode		Comet NON、Comet A、Comet B
Monitor	Number of setting tables	5
	Number of display frames	0-4
	Display mode	Numerical, max / min, graph (Y-T), graph (X-Y), graph (BAR), vector displays
	Display channel	Numerical value display 0-60 points Max / min display 0-40 points Graph display (Y-T) 0-10 points Graph display (X-Y) 0-5 sets Graph display (BAR) 0-20 points Vector display 0-3 points
Measurement	Manual measurement	START key (Touch panel: START button)
	Automatic measurement	Interval measurement, comparator measurement, alarm measurement, sampling measurement and sequence measurement
	Interface	LAN、USB、RS-232C

Channel setting	Coefficient	± (0.00000-200000)	
	Unit	με, mV, °C, kgf, mm, etc.	
	Decimal point	Display after the decimal point can be set arbitrarily with 0 to 5 digits	
	Offset	To be written by arbitrarily measurement channel	
	Sensor mode	The type of sensor to be connected is set.	
		Strain	One-gauge method, three-wire type 120 / 240 / 350 Ω, One-gauge method, four-wire type 120 / 240 / 350 Ω, Two-gauge common dummy method, two-gauge method, Four-gauge method, four-gauge method constant current 350 Ω, Four-gauge method high-resolution mode, Four-gauge method constant current 350 Ω high-resolution mode Four-gauge method 0-2 V mode Gauge with temperature measurement 120 / 240 / 350 Ω
		Voltage	640 mV, 64 V
		Temperature	Thermocouple T, K, J, B, S, R, E, N, Pt 100 3 W
	Channel name	To be set arbitrarily with eight or fewer uppercase English letters, numbers, and symbols	
Sensor ID	Function	Reading and setting of sensor ID, writing of sensor ID	
Expansion channel setting	Function	Function calculations and inter-channel calculations	
	Number of channels	100 channels	
	Characters that can be used	Channel, expansion channel, constant	
	Calculation	Four arithmetic operations	4 types
		General functions	7 types
		Trigonometrical functions	15 types
		Rosette functions	7 types
		Multistage inclinometer functions	3 types
		Logical functions	8 types
		Other functions	1 type
Check function	At the time of measurement	Open check	
	Sensor	Insulation check, sensitivity check, variation check, thermocouple disconnection check, lead wire resistance check, and bridge output check	
	Expansion Channel	Processing time check	
	Analog output	Calibration output Arbitrary output at zero and within the output level range	
	Display setting list	Measurement channel setting, channel setting, reference junction setting, expansion channel setting, analog output setting, interval setting, comparator setting, alarm setting, sampling setting, sequence setting, initial value, lead wire resistance, bridge output, etc.	

*This is effective when using a switch box protocol converter.

Interval measurement	
Function	Recording of measurement values at the set time interval and time
Time interval	Hour / minute / second can be set for each step up to 99 hours, 59 minutes and 59 seconds.
Real time start	Start time (hour / minute / second) can be set for each step
Number of starts	Up to 99 times per step or infinite
Number of steps	Programmable up to 100 steps
GOTO step	Program loop possible to one of the previous steps
Execution processing	Measurement, initial-in, insulation check, variation check, sensitivity check, and thermocouple disconnection check
Number of systems	10 systems Recording channel, file name, recording medium and output interface can be set for each system.

Comparator measurement	
Function	Recording of measurement values based on the set amount of change of arbitrary channel
Comparison amount	Can be set for each step: Up to ±999999
Comparison method	Amount of change or upper / lower limit
Number of starts	Up to 99 times per step or infinite
Number of steps	Programmable up to 100 steps
GOTO step	Program loop possible to one of the previous steps
Number of systems	10 systems Recording channel, file name, recording medium and output interface can be set for each system.

Alarm	
Function	Alarm output when arbitrary channel exceeds the upper and lower limit
Comparison amount	Up to ±999999
Comparison method	Upper and lower limit value
Output	Speaker output, measurement value recording, screen display

Sampling measurement	
Function	Recording at set time intervals
Number of measurements	Specify from 1 to 1000000
Time interval	Select from 0.1, 0.2, 0.5, and 1 seconds Only 1 second can be selected when high accuracy mode is selected
Trigger	Select ON / OFF for each channel
Trigger level	Up to ±999999
Comparison method	OR of amount of change and each channel
Trigger action	Measurement based on the number of measurements or time interval

Sequence control	
Function	Automatic measurement by combining manual measurement, sampling measurement, alarm, interval measurement and comparator measurement
Number of steps	Programmable up to 100 steps
GOTO step	Program loop possible to one of the previous steps
Event step	Interval, comparator, alarm, wait, etc.

Time	
Setting	Year, month, day, hour, minute, second
Accuracy	Daily error: ±1 sec (at 23°C ± 5°C)
Retention	About 30 days (with a full charge)

Display / operation			
Display	Display unit	**LCD panel**	9-inch TFT LCD (with touch panel)
		Resolution	800 x 480 dots
		Point defect	10 dots or less (excluding aging deterioration)
	External output		DVI
Operation			Touch panel, POWER key, FUNCTION key, START key, remote data logger function

Recording		
Built-in	**Function**	Recording / reproduction of measurement data, saving of setting file
	Recording format	CSV format (with header information)
	Capacity	4 GB
SD card	**Function**	Recording / reproduction / copying of measurement data, saving / copying of setting file Writing / reading of sensor ID
	Physical format	FAT 16/32
	Recording format	CSV format (with header information)
	Capacity	4 GB (Designated by us)

Interface	
LAN	10BASE-T/100BASE-TX General-purpose command port server function (various settings, measurement, and data collection)
USB	USB 2.0 protocol compatible mini-B General-purpose command compatible (various settings, measurement, and data collection)
RS-232C	RS-232C compliant Baud rate: 9600, 19200, 115200, 230400, 460800, and 921600 bps General-purpose command compatible (various settings, measurement, and data collection)

TS-963/TS-960 (High-speed, High-accuracy, High-functionality)

Analog output	
Function	Voltage output of measurement value of arbitrary channel
Number of output points	20 points (The EU-10VO analog output unit is required for every 10 points.)
Output range	±10 V, ±5 V, 0-5 V
Capacity (Full scale)	Up to ±999999
Output accuracy	The specifications related to the output conform to the specifications of each unit.
Data update time	Interlocked with measurement cycle, the fastest is 0.1 seconds

Power supply	
Power supply voltage	AC 100-240 V 50/60 Hz
Maximum power consumption	TS-963 : 152 VA max/ TS-960 : 70 VA max

Environment	
Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)

Others	
Outside dimension (Excluding rubber protectors and protrusions)	TS-963: 328 (W) × 174 (H) × 424 (D) mm TS-960: 328 (W) × 148 (H) × 200 (D) mm
Mass	TS-963: Approx. 10 kg / TS-960: Approx. 5 kg

Built-in measurement unit (common to all modes)

Common to all modes	
Number of measuring points	TS-963: 30 points / TS -960: 10 points
Input terminal	Dual-purpose type for screw fixing and soldering
One-touch connector	NDIS one-touch connector

High-speed mode

Measuring speed	0.1 sec (0.2 seconds when using gauge with temperature measurement)	
Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method, three-wire type	120, 240, 350 Ω
	Two-gauge method	60-1000 Ω
	Two-gauge common dummy method	60-1000 Ω
	Four-gauge method	60-1000 Ω
	Four-gauge method constant current	350 Ω
	Four-gauge method 0-2 V mode	60-1000 Ω
	Mode for gauge with temperature measurement function (one-gauge method, three-wire type)	120,240,350Ω T（JIS C1602:2015、IEC 60584-1:2013）
Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1% to -0.5% / Cable round-trip resistance: 100 Ω
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
	Gauge resistance 240 Ω: About 200 Ω or less	
	Gauge resistance 350 Ω: About 300 Ω or less	
Zero stability	±1.0 × 10^{-6} strain/°C or less (one-gauge method) ±0.5 × 10^{-6} strain/°C or less (two-gauge method)	
Initial unbalance	±750 × 10^{-6} strain/°C or less (one-gauge method) ±500 × 10^{-6} strain/°C or less (two-gauge method)	
DC voltage measurement		
V1/1	DC ± 640 mV	
V1/100	DC ± 64 V	
Input impedance	1 MΩ or more	
Allowable input voltage between B and D	DC ± 70 V max	
Thermocouple temperature measurement		
Applicable thermocouple	T,K,J,B,S,R,E,N JIS C1602:2015、IEC 60584-1:2013	
Platinum resistance temperature detector measurement		
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current 3-wire type) JIS C 1604:2013, IEC 60751: 2008	

Strain measurement (High-speed mode)		
Bridge excitation	DC2V 4ms (50 Hz)	
Initial value storage range	±160000 × 10^{-6} strain	
Temperature coefficient of accuracy	±0.002% rdg/°C	
Aging change of accuracy	±0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000 × 10^{-6} strain	1 × 10^{-6} strain
	± 80000 × 10^{-6} strain	2 × 10^{-6} strain
	± 160000 × 10^{-6} strain	4 × 10^{-6} strain
	± 320000 × 10^{-6} strain	8 × 10^{-6} strain
	± 640000 × 10^{-6} strain	16 × 10^{-6} strain
Accuracy (at 23°C ± 5°C)	± (0.08% rdg + 3 digits) (one-gauge method, two-gauge method, four-gauge method) ± (0.08% + 6 digits) (four-gauge method 0-2 V mode)	

Constant current strain measurement (four-gauge method only) (high-speed mode)		
Bridge excitation	DC 6mA 4ms (50 Hz)	
Bridge resistance	350 Ω	
Initial value storage range	± 160000 × 10^{-6} strain	
Temperature coefficient of accuracy	±0.002% rdg/°C	
Aging change of accuracy	±0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000 × 10^{-6} strain	1 × 10^{-6} strain
	± 80000 × 10^{-6} strain	2 × 10^{-6} strain
	± 160000 × 10^{-6} strain	4 × 10^{-6} strain
	± 320000 × 10^{-6} strain	8 × 10^{-6} strain
	± 640000 × 10^{-6} strain	16 × 10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.08%rdg+3digit)	

DC voltage measurement (high-speed mode)			
Initial value storage range			
V1/1		±160.000mV	
V1/100		±16.0000V	
Temperature coefficient of accuracy		±0.0024%rdg/°C	
Aging change of accuracy		±0.024% rdg/year	
Measurement range and resolution		Measurement range	Resolution
	V1/1	± 40.000mV ± 80.000mV ±160.000mV ±320.000mV ±640.000mV	0.001mV 0.002mV 0.004mV 0.008mV 0.016mV
	V1/100	± 4.0000V ± 8.0000V ±16.0000V ±32.0000V ±64.0000V	0.0001V 0.0002V 0.0004V 0.0008V 0.0016V
Accuracy (at 23°C ± 5°C) With moving averaging	**V1/1**	±(0.08%rdg+6digit)	
	V1/100	±(0.08%rdg+6digit)	
Accuracy (at 23°C ± 5°C) Without moving averaging	**V1/1**	±(0.08%rdg+50digit)	
	V1/100	±(0.08%rdg+50digit)	

Platinum resistance temperature detector temperature measurement (JIS C 1604:2013, IEC 60751:2008) (high-speed mode)	
Applicable resistance temperature detector	Pt100
Measurement Method	Three-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	±0.0020% rdg/°C
Aging change of accuracy	±0.05% rdg/year
Measurement range	-200 to +850°C
Resolution	0.1° C
Accuracy (at 23°C ± 5°C)	± (0.1% rdg + 0.3°C)

TS-963/TS-960 (High-speed, High-accuracy, High-functionality)

Thermocouple temperature measurement (JIS C 1602:2015, IEC 60584-1:2013) (high-speed mode)				
Applicable thermocouple	T, K, J, B, S, R, E, N			
Linearization	Digital calculation			
Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
T	-250 to -200°C	0.1°C	±(0.31%rdg+1.9°C)	±(0.31%rdg+5.2°C)
	-200 to -100°C	0.1°C	±(0.14%rdg+0.8°C)	±(0.14%rdg+2.1°C)
	-100 to 0°C	0.1°C	±(0.11%rdg+0.5°C)	±(0.11%rdg+1.2°C)
	0 to +400°C	0.1°C	±(0.08%rdg+0.4°C)	±(0.08%rdg+0.9°C)
K	-210 to -160°C	0.1°C	±(0.17%rdg+0.9°C)	±(0.17%rdg+2.5°C)
	-160 to 0°C	0.1°C	±(0.12%rdg+0.6°C)	±(0.12%rdg+1.5°C)
	0 to +960°C	0.1°C	±(0.09%rdg+0.4°C)	±(0.09%rdg+0.9°C)
	+960 to +1370°C	0.1°C	±(0.10%rdg+0.9°C)	±(0.10%rdg+1.5°C)
J	-200 to -160°C	0.1°C	±(0.15%rdg+0.6°C)	±(0.15%rdg+1.8°C)
	-160° to 0°C	0.1°C	±(0.11%rdg+0.4°C)	±(0.11%rdg+1.3°C)
	0 to +700°C	0.1°C	±(0.09%rdg+0.3°C)	±(0.09%rdg+0.8°C)
	+700 to +1200°C	0.1°C	±(0.09%rdg+0.6°C)	±(0.09%rdg+1.0°C)
B	+200 to +280°C	0.5 to 0.4°C	±(0.03%rdg+6.0°C)	±(0.03%rdg+6.0°C)
	+280 to +800°C	0.3 to 0.1°C	±(0.03%rdg+2.4°C)	±(0.03%rdg+2.4°C)
	+800 to +1760°C	0.1°C	±(0.04%rdg+2.6°C)	±(0.04%rdg+2.6°C)
S	-10 to +200°C	0.1°C	±(0.06%rdg+2.4°C)	±(0.06%rdg+3.1°C)
	+200 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+2.0°C)
R	-10 to +150°C	0.1°C	±(0.06%rdg+2.4°C)	±(0.06%rdg+3.1°C)
	+150 to +1760°C	0.1°C	±(0.05%rdg+1.5°C)	±(0.05%rdg+1.8°C)
E	- 210 to + 550°C	0.1°C	±(0.16%rdg+0.6°C)	±(0.16%rdg+2.0°C)
	+ 550 to +1000°C	0.1°C	±(0.09%rdg+0.4°C)	±(0.09%rdg+0.9°C)
N	- 200 to 0°C	0.1°C	±(0.11%rdg+1.3°C)	±(0.11%rdg+2.7°C)
	0 to +1090°C	0.1°C	±(0.09%rdg+0.5°C)	±(0.09%rdg+1.0°C)
	+1090 to +1300°C	0.1°C	±(0.06%rdg+0.9°C)	±(0.06%rdg+1.3°C)

*The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

High-precision mode

Measuring speed	0.4 sec (50 Hz) / 0.34 sec (60 Hz) (0.8 sec when using gauge with temperature measurement) (50 Hz) / 0.67 sec (60 Hz)	
Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method, three-wire type	120, 240, 350 Ω
	Two-gauge method	60-1000 Ω
	Two-gauge common dummy method	60-1000 Ω
	Four-gauge method	60-1000 Ω
	Four-gauge method constant current	350 Ω
	Four-gauge method high-resolution mode	120-1000 Ω
	Four-gauge method constant current high-resolution mode	350 Ω
	Four-gauge method 0-2 V mode	60-1000 Ω
	Mode for gauge with temperature measurement function (one-gauge method, three-wire type)	120, 240, 350 Ω T(JIS C 1602:2015, IEC 60584-1:2013)
Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
	Four-gauge method constant current high-resolution: 350 Ω	Cable round-trip resistance: 160 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1% to -0.5% / Cable round-trip resistance: 100 Ω
	Four-gauge method constant current high-resolution: 350 Ω	
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
	Gauge resistance 240 Ω: About 200 Ω or less	
	Gauge resistance 350 Ω: About 300 Ω or less	
Zero stability	±1.0 × 10^{-6} strain/°C or less (one-gauge method) ±0.5 × 10^{-6} strain/°C or less (two-gauge method)	
Initial unbalance	±750 × 10^{-6} strain or less (one-gauge method) ±500 × 10^{-6} strain or less (two-gauge method)	
DC voltage measurement		
V1/1	DC±640mV	
V1/100	DC±64V	
Input impedance	1MΩ or more	
Allowable input voltage between B and D	DC±70V MAX	

Thermocouple temperature measurement	
Applicable thermocouple	T,K,J,B,S,R,E,N JIS C1602:2015、IEC 60584-1:2013
Platinum resistance temperature detector measurement	
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current 3-wire type) JIS C 1604:2013, IEC 60751: 2008

Strain measurement (high-precision mode)		
Bridge excitation	DC2V 24ms(50Hz)	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000 × 10^{-6} strain	1 × 10^{-6} strain
	± 80000 × 10^{-6} strain	2 × 10^{-6} strain
	± 160000 × 10^{-6} strain	4 × 10^{-6} strain
	± 320000 × 10^{-6} strain	8 × 10^{-6} strain
	± 640000 × 10^{-6} strain	16 × 10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+1digit)	

Constant current strain measurement (four-gauge method only) (high-precision mode)		
Bridge excitation	DC6mA 24ms(50Hz)	
Bridge resistance	350Ω	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000 × 10^{-6} strain	1 × 10^{-6} strain
	± 80000 × 10^{-6} strain	2 × 10^{-6} strain
	± 160000 × 10^{-6} strain	4 × 10^{-6} strain
	± 320000 × 10^{-6} strain	8 × 10^{-6} strain
	± 640000 × 10^{-6} strain	16 × 10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+1digit)	

High-resolution strain measurement (four-gauge method only) (high-precision mode)		
Bridge excitation	DC5V 24ms(50Hz)	
Initial value storage range	±16000.0×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0 × 10^{-6} strain	0.1 × 10^{-6} strain
	± 8000.0 × 10^{-6} strain	0.2 × 10^{-6} strain
	± 16000.0 × 10^{-6} strain	0.4 × 10^{-6} strain
	± 32000.0 × 10^{-6} strain	0.8 × 10^{-6} strain
	± 64000.0 × 10^{-6} strain	1.6 × 10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+3digit)	

High-resolution strain measurement (four-gauge method only) (high-precision mode)		
Bridge excitation	DC 14 mA 24 ms (50 Hz)	
Bridge resistance	350 Ω	
Initial value storage range	± 16000.0 × 10^{-6} strain	
Temperature coefficient of accuracy	±0.002% rdg/°C	
Aging change of accuracy	±0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0 × 10^{-6} strain	0.1 × 10^{-6} strain
	± 8000.0 × 10^{-6} strain	0.2 × 10^{-6} strain
	± 16000.0 × 10^{-6} strain	0.4 × 10^{-6} strain
	± 32000.0 × 10^{-6} strain	0.8 × 10^{-6} strain
	± 64000.0 × 10^{-6} strain	1.6 × 10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+3digit)	

DC voltage measurement (high-precision mode)			
Initial value storage range			
V1/1		±160.000mV	
V1/100		±16.0000V	
Temperature coefficient of accuracy		±0.0024%rdg/°C	
Aging change of accuracy		±0.024% rdg/year	
Measurement range and resolution	**V1/1**	Measurement range	Resolution
		± 40.000mV ± 80.000mV ±160.000mV ±320.000mV ±640.000mV	0.001mV 0.002mV 0.004mV 0.008mV 0.016mV
	V1/100	± 4.0000V ± 8.0000V ±16.0000V ±32.0000V ±64.0000V	0.0001V 0.0002V 0.0004V 0.0008V 0.0016V
V1/1 accuracy (at 23°C ± 5°C)		±(0.05%rdg+3digit)	
V1/100 accuracy (at 23°C ± 5°C)		±(0.05%rdg+2digit)	

Platinum resistance temperature detector temperature measurement (JIS C 1604:2013, IEC 60751:2008 Pt100) (high-precision mode)	
Applicable resistance temperature detector	Pt100
Measurement Method	Three-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	±0.0020% rdg/°C
Aging change of accuracy	±0.05% rdg/year
Measurement range	-200 to +850°C
Resolution	0.1°C
Accuracy (at 23°C ± 5°C)	± (0.05% rdg + 0.3°C)

Thermocouple temperature measurement (JIS C 1602:2015, IEC 60584-1:2013) (high-precision mode)

Applicable thermocouple		T, K, J, B, S, R, E, N		
Linearization		Digital calculation		
Type	**Measurement range**	**Resolution**	**Accuracy (at 23°C ± 5°C)**	
			(External reference junction)	**(Internal reference junction)**
T	-250 to -200°C -200 to -100°C -100 to +400°C	0.1°C 0.1°C 0.1°C	±(0.19%rdg+0.5°C) ±(0.09%rdg+0.2°C) ±(0.06%rdg+0.2°C)	±(0.19%rdg+3.8°C) ±(0.09%rdg+1.6°C) ±(0.06%rdg+0.9°C)
K	-210 to -160°C -160 to 0°C 0 to +960°C +960 to +1370°C	0.1°C 0.1°C 0.1°C 0.1°C	±(0.11%rdg+0.3°C) ±(0.08%rdg+0.2°C) ±(0.06%rdg+0.1°C) ±(0.06%rdg+0.6°C)	±(0.11%rdg+1.8°C) ±(0.08%rdg+1.1°C) ±(0.06%rdg+0.7°C) ±(0.06%rdg+1.2°C)
J	-200 to -160°C -160 to 0°C 0 to +700°C +700 to +1200°C	0.1°C 0.1°C 0.1°C 0.1°C	±(0.09%rdg+0.2°C) ±(0.07%rdg+0.1°C) ±(0.05%rdg+0.1°C) ±(0.06%rdg+0.4°C)	±(0.09%rdg+1.4°C) ±(0.07%rdg+1.0°C) ±(0.05%rdg+0.6°C) ±(0.06%rdg+0.8°C)
B	+200 to +280°C +280 to +800°C +800 to +1760°C	0.5 to 0.4°C 0.3 to 0.1°C 0.1°C	±(0.03%rdg+1.5°C) ±(0.03%rdg+0.6°C) ±(0.04%rdg+0.4°C)	±(0.03%rdg+1.5°C) ±(0.03%rdg+0.6°C) ±(0.04%rdg+0.4°C)
S	-10 to +200°C +200 to +1760°C	0.1°C 0.1°C	±(0.06%rdg+0.6°C) ±(0.05%rdg+0.4°C)	±(0.06%rdg+1.3°C) ±(0.05%rdg+0.8°C)
R	-10 to +150°C +150 to +1760°C	0.1°C 0.1°C	±(0.06%rdg+0.6°C) ±(0.05%rdg+0.4°C)	±(0.06%rdg+1.3°C) ±(0.05%rdg+0.8°C)
E	-210 to +550°C +550 to +1000°C	0.1°C 0.1°C	±(0.10%rdg+0.2°C) ±(0.06%rdg+0.3°C)	±(0.10%rdg+1.6°C) ±(0.06%rdg+0.7°C)
N	- 200 to 0°C 0 to +1090°C +1090 to +1300°C	0.1°C 0.1°C 0.1°C	±(0.11%rdg+0.4°C) ±(0.05%rdg+0.2°C) ±(0.06%rdg+0.6°C)	±(0.11%rdg+1.8°C) ±(0.05%rdg+0.7°C) ±(0.06%rdg+0.9°C)

* The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

Box / unit connection

Target model	**Measurement box Measurement unit**	EX-50H、 EU-10H、EU-10D、EI-01P
	Output unit	EU-10VO
Number of connectable units	**Measurement box Measurement unit**	Up to 100 units
	Output unit	Up to 2 units
Extension distance		100 m (between devices)
Connection cable		Connection cable for the EX CR-892M (2 m), CR-895M (5 m), CR-8901 (10 m), CR-8902 (20 m), CR-8905 (50 m), CR-8910 (100 m)

* Regarding the number of measurement boxes connected, one EX-50H is counted as five units.

Standard accessories

- Instruction Manual (CD) 1
- AC power cable (CR-03) 1
- Ground wire (CR-20) 1
- SD card 1
- Vinyl cover 1
- Warranty certificate 1
- Phillips screwdriver 1

Related Products

SD card

Supported card capacity: 4 GB (Designated by us)

RP-E11 external printer

The measurement data of the TS-963/-960 data logger is printed out.
RP-E11-K3FJ1-S
(RS-232C connection)

Dedicated printer paper P-80

5 rolls/box Paper size: 80 mm width, 25 m/7200 lines/roll

Measurement software Visual LOG

Visual LOG TDS-7130v2 static measurement software

SB-OT1B one-touch terminal

This terminal block allows one-touch connection of input lead wires. It is used by attaching to the input terminal of the switch box. (One set of five terminals)

T-ZACCS UNIT EU-10VO

- Up to two units or 20 points of analog outputs are possible for one TS-963/-960 unit.
- This unit can be installed anywhere on the line between the data logger and the measurement box and unit.

T-ZACCS UNIT EU-10 VO
analog output unit

This equipment is an analog output unit for the T-ZACCS9 TS-963/-960. Analog data according to inputs, such as strain and voltage can be output. Since this equipment is an independent unit, it can be installed anywhere on the line between the data logger and the measurement box and unit.

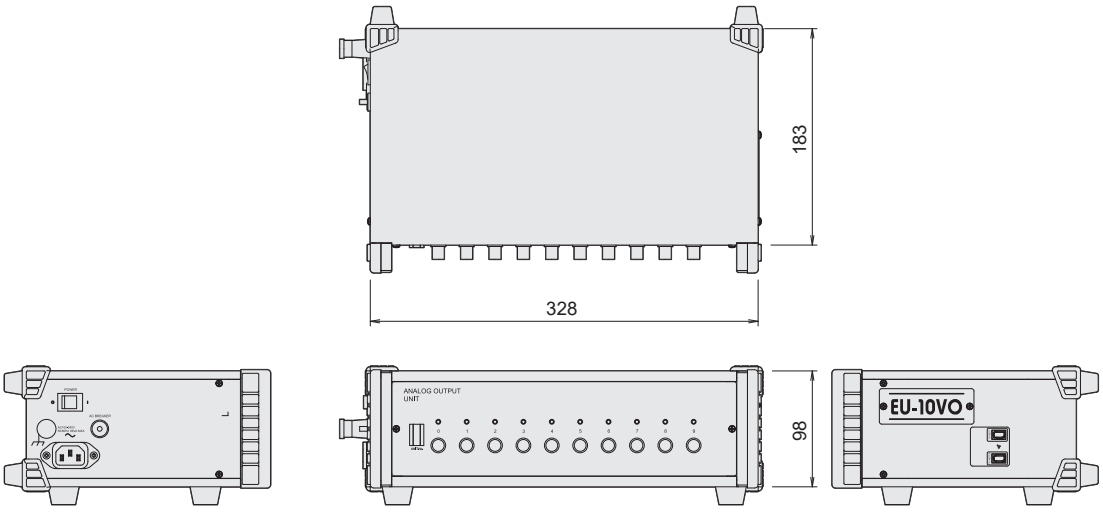
Specifications

Function	
Function	Voltage output of measurement value of arbitrary channel
Number of output points	10 points
Output	BNC connector
Output range	±10 V, ±5 V, 0 to +5 V
Calibration output	Arbitrary output at zero and within the output level range
Accuracy	
Output accuracy	± (0.1% + 5 mV)
Connection with data logger	
Number of connectable units	Up to 2 units
Extension distance	100 m (between devices)
Connection cable	Connection cable for the EX (CR-89**)
Power supply	
Power supply voltage	AC 100-240 V 50/60 Hz
Maximum power consumption	86 VA max
Environment	
Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)
Others	
Outside dimension	328 (W) × 98 (H) ×183 (D) mm (Excluding rubber protectors and protrusions)
Mass	About 3 kg

Standard accessories

AC power cable (CR-03) 1
Ground wire (CR-20) 1
Vinyl cover 1
Connection cable for the EX (CR-892M) 1
Warranty certificate 1

External Dimensions



T-ZACCS UNIT EU-10DO

NEW

- Up to 10 points of non-isolated TTL or LVTTL level digital signals can be output.
- Easy connection with BNC cables

T-ZACCS UNIT EU-10DO
digital output unit

This equipment is an analog output unit dedicated for the T-ZACCS9 TS-960/-963. It is possible to output up to 10 points of TTL/LVTTL level digital signals at the same time based on the trigger and alarm conditions set on the TS-960/TS-963. Since wiring using BNC cables is possible, it is easy to build a system that uses measuring instruments and test equipment tailored to the TS-960/TS-963 measurements, synchronization with the PLC, and trigger control.

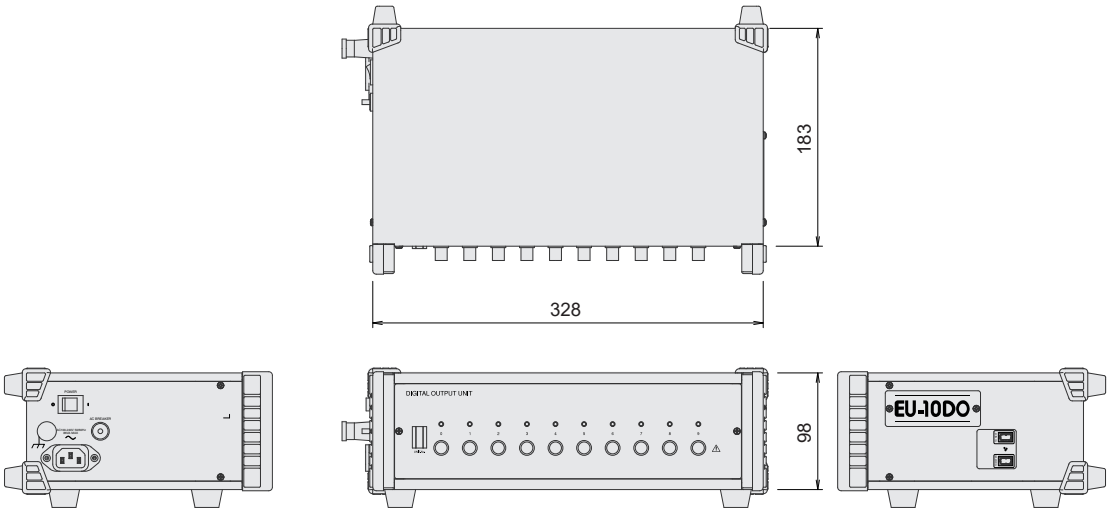
Specifications

Function	
Function	Trigger and alarm signal output or inter-unit synchronization signal output according to TS-960/963 setting
Number of output points	10 points
Output connector	BNC connector
Output format	Non-isolated TTL output DC 5 V (TTL trigger level) HI (ON) level output voltage: 2.0 V or more LO (OFF) level output voltage: 0.8 V or less Non-isolated LVTTL output DC 3.3 V (LVTTL trigger level) HI (ON) level output voltage: 2.0 V or more LO (OFF) level output voltage: 0.8 V or less
Maximum output current	3 mA max
Unit synchronization signal output	Output signal frequency: 10 Hz
Connection with data logger	
Number of connectable units	Up to 1 unit
Extension distance	100 m (between devices)
Connection cable	Connection cable for the EX (CR- 89xx)
Power supply	
Power supply voltage	AC 100-240 V 50/60Hz
Maximum power consumption	86 VA max
Environment	
Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)
Others	
Outside dimension	328 (W) × 183 (D) × 98 (H) mm
Mass	3 kg

Standard accessories

AC power cable (CR-03) 1
Ground wire (CR-20) 1
Connection cable for the EX (CR-892M) 1
Vinyl cover 1
Warranty certificate 1

External Dimensions



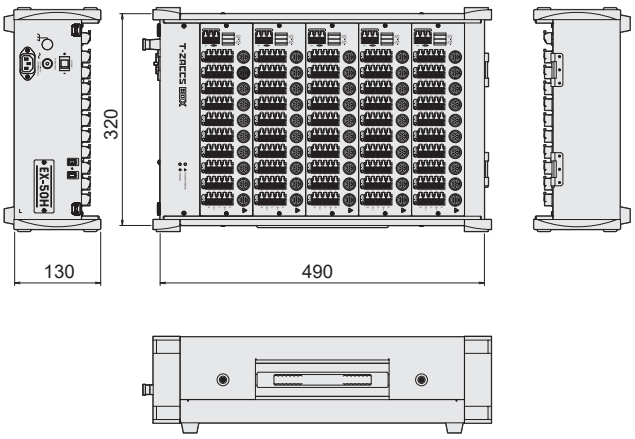
T-ZACCS BOX EX-50H

- 1000 points per 0.1 seconds at the fastest due to adoption of an ultra-high-speed field network
- Our unique next-generation A/D method that achieves both high precision and high stability and high-speed measurement eliminates various thermo-electromotive forces, zero movement of the amplifier, and commercial power supply noise and realizes high-precision and high-stability measurement.
- The high-precision mode can measure 1000 points in 0.4 seconds (50 Hz) even when using the thermocouple measurement or high-resolution mode.
- A strain gauge with temperature measurement function can be measured with one channel.
- Equipped with Complete Compensation Method of Strain (Comet)
- Various check functions (insulation check, sensitivity check, variation check, and thermocouple disconnection check)

T-ZACCS BOX EX-50H

This equipment is a measurement box for expanding the number of measuring points in combination with the T-ZACCS9 TS-963/-960. With 50 measurement points, this equipment allows you to measure strain gauges, strain gauge type converters, thermocouples, platinum resistance temperature detectors, DC voltages, and other equipment. By adopting our unique next-generation A/D method that achieves both high precision and high stability and high-speed measurement, and an ultra-high-speed field network based on the Ethernet, various thermo-electromotive forces, zero movement of the amplifier, and commercial power supply noise are eliminated, and high-precision and high-stability measurement is realized. At the same time, regardless of the number of measuring points, the high-speed mode can measure in 0.1 seconds and the high-precision mode can measure in 0.4 seconds (50 Hz).

External Dimensions



Specifications

Measurement capabilities

Common to all modes		
Number of measuring points	50 points	
Input terminal	Dual-purpose type for screw fixing and soldering	
One-touch connector	NDIS one-touch connector	
Compensation mode	Comet NON, Comet A, Comet B	
Check function	At the time of measurement	Open check
	Sensor	Insulation check, sensitivity check, variation check, and thermocouple disconnection check Lead wire resistance check and bridge output check

High-speed mode

V1/1	DC ± 640 mV	
V1/100	DC ± 64 V	
Input impedance	1 MΩ or more	
Measuring speed	0.1 seconds (0.2 seconds when using a gauge with the temperature measurement)	
Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method, three-wire type	120, 240, 350 Ω
	Two-gauge method	60-1000 Ω
	Two-gauge common dummy method	60-1000 Ω
	Four-gauge method	60-1000 Ω
	Four-gauge method constant current	350 Ω
	Four-gauge method 0-2 V mode	60-1000 Ω
	Mode for gauge with temperature measurement function (one-gauge method, three-wire type)	120,240,350Ω T (JIS C1602:2015、IEC 60584-1:2013)
Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1% to -0.5% / Cable round-trip resistance: 100 Ω
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
	Gauge resistance 240 Ω: About 200 Ω or less	
	Gauge resistance 350 Ω: About 300 Ω or less	
Zero stability	± 1.0 × 10^{-6} strain/°C or less (one-gauge method) ± 0.5 × 10^{-6} strain/°C or less (two-gauge method)	
Initial unbalance	± 750 × 10^{-6} strain or less (one-gauge method) ± 500 × 10^{-6} strain or less (two-gauge method)	
DC voltage measurement		
Allowable input voltage between B and D	DC ± 70 V max	
Thermocouple temperature measurement		
Applicable thermocouple	T,K,J,B,S,R,E,N JIS C1602:2015、IEC 60584-1:2013	
Platinum resistance temperature detector measurement		
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current three-wire type) JIS C 1604:2013, IEC 60751: 2008	

Strain measurement (high-speed mode)		
Bridge excitation	DC2V 4ms(50Hz)	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000 × 10^{-6} strain	1 × 10^{-6} strain
	± 80000 × 10^{-6} strain	2 × 10^{-6} strain
	± 160000 × 10^{-6} strain	4 × 10^{-6} strain
	± 320000 × 10^{-6} strain	8 × 10^{-6} strain
	± 640000 × 10^{-6} strain	16 × 10^{-6} strain
Accuracy (at 23°C ± 5°C)	± (0.08% rdg + 3 digits) (one-gauge method, two-gauge method, four-gauge method) ± (0.08%+ 6 digits) (four-gauge method 0-2 V mode)	

Constant current strain measurement (four-gauge method only) (high-speed mode)		
Bridge excitation	DC6mA 4ms(50Hz)	
Bridge resistance	350Ω	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000 × 10^{-6} strain	1 × 10^{-6} strain
	± 80000 × 10^{-6} strain	2 × 10^{-6} strain
	± 160000 × 10^{-6} strain	4 × 10^{-6} strain
	± 320000 × 10^{-6} strain	8 × 10^{-6} strain
	± 640000 × 10^{-6} strain	16 × 10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.08%rdg+3digit)	

DC voltage measurement (high-speed mode)			
Initial value storage range			
V1/1	±160.000mV		
V1/100	±16.0000V		
Temperature coefficient of accuracy	±0.0024%rdg/°C		
Aging change of accuracy	± 0.024% rdg/year		
Measurement range and resolution		Measurement range	Resolution
	V1/1	± 40.000mV	0.001mV
		± 80.000mV	0.002mV
		±160.000mV	0.004mV
		±320.000mV	0.008mV
		±640.000mV	0.016mV
	V1/100	± 4.0000V	0.0001V
		± 8.0000V	0.0002V
		±16.0000V	0.0004V
		±32.0000V	0.0008V
		±64.0000V	0.0016V
Accuracy (at 23°C ± 5°C) With moving averaging	**V1/1**	±(0.08%rdg+6digit)	
	V1/100	±(0.08%rdg+6digit)	
Accuracy (at 23°C ± 5°C) Without moving averaging	**V1/1**	±(0.08%rdg+50digit)	
	V1/100	±(0.08%rdg+50digit)	

Platinum resistance temperature detector temperature measurement (JIS C 1604:2013, IEC 60751:2008 Pt100) (high-speed mode)	
Applicable resistance temperature detector	Pt100
Measurement Method	Three-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	±0.0020% rdg/°C
Aging change of accuracy	±0.05% rdg/year
Measurement range	-200 to +850°C
Resolution	0.1°C
Accuracy (at 23°C ± 5°C)	± (0.1% rdg + 0.3°C)

Thermocouple temperature measurement (JIS C 1602:2015, IEC 60584-1:2013) (high-speed mode)

Applicable thermocouple	T, K, J, B, S, R, E, N			
Linearization	Digital calculation			
Type	**Measurement range**	**Resolution**	**Accuracy (at 23°C ± 5°C)**	
			(External reference junction)	**(Internal reference junction)**
T	-250 to -200°C	0.1°C	±(0.31%rdg+1.9°C)	±(0.31%rdg+5.2°C)
	-200 to -100°C	0.1°C	±(0.14%rdg+0.8°C)	±(0.14%rdg+2.1°C)
	-100 to 0°C	0.1°C	±(0.11%rdg+0.5°C)	±(0.11%rdg+1.2°C)
	0 to +400°C	0.1°C	±(0.08%rdg+0.4°C)	±(0.08%rdg+0.9°C)
K	-210 to -160°C	0.1°C	±(0.17%rdg+0.9°C)	±(0.17%rdg+2.5°C)
	-160 to 0°C	0.1°C	±(0.12%rdg+0.6°C)	±(0.12%rdg+1.5°C)
	0 to +960°C	0.1°C	±(0.09%rdg+0.4°C)	±(0.09%rdg+0.9°C)
	+960 to +1370°C	0.1°C	±(0.10%rdg+0.9°C)	±(0.10%rdg+1.5°C)
J	-200 to -160°C	0.1°C	±(0.15%rdg+0.6°C)	±(0.15%rdg+1.8°C)
	-160 to 0°C	0.1°C	±(0.11%rdg+0.4°C)	±(0.11%rdg+1.3°C)
	0 to +700°C	0.1°C	±(0.09%rdg+0.3°C)	±(0.09%rdg+0.8°C)
	+700 to +1200°C	0.1°C	±(0.09%rdg+0.6°C)	±(0.09%rdg+1.0°C)
B	+ 200 to + 280°C	0.5 to 0.4°C	±(0.03%rdg+6.0°C)	±(0.03%rdg+6.0°C)
	+ 280 to + 800°C	0.3 to 0.1°C	±(0.03%rdg+2.4°C)	±(0.03%rdg+2.4°C)
	+ 800 to +1760°C	0.1°C	±(0.04%rdg+2.6°C)	±(0.04%rdg+2.6°C)
S	- 10 to + 200°C	0.1°C	±(0.06%rdg+2.4°C)	±(0.06%rdg+3.1°C)
	+ 200 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+2.0°C)
R	- 10 to + 150°C	0.1°C	±(0.06%rdg+2.4°C)	±(0.06%rdg+3.1°C)
	+ 150 to +1760°C	0.1°C	±(0.05%rdg+1.5°C)	±(0.05%rdg+1.8°C)
E	- 210 to + 550°C	0.1°C	±(0.16%rdg+0.6°C)	±(0.16%rdg+2.0°C)
	+ 550 to +1000°C	0.1°C	±(0.09%rdg+0.4°C)	±(0.09%rdg+0.9°C)
N	- 200 to 0°C	0.1°C	±(0.11%rdg+1.3°C)	±(0.11%rdg+2.7°C)
	0 to +1090°C	0.1°C	±(0.09%rdg+0.5°C)	±(0.09%rdg+1.0°C)
	+1090 to +1300°C	0.1°C	±(0.06%rdg+0.9°C)	±(0.06%rdg+1.3°C)

* The accuracy of sensor is not included and thermocouple B does not use the reference junction.

High-precision mode

Measuring speed	0.4 sec (50 Hz) / 0.34 sec (60 Hz) (0.8 sec when using gauge with temperature measurement) (50 Hz) / 0.67 sec (60 Hz)	
Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method, three-wire type	120, 240, 350 Ω
	Two-gauge method	60-1000 Ω
	Two-gauge common dummy method	60-1000 Ω
	Four-gauge method	60-1000 Ω
	Four-gauge method constant current	350 Ω
	Four-gauge method high-resolution mode	120-1000 Ω
	Four-gauge method constant current high-resolution mode	350 Ω
	Four-gauge method 0-2 V mode	60-1000 Ω
	Mode for gauge with temperature measurement function (One-gauge method, three-wire type)	120, 240, 350 Ω T (JIS C 1602:2015, IEC 60584-1:2013)
Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
	Four-gauge method constant current high-resolution: 350 Ω	Cable round-trip resistance: 160 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1 to -0.5% / Cable round-trip resistance: 100 Ω
	Four-gauge method constant current high-resolution: 350 Ω	
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
	Gauge resistance 240 Ω: About 200 Ω or less	
	Gauge resistance 350 Ω: About 300 Ω or less	
Zero stability	± 1.0 × 10^{-6} strain/°C or less (one-gauge method) ± 0.5 × 10^{-6} strain/°C or less (two-gauge method)	
Initial unbalance	± 750 × 10^{-6} strain or less (one-gauge method) ± 500 × 10^{-6} strain or less (two-gauge method)	
DC voltage measurement		
V1/1	DC±640mV	
V1/100	DC±64V	
Input impedance	1 MΩ or more	
Allowable input voltage between B and D	DC±70V MAX	
Thermocouple temperature measurement		
Applicable thermocouple	T,K,J,B,S,R,E,N JIS C1602:2015、IEC 60584-1:2013	
Platinum resistance temperature detector measurement		
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current 3-wire type) JIS C 1604:2013, IEC 60751: 2008	

Strain measurement (high-precision mode)		
Bridge excitation	DC2V 24ms(50Hz)	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain	1×10^{-6} strain
	± 80000×10^{-6} strain	2×10^{-6} strain
	±160000×10^{-6} strain	4×10^{-6} strain
	±320000×10^{-6} strain	8×10^{-6} strain
	±640000×10^{-6} strain	16×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+1digit)	

Constant current strain measurement (four-gauge method only) (high-precision mode)		
Bridge excitation	DC6mA 24ms(50Hz)	
Bridge resistance	350Ω	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain	1×10^{-6} strain
	± 80000×10^{-6} strain	2×10^{-6} strain
	±160000×10^{-6} strain	4×10^{-6} strain
	±320000×10^{-6} strain	8×10^{-6} strain
	±640000×10^{-6} strain	16×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+1digit)	

T-ZACCS BOX EX-50H

High-resolution strain measurement (four-gauge method only) (high-precision mode)		
Bridge excitation	DC5V 24ms(50Hz)	
Initial value storage range	±16000.0×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0×10^{-6} strain ± 8000.0×10^{-6} strain ±16000.0×10^{-6} strain ±32000.0×10^{-6} strain ±64000.0×10^{-6} strain	0.1×10^{-6} strain 0.2×10^{-6} strain 0.4×10^{-6} strain 0.8×10^{-6} strain 1.6×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+3digit)	

High-resolution strain measurement (four-gauge method only) (high-precision mode)		
Bridge excitation	DC14mA 24ms(50Hz)	
Bridge resistance	350Ω	
Initial value storage range	±16000.0×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0×10^{-6} strain ± 8000.0×10^{-6} strain ±16000.0×10^{-6} strain ±32000.0×10^{-6} strain ±64000.0×10^{-6} strain	0.1×10^{-6} strain 0.2×10^{-6} strain 0.4×10^{-6} strain 0.8×10^{-6} strain 1.6×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+3digit)	

DC voltage measurement (high-precision mode)			
Initial value storage range			
V1/1		±160.000mV	
V1/100		±16.0000V	
Temperature coefficient of accuracy		±0.0024%rdg/°C	
Aging change of accuracy		±0.024%rdg/year	
Measurement range and resolution		Measurement range	Resolution
	V1/1	± 40.000mV ± 80.000mV ±160.000mV ±320.000mV ±640.000mV	0.001mV 0.002mV 0.004mV 0.008mV 0.016mV
	V1/100	± 4.0000V ± 8.0000V ±16.0000V ±32.0000V ±64.0000V	0.0001V 0.0002V 0.0004V 0.0008V 0.0016V
V1/1 accuracy (at 23°C ± 5°C)		±(0.05%rdg+3digit)	
V1/100 accuracy (at 23°C ± 5°C)		±(0.05%rdg+2digit)	

Platinum resistance temperature detector temperature measurement (JIS C 1604:2013, IEC 60751:2008 Pt100) (high-precision mode)	
Applicable resistance temperature detector	Pt100
Measurement Method	Three-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	± 0.0020% rdg/°C
Aging change of accuracy	± 0.05% rdg/year
Measurement range	-200 to +850°C
Resolution	0.1° C
Accuracy (at 23°C ± 5°C)	± (0.05% rdg + 0.3°C)

Thermocouple temperature measurement (JIS C 1602:2015, IEC 60584-1:2013) (high-precision mode)				
Applicable thermocouple	T, K, J, B, S, R, E, N			
Linearization	Digital calculation			
Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C)	
			External reference junction)	(Internal reference junction)
T	- 250 to - 200°C - 200 to - 100°C - 100 to + 400°C	0.1°C 0.1°C 0.1°C	±(0.19%rdg+0.5°C) ±(0.09%rdg+0.2°C) ±(0.06%rdg+0.2°C)	±(0.19%rdg+3.8°C) ±(0.09%rdg+1.6°C) ±(0.06%rdg+0.9°C)
K	- 210 to - 160°C - 160 to 0°C 0 to + 960°C + 960 to +1370°C	0.1°C 0.1°C 0.1°C 0.1°C	±(0.11%rdg+0.3°C) ±(0.08%rdg+0.2°C) ±(0.06%rdg+0.1°C) ±(0.06%rdg+0.6°C)	±(0.11%rdg+1.8°C) ±(0.08%rdg+1.1°C) ±(0.06%rdg+0.7°C) ±(0.06%rdg+1.2°C)
J	- 200 to - 160°C - 160 to 0°C 0 to + 700°C + 700 to +1200°C	0.1°C 0.1°C 0.1°C 0.1°C	±(0.09%rdg+0.2°C) ±(0.07%rdg+0.1°C) ±(0.05%rdg+0.1°C) ±(0.06%rdg+0.4°C)	±(0.09%rdg+1.4°C) ±(0.07%rdg+1.0°C) ±(0.05%rdg+0.6°C) ±(0.06%rdg+0.8°C)
B	+ 200 to + 280°C + 280 to + 800°C + 800 to +1760°C	0.5 to 0.4°C 0.3 to 0.1°C 0.1°C	±(0.03%rdg+1.5°C) ±(0.03%rdg+0.6°C) ±(0.04%rdg+0.4°C)	±(0.03%rdg+1.5°C) ±(0.03%rdg+0.6°C) ±(0.04%rdg+0.4°C)
S	- 10 to + 200°C + 200 to +1760°C	0.1°C 0.1°C	±(0.06%rdg+0.6°C) ±(0.05%rdg+0.4°C)	±(0.06%rdg+1.3°C) ±(0.05%rdg+0.8°C)
R	- 10 to + 150°C + 150 to +1760°C	0.1°C 0.1°C	±(0.06%rdg+0.6°C) ±(0.05%rdg+0.4°C)	±(0.06%rdg+1.3°C) ±(0.05%rdg+0.8°C)
E	- 210 to + 550°C + 550 to +1000°C	0.1°C 0.1°C	±(0.10%rdg+0.2°C) ±(0.06%rdg+0.3°C)	±(0.10%rdg+1.6°C) ±(0.06%rdg+0.7°C)
N	- 200 to 0°C 0 to +1090°C +1090 to +1300°C	0.1°C 0.1°C 0.1°C	±(0.11%rdg+0.4°C) ±(0.05%rdg+0.2°C) ±(0.06%rdg+0.6°C)	±(0.11%rdg+1.8°C) ±(0.05%rdg+0.7°C) ±(0.06%rdg+0.9°C)

* The accuracy of sensor is not included and thermocouple B does not use the reference junction.

Connection with data logger

Number of connectable units	Up to 20 units
Extension distance	100 m (between devices)
Connection cable	Connection cable for the EX (CR-89**)

Power supply

Power supply voltage	AC 100 to 240 V 50/60 Hz
Maximum power consumption	EX-50H: 104 VA max

Environment

Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)

Others

Outside dimension	320 (W) × 130 (D) × 490 (H) mm (Excluding rubber protectors and protrusions)
Mass	Approx. 10 kg

Standard accessories

- AC power cable (CR-03) 1
- Ground wire (CR-20) 1
- Vinyl cover 1
- Connection cable for the EX (CR-892M) 1
- Phillips screwdriver 1
- Warranty certificate 1

Related Products

SB-OT1B one-touch terminal

This terminal block allows one-touch connection of input lead wires. It is used by attaching to the input terminal of the switch box. (One set of five terminals)

Connection cable for the EX CR-89XX

This is a cable for connecting the TS-963/-960 data logger to the T-ZACCS BOX/T-ZACCS UNIT and for connecting each BOX and UNIT to each other.

CR-892M (2 m), CR-895M (5 m), CR-8901 (10 m),
CR-8902 (20 m), CR-8905 (50 m), CR-8910 (100 m)

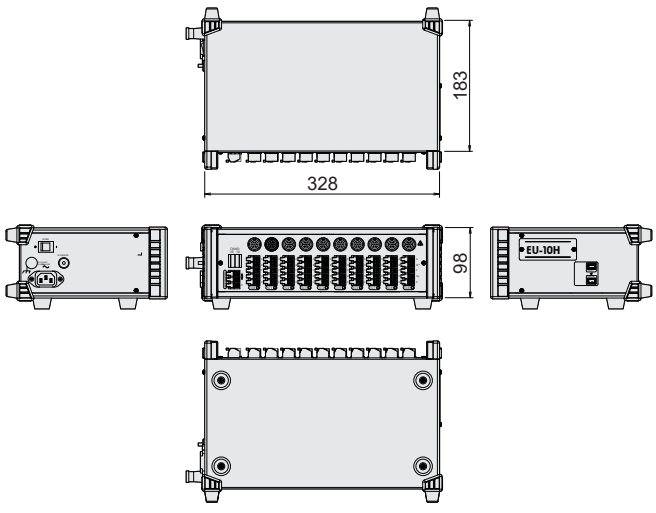
T-ZACCS UNIT EU-10H

- 1000 points per 0.1 sec at the fastest due to adoption of an ultra-high-speed field network.
- Our unique next-generation A/D method that achieves both high precision and high stability, and high-speed measurement eliminates the various thermo-electromotive forces, zero movement of the amplifier, and commercial power supply noise and realizes high-precision and high-stability measurement.
- The high-precision mode can measure 1000 points in 0.4 seconds (50 Hz) even when using the thermocouple measurement or high-resolution mode.
- A strain gauge with temperature measurement function can be measured with one channel.
- Equipped with the Complete Compensation Method of Strain (Comet).
- Various check functions (insulation check, sensitivity check, variation check, and thermocouple disconnection check).
- 10 ch space saving.
- Can be distributed to scattered measurement locations.

T-ZACCS UNIT EU-10H

This equipment is a measurement unit for expanding the number of measuring points in combination with the T-ZACCS9 TS-963/-960. With 10 measurement points, this equipment allows you to measure strain gauges, strain gauge type converters, thermocouples, platinum resistance temperature detectors, DC voltages, and other equipment. By adopting our unique next-generation A/D method that achieves both high precision and high stability and high-speed measurement, and an ultra-high-speed field network based on Ethernet, various thermo-electromotive forces, zero movement of the amplifier, and commercial power supply noise are eliminated, and high-precision and high-stability measurement are realized. At the same time, regardless of the number of measuring points, the high-speed mode can measure in 0.1 seconds, and the high-precision mode can measure in 0.4 seconds (50 Hz).

External Dimensions



Specifications

Measurement capabilities

Common to all modes		
Number of measuring points	10 points	
Input terminal	Dual-purpose type for screw fixing and soldering	
One-touch connector	NDIS one-touch connector	
Compensation mode	Comet NON, Comet A, Comet B	
Check function	At the time of measurement	Open check
	Sensor	Insulation check, sensitivity check, variation check, and thermocouple disconnection check Lead wire resistance check and bridge output check

High-speed mode

Measuring speed	0.1 seconds (0.2 seconds when using the gauge with temperature measurement)	
Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method, three-wire type	120, 240, 350 Ω
	Two-gauge method	60-1000 Ω
	Two-gauge common dummy method	60-1000 Ω
	Four-gauge method	60-1000 Ω
	Four-gauge method constant current	350 Ω
	Four-gauge method 0-2 V mode	60-1000 Ω
	Mode for gauge with temperature measurement function (One-gauge method, three-wire type)	120,240,350 Ω T (JIS C 1602:2015, IEC 60584-1:2013)
Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1 to -0.5%/ Cable round-trip resistance: 100 Ω
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
	Gauge resistance 240 Ω: About 200 Ω or less	
	Gauge resistance 350 Ω: About 300 Ω or less	
Zero stability	± 1.0 × 10^{-6} strain/°C or less (one-gauge method) ± 0.5 × 10^{-6} strain/°C or less (two-gauge method)	
Initial unbalance	± 750 × 10^{-6} strain or less (one-gauge method) ± 500 × 10^{-6} strain or less (two-gauge method)	
DC voltage measurement		
V1/1	DC±640mV	
V1/100	DC±64V	
Input impedance	1 MΩ or more	
Allowable input voltage between B and D	DC±70V MAX	
Thermocouple temperature measurement		
Applicable thermocouple	T,K,J,B,S,R,E,N JIS C1602:2015、IEC 60584-1:2013	
Platinum resistance temperature detector measurement		
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current three-wire type) JIS C 1604:2013, IEC 60751: 2008	

Strain measurement (high-speed mode)		
Bridge excitation	DC2V 4ms(50Hz)	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 80000 × 10^{-6} strain ± 160000 × 10^{-6} strain ± 320000 × 10^{-6} strain ± 640000 × 10^{-6} strain	1×10^{-6} strain 2×10^{-6} strain 4×10^{-6} strain 8×10^{-6} strain 16×10^{-6} strain
Accuracy (at 23°C ± 5°C)	± (0.08% rdg + 3 digits) (one-gauge method, two-gauge method, four-gauge method) ± (0.08%+ 6 digits) (four-gauge method 0-2 V mode)	

Constant current strain measurement (four-gauge method only) (high-speed mode)		
Bridge excitation	DC 6mA 4ms (50 Hz)	
Bridge resistance	350 Ω	
Initial value storage range	± 160000 × 10^{-6} strain	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain ± 80000×10^{-6} strain ±160000×10^{-6} strain ±320000×10^{-6} strain ±640000×10^{-6} strain	1×10^{-6} strain 2×10^{-6} strain 4×10^{-6} strain 8×10^{-6} strain 16×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.08%rdg+3digit)	

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DC voltage measurement (high-speed mode)			
Initial value storage range			
V1/1		±160.000mV	
V1/100		±16.0000V	
Temperature coefficient of accuracy		±0.0024%rdg/°C	
Aging change of accuracy		±0.024%rdg/year	
Measurement range and resolution	**V1/1**	Measurement range	Resolution
		± 40.000mV ± 80.000mV ±160.000mV ±320.000mV ±640.000mV	0.001mV 0.002mV 0.004mV 0.008mV 0.016mV
	V1/100	± 4.0000V ± 8.0000V ±16.0000V ±32.0000V ±64.0000V	0.0001V 0.0002V 0.0004V 0.0008V 0.0016V
Accuracy (at 23°C ± 5°C) With moving averaging	**V1/1**	±(0.08%rdg+6digit)	
	V1/100	±(0.08%rdg+6digit)	
Accuracy (at 23°C ± 5°C) Without moving averaging	**V1/1**	±(0.08%rdg+50digit)	
	V1/100	±(0.08%rdg+50digit)	

Platinum resistance temperature detector temperature measurement (JIS C 1604:2013, IEC 60751:2008 Pt100) (high-speed mode)	
Applicable resistance temperature detector	Pt100
Measurement Method	Three-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	± 0.0020% rdg/°C
Aging change of accuracy	± 0.05% rdg/year
Measurement range	-200 to +850°C
Resolution	0.1°C
Accuracy (at 23°C ± 5°C)	± (0.1% rdg + 0.3°C)

Thermocouple temperature measurement (JIS C 1602:2015, IEC 60584-1:2013) (high-speed mode)

Applicable thermocouple	T, K, J, B, S, R, E, N
Linearization	Digital calculation

Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
T	- 250 to - 200°C - 200 to - 100°C - 100 to 0°C 0 to + 400°C	0.1°C 0.1°C 0.1°C 0.1°C	±(0.31%rdg+1.9°C) ±(0.14%rdg+0.8°C) ±(0.11%rdg+0.5°C) ±(0.08%rdg+0.4°C)	±(0.31%rdg+5.2°C) ±(0.14%rdg+2.1°C) ±(0.11%rdg+1.2°C) ±(0.08%rdg+0.9°C)
K	- 210 to - 160°C - 160 to 0°C 0 to + 960°C + 960 to +1370°C	0.1°C 0.1°C 0.1°C 0.1°C	±(0.17%rdg+0.9°C) ±(0.12%rdg+0.6°C) ±(0.09%rdg+0.4°C) ±(0.10%rdg+0.9°C)	±(0.17%rdg+2.5°C) ±(0.12%rdg+1.5°C) ±(0.09%rdg+0.9°C) ±(0.10%rdg+1.5°C)
J	- 200 to - 160°C - 160 to 0°C 0 to + 700°C + 700 to +1200°C	0.1°C 0.1°C 0.1°C 0.1°C	±(0.15%rdg+0.6°C) ±(0.11%rdg+0.4°C) ±(0.09%rdg+0.3°C) ±(0.09%rdg+0.6°C)	±(0.15%rdg+1.8°C) ±(0.11%rdg+1.3°C) ±(0.09%rdg+0.8°C) ±(0.09%rdg+1.0°C)
B	+ 200 to + 280°C + 280 to + 800°C + 800 to +1760°C	0.5 to 0.4°C 0.3 to 0.1°C 0.1°C	±(0.03%rdg+6.0°C) ±(0.03%rdg+2.4°C) ±(0.04%rdg+2.6°C)	±(0.03%rdg+6.0°C) ±(0.03%rdg+2.4°C) ±(0.04%rdg+2.6°C)
S	- 10 to + 200°C + 200 to +1760°C	0.1°C 0.1°C	±(0.06%rdg+2.4°C) ±(0.05%rdg+0.4°C)	±(0.06%rdg+3.1°C) ±(0.05%rdg+2.0°C)
R	- 10 to + 150°C + 150 to +1760°C	0.1°C 0.1°C	±(0.06%rdg+2.4°C) ±(0.05%rdg+1.5°C)	±(0.06%rdg+3.1°C) ±(0.05%rdg+1.8°C)
E	- 210 to + 550°C + 550 to +1000°C	0.1°C 0.1°C	±(0.16%rdg+0.6°C) ±(0.09%rdg+0.4°C)	±(0.16%rdg+2.0°C) ±(0.09%rdg+0.9°C)
N	- 200 to 0°C 0 to +1090°C +1090 to +1300°C	0.1°C 0.1°C 0.1°C	±(0.11%rdg+1.3°C) ±(0.09%rdg+0.5°C) ±(0.06%rdg+0.9°C)	±(0.11%rdg+2.7°C) ±(0.09%rdg+1.0°C) ±(0.06%rdg+1.3°C)

* The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

High-precision mode

Measuring speed	0.4 sec (50 Hz) / 0.34 sec (60 Hz) (0.8 sec when using gauge with temperature measurement) (50 Hz) / 0.67 sec (60 Hz)	
Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method, three-wire type	120, 240, 350 Ω
	Two-gauge method	60-1000 Ω
	Two-gauge common dummy method	60-1000 Ω
	Four-gauge method	60-1000 Ω
	Four-gauge method constant current	350 Ω
	Four-gauge method high-resolution mode	120-1000 Ω
	Four-gauge method constant current high-resolution mode	350 Ω
	Four-gauge method 0-2 V mode	60～1000 Ω
	Mode for gauge with temperature measurement function (One-gauge method, three-wire type)	120,240,350Ω T（JIS C1602:2015、IEC 60584-1:2013）
Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
	Four-gauge method constant current high-resolution: 350 Ω	Cable round-trip resistance: 160 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1 to -0.5% / Cable round-trip resistance: 100 Ω
	Four-gauge method constant current high-resolution: 350 Ω	
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
	Gauge resistance 240 Ω: About 200 Ω or less	
	Gauge resistance 350 Ω: About 300 Ω or less	
Zero stability	±1.0 × 10^{-6} strain/°C or less (one-gauge method) ± 0.5 × 10^{-6} strain/°C or less (two-gauge method)	
Initial unbalance	± 750 × 10^{-6} strain or less (one-gauge method) ± 500 × 10^{-6} strain or less (two-gauge method)	
DC voltage measurement		
V1/1	DC±640mV	
V1/100	DC±64V	
Input impedance	1MΩ以上	
Allowable input voltage between B and D	DC±70V MAX	
Thermocouple temperature measurement		
Applicable thermocouple	T,K,J,B,S,R,E,N JIS C1602:2015、IEC 60584-1:2013	
Platinum resistance temperature detector measurement		
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current 3-wire type) JIS C 1604:2013, IEC 60751: 2008	

Strain measurement (high-precision mode)		
Bridge excitation	DC2V 24ms(50Hz)	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain ± 80000×10^{-6} strain ±160000×10^{-6} strain ±320000×10^{-6} strain ±640000×10^{-6} strain	1×10^{-6} strain 2×10^{-6} strain 4×10^{-6} strain 8×10^{-6} strain 16×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+1digit)	

Constant current strain measurement (four-gauge method only) (high-precision mode)		
Bridge excitation	DC 6 mA 24 ms (50 Hz)	
Bridge resistance	350 Ω	
Initial value storage range	± 160000 × 10^{-6} strain	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain ± 80000×10^{-6} strain ±160000×10^{-6} strain ±320000×10^{-6} strain ±640000×10^{-6} strain	1×10^{-6} strain 2×10^{-6} strain 4×10^{-6} strain 8×10^{-6} strain 16×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+1digit)	

High-resolution strain measurement (four-gauge method only) (high-precision mode)		
Bridge excitation	DC5V 24ms(50Hz)	
Initial value storage range	±16000.0×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0×10^{-6} strain	0.1×10^{-6} strain
	± 8000.0×10^{-6} strain	0.2×10^{-6} strain
	±16000.0×10^{-6} strain	0.4×10^{-6} strain
	±32000.0×10^{-6} strain	0.8×10^{-6} strain
	±64000.0×10^{-6} strain	1.6×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+3digit)	

High-resolution strain measurement (four-gauge method only) (high-precision mode)		
Bridge excitation	DC14mA 24ms(50Hz)	
Bridge resistance	350Ω	
Initial value storage range	±16000.0×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0×10^{-6} strain	0.1×10^{-6} strain
	± 8000.0×10^{-6} strain	0.2×10^{-6} strain
	±16000.0×10^{-6} strain	0.4×10^{-6} strain
	±32000.0×10^{-6} strain	0.8×10^{-6} strain
	±64000.0×10^{-6} strain	1.6×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+3digit)	

DC voltage measurement (high-precision mode)			
Initial value storage range			
V1/1		±160.000mV	
V1/100		±16.0000V	
Temperature coefficient of accuracy		±0.0024%rdg/°C	
Aging change of accuracy		±0.024%rdg/year	
Measurement range and resolution		Measurement range	Resolution
	V1/1	± 40.000mV	0.001mV
		± 80.000mV	0.002mV
		±160.000mV	0.004mV
		±320.000mV	0.008mV
		±640.000mV	0.016mV
	V1/100	± 4.0000V	0.0001V
		± 8.0000V	0.0002V
		±16.0000V	0.0004V
		±32.0000V	0.0008V
		±64.0000V	0.0016V
V1/1 accuracy (at 23°C ± 5°C)		± (0.05% rdg + 3 digits)	
V1/100 accuracy (at 23°C ± 5°C)		± (0.05% rdg + 2 digits)	

Platinum resistance temperature detector temperature measurement (JIS C 1604:2013, IEC 60751:2008 Pt100) (high-precision mode)	
Applicable resistance temperature detector	Pt100
Measurement Method	Three-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	± 0.0020% rdg/°C
Aging change of accuracy	± 0.05% rdg/year
Measurement range	-200 to +850°C
Resolution	0.1°C
Accuracy (at 23°C ± 5°C)	± (0.05% rdg + 0.3°C)

Thermocouple temperature measurement (JIS C 1602:2015, IEC 60584-1:2013) (high-precision mode)				
Applicable thermocouple	T, K, J, B, S, R, E, N			
Linearization	Digital calculation			
Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
T	- 250 to - 200°C	0.1°C	±(0.19%rdg+0.5°C)	±(0.19%rdg+3.8°C)
	- 200 to - 100°C	0.1°C	±(0.09%rdg+0.2°C)	±(0.09%rdg+1.6°C)
	- 100 to + 400°C	0.1°C	±(0.06%rdg+0.2°C)	±(0.06%rdg+0.9°C)
K	- 210 to - 160°C	0.1°C	±(0.11%rdg+0.3°C)	±(0.11%rdg+1.8°C)
	- 160 to 0°C	0.1°C	±(0.08%rdg+0.2°C)	±(0.08%rdg+1.1°C)
	0 to + 960°C	0.1°C	±(0.06%rdg+0.1°C)	±(0.06%rdg+0.7°C)
	+ 960 to +1370°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.2°C)
J	- 200 to - 160°C	0.1°C	±(0.09%rdg+0.2°C)	±(0.09%rdg+1.4°C)
	- 160 to 0°C	0.1°C	±(0.07%rdg+0.1°C)	±(0.07%rdg+1.0°C)
	0 to + 700°C	0.1°C	±(0.05%rdg+0.1°C)	±(0.05%rdg+0.6°C)
	+ 700 to +1200°C	0.1°C	±(0.06%rdg+0.4°C)	±(0.06%rdg+0.8°C)
B	+ 200 to + 280°C	0.5 to 0.4°C	±(0.03%rdg+1.5°C)	±(0.03%rdg+1.5°C)
	+ 280 to + 800°C	0.3 to 0.1°C	±(0.03%rdg+0.6°C)	±(0.03%rdg+0.6°C)
	+ 800 to +1760°C	0.1°C	±(0.04%rdg+0.4°C)	±(0.04%rdg+0.4°C)
S	- 10 to + 200°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.3°C)
	+ 200 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+0.8°C)
R	- 10 to + 150°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.3°C)
	+ 150 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+0.8°C)
E	- 210 to + 550°C	0.1°C	±(0.10%rdg+0.2°C)	±(0.10%rdg+1.6°C)
	+ 550 to +1000°C	0.1°C	±(0.06%rdg+0.3°C)	±(0.06%rdg+0.7°C)
N	- 200 to 0°C	0.1°C	±(0.11%rdg+0.4°C)	±(0.11%rdg+1.8°C)
	0 to +1090°C	0.1°C	±(0.05%rdg+0.2°C)	±(0.05%rdg+0.7°C)
	+1090 to +1300°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+0.9°C)

* The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

Connection with data logger

Number of connectable units	Up to 100 units can be connected (Including those built into TS-960/-963)
Extension distance	100 m (between devices)
Connection cable	Connection cable for the EX (CR-89**)

Power supply

Power supply voltage	AC 100 to 240 V 50/60Hz
Maximum power consumption	86 VA max

Environment

Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)

Standard accessories

AC power cable (CR-03) 1
Ground wire (CR-20) 1
Vinyl cover 1
Connection cable for the EX (CR-892M) 1
Warranty certificate 1

Related Products

SB-OT1B one-touch terminal

This terminal block allows one-touch connection of input lead wires. It is used by attaching to the input terminal of the switch box. (One set of five terminals)

Connection cable for the EX CR-89XX

This is a cable for connecting the TS-963/-960 data logger to the T-ZACCS BOX/T-ZACCS UNIT and for connecting each BOX and UNIT to each other.
CR-892M (2 m), CR-895M (5 m), CR-8901 (10 m),
CR-8902 (20 m), CR-8905 (50 m), CR-8910 (100 m)

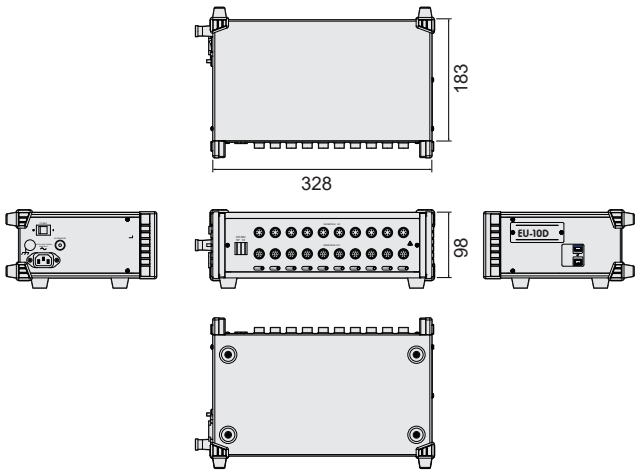
T-ZACCS UNIT EU-10D

- Digital displacement sensors can be measured in combination with the T-ZACCS9 TS-963/-960.
- Two types of digital displacement sensors are supported.
- There is no signal degradation since this equipment handles digital signals.
- This equipment can be used in combination with other T-ZACCS BOX and/or T-ZACCS UNIT devices.

T-ZACCS UNIT EU-10D

This equipment is a digital displacement sensor measurement unit in combination with the T-ZACCS9 TS-963/-960. The measurement of the digital displacement sensor can be performed with 10 measurement points.
This equipment can perform high-speed measurement regardless of the number of measurement points by performing our original high-precision and high-stable measurement and by adopting an ultra-high-speed field network based on the Ethernet.

External Dimensions



Specifications

Function

Number of measuring points	10 points		
Supported digital displacement sensors		Sensor A (5V)	Sensor B (12V)
	Compatible connector	R03-PB6M (Manufactured by Tajimi)	R03-PB8M (Manufactured by Tajimi)
	Sensor power supply	4.5-5.5V (100mA)	11.4-12.6V (50mA)
	Pin assignment	A: Phase A B: Phase B C: +5V D: NC E: GND F: GND	A: GND B: Phase A C: +12V D: Phase B E: NC F: Shield G: NC H: NC
Input signal	Rectangular wave voltage input		
Counting method	Up/down counting by phase difference of phase A + phase B		
Measurement range	± 640000 integrated counting		
Measuring speed	0.1 seconds		
Measurement accuracy	Depending on the digital displacement sensor used		
Measurement resolution	Depending on the digital displacement sensor used		
Quantization error	±1 count		
Counter reset	When the power is turned ON／ Full count		

Connection with data logger

Number of connectable units	Up to 100 units can be connected (Including those built into data logger)
Extension distance	100 m (between devices)
Connection cable	Connection cable for the EX (CR-89**)

Power supply

Power supply voltage	AC 100 to 240 V 50/60 Hz
Maximum power consumption	86 VA max

Environment

Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)

Others

Outside dimension	3328 (W) × 98 (H) × 183 (D) mm (Excluding rubber protectors and protrusions)
Mass	Approx. 3 kg

Standard accessories

- AC power cable (CR-03) 1
- Ground wire (CR-20) 1
- Vinyl cover 1
- Connection cable for the EX (CR-892M) 1
- Warranty certificate 1

T-ZACCS + EI-01P (switch box protocol converter)

- Measurement with the ISW-50G/IHW-50G switch box is possible.
- No special settings are required for ease of use.

T-ZACCS + EI-01P

This equipment is a protocol converter connected to the T-ZACCS9 TS-963/-960 to operate the ISW-50G/IHW-50G switch box. This equipment can operate one switch box.

Specifications

Connection with data logger

Target model	TS-960/-963
Number of connectable units	Up to 20 units (in total including EX-50H)
Extension distance	100 m (between devices)
Connection cable	Connection cable for the EX (CR-89**)

Connection with switch box

Target model		IHW-50G、ISW-50G
ELECTRICAL (RS-422)	**Number of connectable units**	1 unit, 50 points
	Extension distance	2 m
	Connection cable	Extension cable for the ISW/IHW (CR-832M)

Display / operation

POWER LED	Lights up with the power is ON
SYSTEM LED	LED indicating system errors (Normal state: Lights off ISW-50G/IHW-50G connected state: Blinking in red Error state: Lighting in red)

Power supply

Power supply voltage	AC 100 to 240 V 50/60 Hz
Maximum power consumption	12 VA max

Environment

Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)

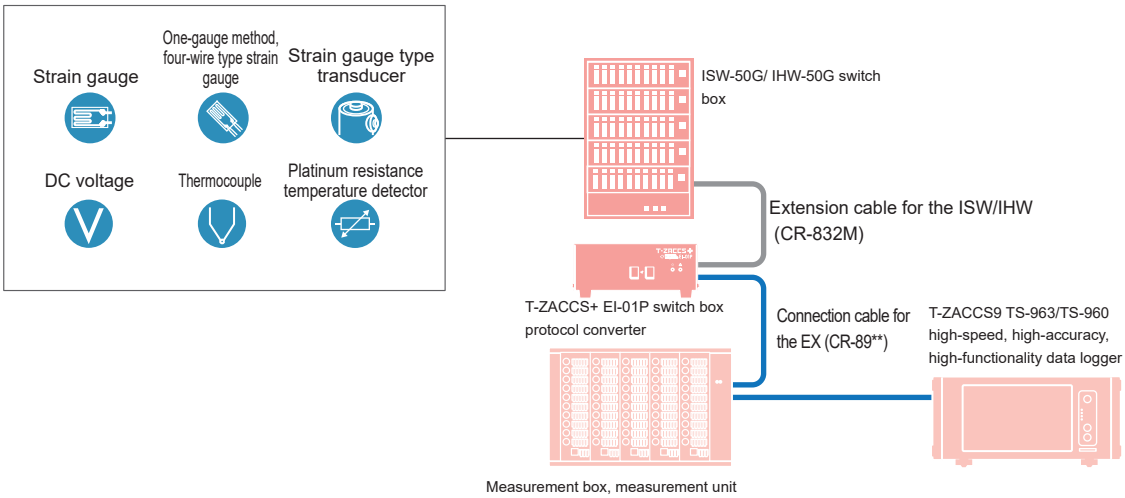
Others

Outside dimension	160 (W) × 60 (H) × 171.5 (D) mm (Excluding protrusions)
Mass	Approx. 1 kg

Standard accessories

AC power cable (CR-03) 1
Ground wire (CR-20) 1
Connection cable for the EX (CR-892M) 1
Warranty certificate 1

System Block Diagram



T-ZACCS + EE-00R repeater

NEW

- The communication distance between devices of 100 m can be further extended by 100 m.
- No special settings are required and easy to use.

T-ZACCS + EE-00R repeater

This equipment is a repeater that is connected between the T-ZACCS 9 and T-ZACCS BOX/T-ZACCS UNIT or between the T-ZACCS BOX/T-ZACCS UNIT and T-ZACCS BOX/T-ZACCS UNIT to extend the communication distance. By using this equipment, the communication distance between devices of 100 m can be further extended by 100 m.

Specifications

Connection with data logger

Target model	T-ZACCS9 T-ZACCS BOX/T-ZACCS UNIT
Number of connectable units	Up to 100 units * Each additional unit disables the use of 10 channels.
Extension distance	100 m (between devices)
Connection cable	Connection cable for the EX (CR-89**)

Display

Power LED	Lights up with the power is ON
Error LED	Shows error indication.

Power supply

Rated power supply voltage	AC 100 to 240 V 50/60Hz
Maximum power consumption	12 VA max

Environment

Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)

Others

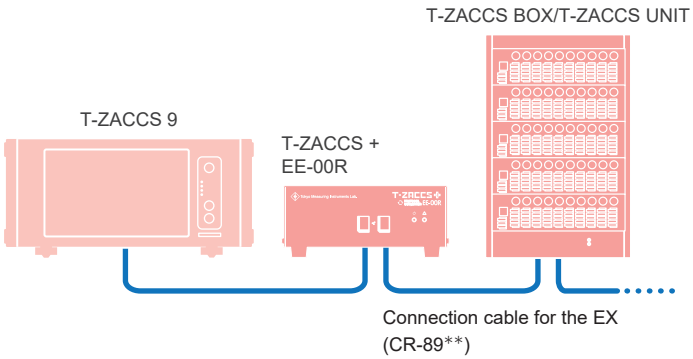
Outside dimension	160 (W) × 60 (H) × 171.5 (D) mm (Excluding protrusions)
Mass	Approx. 1kg

Standard accessories

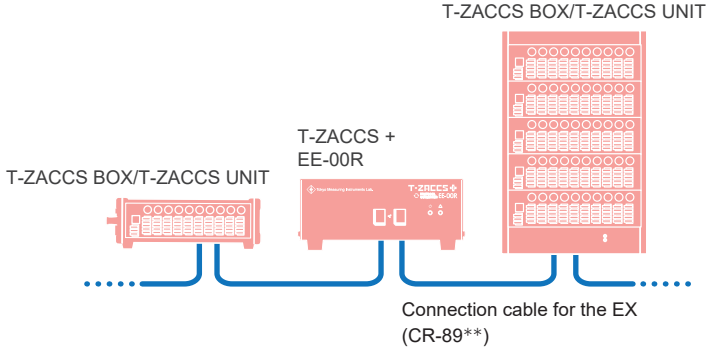
C power cable (CR-03) 1
Ground wire (CR-20) 1
Connection cable for the EX (CR-892M) 1
Warranty certificate 1

System Block Diagram

■ When connected between the T-ZACCS 9 and T-ZACCS BOX/T-ZACCS UNIT



■ When connected between the T-ZACCS BOX/T-ZACCS UNIT



TS-560

T-ZACCS 5

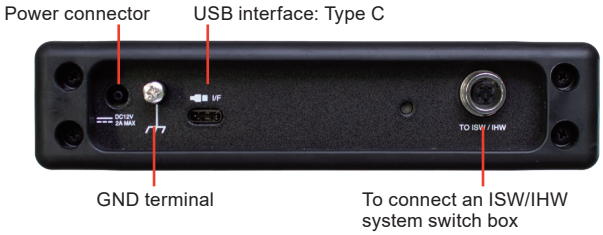
- Secure data retention by robust built-in data memory
- Realization of stable interval measurement with a clock accuracy of ±1 second per day
- Collective setting of coefficient, unit, decimal point and sensor type by “Sensor ID”
- Equipped with interval measurement “Quick Interval” that requires no settings
- Equipped with “Remote Data Logger” that enables remote operation from an Internet browser
- The maximum number of measurement points is 1000 (using external switch boxes)
- Equipped with the Complete Compensation Method of Strain
- Various check functions (Automatic check by a timer is possible)
- Color LCD monitor with touch panel
- Equipped with automatic measurement function using interval timer and monitor comparator
- Supports SD card and USB memory as recording media
- Equipped with LAN, USB, and RS-232C as standard
- Can be used with built-in battery even when external power supply is cut off

TS-560 data logger

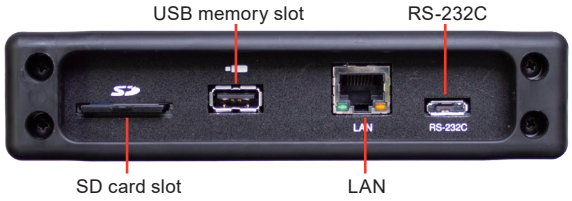
This equipment is a data logger that can easily perform multi-point measurements when combined with the high-speed IHW-50G switch box or the ISW-50G switch box. It is possible to measure up to 1000 points depending on the user application, including strain gauges, strain gauge type transducers, DC voltages, thermocouples, platinum resistance temperature detectors, and other equipment. Since this data logger is smaller and lighter than conventional ones, it can be used in a variety of measurement situations. It employs a color LCD monitor with touch panel and provides clear monitor display and comfortable, intuitive operability to enable monitoring of measurement data and quick checking and verification after measurement.

Side interface

● Right side



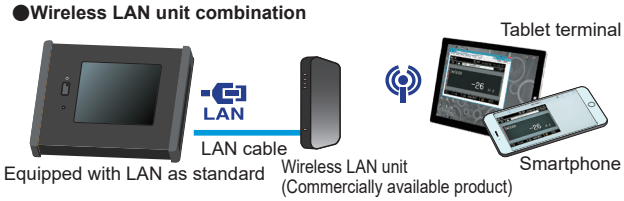
● Left side



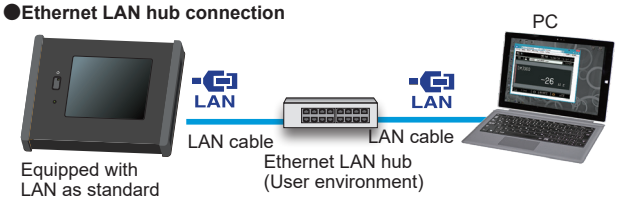
Remote data logger function

Remote operation according to the user communication mode
Equipped with Web server function (remote data logger function). Measurement and monitoring with the TS-560 can be performed from an Internet browser. No special software is required.

●Wireless LAN unit combination



●Ethernet LAN hub connection



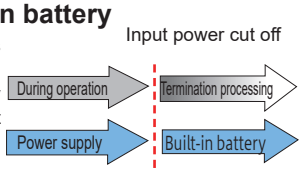
File download using remote data logger function
During remote operation, measurement data files recorded by the equipment in a data memory or SD card can be downloaded (transferred) to a PC or tablet. It is also possible to select multiple files.
*Files saved on a USB memory device cannot be downloaded.

TS-560

Data protection

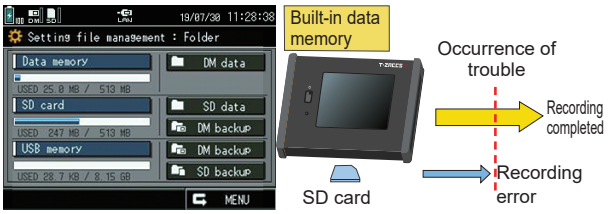
● Equipped with a built-in battery

Even if the external input power is suddenly cut off while accessing a file, file corruption can be prevented by continuing to supply power without power interruptions.



● Data backup function

Although an SD card is used to record measurement data, the highly durable and reliable built-in data memory ensures data backup even when the SD card fails.



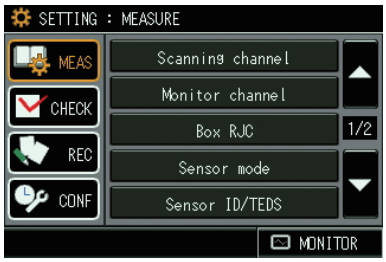
The SD cards designated by us have a long data retention period (about 10 years) and are dedicated for industrial applications suitable for measurements with frequent writing.
USB memory devices are used for data copying and reproduction.

Touch panel display

The display is a color LCD display with a touch panel that is easy to see and intuitive to use. It also supports display in Japanese and English.

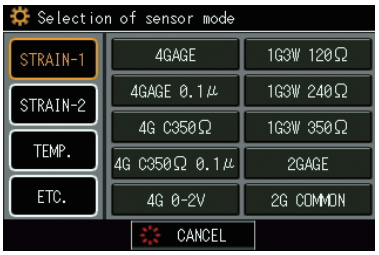
● Setting Menu

Measurement:
Sensor mode, scan channel, sensor ID, etc.
Check:
Check, output of setting list, list output of automatic measurement setting, etc.
Recording:
File management, file output, interface selection, etc.
Configuration:
Date/time, measurement environment, version upgrade, factory setting, etc.



● Sensor mode selection

Strain-1:
4 GAGE/4 GAGE 0.1 μ/1G3W/
4 G C350 Ω / 4G C350 Ω 0.1 μ / other
Strain-2:
1G4W 120 Ω, 240 Ω, 350 Ω
1G3W 120 Ω -T, 240 Ω -T, 350 Ω -T
Temperature:
T (CC)/K (CA)/J (IC)/B/S/R/N/E (CRC)/Pt100 3W
Other:
DC 640 mV/DC 64 V/JUMP



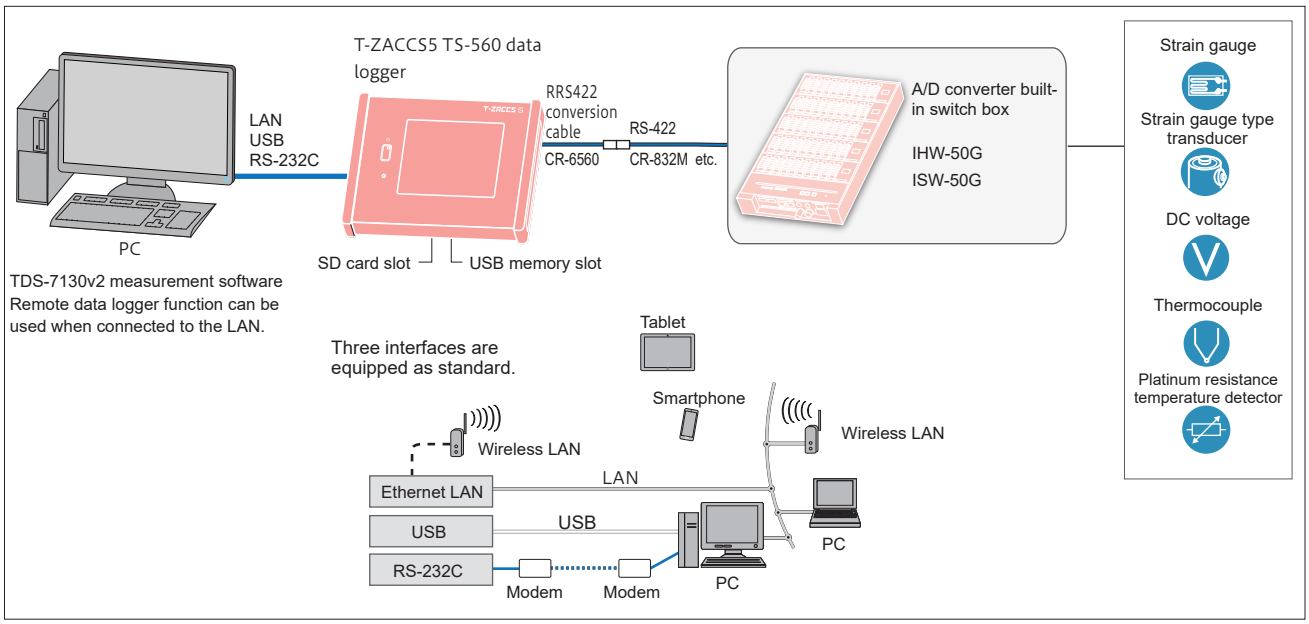
● Sensor ID setting

The sensor ID (parameter) can be saved. Parameters of coefficient, unit, display digit, and sensor type can be set collectively. For example, when replacing some of the connected sensors, the setting of new measurement is completed by simply reading out the saved sensor IDs and updating only the relevant parameters.

Specifications

Measurement capabilities		
Number of measuring points		Up to 1000 points (Up to 2000 points when using strain gauge with temperature measurement function)
Measuring speed	IHW-50G	0.4 sec / 1000 points (1 sec/1000 points)
	ISW-50G	2 sec / 1000 points (3 sec/1000 points)
Measuring mode		Initial, direct, measure (For temperature measurement, direct only)
Simple measure		Coefficient 1.000 Unit Interlocked with sensor mode Decimal point Interlocked with sensor mode
Compensation mode		Comet NON, Comet A, Comet B
Measuring point switching method	Scanning	Automatic switching measurement from the first channel to the last channel (jump possible)
	Monitor	Repeated measurement of monitor channels (up to 10 points)
Scanning measurement start	Manual	START button (Monitor screen)
	Automatic	Interval timer, monitor comparator
	Interface	LAN, USB, RS-232C
Channel setting	Coefficient	± (0.0001-99999)
	Unit	40 types including μE, mV, °C, kgf, mm
	Decimal point	Display after the decimal point can be set arbitrarily with 0 to 5 digits
	Offset	To be written by arbitrarily measurement channel
	Sensor mode	Jump

System Block Diagram



Measurement capabilities				
Channel setting	Sensor mode		Strain	One-gauge method three-wire type, 120 / 240 / 350 Ω
				One-ga8uge method four-wire type, 120 / 240 / 350 Ω
				Two-gauge common dummy method, two-gauge method
				Four-gauge method, four-gauge method constant current 350 Ω
				Four-gauge method high-resolution mode
				Four-gauge method constant current 350 Ω high-resolution mode
				Four-gauge method 0-2 V mode
				Gauge with temperature measurement 120 / 240 / 350 Ω
			DC voltage 640 mV, 64 V	
			Temperature	Thermocouple T/K/J/B/S/R/E/N
				Platinum resistance temperature detector Pt100 3W
Sensor ID TEDS function	Sensor ID	Function	Reading and setting of sensor ID Writing of sensor ID	
	TEDS	Standard	IEEE 1451.4 Class 2 compatible (Template No. 33)	
		Function	Sensor information reading and setting	
Check function	At the time of measurement		Open check	
	Sensor		Insulation check, sensitivity check, variation check, thermocouple disconnection check, lead wire resistance check, bridge output check	

Interval timer		
Function		Scanning measurement at the set time interval and time
Quick setting	Time interval	1 min / 10 min / 1 hr (measured on the minute or hour)
Table setting	Time interval	Hour / minute / second can be set for each step up to 99 hours, 59 minutes, and 59 seconds.
	Real time start	Start time (day / hour / minute / second) can be set for each step.
	Number of starts	Up to 99 times per step or infinite
	Number of steps	Programmable up to 50 steps
	GOTO step	Program loop possible to one of the previous steps
	GOTO comparator	Go to Step 1 of the monitor comparator.
	Execution processing	Scanning, insulation check, sensitivity check, variation check, thermocouple disconnection check
Sleep function		When the interval between the end of scanning and the start of scanning is 1 min or longer, the power is turned on/OFF automatically.

Monitor comparator		
Function		Automatic measurement based on the amount of change in the setting of monitor channel (1 point)
Table setting	Comparison amount	Can be set for each step: Up to ±999999
	Comparison method	Amount of change or upper / lower limit
	Number of starts	Up to 99 times per step or infinite
	Number of steps	Programmable up to 50 steps
	GOTO step	Program loop possible to one of the previous steps
	GOTO Interval	Go to Step 1 of the interval.

Remote data logger function	
Function	Remote operation of data logger, remote monitoring, and data download function by the Web server function
Connection	LAN
File download	Download (transfer) of the measurement data files (multiple files can be selected) in the data memory or SD card to a PC or tablet in the ZIP format

Time	
Setting	Year, month, day, hour, minute, second
Accuracy	Daily error: ±1 sec (at 23°C ± 5°C)

Display / operation	
Display unit	Color TFT LCD display (with a touch panel), 320 x 240 dots
	Point defect: 10 dots or less (excluding aging deterioration)
Operation	Touch panel, POWER key
Automatic backlight OFF	When no command is received from the operation / interface for an arbitrary set time, the LCD backlight is turned OFF automatically. Automatic backlight OFF function can be set to ON/OFF

Recording		
Built-in	Function	Recording / reproduction of measurement data, saving of setting file
	Recording format	TDS format, CSV format 540 CSV format
	Capacity	512 MB
SD card	Function	Recording / reproduction / copying of measurement data, Saving / copying of setting file Writing / reading of sensor ID
	Physical format	FAT16/32
	Recording format	TDS format, CSV format 540 CSV format
	Capacity	512 MB (Designated by us)
USB memory	Function	Reproduction / copying of measurement data, Saving / copying of setting file Writing / reading of sensor ID
	Physical format	FAT16/32

Interface	
LAN	10BASE-T/100BASE-TX General-purpose command port server function (various settings, measurement, data collection) Web server function (remote data logger function)
USB	USB 2.0 protocol compatible (Connection terminal: USB Type-C) General-purpose command compatible (various settings, measurement, data collection)
RS-232C	USB 2.0 protocol compatible (Connection terminal: USB Type-C) General-purpose command compatible (various settings, measurement, data collection)

ISW/IHW switch box	
Measurement accuracy	Depends on switch box specifications
Target model	IHW-50G/ISW-50G
Number of connectable units	20 units connected（1000 points）
Extension distance	800 m (between devices)
Connection cable	CR-832M (when using CR-6560)

* The first switch box connection interface supports only ELECTRICAL (RS-422).

Internal power supply	
Internal battery	Lithium-ion battery
Battery capacity	2450 mAh
Continuous use time	About 1 hr (Temperature: 23°C ± 5°C, when the IHW-50G is connected)
Charging time	About 3 hr (standby) (when using CR-1867)

Power supply	
Rated power supply voltage	AC adapter (CR-1867) AC 100 to 240 V 50/6 0 Hz
Maximum power consumption	2A MAX（DC12V）

Environment		
Operating temperature / humidity range	0 to +50°C	85% RH or less (No condensation)
Charging temperature / humidity range	0 to +40°C	85% RH or less (No condensation)

Other	
Outside dimension	200 (W) × 30 (H) × 150 (D) mm (Excluding protrusions)
Mass	Approx. 1 kg

Standard accessories

Instruction Manual (CD) 1
AC adapter (CR-1869)..... 1
RS422 conversion cable (CR-6560) 1
Ground wire (CR-2020) 1
Warranty certificate 1

Options

DC Power Cable (CR-062)

TS-560

Related Products

SD card 512 MB

Be sure to use highly durable industrial SD cards designated by us.

RS-232C cable CR-5532

This is a D-sub 9P 10P (small) cross 1.5 m cable to be used to connect to a PC.

Measurement software Visual LOG

Visual LOG TDS-7130v2 static measurement software
Visual LOG Light TDS-700L interval measurement software
Visual LOG Light TDS-Mail data mail management software

IHW-50G high-speed switch box

This equipment is a switch box with built-in A/D converter (parallel operation compatible) that enables high-speed and high-accuracy measurements. High-speed measurement of 50 points in 0.4 sec is possible. In a system using multiple units of this equipment, even strain measurements of 1000 points can be performed in 0.4 sec. An insulated RS-422 is used to connect to the TS-560 main unit.

ISW-50G switch box

This equipment is a switch box with a built-in A/D converter that enables high-speed and high-accuracy measurements. Measurement of 50 points in 2 sec is possible. In a system using multiple units of this equipment, even strain measurements of 1000 points can be performed in 2 sec. An insulated RS-422 is used to connect to the TS-560 main unit.

Comparison of functions of major compatible switch boxes

Switch box model	Number of measuring points	Connector combined use	Strain	Constant current mode	High-resolution mode	DC voltage	Thermocouple	Platinum resistance temperature detector	Built-in lightning arrester	Scanning speed (measurement time*1)	one-gauge method four-wire type*2	Switching method	Application
IHW-50G	50	-	●	●	●	●	●	●	●	0.4 sec / 1000 points (0.04 sec/point) (1 sec)	●	Semiconductor relay	Strain / temperature of gage with temperature measurement function, 1 ch
IHW-50G-05		●											
ISW-50G	50	-	●	●	●	●	●	●	●	2 sec / 1000 points (0.04 sec/point) (3 sec)	●	Semiconductor relay	Strain / temperature of gage with temperature measurement function, 1 ch measurement function compatible
ISW-50G-05		●											

*1: The scanning time includes the time for data logger recording, interface output, etc.
*2: One-gauge method four-wire type: In addition to the one-gauge method four-wire type unit option (code: HF) built into the main unit, a switch box equipped with the same function can also be used.

TS-360 (Portable data logger)

NEW T-ZACCS 3

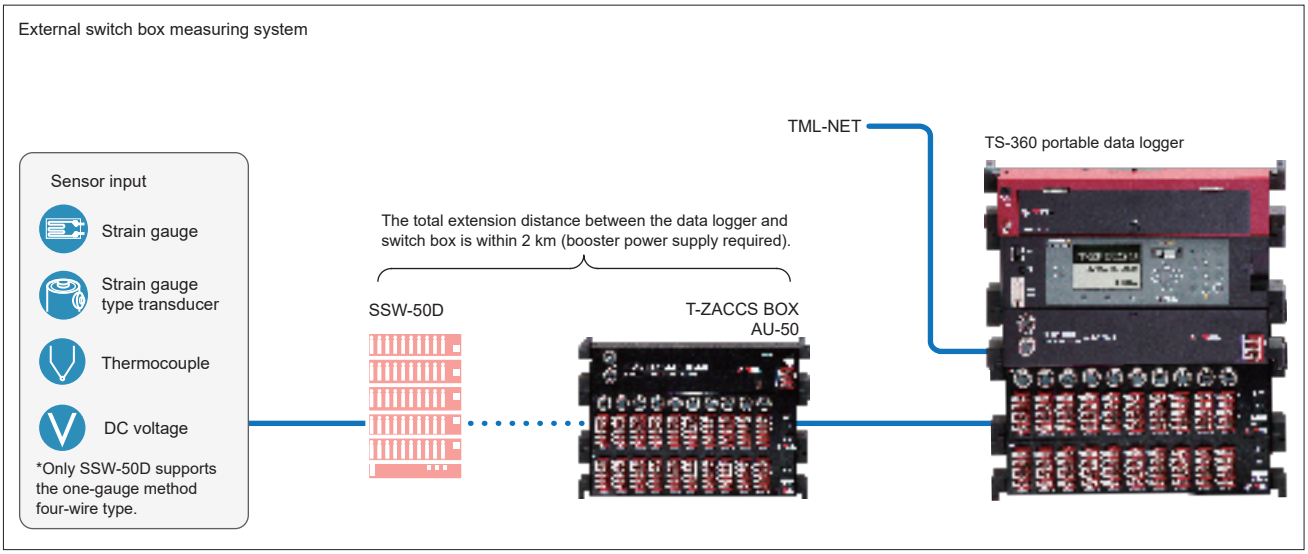
- The number of measurement points is up to 50 when the main unit and channel unit are combined, and up to 1000 points by connecting external switch boxes.
- Can be powered by 4D size batteries, the dedicated AC adapter (optional), an external battery (12 VDC), etc.
- LAN, USB and RS-232C interfaces are equipped as standard.
- A remote measurement assistance function for LAN communication is available.
- The channel unit can also be utilized as an external switch box when combined with AU-50M master unit sold separately.
- SSW-50D can also be connected.
- Recording is performed using the built-in data memory (16 GB) and/or an external SD card (16 GB).
- Network modules can be connected.

TS-360 portable data logger

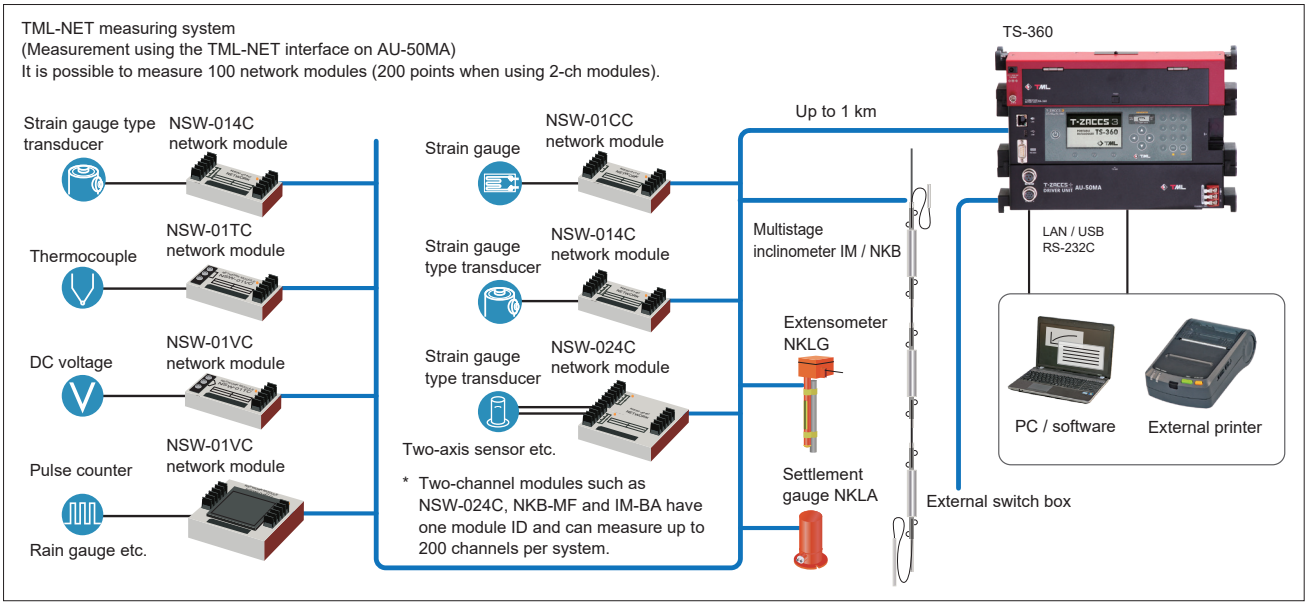
This product is a portable data logger that can measure a strain gauge, strain gauge converter, DC voltage and thermocouple by combining a control unit, battery unit, driver unit, and channel unit.
Each channel unit can connect 10 measurement points and up to five units (50 measurement points) can be connected. In addition, by connecting external switch boxes, it is possible to measure up to 1000 points.
This product can be operated using commercially available D size batteries or a battery even in places where AC power is unavailable.

It is equipped with a large capacity built-in data memory and sleep interval timer function that enable automatic measurement over a long period of time. It is also possible to record and save the measurement data and setting files on an SD card. LAN, USB and RS-232C are equipped as standard for communication interfaces to allow various settings and data to be imported from a PC. As for LAN communication, a remote measurement assistance function is available, and the risk of communication error is reduced when building a remote communication system with this product.

System Block Diagram

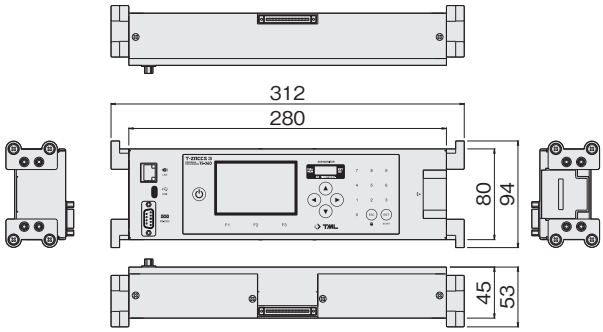


TS-360 (Portable data logger)

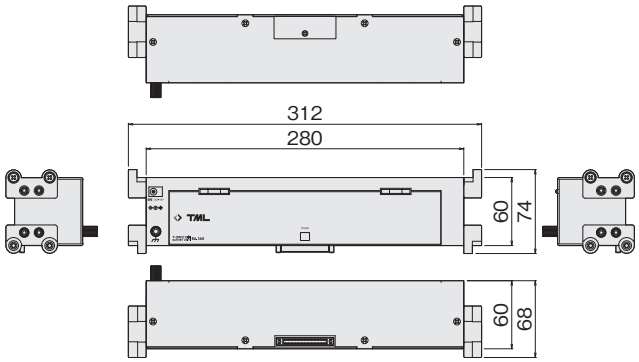


External Dimensions

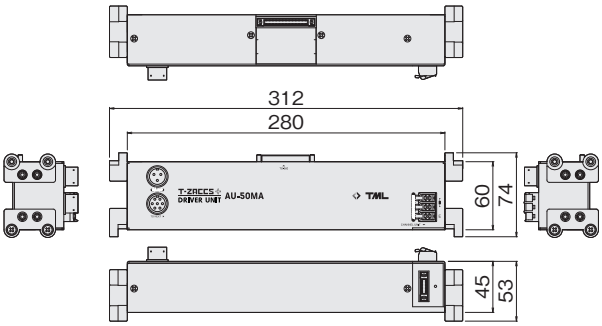
T-ZACCS3 TS-360 control unit



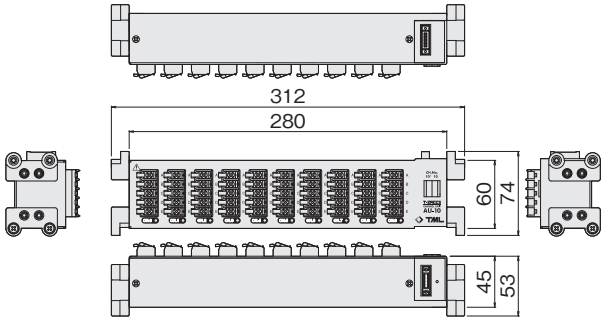
T-ZACCS+ BA-360 battery unit



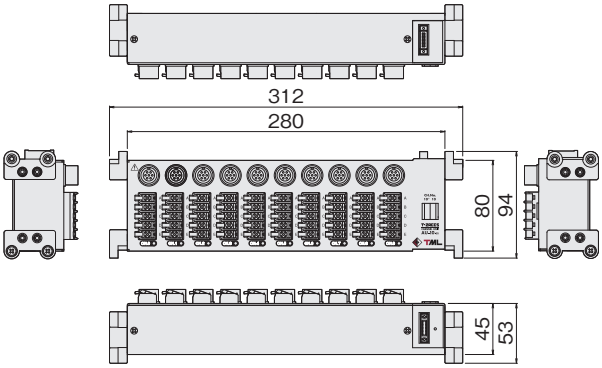
T-ZACCS+ AU-50MA driver unit



T-ZACCS UNIT AU-10 channel unit



T-ZACCS UNIT AU-10-05 channel unit



Specifications
T-ZACCS3 TS-360 control unit

Measurement capabilities			
Number of measuring points		Up to 1000 points	
Measuring speed	Scan measurement	0.080 sec/point (50 Hz) 0.067 sec/point (60 Hz)	
	Monitor measurement	0.5 sec/point	
Measuring mode		Initial, direct, measure (For temperature measurement, direct only)	
Simple measure		Coefficient	1
		Unit	Interlocked with sensor mode
		Decimal point	Interlocked with sensor mode
Compensation mode		Comet NON, Comet A, Comet B	
Monitor	Display mode	OFF, value, scan	
	Number of display channels	Numerical value display	1 - 8 points
		Scan display	1 - 1000 points
Measurement	Manual measurement	START key	
	Automatic measurement	Interval measurement, comparator measurement	
	Interface	LAN, USB, RS-232C	
Channel setting	Coefficient	± (0.00000-200000)	
	Unit	με, mV, °C, kgf, mm, etc.	
	Decimal point	Display after the decimal point can be set arbitrarily with 0 to 5 digits	
	Offset	To be written by arbitrarily measurement channel	
	Sensor mode	The type of sensor to be connected is set.	
		Strain	One-gauge method three-wire type 120 / 240 / 350 Ω,
			One-gauge method four-wire type*120 / 240 / 350 Ω,
			Two-gauge common dummy method, two-gauge method,
			Four-gauge method, four-gauge method constant current 350 Ω
		Voltage	Voltage [300 mV]
			Voltage [30 V]
		Temperature	Thermocouple T, K, J, B, S, R, E, N
Check function	At the time of measurement	Open check	
	Sensor	Insulation check, sensitivity check, variation check, thermocouple disconnection check lead wire resistance check, bridge output check Coefficient check	
	Display setting list	Initial value, lead wire resistance	

* The one-gauge method four-wire type is only supported by the SSW-50D. (As of June 2024)

Interval measurement	
Function	Recording of measurement values at the set time interval and time
Time interval	Hour / minute / second can be set for each step up to 99 hours, 59 minutes, and 59 seconds.
Real time start	Start time (hour / minute / second) can be set for each step
Number of starts	Up to 9999 times per step or infinite
Number of steps	Programmable up to 10 steps
GOTO step	Program loop possible to one of the previous steps
GOTO comparator	Go to Step 1 of the comparator.
Sleep function	Turns the power ON/OFF automatically when the interval 1 minute or longer from the end of the scan to the start of the next scan.

Comparator measurement	
Function	Recording of measurement values based on the set amount of change of arbitrary channel (1 point)
Comparison amount	Can be set for each step: Up to ±999999
Comparison method	Upper / lower limit values, relative value
Number of starts	Up to 9999 times per step or infinite
Number of steps	Programmable up to 10 steps
GOTO step	Program loop possible to one of the previous steps
GOTO Interval	Go to Step 1 of the interval.

Time			
Setting			Year, month, day, hour, minute, second
Accuracy			Daily error: ±1 sec (at 23°C ± 5°C)
Retention			About 30 days (with full charge)
Display / operation			
Display	Display unit	LCD panel	3.0-inch semi-transparent monochrome STN LED backlight
		Resolution	255 x 160 dots
		Point defect	10 dots or less (excluding aging deterioration)
Operation			POWER, Cross key, ESC, ENT 0-9, F1, F2, F3
Recording			
Built-in	Function		Recording / reproduction of measurement data Saving of setting file
	Recording format		CSV format, TDS format
	Capacity		16 GB
SD card	Function		Recording / reproduction / copying of measurement data Saving / copying of setting file
	Physical format		FAT32
	Recording format		CSV format, TDS format
	Capacity		16 GB (Designated by us)
Interface			
LAN			10BASE-T/100BASE-TX General-purpose command port server function (various settings, measurement, data collection)
USB			USB 2.0 protocol compatible USB Type-C receptacle Various settings, measurement, data collection
RS-232C			RS-232C compliant Baud rate 9600, 19200, 38400, 57600, 115200 bps Various settings, measurement, data collection
Power supply			
Power supply voltage			Supplied by BA-360
Environment			
Operating temperature / humidity range			10 to +50°C 85% RH or less (No condensation)
Other			
Outside dimension			280 (W) × 45 (H) × 80 (D) mm (Excluding rubber protectors and protrusions)
Mass			Approx. 800 g

Standard accessories

Instruction Manual (CD) 1
D size alkaline dry-cell battery 4
SD card 1
Phillips screwdriver 1
Warranty certificate 1

Options

SD card (16 GB (Designated by us))
AC adapter (CR-1869)
AC Adapter [For China] (CR-1869-C)
DC Power Cable (CR-062)
RS-232C cable (CR-5360)
USB cable for (CR-6189)
External printer (RS-232C connection) (DPU-S245 (RS-232C connection))
Shoulder belt (TSB-360)
For belt bracket 60 mm (BA-360, AU-50MA, AU-10) (TSB-366)
For belt bracket 80 mm (TS-360, AU-10-05) (TSB-368)

TS-360 (Portable data logger)

T-ZACCS+ AU-50MA driver unit

Measurement capabilities			
Number of measuring points (AU-50MA)	When the switch boxes are connected	Up to 1000 points	
	When the switch boxes and channel units are connected in combination		
	When the channel units are connected	Up to 50 points	
Measuring speed		0.080 sec/point (50 Hz) 0.067 sec/point (60 Hz)	
Measuring mode		Direct	
Strain measurement	Applicable wiring method, gauge resistance	One-gauge method three-wire type	120/240/350 Ω
		One-gauge method four-wire type*	120/240/350 Ω
		Two-gauge method	120-1000 Ω
		Two-gauge common dummy method	120-1000 Ω
		Four-gauge method	120-1000 Ω
		Four-gauge method constant current	350 Ω
	Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
		One-gauge method four-wire type*	Cable round-trip resistance: 200 Ω or less
	Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1 to -0.5%/Cable round-trip resistance of 100 Ω
	Lead wire resistance compensation range CometB (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
		Gauge resistance 240 Ω: About 200 Ω or less	
		Gauge resistance 350 Ω: About 300 Ω or less	
	Zero stability	± 1.0 × 10^{-6} strain/°C or less (one-gauge method) ± 0.5 × 10^{-6} strain/°C or less (two-gauge method)	
	Initial unbalance	± 750 × 10^{-6} strain or less (one-gauge method three-wire type) ± 500 × 10^{-6} strain or less (one-gauge method four-wire type*) ±500 × 10^{-6} strain or less (two-gauge method)	
DC voltage measurement	Input impedance	1 MΩ or more	
	Allowable input voltage between B and D	DC±50V MAX	
Thermocouple temperature measurement		T, K, J, B, S, R, E, N JIS C1602:2015 IEC60584-1:2013	
Check function	At the time of measurement	Open check	
	Sensor	Insulation check, sensitivity check, variation check, thermocouple disconnection check lead wire resistance check, bridge output check	

* The one-gauge method four-wire type is only supported by the SSW-50D. (As of June 2024)

Strain measurement		
Bridge excitation	DC 2 V 24 ms (50 Hz)	
Initial value storage range	± 160000 × 10^{-6} strain	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 30000×10^{-6} strain ±300000×10^{-6} strain	1×10^{-6} strain 10×10^{-6} strain
Accuracy (at 23°C ± 5°C) (Excluding the one-gauge method four-wire type)	±(0.08%rdg+1digit)	
Accuracy (at 23°C ± 5°C) One-gauge method four-wire type*	±(0.28%rdg+1digit)	

Constant current strain measurement (four-gauge method only)		
Bridge excitation	DC 6 mA 24 ms (50 Hz)	
Bridge resistance	350 Ω	
Initial value storage range	± 160000 × 10^{-6} strain	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 30000×10^{-6} strain ±300000×10^{-6} strain	1×10^{-6} strain 10×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.08%rdg+1digit)	

DC voltage measurement		
Initial value storage range	V1/1	±160.000mV
	V1/100	±16.0000V
Temperature coefficient of accuracy		±0.0024%rdg/°C
Aging change of accuracy		±0.024%rdg/year
Measurement range and resolution		Measurement range / Resolution
	V1/1	± 30.000mV / 0.001mV ±300.000mV / 0.010mV
	V1/100	± 3.0000V / 0.0001V ±30.0000V / 0.0010V
Accuracy (at 23°C ± 5°C)	V1/1	±(0.08%rdg+3digit)
	V1/100	±(0.08%rdg+2digit)

Thermocouple temperature measurement (JIS C 1602:2015, IEC 60584-1:2013)

Applicable thermocouple	T, K, J, B, S, R, E, N
Linearization	Digital calculation

Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
T	-250 to -200°C	0.1°C	0.38%rdg+0.6°C	0.38%rdg+3.9°C
	-200 to -100°C	0.1°C	0.15%rdg+0.2°C	0.15%rdg+1.4°C
	-100 to +400°C	0.1°C	0.10%rdg+0.2°C	0.10%rdg+1.0°C
K	-210 to -160°C	0.1°C	0.19%rdg+0.3°C	0.19%rdg+1.6°C
	-160 to 0°C	0.1°C	0.12%rdg+0.2°C	0.12%rdg+1.0°C
	0 to +960°C	0.1°C	0.08%rdg+0.1°C	0.08%rdg+0.5°C
	+960 to +1370°C	0.1°C	0.10%rdg+0.9°C	0.10%rdg+1.4°C
J	-200 to -160°C	0.1°C	0.16%rdg+0.2°C	0.16%rdg+1.2°C
	-160 to 0°C	0.1°C	0.12%rdg+0.1°C	0.12%rdg+0.8°C
	0 to +700°C	0.1°C	0.08%rdg+0.1°C	0.08%rdg+0.5°C
	+700 to +1200°C	0.1°C	0.08%rdg+0.6°C	0.08%rdg+0.9°C
B	+200 to +280°C	0.5 to 0.4°C	0.04%rdg+4.0°C	0.04%rdg+4.0°C
	+280 to +800°C	0.3 to 0.1°C	0.04%rdg+1.2°C	0.04%rdg+1.2°C
	+800 to +1760°C	0.1°C	0.05%rdg+0.4°C	0.05%rdg+0.4°C
S	-10 to +200°C	0.1°C	0.09%rdg+0.6°C	0.09%rdg+1.2°C
	+200 to +1760°C	0.1°C	0.07%rdg+0.4°C	0.07%rdg+0.7°C
R	-10 to +150°C	0.1°C	0.09%rdg+0.7°C	0.09%rdg+1.2°C
	+150 to +1760°C	0.1°C	0.07%rdg+0.4°C	0.07%rdg+0.7°C
E	-210 to +550°C	0.1°C	0.17%rdg+0.2°C	0.17%rdg+1.4°C
	+550 to +1000°C	0.1°C	0.09%rdg+0.4°C	0.09%rdg+0.8°C
N	-200 to 0°C	0.1°C	0.18%rdg+0.4°C	0.18%rdg+1.6°C
	0 to +1090°C	0.1°C	0.08%rdg+0.2°C	0.08%rdg+0.6°C
	+1090 to +1300°C	0.1°C	0.08%rdg+0.9°C	0.08%rdg+1.2°C

* The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

Switch box drive unit		
Target model		SSW-50D、ASW-50C
		AU-50M
Number of connectable units	Without booster power supply	8 units connected, 400 points
	With booster power supply	20 units connected, 1000 points
Extension distance	Without booster power supply	120m
	With booster power supply	2km
Connection cable		Switch box connection cable (CR-65)

TML-NET drive unit		
Target model		NSW series / TML-NET compatible transducer
Number of connectable units	Low power consumption type	Up to 100 units
	Conventional type	Up to 20 units (150 m or less)
Extension distance	Low power consumption type	1km
	Conventional type	1 km or less (up to 10 units)
Connection cable		Dedicated TML-NET cable (CR-6930)

When the channel units are connected	
Target model	AU-10, AU-10-05
Number of connectable units	Up to 5 units
Connection connector	Dedicated connector for unit connection

Power supply	
Power supply voltage	Supplied by TS-360

Environment	
Operating temperature / humidity range	-10 to +50°C 85% RH or less (No condensation)

Other		
Outside dimension	280 (W) × 45 (H) × 60 (D) mm (Excluding rubber protectors and protrusions)	
Mass	Approx. 800 g	

T-ZACCS+ BA-360 battery unit

Function		
Function	Supply power to TS-360	
Battery used	D size alkaline dry-cell battery x 4	
Environment		
Operating temperature / humidity range	-10 to +50°C 85% RH or less (No condensation)	
Power supply		
Power supply	D size dry-cell battery x 4	
	Dedicated AC adapter (CR-1867)	AC 100 to 240 V 50/60 Hz
	External DC power input	DC 9 to 18 V
Other		
Outside dimension	280 (W) × 60 (H) × 60 (D) mm (Excluding rubber protectors and protrusions)	
Mass	Approx. 1.2 kg (including D size dry-cell battery x 4)	

T-ZACCS UNIT AU-10/AU-10-05 channel unit

Function		
Number of measuring points	10 points	
Input terminal	Dual-purpose type for screw fixing and soldering	
One-touch connector	NDIS one-touch connector (AU-10-05 only)	
Measurement capabilities	Equivalent to AU-50MA / AU-50M	
Power supply		
Power supply voltage	Supplied by AU-50MA / AU-50M	
Environment		
Operating temperature / humidity range	-10 to +50°C 85% RH or less (No condensation)	
Other		
Outside dimension	AU-10 280 (W) ×45 (H) ×60 (D) mm AU-10-05 280 (W) ×45 (H) ×80 (D) mm (Excluding rubber protectors and protrusions)	
Mass	AU-10 Approx. 900 g AU-10-05 Approx. 1.2 kg	
Standard accessories	Warranty certificate	1
Options		
Protective cover (60 mm type) (AU-10)	TS-360-F60	
Protective cover (80 mm type) (AU-10-05)	TS-360-F80	
Handle for AU-50 (AU-10, AU-10-05)	-	

Related Products

T-ZACCS + Alarm unit AL-360

The AL-360 is a dedicated alarm unit that connects to the TS-360. The alarm output is a function that monitors a specified channel and closes a specified contact when the measurement value changes by a certain amount (relative value setting) or exceeds a threshold value (upper and lower limit setting).
This monitoring compares and switches the contact when monitoring or scanning is performed. There are four contacts to be output and the contacts of comparison channel, comparison condition and output destination can be set. In addition, if one contact is set for multiple channels, it is also possible to close the contact when any one of the channels exceeds the set range.

Specifications

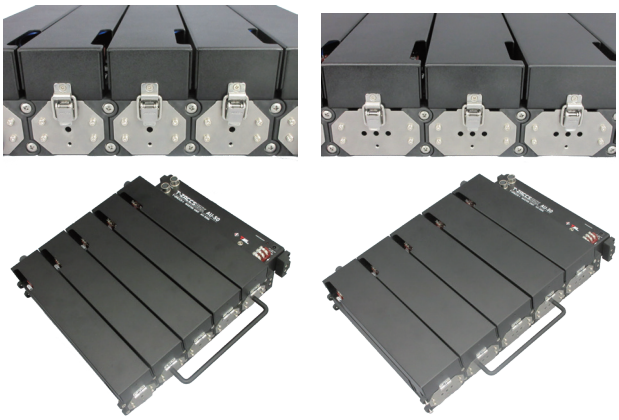
Target model	TS-360
Number of contacts	4 points
Contact	Semiconductor relay (a-contact: Normally open) Contact capacity AC 140 V / DC 200 V max Rated current: 0.6 A max Inrush current: 1.8 A max ON resistance: 2 Ω max
Display	Status LED Lights up when each contact is closed
Comparison method	Relative value / upper and lower limits
Number of setting tables	1000 table
Other functions	Alarm test
Power supply	Supplied via TS-360
Operating temperature / humidity range	-10 to +50°C 85% RH or less (No condensation)
Outside dimension	280 (W) × 45 (H) × 60 (D) mm (Excluding rubber protectors and protrusions)
Mass	Approx. 600 g

TS-360 (Portable data logger)

Related Products

Protective cover TS-360 top cover

A protective cover that is easy to attach and remove.
Model name: TS-360-F60 (for AU-10)
TS-360-F80 (for AU-10-05)
TS-360 main unit and AU-10/-10-05 channel unit



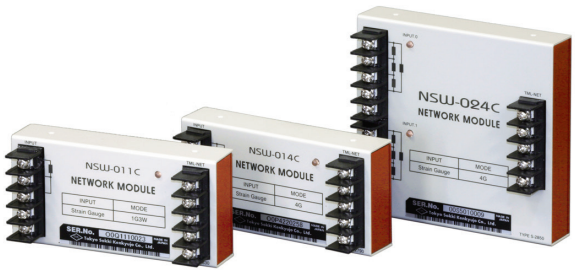
DPU-S245 (External printer)

The measurement data of the TS-360 is printed out. The TP-S245L-1 recording paper (optional) is used.

CR-4530 printer cable

NSW network module

This equipment enables measurement control and data transfer via a two-wire type network line. A measurement circuit is configured near a strain gauge, DC voltage signal, thermocouples, etc. and the measurement data is digitized. This allows for stable measurements over a long period of time without influences by decreased sensitivity and cable insulation degradation due to cable extension.



CR-1867 AC adapter

This equipment is connected to AC 100 V to supply the power.

Measurement software Visual LOG

Visual LOG TDS-7130v2 static measurement software
Visual LOG Light TDS-700L interval measurement software
Visual LOG Light TDS-Mail data mail management software

SD card

Supported card capacity: 16 GB (Designated by us)

Cable

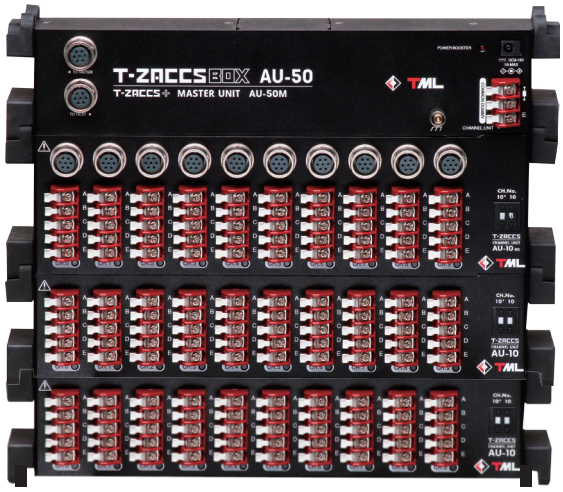
CR-5360 RS-232C cable
D-sub 9P-D-sub 9 P cross 1.5 m
This cable is used to connect to a PC.

CR-6189 USB cable
USB(C)-USB(A) 1.5 m
This cable is used to connect to a PC.

T-ZACCS BOX AU-50

NEW

- This equipment is used with the master unit and channel unit in combination.
- Measurements of strain, DC voltage and thermocouple are possible.
- The number of measuring points is up to 50 per 1 set.
- The number of measuring points can be selected according to the number of channel units connected.
- A power booster for multipoint long-distance extension is built in.
- The complete compensation method of strain (Comet) is supported.
- Can be used with the T-ZACCS 3 TS-360 portable data logger and the TDS-540 data logger.



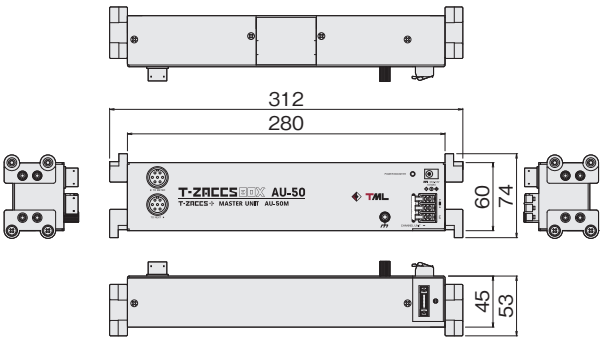
AU-50 switch box

This product is a switch box that combines the master unit and channel unit.
In addition to expanding and extending the number of measuring points of the T-ZACCS 3 TS-360 portable data logger, it can also be used with the TDS-540 data logger.

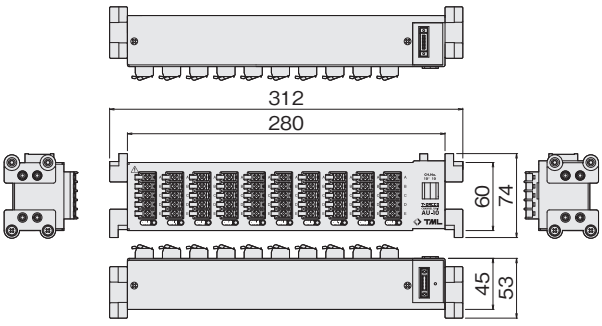
Up to five channel units can be connected to one master unit, allowing for strain measurement, DC voltage measurement, and temperature measurement using thermocouple. Since any number of channel units can be connected, measurements can be performed at the necessary and sufficient number of measuring points.

External Dimensions

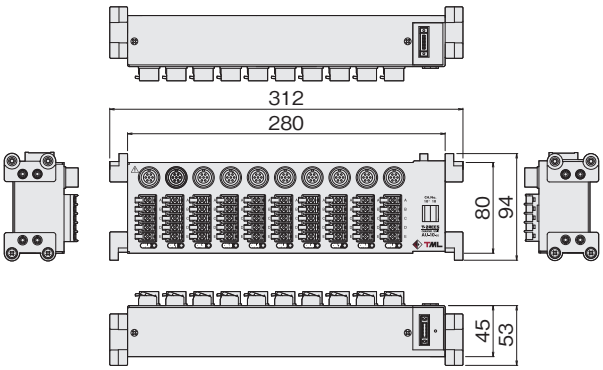
T-ZACCS + AU-50M master unit



T-ZACCS UNIT AU-10 channel unit



T-ZACCS UNIT AU-10-05 channel unit



T-ZACCS BOX AU-50

Specifications

T-ZACCS + AU-50M master unit

Measurement capabilities			
Number of measuring points	**Number of measuring points When the channel units are connected**	Up to 50 points (A total of 5 units of AU-10 or AU-10-05)	
Strain measurement	**Applicable wiring method, gauge resistance**	One-gauge method three-wire type	120/240/350 Ω
		Two-gauge method	120-1000 Ω
		Two-gauge common dummy method	120-1000 Ω
		Four-gauge method	120-1000 Ω
		Four-gauge method constant current	350 Ω
	Measurement range	Depends on the data logger combined	
	Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
	Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1 to -0.5%/ Cable round-trip resistance of 100 Ω
	Zero stability	± 1.0 × 10^{-6} strain/°C or less (one-gauge method) ± 0.5 × 10^{-6} strain/°C or less (two-gauge method)	
	Other specifications	Depends on the data logger combined	
DC voltage measurement	**Measurement range**	Depends on the data logger combined	
	Accuracy	Depends on the data logger combined	
	Input impedance	1 MΩ or more	
Thermocouple temperature measurement	**Thermocouple type**	Depends on the data logger combined	
	Measurement range	Depends on the data logger combined	
	Accuracy	Depends on the data logger combined	
Display/operation			
Sensor mode		Set each point by the data logger.	
Measuring point number		Set the top 2 digits arbitrarily for every 10 points.	
Measuring point display		Three-color LED at each point	
When the channel units are connected			
Target model		AU-10 or AU-10-05	
Number of connectable units		Up to 5 units	
Data logger connection			
Target model		TDS-540, TS-360 (AU-50MA)	
Extension distance		According to the data logger to be connected	
Connection cable		Switch box connection cable (CR-65)	
Power supply			
Power supply	**Usually, supplied by a data logger**		
	When a booster is used	Dedicated AC power adapter (optional) or external DC power input	
		Power supply voltage: AC power adapter	AC 100 to 240 V 50/60 Hz
		Power supply voltage: DC power supply	DC 9 to 18 V
Environment			
Operating temperature / humidity range		-10 to +50°C 85% RH or less (No condensation)	
Other			
Outside dimension		280 (W) × 45 (H) × 60 (D) mm (Excluding rubber protectors and protrusions)	
Mass		Approx. 800 g	
Standard accessories		Instruction Manual (CD)	1
		Connection cable CR-65	1
		Phillips screwdriver	1
		Warranty certificate	1
Options		AC power adapter	CR-1869
		AC Adapter [For China]	CR-1869-C
		DC Power Cable	CR-062
		For belt bracket 60 mm (AU-50M, AU-10)	TSB-366
		For belt bracket 80 mm (AU-10-05)	TSB-368

T-ZACCS UNIT AU-10/AU-10-05 channel unit

Measurement capabilities		
Number of measuring points	10 points	
Input terminal	Dual-purpose type for screw fixing and soldering	
One-touch connector	NDIS one-touch connector (AU-10-05 only)	
Measurement capabilities	Equivalent to AU-50MA / AU-50M	
Power supply		
Power supply voltage	Supplied by AU-50MA / AU-50M	
Environment		
Operating temperature / humidity range	-10 to +50°C 85% RH or less (No condensation)	
Other		
Outside dimension	AU-10 280 (W) × 45 (H) × 60 (D) mm AU-10-05 280 (W) × 45 (H) × 80 (D) mm (Excluding rubber protectors and protrusions)	
Mass	AU-10 Approx. 900 g AU-10-05 Approx. 1.2 kg	
Standard accessories	Warranty certificate	1
Options		
Protective cover (60 mm type) (AU-10)	TS-360-F60	
Protective cover (80 mm type) (AU-10-05)	TS-360-F80	
Handle for AU-50 (AU-10, AU-10-05)	-	

When protective cover (60 mm type) is attached

When protective cover (80 mm type) is attached

* Use the protective cover (60 mm type) for the AU-10 and the protective cover (80 mm type) for the AU-10-05.
* The protective cover is attached to each channel unit.
* To install the handle for AU-50, four or more AU-10 units with the protective cover attached are required, and three or more AU-10-05 units are required.

TDS-540 (General-purpose type)

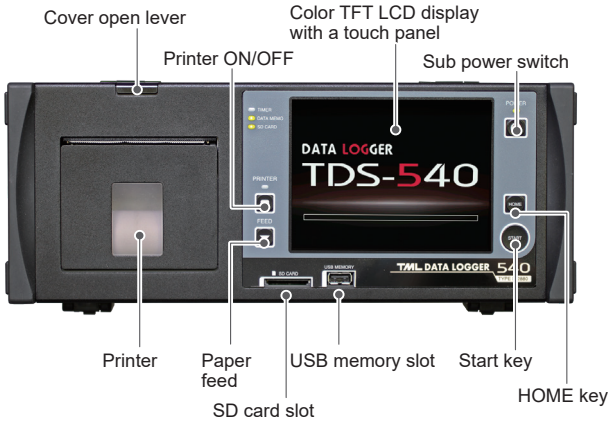
- Secure data retention by robust built-in data memory and UPS circuit
- Realization of stable interval measurement with a clock accuracy of ±1 second per day
- Fast start-up within 4 seconds at the fastest
- Collective setting of coefficient, unit, decimal point, and sensor type by “Sensor ID”
- Equipped with interval measurement “Quick Interval” that requires no settings
- Equipped with remote operation “Remote Data Logger” from an Internet browser
- The number of measuring points is 1000 (using external switch boxes)
- High-speed measurement of 0.04 sec per point
- Equipped with high-resolution (0.1 x 10^{-6} strain) mode
- A strain gauge with temperature measurement function can be measured with one channel.
- Equipped with Complete Compensation Method of Strain
- Various check functions (Automatic check by a timer is possible)
- Color LCD monitor with a touch panel
- Built-in high-speed printer (0.04 sec per line per channel)
- Supports SD card and USB memory as recording media
- Equipped with LAN, USB and RS-232C as standard
- Wireless LAN unit can be equipped (factory option)
- A semiconductor relay switch box with up to 30 points can be built in
- The built-in switch box is available with a surge absorber for lightning protection as standard.
- TML-NET compatible (in combination with the ASW/SSW unit and ND-100)

TDS-540 data logger

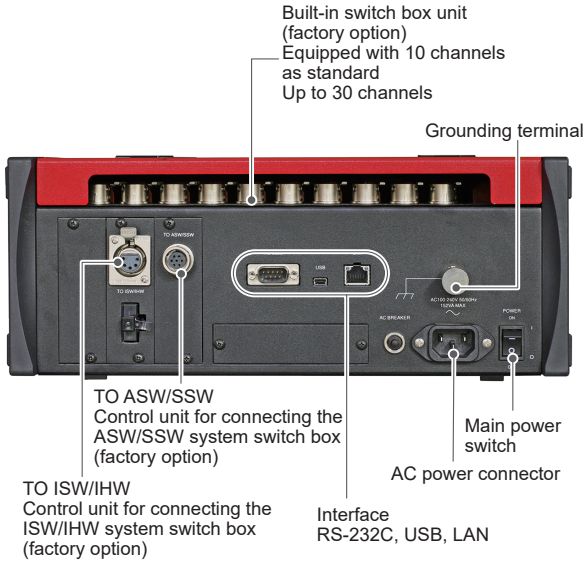
CE

This equipment is a data logger for multipoint automatic switching measurements of strain gauges, temperature, DC voltage, thermocouples, platinum resistance temperature detectors, etc. Our unique measurement method eliminates various thermo-electromotive forces, amplifier zero shifts, and commercial power noise, achieving highly accurate and stable measurements. The number of measuring points is up to 30 using the main unit only, and up to 1000 points can be measured when using external switch boxes in combination. In addition, when combined with the IHW-50G high-speed switch box, up to 1000 points of strain measurements can be performed in 0.4 sec. Newly equipped with a remote data logger function, this enables remote operation from an Internet browser. Equipped with wireless LAN (optional), this enables measurement and monitoring of the data logger from a tablet or smartphone. The interface supports Ethernet LAN, USB, RS-232C, and optionally wireless LAN.

Front panel



Back panel

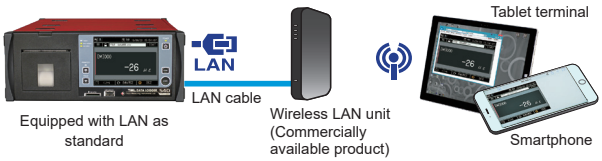


TDS-540 (General-purpose type)

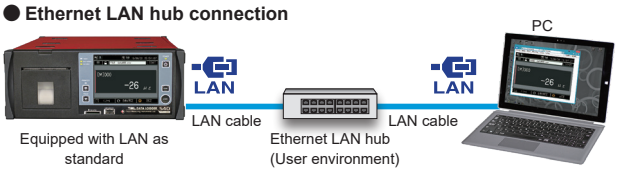
Remote data logger function

Remote operation according to the user communication mode
Equipped with a Web server function (remote data logger function).
Measurement and monitoring with the TDS-540 can be performed from an Internet browser.
No special software is required.

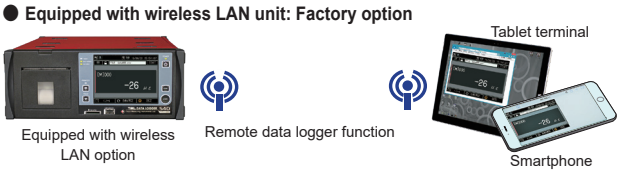
● **Wireless LAN unit combination**



● **Ethernet LAN hub connection**



● **Equipped with wireless LAN unit: Factory option**



The built-in wireless LAN unit is only certified in Japan. It does not support overseas use.
Connect a commercially available wireless LAN router to use this unit.

File download using remote data logger function
During remote operation, measurement data files recorded by the equipment in a data memory or SD card can be downloaded (transferred) to a PC or tablet. It is also possible to select multiple files.

* Files saved on a USB memory device cannot be downloaded.

One-gauge method four-wire type measurement method [Patented]

Strain measurement is possible with one-touch connection using a modular plug.
The one-gauge method four-wire type strain measurement method developed by us connects four-wire type lead wires to a strain gauge and enables connection using a modular plug. One-touch connection using a modular connector significantly improves the prolonged connection work for multipoint measurements. The four-wire type achieves the following functions.

- No decreased sensitivity due to lead wire resistance
- No influence due to thermal output of lead wires
- No influence of contact resistance
- Lead-free, environmentally friendly strain measurement with plug-in connection

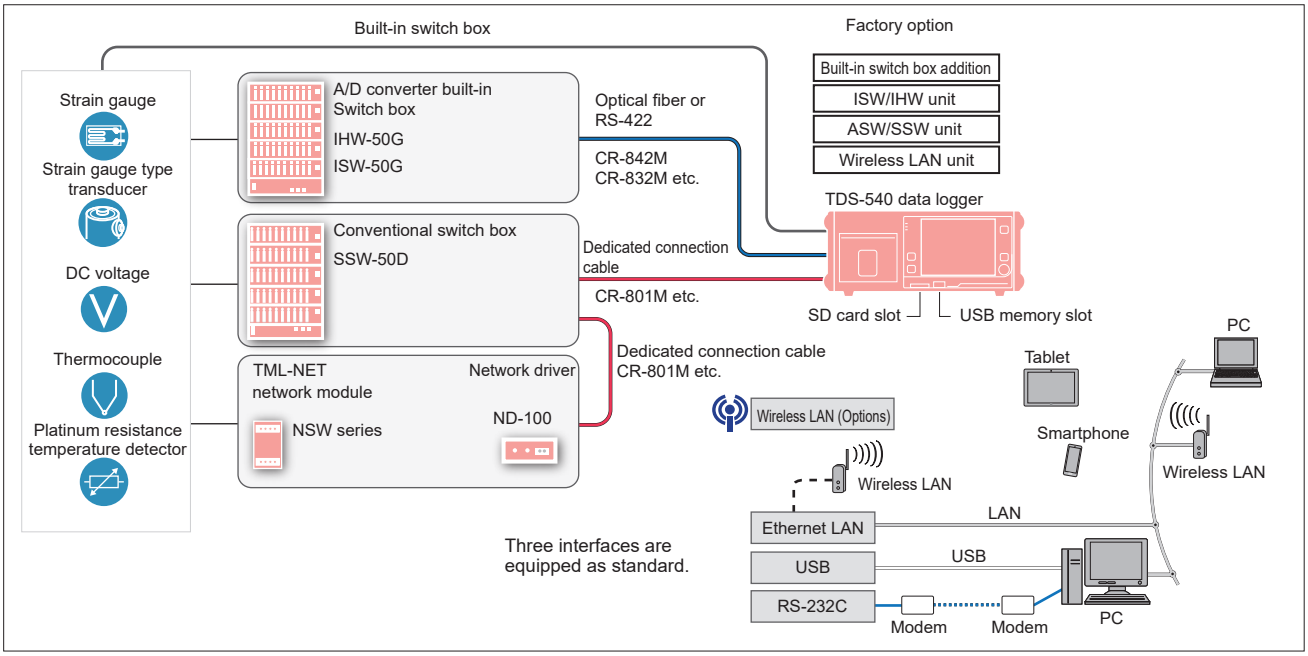
1-CH strain / temperature simultaneous measurement

Strain gauge with temperature measurement function: FLAB-2T, QFLAB-2T, etc.

Our unique strain gauge with temperature measurement function previously required two channels for strain measurement and temperature measurement. However, the TDS-540 can simultaneously measure strain and T-type thermocouples with only one channel using the one-gauge method three-wire type connection.

* 1-CH measurement of strain gauge with temperature measurement function can be used with the built-in switch box, as well as the ISW-50G and IHW-50G.

System Block Diagram



Specifications

Measurement capabilities			
Number of measuring points	When the switch boxes are connected		Up to 1000 points (Up to 2000 points when using strain gauge with temperature measurement function)
	When the switch boxes and built-in switch box units are connected in combination		
	Built-in switch box unit		Up to 30 points (Up to 60 points when using strain gauge with temperature measurement function)
Scanning speed (Measuring speed)	IHW-50G		0.4 sec/1000 points (1 sec/1000 points)
	ISW-50G		2 sec/1000 points (3 sec/1000 points)
	ISW-50C		3 sec/1000 points (5 sec/1000 points)
	ASW/SSW		0.08 sec/points (80 sec/1000 points)
	TML-NET		0.20 sec/points (200 sec/1000 points)
	Built-in switch box unit		0.04 sec/point, 0.08 sec/point
Measuring mode			Initial, direct, measure (For temperature measurement, direct only)
Compensation mode			Coefficient 1.000 Unit Interlocked with sensor mode Decimal point Interlocked with sensor mode
Compensation mode			Comet NON, Comet A, Comet B
Measuring point switching method	Scanning		Automatic switching measurement from the first channel to the last channel (jump possible)
	Monitor		Repeated measurement of monitor channels (up to 10 points)
Scanning measurement start	Manual		Start key switch
	Automatic		Interval timer, monitor comparator
	Interface		LAN, USB, RS-232C, wireless LAN (optional)
Channel setting	Coefficient		± (0.0001-99999)
	Unit		40 types including με, mV, °C, kgf, mm
	Decimal point		Display after the decimal point can be set arbitrarily with 0 to 5 digits
	Offset		To be written by arbitrarily measurement channel
	Sensor mode		The type of sensor to be connected is set.
			Strain: One-gauge method three-wire type, 120 / 240 / 350 Ω Two-gauge common dummy method, two-gauge method Four-gauge method, four-gauge method constant current 350 Ω Four-gauge method high-resolution mode Four-gauge method constant current 350 Ω high-resolution mode Four-gauge method 0-2 V mode Gauge with temperature measurement 120 / 240 / 350 Ω
			DC voltage 640 mV, 64 V
			Temperature: Thermocouple T/K/J/B/S/R/E/N/Pt100 3W
			TML-NET: Various network modules
Sensor ID TEDS function	Sensor ID	Function	Reading and setting of sensor ID Writing of sensor ID
	TEDS	Standard	IEEE 1451.4 Class 2 compatible (Template No. 33)
		Function	Sensor information reading and setting
Check function	At the time of measurement		Open check, thermocouple disconnection check
	Sensor		Insulation check, sensitivity check, variation check, thermocouple disconnection check, lead wire resistance check, bridge output check
TML-NET	When the ASW/SSW system control unit is available		ID check, sensitivity check, check module, channel setting

Interval timer		
Function		Scanning measurement at the set time interval and time
Quick setting	Time interval	1 min / 10 min / 1 hr (measured on the minute or hour)
Table setting	Time interval	Hour / minute / second can be set for each step up to 99 hours, 59 minutes, and 59 seconds.
	Real time start	Start time (day / hour / minute / second) can be set for each step.
	Number of starts	Up to 99 times per step or infinite
	Number of steps	Programmable up to 50 steps
	GOTO step	Program loop possible to one of the previous steps
	GOTO comparator	Go to Step 1 of the monitor comparator.
	Execution processing	Scanning, insulation check, sensitivity check, variation check, thermocouple disconnection check
Sleep function		When the interval between the end of scanning and the start of scanning is 1 min or longer, the power is turned on/OFF automatically.

Monitor comparator		
Function		Automatic measurement based on the amount of change in the setting of monitor channel (1 point)
Table setting	Comparison amount	Can be set for each step: Up to ±999999
	Comparison method	Amount of change or upper / lower limit
	Number of starts	Up to 99 times per step or infinite
	Number of steps	Programmable up to 50 steps
	GOTO step	Program loop possible to one of the previous steps
	GOTO Interval	Go to Step 1 of the interval.

Remote data logger function	
Function	Remote operation of data logger, remote monitoring, and data download function by the Web server function
Connection	LAN, Wireless LAN (Options)
File download	Download (transfer) of the measurement data files (multiple files can be selected) in the data memory or SD card to a PC or tablet in the ZIP format

Time	
Setting	Year, month, day, hour, minute, second
Accuracy	Daily error: ±1 sec (at 23°C ± 5°C)
Retention	About 60 days (with full charge)

Display/operation	
Display unit	Color TFT LCD display (with a touch panel), 320 x 240 dots
Operation	Touch panel, POWER key, HOME key START key, PRINTER key, FEED key

Recording		
Built-in	Function	Recording / reproduction of measurement data, saving of setting file
	Recording format	TDS format, CSV format 540 CSV format
	Capacity	512 MB
SD card	Function	Recording / reproduction / copying of measurement data, saving / copying of setting file Writing / reading of sensor ID
	Physical format	FAT16/32
	Recording format	TDS format, CSV format 540 CSV format
	Capacity	512 MB (Designated by us)
USB memory	Function	Reproduction / copying of measurement data, saving / copying of setting file Writing / reading of sensor ID
	Physical format	FAT16/32

Printer	
Printing content	Measurement data, setting values, check results, etc.
Printing method	Thermal
Printing speed	1 channel, 1 line/0.04 sec
Suitable paper	P-80 (Paper width: 80 mm)

Interface	
Wireless LAN (Options) * This is only available in Japan.	IEEE 802.11b/g/n compliant General-purpose command port server function (various settings, measurement, data collection) Web server function (remote data logger function) DHCP server function
LAN	10BASE-T/100BASE-TX General-purpose command port server function (various settings, measurement, data collection) Web server function (remote data logger function)
USB	USB 2.0 protocol compatible General-purpose command compatible (various settings, measurement, data collection)
RS-232C	RS-232C compliant Baud rate 9600/19200/115200 bps General-purpose command compatible (various settings, measurement, data collection)

Power supply	
Rated power supply voltage	AC 100 to 240 V 50/60 Hz
Maximum power consumption	152 VA max

Environment	
Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)

Other	
Outside dimension	320 (W) × 130 (H) × 440 (D) mm (Excluding rubber protectors and protrusions)
Mass	About 8 kg (when equipped with a built-in switch box unit (10 channels))

TDS-540 (General-purpose type)

Built-in switch box unit (factory option)

Number of measuring points	Up to 30 points (equipped with 10 points as standard)	
Switch	Semiconductor relay	
Lightning arrester	Each channel is equipped with a surge absorber for lightning protection as standard.	
Input terminal	Dual-purpose type for screw fixing and soldering	
One-touch connector	NDIS one-touch connector	
Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method three-wire type	120/240/350 Ω
	Two-gauge method	60-1000 Ω
	Two-gauge common dummy method	60-1000 Ω
	Four-gauge method	60-1000 Ω
	Four-gauge method constant current	350 Ω
	Four-gauge method high-resolution mode	120-1000 Ω
	Four-gauge method constant current high-resolution mode	350 Ω
	Four-gauge method 0-2 V mode	60-1000 Ω
	Mode for gauge with temperature measurement function (One-gauge method three-wire type)	120/240/350Ω T(JIS C1602-1995、IEC 60584)
Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
	Four-gauge method constant current high-resolution: 350 Ω	Cable round-trip resistance: 160 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1 to -0.5%/ Cable round-trip resistance: 100 Ω
	Four-gauge method constant current high-resolution: 350 Ω	
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
	Gauge resistance 240 Ω: About 200 Ω or less	
	Gauge resistance 350 Ω: About 300 Ω or less	
Zero stability	± 1.0 × 10^{-6} strain/°C or less (one-gauge method) ± 0.5 × 10^{-6} strain/°C or less (two-gauge method)	
Initial unbalance	± +750 × 10^{-6} strain or less (one-gauge method) ± +500 × 10^{-6} strain or less (two-gauge method)	
DC voltage measurement		
V 1/1	DC±640mV	
V 1/100	DC±64V	
Input impedance	1 MΩ or more	
Allowable input voltage between B and D	DC±70V MAX	
Thermocouple temperature measurement		
Applicable thermocouple	T/K/J/B/S/R/E/N JIS C 1602-1995, IEC 60584	
Platinum resistance temperature detector measurement		
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current 3-wire type) JIS C 1604-1997, IEC 60751	

Strain measurement		
Bridge excitation	DC 2 V 24 ms (50 Hz)	
Initial value storage range	± 160000 × 10^{-6} strain	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain	1×10^{-6} strain
	± 80000×10^{-6} strain	2×10^{-6} strain
	±160000×10^{-6} strain	4×10^{-6} strain
	±320000×10^{-6} strain	8×10^{-6} strain
	±640000×10^{-6} strain	16×10^{-6} strain
Accuracy (at 23°C ± 5°C) (Excluding the one-gauge method four-wire type)	±(0.05%rdg+1digit)	

Constant current strain measurement (four-gauge method only)		
Bridge excitation	DC6mA 24ms (50Hz)	
Bridge resistance	350Ω	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain	1×10^{-6} strain
	± 80000×10^{-6} strain	2×10^{-6} strain
	±160000×10^{-6} strain	4×10^{-6} strain
	±320000×10^{-6} strain	8×10^{-6} strain
	±640000×10^{-6} strain	16×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+1digit)	
High-resolution strain measurement (four-gauge method only)		
Bridge excitation	DC 5 V 48ms (50Hz)	
Initial value storage range	±16000.0×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0×10^{-6} strain	0.1×10^{-6} strain
	± 8000.0×10^{-6} strain	0.2×10^{-6} strain
	±16000.0×10^{-6} strain	0.4×10^{-6} strain
	±32000.0×10^{-6} strain	0.8×10^{-6} strain
	±64000.0×10^{-6} strain	1.6×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+3 digits)	
High-resolution constant current strain measurement (four-gauge method only)		
Bridge excitation	DC14mA 48ms (50Hz)	
Bridge resistance	350Ω	
Initial value storage range	±16000.0×10^{-6} strain	
Temperature coefficient of accuracy	±0.002%rdg/°C	
Aging change of accuracy	±0.02%rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0×10^{-6} strain	0.1×10^{-6} strain
	± 8000.0×10^{-6} strain	0.2×10^{-6} strain
	±16000.0×10^{-6} strain	0.4×10^{-6} strain
	±32000.0×10^{-6} strain	0.8×10^{-6} strain
	±64000.0×10^{-6} strain	1.6×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.05%rdg+3 digits)	

DC voltage measurement			
Initial value storage range	V1/1 :±160.000mV V1/100 :±16.0000V		
Temperature coefficient of accuracy	±0.0024%rdg/°C		
Aging change of accuracy	±0.024%rdg/year		
Measurement range and resolution		Measurement range	Resolution
	V1/1	± 40.000mV	0.001mV
		± 80.000mV	0.002mV
		±160.000mV	0.004mV
		±320.000mV	0.008mV
		±640.000mV	0.016mV
	V1/100	± 4.0000V	0.0001V
		± 8.0000V	0.0002V
		±16.0000V	0.0004V
		±32.0000V	0.0008V
		±64.0000V	0.0016V
V1/1 accuracy (at 23°C ± 5°C)	±(0.05%rdg+3 digits)		
V1/100 accuracy (at 23°C ± 5°C)	±(0.05%rdg+2 digits)		

Thermocouple temperature measurement (JIS C 1602-1995, IEC 60584)				
Applicable thermocouple		T, K, J, B, S, R, E, N		
Linearization		Digital calculation		
Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
T	- 250 to - 200°C	0.1°C	±(0.19%rdg+0.5°C)	±(0.19%rdg+3.8°C)
	- 200 to - 100°C	0.1°C	±(0.09%rdg+0.2°C)	±(0.09%rdg+1.6°C)
	- 100 ~ + 400°C	0.1°C	±(0.06%rdg+0.2°C)	±(0.06%rdg+0.9°C)
K	- 210 to - 160°C	0.1°C	±(0.11%rdg+0.3°C)	±(0.11%rdg+1.8°C)
	- 160 to 0°C	0.1°C	±(0.08%rdg+0.2°C)	±(0.08%rdg+1.1°C)
	0 ~ + 960°C	0.1°C	±(0.06%rdg+0.1°C)	±(0.06%rdg+0.7°C)
	+ 960 to +1370°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.2°C)
J	- 200 to - 160°C	0.1°C	±(0.09%rdg+0.2°C)	±(0.09%rdg+1.4°C)
	- 160 to 0°C	0.1°C	±(0.07%rdg+0.1°C)	±(0.07%rdg+1.0°C)
	0 to + 700°C	0.1°C	±(0.05%rdg+0.1°C)	±(0.05%rdg+0.6°C)
	+ 700 to +1200°C	0.1°C	±(0.06%rdg+0.4°C)	±(0.06%rdg+0.8°C)
B	+ 200 ~ + 280°C	0.5 to 0.4°C	±(0.03%rdg+1.5°C)	±(0.03%rdg+1.5°C)
	+ 280 to + 800°C	0.3 to 0.1°C	±(0.03%rdg+0.6°C)	±(0.03%rdg+0.6°C)
	+ 800 to +1760°C	0.1°C	±(0.04%rdg+0.4°C)	±(0.04%rdg+0.4°C)
S	- 10 to + 200°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.3°C)
	+ 200 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+0.8°C)
R	- 10 to + 150°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.3°C)
	+ 150 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+0.8°C)

Thermocouple temperature measurement (JIS C 1602-1995, IEC 60584)				
Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
E	- 210 to + 550°C	0.1°C	±(0.10%rdg+0.2°C)	±(0.10%rdg+1.6°C)
	+ 550 to +1000°C	0.1°C	±(0.06%rdg+0.3°C)	±(0.06%rdg+0.7°C)
N	- 200 to 0°C	0.1°C	±(0.11%rdg+0.4°C)	±(0.11%rdg+1.8°C)
	0 to +1090°C	0.1°C	±(0.05%rdg+0.2°C)	±(0.05%rdg+0.7°C)
	+1090 to +1300°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+0.9°C)

* The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

Platinum resistance temperature detector temperature measurement (JIS C 1604-1997, IEC 60751 Pt100)	
Applicable resistance temperature detector	Pt100
Measurement Method	3-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	± 0.0020% rdg/°C
Aging change of accuracy	± 0.05% rdg/year
Measurement range	-200 to +850°C
Resolution	0.1°C
Accuracy (at 23°C ± 5°C)	± (0.05% rdg + 0.3°C)

Built-in one-gauge method four-wire type unit (factory option)

Number of measuring points	Up to 30 points can be equipped for every 10 points	
Switch	Semiconductor relay	
Modular connector	6-Pin modular jack	
Applicable gauge resistance	120/240/350 Ω	
Sensor cable extension range	Cable round-trip resistance: 200 Ω or less	
Zero stability	±1.0 × 10^{-6} strain/°C or less	
Initial unbalance	± 500 × 10^{-6} strain or less	
Initial value storage range	± 100000 × 10^{-6} strain	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain	1×10^{-6} strain
	± 80000×10^{-6} strain	2×10^{-6} strain
	±100000×10^{-6} strain	4×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.25%rdg+1digit)	

ISW/IHW unit (factory option)

The specifications related to measurement conform to those of the switch box.

Connection

Target model		IHW-50G/ISW-50G
ELECTRICAL (RS-422)	Number of connected units / extension distance	20 units connected, 1000 points, distance between devices 800 m
	Connection cable	CR-832M extension cable for ISW/IHW
OPTICAL (Optical fiber)	Number of connected units / extension distance	20 units connected, 1000 points, distance between devices 800 m
	Connection cable	Extension optical cable for ISW/IHW: CR-842M

ASW/SSW unit (factory option)

The specifications related to measurement conform to those of the built-in switch box.

Target model		SSW-50D/ASW-50C/ND-100
Network module target model		All models (One ND-100 is required for every 100 points)
Number of connected units / extension distance	Without booster power supply	8 units connected, 400 points, extension distance 120 m
	With booster power supply	20 units connected, 1000 points, extension distance 2 km
Connection cable		Switch box connection cable CR-65 or switch box extension cable CR-800

* The number of network modules connected and the extension distance conform to the specifications of ND-100.

Standard accessories

Quick Reference 1
Instruction Manual (CD) 1
AC power cable (CR-03) 1
Ground wire (CR-20) 1
Printer paper (P-80) ..... 2 rolls
Phillips screwdriver 1
Warranty certificate 1

TDS-540 (General-purpose type)

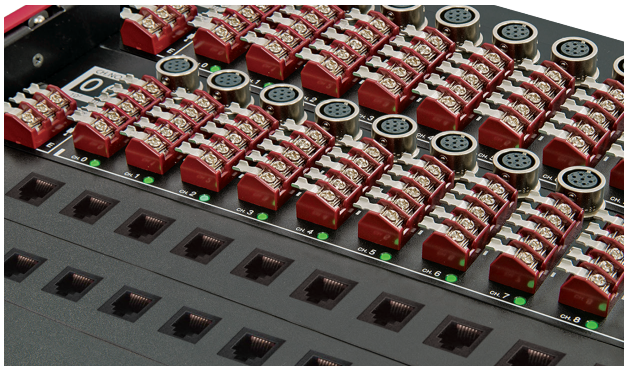
Factory option

Built-in switch box addition
The built-in switch box is equipped with the normal unit 10 channels as standard. The expansion units can be selected from the high-speed units equipped with ADC and the normal units without ADC (mixing is not possible), and up to 30 channels can be equipped in units of 10 channels.

Normal unit: Each unit operates sequentially
TDS-540-20 (built-in 20 channels)
TDS-540-30 (built-in 30 channels)

High-speed unit: Each unit operates in parallel
TDS-540-20H (built-in 20 channels)
TDS-540-30H (built-in 30 channels)

Built-in one-gauge method four-wire type unit
This is an option for the normal unit 10 channels and when adding the high-speed unit.



Equipped with 10 CH (channels) as standard, expanded in units of 10 CH, up to 30 CH
* The photo may vary from the actual product.

ISW/IHW unit
Control unit for connecting the ISW/IHW system switch box

ASW/SSW unit
Control unit for connecting the ASW/SSW system switch box

Wireless LAN unit
This unit enables easy remote operation from a tablet, etc.
* This is only available in Japan.

Option code

TDS-540 (-30HF - 02A)

Built-in unit option	
None	10CH (as standard)
-20	20CH
-30	30CH
-20H	High-speed 20CH
-30H	High-speed 30CH
-10HF	(High-speed + 1G4W)-10CH
-20HF	(High-speed + 1G4W)-20CH
-30HF	(High-speed + 1G4W)-30CH

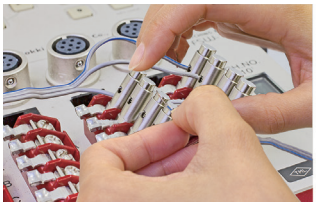
Other options	
None	None
-01	ASW/SSW
-02A	ISW/IHW (With Optical Fiber Option)
-02N	ISW/IHW (Without Optical Fiber Option)
-03A	ASW/SSW+ISW/IHW (With Optical Fiber Option)
-03N	ASW/SSW+ISW/IHW (Without Optical Fiber Option)
-04	Wireless LAN
-05	Wireless + ASW/SSW
-06A	Wireless +ISW/IHW (With Optical Fiber Option)
-06N	Wireless + ISW/IHW (Without Optical Fiber Option)
-07A	Wireless +ASW/SSW+ISW/IHW (With Optical Fiber Option)
-07N	Wireless + ASW/SSW + ISW/IHW (Without Optical Fiber Option)

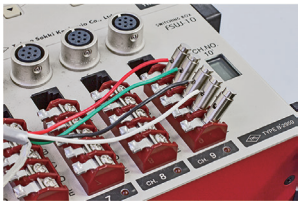
Related Products

SD card 512 MB
Be sure to use highly durable industrial SD cards designated by us.

Dedicated printer paper P-80
Five rolls/box
Paper size: 80 mm width, 25 m/7200 lines/roll

SB-OT1B one-touch terminal
This terminal block allows one-touch connection of input lead wires. It is used by attaching it to the input terminal of the switch box. (One set of five terminals)





CR-5811 one-gauge method four-wire type modular conversion cable
Use this cable when connecting one-gauge method four-wire type loose wires with the built-in switch box HF.

ND-100 TML-NET network driver
This is a driver interface that drives a TML-NET compatible converter or network module from a data logger. A distributed data recording system is built.

Measurement software Visual LOG
Visual LOG TDS-7130v2 static measurement software
Visual LOG Light TDS-700L interval measurement software
Visual LOG Light TDS-Mail data mail management software

Comparison of functions of major compatible switch boxes

Switch box model name	Number of measuring points	Connector combined use	Strain	Constant current mode	High-resolution mode	DC Voltage	Thermocouple	Platinum resistance temperature detector	Built-in lightning arrester	Scanning speed [Measurement time*3]	one-gauge method four-wire type*1	Switching method	Application
IHW-50G	50	-	●	●	●	●	●	●	●	0.4 sec / 1000 points (0.04 sec/point) [1 sec]	●	Semiconductor relay	Strain / temperature of gage with temperature measurement function, 1 ch measurement function compatible
IHW-50G-05		●											
ISW-50G	50	-	●	●	●	●	●	●	●	2 sec / 1000 points (0.04 sec/point) [3 sec]	●	Semiconductor relay	Strain / temperature of gage with temperature measurement function, 1 ch measurement function compatible
ISW-50G-05		●											
SSW-50D	50	-	●	●	●	●	●	-	●*2	80 sec / 1000 points (0.08 sec/point) [80 sec]	●	Semiconductor relay	
SSW-50D-05		●											

*1: One-gauge method four-wire type: In addition to the one-gauge method four-wire type unit option (code: HF) built into the main unit, a switch box equipped with the same function can also be used.
*2: Factory option
*3: The scanning time includes the time for data logger recording, interface output, etc.

IHW-50G (High-speed)

- Electrically isolated from the data logger main unit
- Measurements of strain, DC voltage, thermocouple, and platinum resistance temperature detector
- Equipped with high-resolution (0.1 x 10^{-6} strain) mode*
- Sampling speed is 0.04 sec for 1 point and 0.4 sec for 50 points. In a system using multiple units of this equipment, 1000 points can be measured in 0.4 sec.
- One-gauge method four-wire type measurement via modular plug connection
- Equipped with gauge mode with temperature measurement function that can measure strain and temperature using 1 channel
- Each channel is equipped with a surge absorber for lightning protection as standard.
- Equipped with Complete Compensation Method of Strain

* The high-resolution mode supports the four-gauge method and the four-gauge constant current method.

IHW-50G-05 high-speed switch box

This equipment is a switch box with a built-in A/D converter that enables high-speed and high-accuracy measurements and was developed to be used in combination with the TS-560/TDS-540 data logger to expand the number of measuring points. High-speed measurement of 50 points in 0.4 sec is possible. Thanks to parallel operation of the built-in A/D converter in a system using multiple units of this equipment, even strain measurements of 1000 points can be performed in 0.4 sec. High-speed digital communication via RS-422 or optical fiber isolated from the measuring instrument main unit makes this equipment extremely resistant to noise.

IHW-50G-05

In addition to the standard terminals, all points are equipped with NDIS one-touch connectors (receptacles). This equipment is convenient for connecting strain gauge type transducers with tip NDIS plug. For this type, its depth becomes large because of the additional space for the connectors.

Option code

ISW/IHW -50G (- A)

Other options	
-A	With Optical Fiber Option
-N	Without Optical Fiber Option

With Optical Fiber Option

Without Optical Fiber Option

Specifications

Standard specifications IHW-50G (Standard mode)

Strain measurement

Sensor mode	(One-gauge method three-wire type, two-gauge method, four-gauge method) Four-gauge method 0-2 V, four-gauge method constant current, One-gauge method four-wire type, mode for gauge with temperature measurement function * The two-gauge common dummy method cannot be used.	
Bridge excitation	Constant voltage: DC 2 V 24 ms (50 Hz) Constant current (four-gauge method only): DC 6 mA 24 ms (50 Hz)	
Initial value storage range	Conform to that of the data logger	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain	1×10^{-6} strain
	± 80000×10^{-6} strain	2×10^{-6} strain
	±160000×10^{-6} strain	4×10^{-6} strain
	±320000×10^{-6} strain	8×10^{-6} strain
	±640000×10^{-6} strain	16×10^{-6} strain
Accuracy (at 23°C ± 5°C) *Excluding the one-gauge method four-wire type	±(0.05%rdg+1 digit)	
Accuracy (at 23°C ± 5°C) *One-gauge method four-wire type	±(0.25%rdg+1 digit)	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Bridge resistance (constant current method)	350 Ω	
Extension range (constant current method)	Equivalent to cable round-trip resistance of 400 Ω	
Sensitivity change (constant current method)	+0.1 to -0.5%/Cable round-trip resistance of 100 Ω	

High-resolution strain measurement

Sensor mode	Four-gauge method, four-gauge method constant current	
Bridge excitation	Constant voltage DC5V 48ms(50Hz) Constant current DC14mA 48ms(50Hz)	
Initial value storage range	Conform to that of the data logger	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0×10^{-6} strain	0.1×10^{-6} strain
	± 8000.0×10^{-6} strain	0.2×10^{-6} strain
	±16000.0×10^{-6} strain	0.4×10^{-6} strain
	±32000.0×10^{-6} strain	0.8×10^{-6} strain
	±64000.0×10^{-6} strain	1.6×10^{-6} strain
Accuracy (at 23°C ± 5°C)	± (0.05% rdg + 3 digits)	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Bridge resistance (constant current method)	350 Ω	
Extension range (constant current method)	Equivalent to cable round-trip resistance of 160 Ω	
Sensitivity change (constant current method)	+0.1% to -0.5%/Cable round-trip resistance of 100 Ω	

DC voltage measurement

Initial value storage range		Conform to that of the data logger	
Measurement range and resolution		Measurement range	Resolution
	V1/1	± 40.000mV	0.001mV
		± 80.000mV	0.002mV
		±160.000mV	0.004mV
		±320.000mV	0.008mV
		±640.000mV	0.016mV
	V1/100	± 4.0000V	0.0001V
		± 8.0000V	0.0002V
		±16.0000V	0.0004V
		±32.0000V	0.0008V
		±64.0000V	0.0016V
Accuracy (23°C ±5°C)	**V1/1**	±(0.05%rdg+3 digit)	
	V1/100	±(0.05%rdg+2 digit)	
Temperature coefficient of accuracy		±0.0024%rdg/°C	
Aging change of accuracy		±0.024%rdg/year	

IHW-50G (High-speed)

Thermocouple temperature measurement (JIS C 1602-1995, IEC 60584)

Applicable thermocouple		T, K, J, B, S, R, E, N		
Linearization		Digital calculation		
Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
T	-250 to -200°C	0.1°C	±(0.19%rdg+0.5°C)	±(0.19%rdg+3.8°C)
	-200 to -100°C	0.1°C	±(0.09%rdg+0.2°C)	±(0.09%rdg+1.6°C)
	-100 to + 400°C	0.1°C	±(0.06%rdg+0.2°C)	±(0.06%rdg+0.9°C)
K	-210 to -160°C	0.1°C	±(0.11%rdg+0.3°C)	±(0.11%rdg+1.8°C)
	-160 to 0°C	0.1°C	±(0.08%rdg+0.2°C)	±(0.08%rdg+1.1°C)
	0 to +960°C	0.1°C	±(0.06%rdg+0.1°C)	±(0.06%rdg+0.7°C)
	+960 to +1370°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.2°C)
J	-200 to -160°C	0.1°C	±(0.09%rdg+0.2°C)	±(0.09%rdg+1.4°C)
	-160 to 0°C	0.1°C	±(0.07%rdg+0.1°C)	±(0.07%rdg+1.0°C)
	0 to +700°C	0.1°C	±(0.05%rdg+0.1°C)	±(0.05%rdg+0.6°C)
	+700 to +1200°C	0.1°C	±(0.06%rdg+0.4°C)	±(0.06%rdg+0.8°C)
B	+200 to +280°C	0.5 to 0.4°C	±(0.03%rdg+1.5°C)	±(0.03%rdg+1.5°C)
	+280 to +800°C	0.3 to 0.1°C	±(0.03%rdg+0.6°C)	±(0.03%rdg+0.6°C)
	+800 to +1760°C	0.1°C	±(0.04%rdg+0.4°C)	±(0.04%rdg+0.4°C)
S	-10 to +200°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.3°C)
	+200 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+0.8°C)
R	-10 to +150°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.3°C)
	+150 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+0.8°C)
E	-210 to +550°C	0.1°C	±(0.10%rdg+0.2°C)	±(0.10%rdg+1.6°C)
	+550 to +1000°C	0.1°C	±(0.06%rdg+0.3°C)	±(0.06%rdg+0.7°C)
N	-200 to 0°C	0.1°C	±(0.11%rdg+0.4°C)	±(0.11%rdg+1.8°C)
	0 to +1090°C	0.1°C	±(0.05%rdg+0.2°C)	±(0.05%rdg+0.7°C)
	+1090 to +1300°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+0.9°C)

* The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

Platinum resistance temperature detector temperature measurement (JIS C 1604-1997, IEC 60751 Pt100)

Applicable resistance temperature detector	Pt100
Measurement Method	Three-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	± 0.002% rdg/°C
Aging change of accuracy	± 0.05% rdg/year
Measurement range	-200 to +850°C
Resolution	0.1°C
Accuracy (at 23°C ± 5°C)	± (0.05% rdg + 0.3°C)

High-speed mode (HSP) compatible specifications IHW-50G-01 (factory option)

Measurements with the high-speed mode (HSP) of the TDS-630 data logger. The strain high-resolution mode cannot be used.

Strain measurement

Sensor mode	(One-gauge method three-wire type, two-gauge method, four-gauge method) Four-gauge method 0-2 V, four-gauge method constant current, One-gauge method four-wire type, mode for gauge with temperature measurement function * The two-gauge common dummy method cannot be used.	
Bridge excitation	Constant voltage DC2V 4ms (50 Hz) Constant current (four-gauge method only) DC 6mA 4ms (50 Hz)	
Initial value storage range	Conform to that of the data logger	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain	1×10^{-6} strain
	± 80000×10^{-6} strain	2×10^{-6} strain
	±160000×10^{-6} strain	4×10^{-6} strain
	±320000×10^{-6} strain	8×10^{-6} strain
	±640000×10^{-6} strain	16×10^{-6} strain
Accuracy (at 23°C ± 5°C) *** Excluding the one-gauge method four-wire type**	±(0.08%rdg+3 digit)	
Accuracy (at 23°C ± 5°C) *** One-gauge method four-wire type**	±(0.28%rdg+3 digit)	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Bridge resistance (constant current method)	350 Ω	
Extension range (constant current method)	Equivalent to cable round-trip resistance of 400 Ω	
Sensitivity change (constant current method)	+0.1% to -0.5%/Cable round-trip resistance of 100 Ω	

DC voltage measurement

Initial value storage range		Conform to that of the data logger	
		Measurement range	Resolution
Measurement range and resolution	V1/1	± 40.000mV	0.001mV
		± 80.000mV	0.002mV
		±160.000mV	0.004mV
		±320.000mV	0.008mV
		±640.000mV	0.016mV
	V1/100	± 4.0000V	0.0001V
		± 8.0000V	0.0002V
		±16.0000V	0.0004V
		±32.0000V	0.0008V
		±64.0000V	0.0016V
Moving averaging process		**Enabled**	**Disabled**
V1/1 accuracy (at 23°C ± 5°C)		±(0.08%rdg+6 digit)	±(0.08%rdg+50 digit)
V1/100 accuracy (at 23°C ± 5°C)		±(0.08%rdg+6 digit)	±(0.08%rdg+50 digit)
Temperature coefficient of accuracy		±0.0024%rdg/°C	
Aging change of accuracy		±0.024%rdg/year	

* The moving average of the last five A/D conversion values is calculated. DC voltage measurement can be set to disabled.

Thermocouple temperature measurement (JIS C 1602-1995, IEC 60584)

Applicable thermocouple		T, K, J, B, S, R, E, N		
Linearization		Digital calculation		
Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
T	-250 to -200°C	0.1°C	±(0.31%rdg+1.9°C)	±(0.31%rdg+5.2°C)
	-200 to -100°C	0.1°C	±(0.14%rdg+0.8°C)	±(0.14%rdg+2.1°C)
	-100 to +0°C	0.1°C	±(0.11%rdg+0.5°C)	±(0.11%rdg+1.2°C)
	0 to + 400°C	0.1°C	±(0.08%rdg+0.4°C)	±(0.08%rdg+0.9°C)
K	-210 to -160°C	0.1°C	±(0.17%rdg+0.9°C)	±(0.17%rdg+2.5°C)
	-160 to 0°C	0.1°C	±(0.12%rdg+0.6°C)	±(0.12%rdg+1.5°C)
	0 to +960°C	0.1°C	±(0.09%rdg+0.4°C)	±(0.09%rdg+0.9°C)
	+960 to +1370°C	0.1°C	±(0.10%rdg+0.9°C)	±(0.10%rdg+1.5°C)
J	-200 to -160°C	0.1°C	±(0.15%rdg+0.6°C)	±(0.15%rdg+1.8°C)
	-160 to 0°C	0.1°C	±(0.11%rdg+0.4°C)	±(0.11%rdg+1.3°C)
	0 to + 700°C	0.1°C	±(0.09%rdg+0.3°C)	±(0.09%rdg+0.8°C)
	+700 to +1200°C	0.1°C	±(0.09%rdg+0.6°C)	±(0.09%rdg+1.0°C)
B	+200 to +280°C	0.5 to 0.4°C	±(0.03%rdg+6.0°C)	±(0.03%rdg+6.0°C)
	+280 to +800°C	0.3 to 0.1°C	±(0.03%rdg+2.4°C)	±(0.03%rdg+2.4°C)
	+800 to +1760°C	0.1°C	±(0.04%rdg+2.6°C)	±(0.04%rdg+2.6°C)
S	-10 to +200°C	0.1°C	±(0.06%rdg+2.4°C)	±(0.06%rdg+3.1°C)
	+200 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+2.0°C)
R	-10 to 150°C	0.1°C	±(0.06%rdg+2.4°C)	±(0.06%rdg+3.1°C)
	+150 to +1760°C	0.1°C	±(0.05%rdg+1.5°C)	±(0.05%rdg+1.8°C)
E	-210 to +550°C	0.1°C	±(0.16%rdg+0.6°C)	±(0.16%rdg+2.0°C)
	+550 to +1000°C	0.1°C	±(0.09%rdg+0.4°C)	±(0.09%rdg+0.9°C)
N	-200 to 0° C	0.1°C	±(0.11%rdg+1.3°C)	±(0.11%rdg+2.7°C)
	0 to +1090°C	0.1°C	±(0.09%rdg+0.5°C)	±(0.09%rdg+1.0°C)
	+1090 to +1300°C	0.1°C	±(0.06%rdg+0.9°C)	±(0.06%rdg+1.3°C)

* The moving average of the last five A/D conversion valuesis calculated.
* The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

Platinum resistance temperature detector temperature measurement (JIS C 1604-1997, IEC 60751 Pt100)

Applicable resistance temperature detector	Pt100
Measurement Method	Three-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	± 0.002% rdg/°C
Aging change of accuracy	± 0.05% rdg/year
Measurement range of accuracy	-200 to +850°C
Resolution	0.1°C
Accuracy (at 23°C ± 5°C)	± (0.05% rdg + 0.3°C)

Measurement capabilities

Number of measuring points	Up to 50 points * When the mode for strain gauge with temperature measurement function is used, more than 50 points can be measured.

Measuring point switching method

High-speed scanning measurement	Parallel switching measurement from the first channel to the last channel of each unit in the box (jump possible)
Monitor measurement (during standard mode)	Measurement of specified channel

Measuring point switching speed

mode	IHW-50G (Standard model)	
	50Hz area	60Hz area
Strain	40ms/ch	34ms/ch
Strain high-resolution	120ms/ch	100ms/ch
Voltage	40ms/ch	34ms/ch
Thermocouple temperature	40ms/ch*	34ms/ch*
Platinum resistance temperature detector temperature	40ms/ch	34ms/ch

* When using the thermocouple mode, add the measurement time of 1 point for every 10 points.
* If even a gauge with temperature measurement function is used even at 1 point, the measurement time is twice as long as that in the table above.

Compensation mode

Compensation mode (Processing of measurement value)	Comet None: Supported
	Comet A: Supported
	Comet B: Supported

TEDS (Transducer Electronic Data Sheet)

Function	Depends on the data logger combined
Connection	Six-pin modular jack, NDIS one-touch connector (-05 type only)

Check function

Stabilized insulation	Supported	**Direct**	Supported
Sensitivity	Supported	**Lead wire**	Supported
Variation	Supported	**Hum**	Supported
Thermocouple disconnection	Supported		

Operation

[SET]	Start changing the measuring point position, determine the measuring point allocation.
[+] [-]	Change the measuring point allocation for every 10 points.

Display

Measuring point number	For every 10 points, the upper two digits are displayed on a seven-segment, two-digit LCD.
Measuring point display	Red LED at each point

Setting

Measuring point allocation	Set by key operation, retain in an EEPROM.
Sensor mode	Set each point from the data logger.
Settable sensor mode	
Jump	Jump
Strain	One-gauge method three-wire type, 120 / 240 / 350 Ω, One-gauge method four-wire type, 120 / 240 / 350 Ω, two-gauge method, four-gauge method, Four-gauge method constant current 350 Ω, four-gauge method, high-resolution mode, Four-gauge method constant current 350 Ω high-resolution mode Four-gauge method 0-2 V mode *The two-gauge common dummy method cannot be used.
Strain gauge with temperature measurement function	Strain gauge with temperature measurement function, 120 / 240 / 350 Ω * Supported by the TS-560 and TDS-540 only
Voltage	Voltage [640 mV]/[64 V]
Temperature	T, K, J, B, S, R, E, N, Pt100 3W

Connection with data logger (Communication with data logger)

ELECTRICAL (RS-422)	Extension distance Connection cable	Distance between devices: 800 m RS422 cable CR-832M
OPTICAL (Optical fiber)	Extension distance Connection cable	Distance between devices: 800 m Optical fiber cable CR-842M
TO METER	Connect to the data logger side * Either RS-422 or optical fiber	
TO NEXT	Connect to the next ISW/IHW system switch boxes. * Either RS-422 or optical fiber	

Channel unit

Number of measuring points	Up to 50 points
Switch	Semiconductor relay
Lightning arrester	Each channel is equipped with a surge absorber for lightning protection as standard.
Input terminal	Dual-purpose type for screw fixing and soldering
Connector	Six-pin modular jack NDIS one-touch connector (-05 type only)
TEDS readout	Readout of TEDS (Transducer Electronic Data Sheet) compatible sensor information

Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method three-wire type : 120, 240, 350Ω	
	One-gauge method four-wire type : 120, 240, 350Ω	
	Two-gauge method : 60 to 1000Ω	
	Four-gauge method : 60 to 1000Ω	
	Four-gauge method constant current: 350Ω	
	Four-gauge method high-resolution mode : 120 to 1000Ω	
	Four-gauge method constant current high-resolution : 350Ω	
	Four-gauge method 0-2 V mode : 60~1000Ω	
	Mode for strain gauge with temperature measurement function : 120, 240, 350Ω (One-gauge method three-wire type, thermocouple T) T JIS C 1602-1995, IEC 60584 * Supported by the TS-560 and TDS-540 only	
Sensor cable extension range	Four-gauge method constant current high-resolution	Cable round-trip resistance: 140 Ω or less
	Four-gauge method constant current high-resolution 350 Ω	Cable round-trip resistance: 140 Ω or less
	One-gauge method four-wire type	Cable round-trip resistance: 200 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1 to -0.5% per cable round-trip resistance of 100 Ω
	Four-gauge method constant current high-resolution 350 Ω	
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω	About 100 Ω or less
	Gauge resistance 240 Ω	About 200 Ω or less
	Gauge resistance 350 Ω	About 300 Ω or less
Zero stability	±1.0 με/°C or less (one-gauge method) ± 0.5 με/°C or less (two-gauge method)	
DC voltage measurement	V 1/1 : DC ± 640 mV V 1/100: DC ± 64 V Input impedance: 1 MΩ or more Allowable input voltage between B and D: DC ± 70 V max	
Thermocouple temperature measurement		
Applicable thermocouple	T, K, J, B, S, R, E, N JIS C 1602-1995, IEC 60584	
Platinum resistance temperature detector measurement		
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current 3-wire type) JIS C 1604-1997, IEC 60751 Pt100	

Environment

Operating temperature / humidity range	0 to +50°C 85% RH or less (No condensation)

Power supply (AC power supply)

AC power supply	**Rated voltage**	AC 100 to 240 V 50/60 Hz
	Allowable voltage	AC 85 to 250 V 50/60 Hz
	Maximum power consumption	104 VA max
DC power supply	**Rated voltage**	DC 12 V
	Allowable voltage	DC 10 to 16 V

Outside dimension / mass

Normal type	298 (W) x 100 (H) x 500 (D) mm (excluding protrusions) Approx. 8 kg
-05 type	298 (W) x 100 (H) x 600 (D) mm (excluding protrusions) Approx. 8 kg

Standard accessories

Instruction Manual.....1
AC power cable (CR-03).....1
Ground wire (CR-20).....1
Connection cable.....1
(RS-422 cable CR-832M)
Phillips screwdriver.....1
Warranty certificate.....1

Related Products

SB-OT1B one-touch terminal

This terminal block allows one-touch connection of input lead wires. It is used by attaching it to the input terminal of the switch box. (One set of five terminals)

ISW-50G

- Electrically isolated from the data logger main unit
- Measurements of strain, DC voltage, thermocouple, and platinum resistance temperature detector
- Equipped with high-resolution (0.1 x 10^{-6} strain) mode*
- Sampling speed is 0.04 sec for 1 point and 2 sec for 50 points. In a system using multiple units of this equipment, 1000 points can be measured in 2 sec.
- One-gauge method four-wire type measurement via modular plug connection
- Equipped with gauge mode with temperature measurement function that can measure strain and temperature using 1 channel
- Each channel is equipped with a surge absorber for lightning protection as standard.
- Equipped with Complete Compensation Method of Strain

* The high-resolution mode supports the standard mode, four-gauge method, and the four-gauge constant current method.

ISW-50G switch box

This equipment is a switch box with a built-in A/D converter that enables high-speed and high-accuracy measurements and was developed to be used in combination with the TS-560/TDS-540 data logger to expand the number of measuring points. High-speed digital communication via RS-422 or optical fiber isolated from the measuring instrument main unit makes this equipment extremely resistant to noise.

ISW-50G-05

In addition to the standard terminals, all points are equipped with NDIS one-touch connectors (receptacles). This equipment is convenient for connecting strain gauge type transducers with tip NDIS plugs. For this type, its depth becomes large because of the additional space for the connectors.

Option code

ISW/IHW -50G (- A)

Other options	
-N	Without Optical Fiber Option
-A	With Optical Fiber Option

With Optical Fiber Option

Without Optical Fiber Option

Specifications

Strain measurement

Sensor mode	(One-gauge method three-wire type, two-gauge method, four-gauge method) Four-gauge method 0-2 V, four-gauge method constant current, one-gauge method four-wire type, mode for gauge with temperature measurement function	
Bridge excitation	Constant voltage DC 2 V 24 ms (50 Hz) Constant current (four-gauge method only) DC 6 mA 24 ms (50 Hz)	
Initial value storage range	Conform to that of the data logger	
Measurement range and resolution	Measurement range	Resolution
	± 40000×10^{-6} strain	1×10^{-6} strain
	± 80000×10^{-6} strain	2×10^{-6} strain
	±160000×10^{-6} strain	4×10^{-6} strain
	±320000×10^{-6} strain	8×10^{-6} strain
	±640000×10^{-6} strain	16×10^{-6} strain
Accuracy (at 23°C ± 5°C) * Excluding the one-gauge method four-wire type	±(0.05%rdg+1 digit)	
Accuracy (at 23°C ± 5°C) * One-gauge method four-wire type	±(0.25%rdg+1 digit)	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Bridge resistance (constant current method)	350 Ω	
Extension range (constant current method)	Equivalent to cable round-trip resistance of 400 Ω	
Sensitivity change (constant current method)	+ 0.1 to -0.5%/Cable round-trip resistance of 100 Ω	

High-resolution strain measurement

Sensor mode	Four-gauge method, four-gauge method constant current	
Bridge excitation	Constant voltage DC 5 V 48 ms (50 Hz) Constant current DC 14 mA 48 ms (50 Hz)	
Initial value storage range	Conform to that of the data logger	
Measurement range and resolution	Measurement range	Resolution
	± 4000.0×10^{-6} strain	0.1×10^{-6} strain
	± 8000.0×10^{-6} strain	0.2×10^{-6} strain
	±16000.0×10^{-6} strain	0.4×10^{-6} strain
	±32000.0×10^{-6} strain	0.8×10^{-6} strain
	±64000.0×10^{-6} strain	1.6×10^{-6} strain
Accuracy (at 23°C ± 5°C)	± (0.05% rdg + 3 digits)	
Temperature coefficient of accuracy	± 0.002% rdg/°C	
Aging change of accuracy	± 0.02% rdg/year	
Bridge resistance (constant current method)	350 Ω	
Extension range (constant current method)	Equivalent to cable round-trip resistance of 160 Ω	
Sensitivity change (constant current method)	+ 0.1 to -0.5%/Cable round-trip resistance of 100 Ω	

DC voltage measurement

Initial value storage range		**Conform to that of the data logger**	
Measurement range and resolution		Measurement range	Resolution
	V1/1	± 40.000mV	0.001mV
		± 80.000mV	0.002mV
		±160.000mV	0.004mV
		±320.000mV	0.008mV
		±640.000mV	0.016mV
	V1/100	± 4.0000V	0.0001V
		± 8.0000V	0.0002V
		±16.0000V	0.0004V
		±32.0000V	0.0008V
		±64.0000V	0.0016V
Accuracy (23°C ± 5°C)	**V1/1**	±(0.05%rdg+3 digit)	
	V1/100	±(0.05%rdg+2 digit)	
Temperature coefficient of accuracy		± 0.0024% rdg/°C	
Aging change of accuracy		± 0.024% rdg/year	

Thermocouple temperature measurement (JIS C 1602-1995, IEC 60584)

Applicable thermocouple	T, K, J, B, S, R, E, N
Linearization	Digital calculation

Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
T	-250 to -200°C	0.1°C	±(0.19%rdg+0.5°C)	±(0.19%rdg+3.8°C)
	-200 to -100°C	0.1°C	±(0.09%rdg+0.2°C)	±(0.09%rdg+1.6°C)
	-100 to +400°C	0.1°C	±(0.06%rdg+0.2°C)	±(0.06%rdg+0.9°C)
K	-210 to -160°C	0.1°C	±(0.11%rdg+0.3°C)	±(0.11%rdg+1.8°C)
	-160 to 0°C	0.1°C	±(0.08%rdg+0.2°C)	±(0.08%rdg+1.1°C)
	0 to +960°C	0.1°C	±(0.06%rdg+0.1°C)	±(0.06%rdg+0.7°C)
	+960 to +1370°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.2°C)
J	-200 to -160°C	0.1°C	±(0.09%rdg+0.2°C)	±(0.09%rdg+1.4°C)
	-160 to 0°C	0.1°C	±(0.07%rdg+0.1°C)	±(0.07%rdg+1.0°C)
	0 to +700°C	0.1°C	±(0.05%rdg+0.1°C)	±(0.05%rdg+0.6°C)
	+700 to +1200°C	0.1°C	±(0.06%rdg+0.4°C)	±(0.06%rdg+0.8°C)
B	+200 to +280°C	0.5 to 0.4°C	±(0.03%rdg+1.5°C)	±(0.03%rdg+1.5°C)
	+280 to +800°C	0.3 to 0.1°C	±(0.03%rdg+0.6°C)	±(0.03%rdg+0.6°C)
	+800 to +1760°C	0.1°C	±(0.04%rdg+0.4°C)	±(0.04%rdg+0.4°C)
S	-10 to +200°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.3°C)
	+200 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+0.8°C)
R	-10 to +150°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+1.3°C)
	+150 to +1760°C	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+0.8°C)
E	-210 to +550°C	0.1°C	±(0.10%rdg+0.2°C)	±(0.10%rdg+1.6°C)
	+550 to +1000°C	0.1°C	±(0.06%rdg+0.3°C)	±(0.06%rdg+0.7°C)
N	-200 to 0°C	0.1°C	±(0.11%rdg+0.4°C)	±(0.11%rdg+1.8°C)
	0 to +1090°C	0.1°C	±(0.05%rdg+0.2°C)	±(0.05%rdg+0.7°C)
	+1090 to +1300°C	0.1°C	±(0.06%rdg+0.6°C)	±(0.06%rdg+0.9°C)

* The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

Platinum resistance temperature detector temperature measurement (JIS C 1604-1997, IEC 60751 Pt100)

Applicable resistance temperature detector	Pt100
Measurement Method	Three-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	± 0.0020% rdg/°C
Aging change of accuracy	± 0.05% rdg/year
Measurement range	-200 to +850C°
Resolution	0.1C°
Accuracy (at 23°C ± 5°C)	± (0.05% rdg + 0.3C°)

Measuring point switching speed

Sensor mode	Switching speed 50 Hz area	Switching speed 60 Hz area
Strain	40 ms	34 ms
Strain high-resolution	120 ms	100 ms
Voltage	40 ms	34 ms
Thermocouple temperature (Data for 1 CH is added for every 10 points.)	40ms	34ms
Platinum temperature	40 ms	34 ms

* Excluding transfer time

Measurement capabilities

Number of measuring points	Up to 50 points * When the mode for strain gauge with temperature measurement function is used, more than 50 points can be measured.

Measuring point switching method

Scan measurement	Switching measurement from the first channel to the last channel in the box (jump possible)
Monitor measurement	Measurement of specified channel

Measurement time

When measuring strain of all points		50 Hz area	60 Hz area
Scanning measurement time	10 points	0.4 sec	0.34 sec
	20 points	0.8 sec	0.67 sec
	30 points	1.2 sec	1.00 sec
	40 points	1.6 sec	1.34 sec
	50 points	2.0 sec	1.67 sec

* Excluding transfer time
* When using the thermocouple mode, add the measurement time of 1 point for every 10 points.
* Add the measurement time separately to the above-mentioned measurement time obtained by using a strain gauge with temperature measurement function.
* When the high-resolution mode is used, the measurement time per point is three times longer.

Compensation mode

Compensation mode (Processing of measurement value)	Comet None	: Supported
	Comet A	: Supported
	Comet B	: Supported

Check function

Stabilized insulation	Supported	**Direct**	Supported
Sensitivity	Supported	**Lead wire**	Supported
Variation	Supported	**Hum**	Supported
Thermocouple disconnection	Supported		

Operation

[SET]	Start changing the measuring point position, determine the measuring point allocation.
[+] [-]	Change the measuring point allocation for every 10 points.

Display

Measuring point number	For every 10 points, the upper two digits are displayed on a seven-segment, two-digit LCD.
Status display	Red LED at each point

Setting

Measuring point allocation	Set by key operation, retain in an EEPROM.
Sensor mode	Set each point from the data logger.

Settable sensor mode

Jump	Jump
Strain	One-gauge method three-wire type, 120 / 240 / 350 Ω, one-gauge method four-wire type, 120 / 240 / 350 Ω, two-gauge method, two-gauge common dummy method, four-gauge method, four-gauge method constant current 350 Ω, four-gauge method, high-resolution mode, four-gauge method constant current 350 Ω high-resolution mode, four-gauge method 0-2 V mode
Strain gauge with temperature measurement function	Strain gauge with temperature measurement function, 120 / 240 / 350 Ω * Supported by the TS-560 and TDS-540 only
Voltage	Voltage [640 mV]/[64 V]
Temperature	T, K, J, B, S, R, E, N, Pt100 3W

Connection with data logger (Communication with data logger)

ELECTRICAL (RS-422)	Extension distance	Distance between devices: 800 m
	Connection cable	RS422 cable CR-832M
OPTICAL (Optical fiber)	Extension distance	Distance between devices: 800 m
	Connection cable	Optical fiber cable CR-842M
TO METER	Connect to the data logger side * Either RS-422 or optical fiber	
TO NEXT	Connect to the next ISW/IHW system switch boxes. * Either RS-422 or optical fiber	

Channel unit

Number of measuring points	Up to 50 points
Switch	Semiconductor relay
Lightning arrester	Each channel is equipped with a surge absorber for lightning protection as standard.
Input terminal	Dual-purpose type for screw fixing and soldering
Connector	Six-pin modular jack NDIS one-touch connector (-05 type only)
TEDS readout	Readout of TEDS (Transducer Electronic Data Sheet) compatible sensor information * Supported by the TS-560 and TDS-540 only

ISW-50G

Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method three-wire type :120, 240, 350 Ω	
	One-gauge method four-wire type : 120, 240, 350 Ω	
	Two-gauge method : 60–1000 Ω	
	Two-gauge common dummy method : 60–1000 Ω	
	Four-gauge method : 60–1000 Ω	
	Four-gauge method constant current : 350 Ω	
	Four-gauge method high-resolution mode : 120–1000 Ω	
	Four-gauge method constant current high-resolution : 350 Ω	
	Four-gauge method 0-2 V mode : 60–1000 Ω	
	Mode for strain gauge with temperature measurement function 120, 240, 350 Ω (One-gauge method three-wire type, thermocouple T) T JIS C 1602-1995, IEC 60584 * Supported by the TS-560 and TDS-540 only	
Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
	Four-gauge method constant current high-resolution 350 Ω	Cable round-trip resistance: 140 Ω or less
	One-gauge method four-wire type	Cable round-trip resistance: 200 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1 to -0.5% per cable round-trip resistance of 100 Ω
	Four-gauge method constant current high-resolution 350 Ω	
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω	About 100 Ω or less
	Gauge resistance 240 Ω	About 200 Ω or less
	Gauge resistance 350 Ω	About 300 Ω or less
Zero stability	±1.0 με/C° or less (one-gauge method) ± 0.5 με/C° or less (two-gauge method)	
DC voltage measurement	V 1/1 : DC ± 640 mV V 1/100: DC ± 64 V Input impedance: 1 MΩ or more Allowable input voltage between B and D: DC ± 70 V max	
Thermocouple temperature measurement		
Applicable thermocouple	T, K, J, B, S, R, E, N JIS C 1602-1995, IEC 60584	
Platinum resistance temperature detector measurement		
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current three-wire type) JIS C 1604-1997, IEC 60751 Pt100	

Environment

Operating temperature / humidity range	0C° to +50C° 85% RH or less (No condensation)

Power supply (AC power supply)

AC power supply	**Rated voltage**	AC 100 to 240 V 50/60 Hz
	Allowable voltage	AC 85 to 250 V 50/60 Hz
	Maximum power consumption	37 VA max
DC power supply	**Rated voltage**	DC 12 V
	Allowable voltagevoltage	DC 10 to 16 V
	Maximum consumption current	0.8 A max

Outside dimension / mass

Normal type	298 (W) x 100 (H) x 500 (D) mm (excluding protrusions) Approx. 8 kg
-05 type	298 (W) x 100 (H) x 600 (D) mm (excluding protrusions) Approx. 8 kg

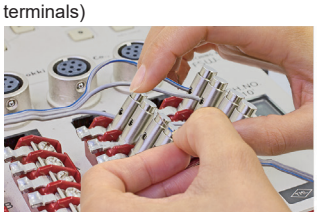
Standard accessories

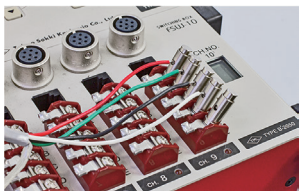
Instruction Manual..... 1
AC power cable (CR-03) 1
Ground wire (CR-20) 1
Connection cable 1
(CR- 842M Optical fiber cable or CR-832M RS-422 cable)
Phillips screwdriver 1
Warranty certificate 1

Related Products

SB-OT1B one-touch terminal

This terminal block allows one-touch connection of input lead wires. It is used by attaching it to the input terminal of the switch box. (One set of five terminals)





SSW-50D

- Measurements of strain, DC voltage and thermocouple are possible.
- Strain measurement using the new one-gauge method four-wire type is possible.
- Modular plug connection allows for significant reduction in wiring time. (Modular connectors can only be used for the new one-gauge method four-wire type measurement.)
- A power booster for multipoint long distance extension is built in.
- Cascade connection with SSW / ASW-50C is possible.
- A heater for moisture prevention can be built in optionally.
- Equipped with Complete Compensation Method of Strain

This equipment is a switch box for expanding the number of measuring points in combination with the TDS-540 data logger. The number of measuring points is 50 points per unit and, in addition to measurements of strain, DC voltage and thermocouple temperature, it is also possible to perform the one-gauge method four-wire type strain measurement, which is a new measurement method. A modular connector is provided for the one-gauge method four-wire type strain measurement to facilitate speedy wiring work when performing multipoint measurements.

Specifications

Number of measuring points	50 points	
Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method three-wire type	: 120, 240, 350 Ω
	One-gauge method four-wire type	: 120, 240, 350 Ω
	Two-gauge method	: 60–1000 Ω
	Two-gauge common dummy method	: 60–1000 Ω
	Four-gauge method (standard resolution mode)	: 60–1000 Ω
	Four-gauge method (high-resolution mode)	: 120–1000 Ω
	Four-gauge method constant current	: 350 Ω
Measurement range	Depends on the data logger combined	
Sensor cable extension range	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
	Four-gauge method constant current high-resolution: 350 Ω	Cable round-trip resistance: 80 Ω or less
	One-gauge method four-wire type	Cable round-trip resistance: 200 Ω or less
Zero stability	One-gauge method three-wire type (±1.0 × 10^{-6} strain/°C or less) One-gauge method four-wire type (±1.0 × 10^{-6} strain/°C or less) Two-gauge method (± 0.5 × 10^{-6} strain/°C or less)	
Voltage measurement		
Measurement range	Depends on the data logger combined	
Input impedance	1 MΩ or more	
Thermocouple temperature measurement		
Measurement range	Depends on the data logger combined	
Sensor mode		
REMOTE	Set each point from the data logger.	
Measuring point number	Set the top two digits arbitrarily for every 10 points.	
Measuring point display	Red LED at each point	
Switch	Semiconductor relay	
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)	
Power supply	Usually, supplied by a data logger	
AC power supply	Only when booster / heater are used	
Rated voltage	AC 100 to 240 V 50/60 Hz	
Allowable voltage	AC 85 to 250 V 50/60 Hz	
Maximum power consumption	17 VA max (AC 121 to 250 V) 10 VA max (AC 85 to 120 V)	
Outside dimension	SSW-50D : 298 (W) × 100 (H) × 500 (D) mm (Excluding protrusions) SSW-50D-05 : 298 (W) × 100 (H) × 600 (D) mm (Excluding protrusions)	
Mass	SSW-50D: Approx. 7 kg SSW-50D-05: Approx. 8 kg	

Standard accessories

Instruction Manual..... 1
AC power cable (CR-03) 1
Connection cable (CR-65) 1
Phillips screwdriver 1
Warranty certificate 1

SSW-50D switch box

SSW-50D-05

In addition to the standard terminals, all points are equipped with NDIS one-touch connectors (receptacles). This equipment is convenient for connecting strain gauge type transducers with tip NDIS plug. For this type, its depth becomes large because of the additional space for the connectors.

Factory option

Heater for moisture prevention
Power consumption

AC100V	50/60 Hz	26 VA max
AC 240 V	50/60 Hz	110 VA max

Gas tube arrester for lightning protection

Protection voltage	170 V to 290 V
Protection current	10 kA

Related Products

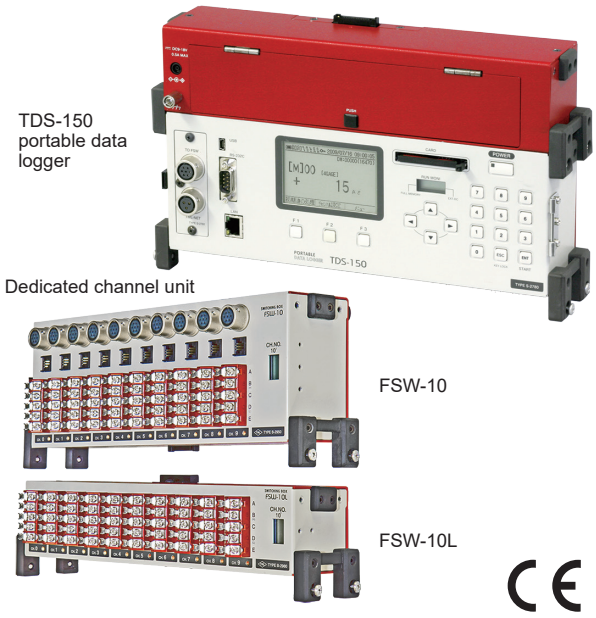
SB-OT1B one-touch terminal

This terminal block allows the one-touch connection of input lead wires. It is used by attaching it to the input terminal of the switch box. (One set of five terminals)

TDS-150 (Portable)

- Up to five channel units (FSW-10/FSW-10L) (50 ch) can be connected (both are optional).
- Long-term automatic measurement is possible using the sleep interval timer.
- Low power consumption
- Measurements of strain, DC voltage, thermocouple / platinum resistance temperature detector are possible.
- Equipped with large capacity data memory
- The one-gauge method four-wire type measurement is possible.
- Equipped with TEDS reading function
- Equipped with Complete Compensation Method of Strain
- Network modules can be connected (optional)
- Measurement via wireless communication using the ZT-150 wireless controller and ZT-014 wireless module (optional) is possible.
- Equipped with concrete sensor mode

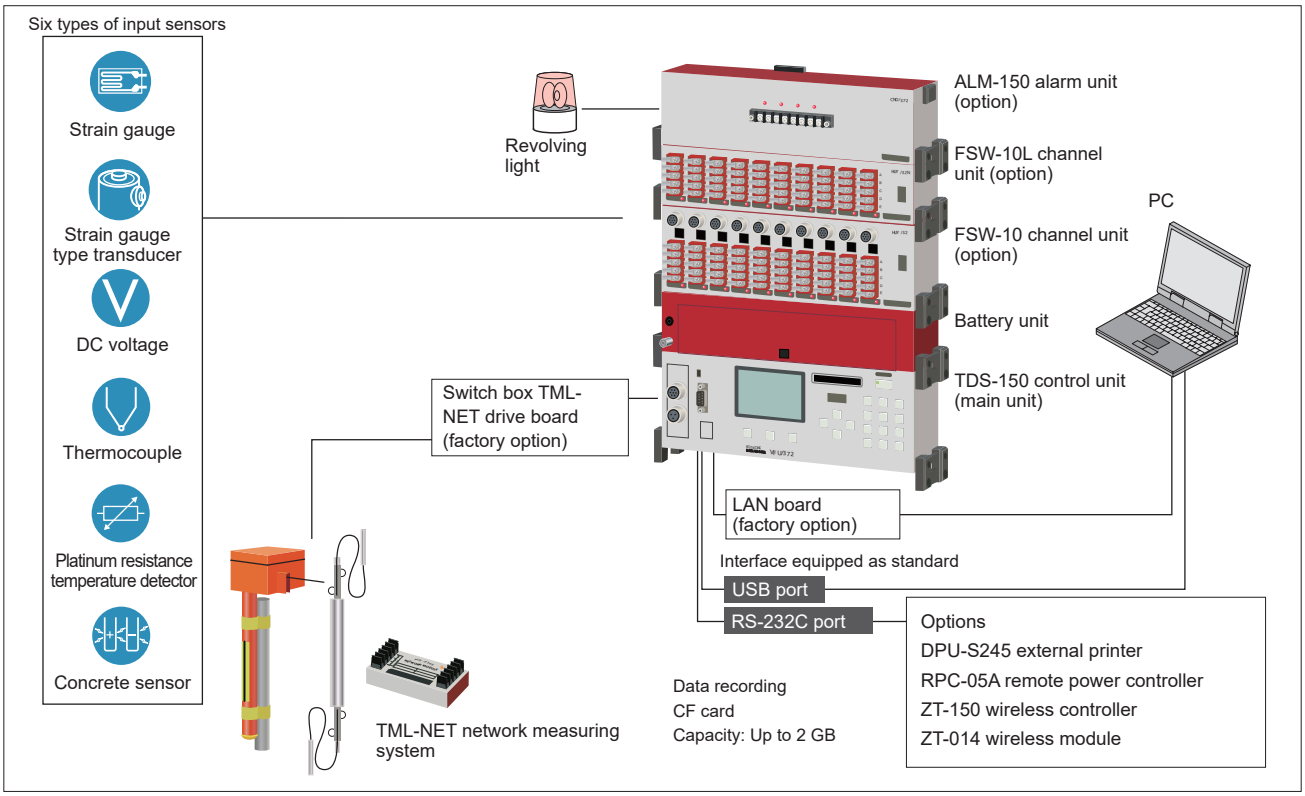
*The TDS-150 and the FSW-10/-10L channel unit are CE mark compliant.



This equipment is a portable data logger that can measure strain gauges, strain gauge type transducers, DC voltages, thermocouples, and platinum resistance temperature detectors in combination with the dedicated channel units (FSW-10/FSW-10L). Up to five units of the 10-channel unit (FSW-10/FSW-10L) (50 channels) can be connected. In addition, up to 100 channels can be connected using the switch box TML-NET drive board (optional). This product can be operated using commercially available D size alkaline dry-cell batteries or batteries even in places where AC power is unavailable.

It is equipped with data memory and sleep interval timer function that enable automatic measurement over a long period of time. It is possible to record the data and settings to a CF card. USB and RS-232C are equipped as interfaces to allow various settings and data to be imported from a PC. Wireless measurement is possible using the ZT-150 wireless controller and ZT-014 wireless module (optional). In addition, the CONCRETE mode is newly installed, and this allows the concrete filling detection sensor KZA and concrete moisture sensor KZW, which previously required two channels, to be measured with one channel.

System Block Diagram



Specifications

Number of measuring points

Up to 100 points	When using the switch box TML-NET drive board (factory option) or when using the ZT-150 wireless controller in combination
50 points	Dedicated channel unit FSW-10/FSW-10L When 5 units are connected

Applicable sensor

Strain measurement	One-gauge method four-wire type 120Ω One-gauge method four-wire type 240Ω One-gauge method four-wire type 350Ω	Bridge voltage DC 1 V 48 ms (50 Hz)
	One-gauge method three-wire type 120Ω One-gauge method three-wire type 240Ω One-gauge method three-wire type 350Ω	
	Two-gauge method 120–1000Ω Four-gauge method 120–1000Ω Four-gauge method constant current 350Ω	
	Four-gauge method 120~1000Ω	Bridge voltage DC 2 V 24 ms (50 Hz)
Thermocouple measurement	Thermocouple T Thermocouple K Thermocouple J Thermocouple B Thermocouple S Thermocouple R Thermocouple E Thermocouple N	Linearization digital calculation JIS C 1602-1995
Voltage measurement	DC 300 mV ± 300 mV DC 30 V ± 30 V	Input impedance V 1/1 500 MΩ or more V 1/100 1 MΩ or more
Platinum resistance temperature detector measurement	Platinum temperature measurement 3-wire type	Linearization digital calculation JIS C 1604-1997 Pt100
Concrete sensor measurement	CONCRETE (Concrete filling detection sensor, etc.)	Applied voltage: DC 2 V DC voltage measurement of sensor residual charge: Measured at ± 30 V
Wireless measurement	Four-gauge method connection to the ZT-014 wireless module (optional) 350-1000 Ω	Received by the ZT-150 wireless controller (optional)
TML-NET	Operates the NSW series (optional)	Data reading from the network module

Measurement range

Measurement item	Range	Measurement range	Measuring mode	Initial value storage range
Strain measurement	×1 ×10	±30000×10^{-6} strain ±300000×10^{-6} strain	Initial, direct, measure	±160000×10^{-6} strain
DC voltage measurement	×1 ×10	V 1/1 ± 30.000mV ±300.000mV	Initial, direct, measure	V1/1 ±160.000mV V1/100 ± 16.0000V
	×1 ×10	V 1/100 ± 3.0000 V ±30.0000 V		
Thermocouple temperature measurement	-	T: -250 to + 400C° K: -210 to +1370C° J: -200 to +1200C° B: +200 to +1760C° S: -10 to +1760C° R: -10 to +1760C° E: -210 to +1000C° N: -200 to +1300C°	Direct	-
Platinum resistance temperature detector	-	–200 to +850C°	Direct	-

The measurement range of the four-gauge method 0-2 V mode (supporting our differential transformer displacement meter, etc.) is as follows.
x1 : ±15000×10^{-6} strain, x10 : ±150000×10^{-6} strain

Measurement accuracy

Sensor mode	Range	Resolution	Accuracy (at 23°C ± 5°C)	Temperature coefficient of accuracy (% rdg/°C)	Aging change of accuracy (% rdg/year)
Strain (Excluding the One-gauge method four-wire type)	×1	1×10^{-6} strain	±(0.08%rdg+1digit)	±0.002	±0.02
	×10	10×10^{-6} strain	±(0.08%rdg+1digit)	±0.002	±0.02
Strain (One-gauge method four-wire type)	×1	1×10^{-6} strain	±(0.28%rdg+1digit)	±0.002	±0.02
	×10	10×10^{-6} strain	±(0.28%rdg+1digit)	±0.002	±0.02
Voltage V1/1	×1	0.001mV	±(0.08%rdg+3digit)	±0.0024	±0.02
	×10	0.010mV	±(0.08%rdg+3digit)	±0.0024	±0.02
Voltage V1/100	×1	0.0001V	±(0.08%rdg+2digit)	±0.002	±0.02
	×10	0.0010V	±(0.08%rdg+2digit)	±0.002	±0.02
Platinum resistance temperature detector Pt100 3W	-	0.1°C	±(0.08%rdg+0.3°C)	±0.002	±0.05
Strain measurement with wireless module	-	1×10^{-6} strain	±(0.10%rdg+3digit)	±0.01	-

* The range is automatically switched.

Lead wire resistance compensation Comet B (One-gauge method three-wire type)	Gauge resistance	Lead wire resistance value compensation range
	120Ω	About 100 Ω or less
	240Ω	About 200 Ω or less
	350Ω	About 300 Ω or less

Thermocouple measurement accuracy

Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) External reference junction	Accuracy (at 23°C ± 5°C) Internal reference junction
T	-250 to -200°C	0.1°C	±(0.38%rdg+0.6°C)	±(0.38%rdg+3.9°C)
	-200 to -100C°	0.1°C	±(0.15%rdg+0.2°C)	±(0.15%rdg+1.4°C)
	-100 to +400C°	0.1°C	±(0.10%rdg+0.2°C)	±(0.10%rdg+0.8°C)
K	-210 to -160C°	0.1°C	±(0.19%rdg+0.3°C)	±(0.19%rdg+1.6°C)
	-160 to 0C°	0.1°C	±(0.12%rdg+0.2°C)	±(0.12%rdg+1.0°C)
	0 to +960C°	0.1°C	±(0.08%rdg+0.1°C)	±(0.08%rdg+0.5°C)
	+960 to +1370C°	0.1°C	±(0.10%rdg+0.9°C)	±(0.10%rdg+1.4°C)
J	-200 to -160C°	0.1°C	±(0.16%rdg+0.2°C)	±(0.16%rdg+1.2°C)
	-160 to 0C°	0.1°C	±(0.12%rdg+0.1°C)	±(0.12%rdg+0.8°C)
	0 to +700C°	0.1°C	±(0.08%rdg+0.1°C)	±(0.08%rdg+0.5°C)
	+700 to +1200C°	0.1°C	±(0.08%rdg+0.6°C)	±(0.08%rdg+0.9°C)
B	+200 to +280C°	0.5 to 0.4°C	±(0.04%rdg+4.0°C)	±(0.04%rdg+4.0°C)
	+280 to +800C°	0.3 to 0.1°C	±(0.04%rdg+1.2°C)	±(0.04%rdg+1.2°C)
	+800 to +1760C°	0.1°C	±(0.05%rdg+0.4°C)	±(0.05%rdg+0.4°C)
S	-10 to +200C°	0.1°C	±(0.09%rdg+0.6°C)	±(0.09%rdg+1.2°C)
	+200 to +1760C°	0.1°C	±(0.07%rdg+0.4°C)	±(0.07%rdg+0.7°C)
R	-10 to +150C°	0.1°C	±(0.09%rdg+0.7°C)	±(0.09%rdg+1.2°C)
	+150 to +1760C°	0.1°C	±(0.07%rdg+0.4°C)	±(0.07%rdg+0.7°C)
E	-210 to +550C°	0.1°C	±(0.17%rdg+0.2°C)	±(0.17%rdg+1.4°C)
	+550 to +1000C°	0.1°C	±(0.09%rdg+0.4°C)	±(0.09%rdg+0.8°C)
N	-200 to 0C°	0.1°C	±(0.18%rdg+0.4°C)	±(0.18%rdg+1.6°C)
	0 to +1090C°	0.1°C	±(0.08%rdg+0.2°C)	±(0.08%rdg+0.6°C)
	+1090 to +1300C°	0.1°C	±(0.08%rdg+0.9°C)	±(0.08%rdg+1.2°C)

The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

Measurement switching speed

Switch box	Sensor mode	Switching speed 50 Hz area	Switching speed 60 Hz area
FSW-10/-10L	Strain measurement	80 ms	67 ms
	DC voltage measurement	80 ms	67 ms
	Concrete sensor measurement	160 ms	134 ms
	Thermocouple measurement * Time for 1 ch is added for every 10 points.	80 ms	67 ms
	Platinum resistance temperature detector measurement	80 ms	67 ms
TML-NET	Each module	200 ms	200 ms

Display / function

Display	Display unit	LCD with backlight
	Resolution	255 x 160 dots
	Display content	Measurement data, setting list, Y-T monitor
Time	Setting	Year, month, day, hour, minute, second
	Accuracy	Daily error: ±1 sec (at 23°C ± 5°C)
Interface	USB, RS-232C, LAN (Options)	
	Function	Receiving of commands, sending of measurement data, etc.
Measuring mode	Initial, direct or measure can be set for each point. (For temperature measurement, direct only)	
Measuring point switching method	Scanning	Automatic switching measurement from the first channel to the last channel (jump possible)
	Monitor	Repeated measurement of monitor channels Graphic monitor for time change
Measurement start	Start key switch, interval timer, RS-232C, USB, LAN (optional)	
Program setting	Can be set for each point	
	Coefficient	± (0.0001-99999)
	Unit	40 types including με, mV, °C, kN, mm
	Decimal point	Display after the decimal point can be set arbitrarily with 0 to 6 digits
	Initial value	Can be written to each arbitrarily measurement channel
	Sensor mode	The type of sensor to be connected can be set.
Simple measure	Coefficient	1.0000
	Unit	Interlocked with sensor mode
	Decimal point	Interlocked with sensor mode
Self-diagnosis function	Insulation, variation, thermocouple disconnection, lead wire resistance, bridge output, coefficient setting	

TDS-150 (Portable)

TEDS function	Standard	IEEE 1451.4 Class 2
	Function	Reading of TEDS sensor information
Interval timer	Function	Automatic start at the set time interval and time
	Interval	Hour / minute / second can be set for each step up to 99 hours, 59 minutes, and 59 seconds.
	Number of starts	Up to 99 times per step or infinite
	Number of steps	Programmable up to 10 steps
	Real time start	Start time (day / hour / minute / second) can be set for each step
	GOTO step	Program loop possible to one of the previous steps
	Sleep function	The power is turned on 5 sec before the measurement time and automatically turned OFF after the measurement is completed. Sleep function can be set to ON/OFF.
Monitor comparator	Function	Automatic measurement based on the set amount of change of monitor channel (1 point)
	Comparison amount	Can be set for each step: Up to ±999999
	Comparison method	Select either amount of change or absolute value.
	Number of starts	Up to 99 times per step or infinite
	Number of steps	Programmable up to 10 steps
	GOTO step	Program loop possible to one of the previous steps
	GOTO Interval	Go to Step 1 of the interval.
Data memory	Function	Recording / reproduction of measurement data
	Recording content	Measuring mode, channel number, measurement data, time data, data number
	Data capacity	Up to about 80000 units About 16000 scans with 10 channels
	Data retention period	About 20 days (with full charge)
Memory card	Card standard	CF card
	Card capacity	Up to 2 GB (Designated by us)
Auto power OFF	When no command is received from the key operation / each interface for an arbitrary time, the power is turned OFF automatically. Auto power OFF function can be set to ON/OFF.	

Switch box TML-NET drive board (Options)	TML-NET drive unit Cable used Dedicated 2-core shielded cable (2-12.5L1) When using a low-power consumption network module Number of connectable units: Up to 100 units NSW-011C/-014C/-024C/-01 VC/-01TC Total extension distance 1 km or less When using a conventional network module Number of connected units Up to 20 units (NSW-014B etc., 150 m or less) Total extension distance 1 km or less (NSW-014B etc., 10 units or less)
Continuous use time	Using D size alkaline dry-cell batteries, LCD backlight (at 23°C ± 5°C) No option About 40 hr When using LAN board About 9.5 hr Switch box TML-NET drive board NSW-014C When using 100 units About 1 hr NSW-014B When using 20 units About 1 hr
Use time during sleep interval (1 hour interval)	Using D size alkaline dry-cell batteries, LCD backlight (at 23°C ± 5°C) No option About 8 months When using LAN board About 2 months Switch box TML-NET drive board NSW-014C When using 100 units About 10 days NSW-014B When using 20 units About 10 days
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation) When using LAN board (optional), 0 to +50°C, 85% RH or less (No condensation)
Storage temperature range	-20 to +60C°
Power supply	D size alkaline dry-cell battery x 4, dedicated AC adapter CR-1867 or external power input DC 9-18 V
Outside dimension	DS-150 280 (W) × 60 (H) × 162 (D) mm (Excluding protrusions) FSW-10 280 (W) × 60 (H) × 100 (D) mm (Excluding protrusions) FSW-10L 280 (W) × 60 (H) × 60 (D) mm (Excluding protrusions)
Mass	TDS-150 : Approx. 2.1 kg (Including battery unit and dry cell batteries) FSW-10 : Approx. 1.5 kgg FSW-10L : Approx. 1 kg

Standard accessories

Instruction Manual..... 1
D size alkaline dry-cell battery 4
Phillips screwdriver 1
Shoulder belt 1
Warranty certificate 1

Options

AC Adapter (CR-1869)
AC Adapter [For China] (CR-1869-C)
DC Power Cable (CR-062)

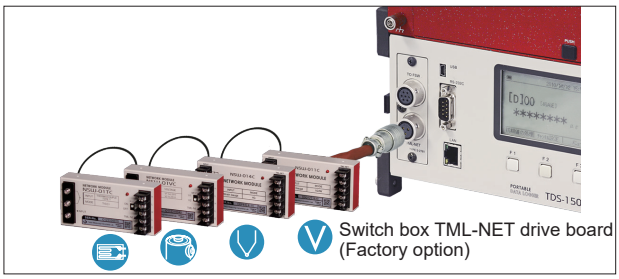
Related Products

LAN board (factory option)

This board adds LAN (Ethernet) interface to the TDS-150.

TDS-150-06 (Switch box TML-NET drive board) (Factory option)

By installing the TML-NET drive board, the transducer and network module NSW compatible with the TML-NET network measuring system can be used.



Switch box TML-NET drive board (Factory option)

See pages 265 - 273 for details.

FSW-10 / FSW-10L (Dedicated channel unit)

This is a 10-ch switch box that connects to the TDS-150. Measurements of strain gauges, strain gauge type transducers, DC voltages, thermocouples, platinum resistance temperature detectors can be performed.

ALM-150 (Dedicated alarm unit)

This equipment is a dedicated alarm unit that connects to the TDS-150. The alarm output is a function that monitors a specified channel and closes a specified contact when the measurement value changes by a certain amount (relative value setting) or exceeds a threshold value (upper and lower limit setting).

Specifications

Number of contact outputs	4 points
Contact capacity	AC 140 V / DC 200 V max
	Rated current: 0.5 A max
	Inrush current: 1.5 A max
	ON resistance: 3.2 Ω max
Display	Status LED: Lights up when each contact is closed
Comparison method	Relative value / upper and lower limits
Number of setting tables	100 table
Other functions	Alarm test
Power supply	Supplied via TDS-150
Outside dimension	280 (W) × 60 (H) × 80 (D) mm (Excluding protrusions)
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Mass	About 600 g

Standard accessories

Instruction Manual..... 1
Warranty certificate 1

Protective cover TDS-150 top cover

A protective cover that is easy to attach and remove.
Model name: TDS-150-F01
Compatible with the TDS-150 main unit and FSW-10 channel unit

CR-1867 AC adapter

This equipment is connected to AC 100 V to supply the power.

Measurement software Visual LOG

Visual LOG TDS-7130v2 static measurement software
Visual LOG Light TDS-700L interval measurement software
Visual LOG Light TDS-Mail data mail management software

CF card

Supported card capacity: 128 MB to 2 GB (Designated by us)

DPU-S245 (External printer)

The measurement data of the TDS-150 is printed out. The TP-S245L-1 recording paper (optional) is used.

CR-4530 printer cable

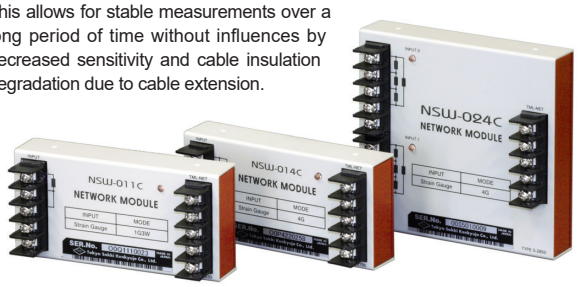
RPC-05A (Remote power controller)

By combining with this remote power controller, the sleep function of the TDS-150 is utilized to enable long-term measurement powered by an external battery.

Dedicated cable CR-5354
A cable for connecting to the TDS-150 is required.

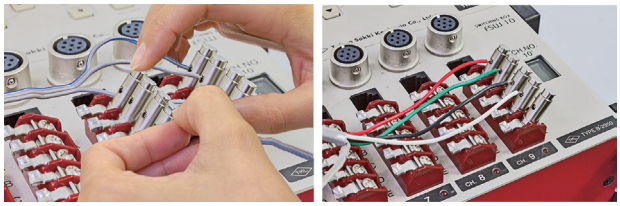
NSW network module

This equipment enables measurement control and data transfer via a two-wire type network line. A measurement circuit is configured near a strain gauge, DC voltage signal, thermocouples, etc. and the measurement data is digitized. This allows for stable measurements over a long period of time without influences by decreased sensitivity and cable insulation degradation due to cable extension.



SB-OT1B one-touch terminal

This terminal block allows one-touch connection of input lead wires. It is used by attaching it to the input terminal of the switch box. (One set of five terminals)



Cable

CR-5360 RS-232C cable
D-sub 9P-D-sub 9 P cross 1.5 m
This cable is used to connect to a PC.

CR-6187 USB cable
miniB-A (with ferrite Core) 1.8 m
This cable is used to connect to a PC.

TDS-150 (Portable)

External Dimensions

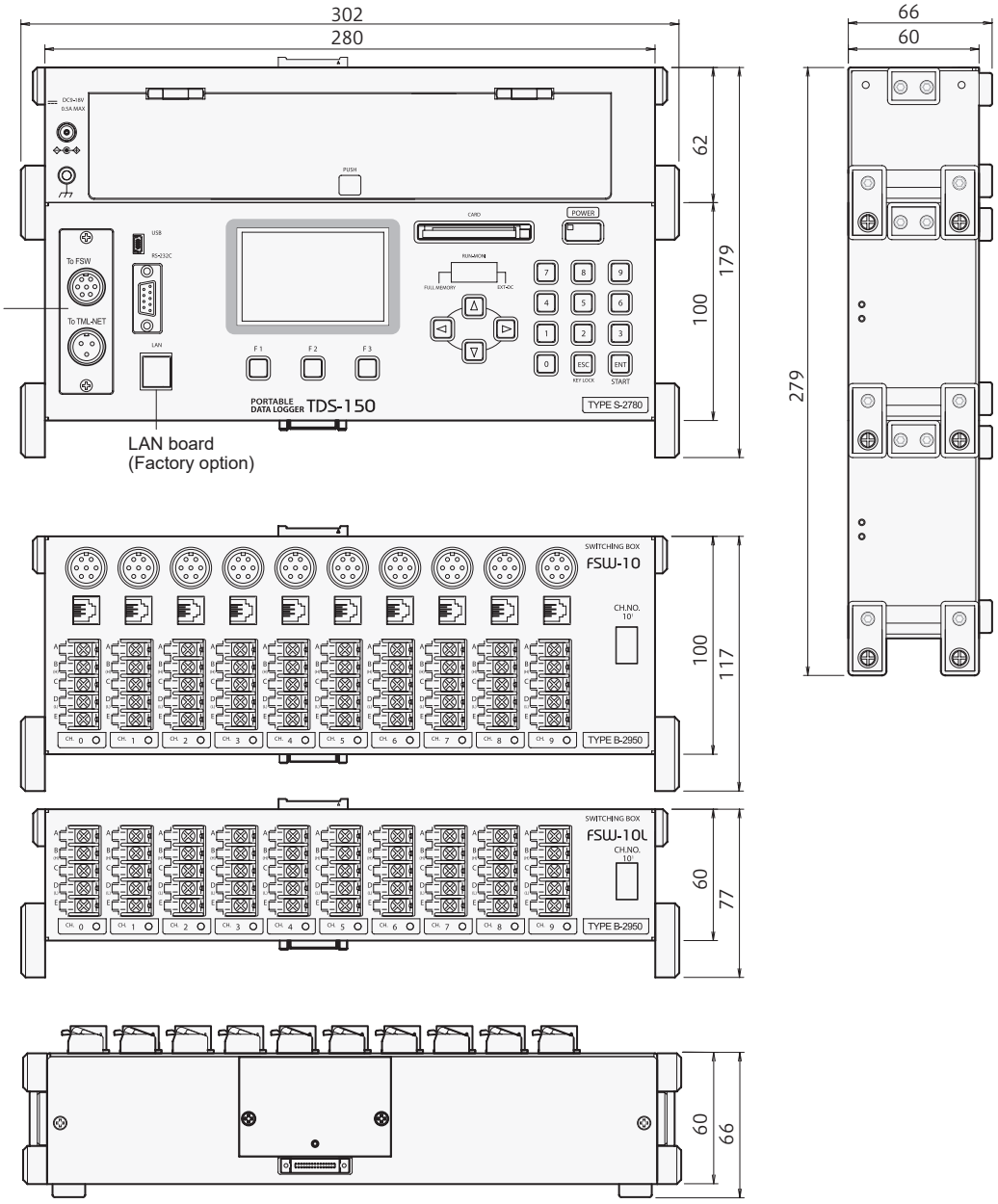
TDS-150 control unit
(Main unit)

Switch box TML-NET
drive board
(Factory option)

LAN board
(Factory option)

FSW-10 channel unit
(Options)

FSW-10L channel unit
(Options)



TC-37K (Handheld)

NEW T-ZACCS 3

- Scanning as fast as 0.1 seconds (in single-channel mode)
- Monitor that displays maximum (MAX) and minimum (MIN) values
- Measurements of strain, DC voltage, thermocouple, platinum resistance temperature detector, resistance, and insulation resistance are possible.
- Since this equipment can also measure insulation resistance, it can check sensors.
- Now supports the “1-gage 2-wire” sensor mode (quarter -bridge, 2-wire)
- 1G4W compatible (one-gauge method four-wire type strain measurement method)
- TEDS compatible
- One-touch connection of loose wires
- Quickly operate key functions via shortcut keys
- Automatic measurement using interval timer
- Compatible with the measurement software “TDS-7130v2”
- Equipped with an SD card slot
- Low power consumption
- Powered by 4 AA size dry-cell batteries, easy to replace in the field
- Multipoint measurement in combination with the CSW-5B switch box
- Can be combined with the two-axis inclinometer adapter

Strain gauge	DC voltage	Thermocouples	Platinum resistance temperature detector

Strain gauge type transducer
Load cells, displacement meters, pressure meters, inclinometers, etc.

TEDS compatible
This equipment instantly and automatically recognizes the information of a transducer having a built-in IC chip in which individual parameters of measurement capacity and rated output are recorded.

TC-37K handheld data logger

TC-37K is a compact handheld measuring instrument that fits neatly in one hand. It has a splashproof structure and can be used safely outdoors. The terminal section for connecting a sensor is a one-touch type that allows easy connection of both lead wires and banana plugs, allowing for speedy measurements. It is possible to set the sensor modes, coefficients, and initial values of up to 20 channels and record the measurement data. This makes it easy to organize data even when collecting data while moving around multiple sites. In addition, by using the dedicated CSW-5B switch box, automatic measurement of five points is possible. It is possible to record using an interval timer, data memory, and SD card, and it can also be connected to a PC for control and data transfer. The check functions for resistance and insulation resistance allow it to be used to check strain gauges, transducers, and other devices.

High-brightness LCD, easy operation

LCD with backlight
Resolution: 255 x 160 dots
Main display content
Measurement data, setting list, graphic display of time series data, etc.

SD card

Measurement data and configuration settings can be stored on an SD card.
Firmware can also be upgraded via the card.
Supported card capacity: up to 16 GB.

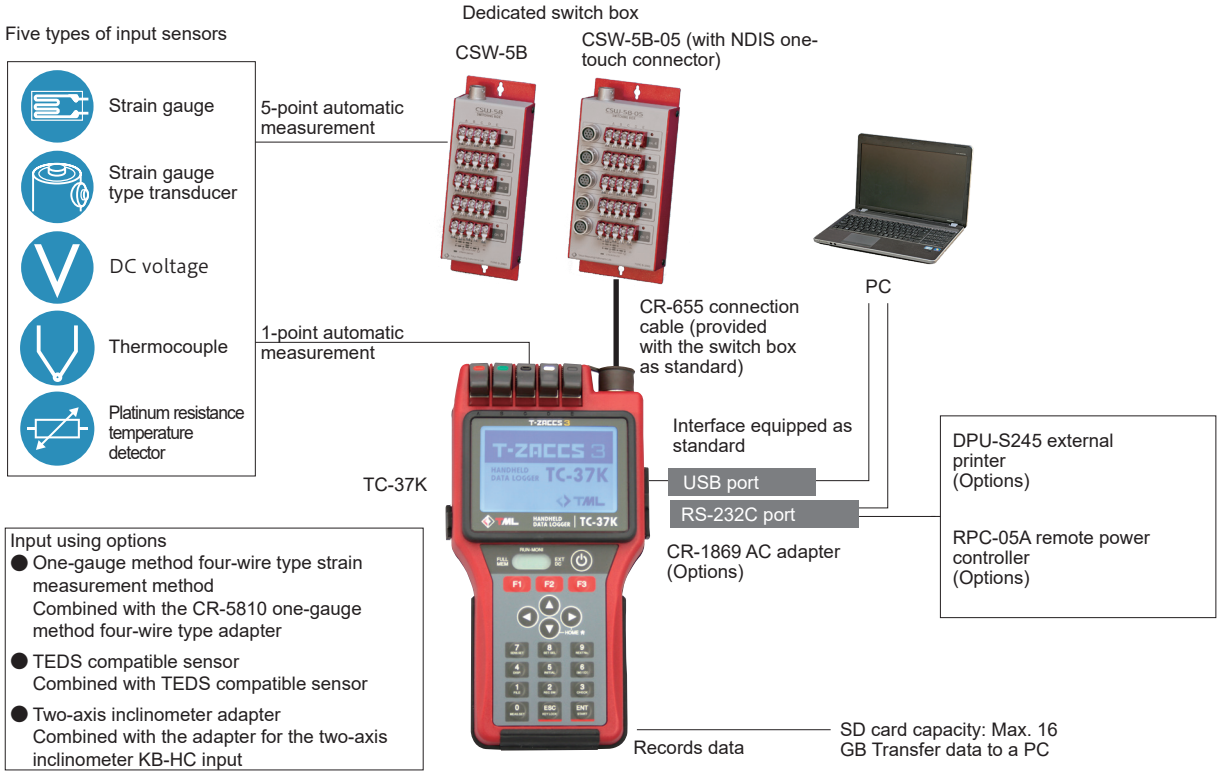
Interface: RS-232C and USB

Interface
Control and data transfer via RS-232C and USB
The USB driver is included in the separately sold Instruction Manual: Interface Edition or the monitoring measurement software Visual LOG Light.

AC adapter (optional) compatible

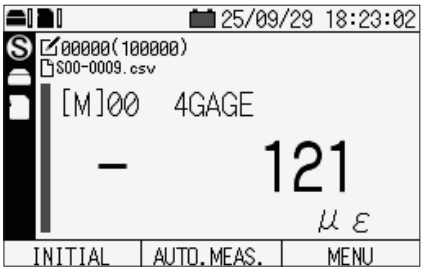
TC-37K (Handheld)

System Block Diagram

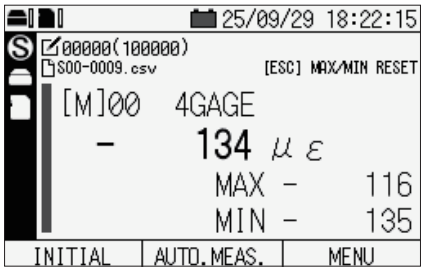


Operation screen examples

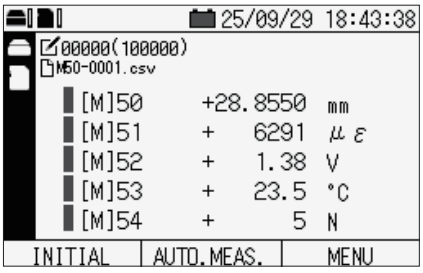
[Monitor screen, single]



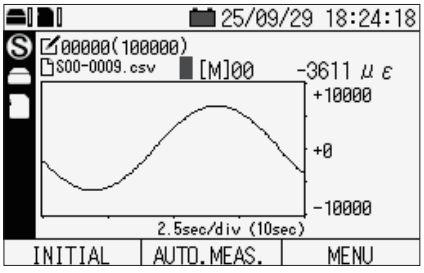
[Monitor screen, single MAX/MIN]



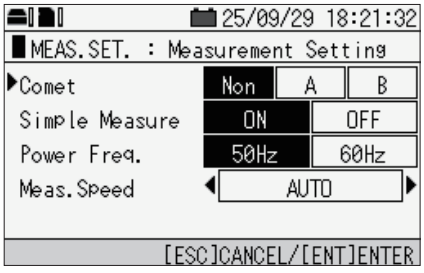
[Monitor screen, multi]



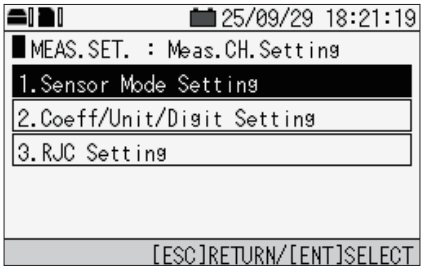
[Waveform monitor]



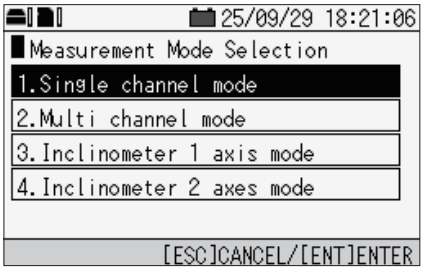
[Measurement Setting]



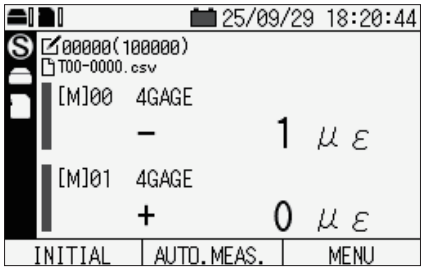
[Meas.CH.Setting]



[Measurement CH.Mode Selection]



[Inclinometer, two-axis mode]



Specifications
Measurement capabilities

Number of measuring points	**Single channel mode / inclinometer, one-axis mode**	1 point	
		Sensor input	One-touch terminal
			NDIS one-touch connector
	Multichannel mode (When combined with the dedicated switch box)	5 points	
		Target switch box	CSW-5B, CSW-5B-05
	Inclinometer, two-axis mode (When combined with the two-axis insertion type inclinometer adapter)	2 points	
		Target adapter	IA-33, IA-32
Measuring speed	**Normal mode**	500 ms/point (Monitor), 500 ms/point (Scanning)	
	High-speed mode	100 ms/point (Monitor), 100 ms/point (Scanning)	
Measuring point switching method	**Single channel mode**	Repeated measurement of 1 channel	
	Multichannel mode	Automatic switching measurement of 5 channels from *0 to *4	
Measuring mode		Initial, direct, measure (For temperature measurement, direct only)	
Simple measure		Coefficient: 1 Unit: Interlocked with sensor mode Decimal point: Interlocked with sensor mode	
Compensation mode		Comet NON, Comet A, Comet B	
Monitor	**Display mode**	OFF, numerical value, waveform (Y-T), numerical value / maximum value / minimum value	
	Number of display channels	Numerical value display	1, 2, 5 points
		Waveform (Y-T) display	1 point
		Numerical value / maximum value / minimum value display	1, 2, 5 points
Measurement	**Manual**	Start key switch	
	Automatic	Interval timer	
	Interface	USB, RS-232C	
Channel setting	**Coefficient**	± (0.00001 to 200000)	
	Unit	48 types including με, mV, °C, kgf, mm	
	Decimal point	Display after the decimal point can be set arbitrarily with 0 to 5 digits	
	Offset	To be written by arbitrarily measurement channel	
	Sensor mode	The type of sensor to be connected is set.	
		Strain	One-gauge method two-wire type, 120 / 240 / 350 Ω, One-gauge method three-wire type, 120 / 240 / 350 Ω, One-gauge method four-wire type, 120 / 240 / 350 Ω, Two-gauge method, Four-gauge method, Four-gauge method constant current, 350 Ω, Four-gauge method, 0-2 V mode
		Voltage	DC 300 mV (V1/1) DC 30 V (V1/100) DC Auto
		Temperature	Thermocouple T, K, J, B, S, R, E, N, Pt100 3 W

* DC Auto can only be used in the single channel mode.
* DC Auto automatically switches between V1/1 and V1/100 depending on the input voltage.

Strain measurement		
Applicable wiring method, gauge resistance	One-gauge method two-wire type	120, 240, 350Ω
	One-gauge method three-wire type	120, 240, 350Ω
	One-gauge method four-wire type	120, 240, 350Ω
	Two-gauge method	120 to 1000Ω
	Four-gauge method	120 to 1000Ω
	Four-gauge method constant current	350Ω
	Four-gauge method, 0-2 V mode	120 to 1000Ω
Sensor cable extension range	One-gauge method four-wire type	Cable round-trip resistance: 200 Ω or less
	Four-gauge method constant current, 350 Ω	Cable round-trip resistance: 400 Ω or less
Sensitivity change	Four-gauge method constant current, 350 Ω	+0.1 to -0.5% / Cable round-trip resistance: 100 Ω
Lead wire resistance compensation range Comet B (1G3W)	Gauge resistance 120 Ω: About 100 Ω or less	
	Gauge resistance 240 Ω: About 200 Ω or less	
	Gauge resistance 350 Ω: About 300 Ω or less	
Zero stability	± 1.0 × 10^{-6} strain/°C or less (one-gauge method) ± 0.5 × 10^{-6} strain/°C or less (two-gauge method)	
Initial unbalance	± 750 × 10^{-6} strain or less (one-gauge method) ± 500 × 10^{-6} strain or less (one-gauge method four-wire type) ± 500 × 10^{-6} strain or less (two-gauge method)	
DC voltage measurement		
Input impedance	1MΩ or higher	
Allowable input voltage between B and D	DC±50V MAX	
Thermocouple temperature measurement		
Applicable thermocouple	T, K, J ,B, S, R, E, N JIS C1602:2015, IEC 60584-1:2013	
Platinum resistance temperature detector measurement		
Applicable platinum resistance temperature detector	Pt100 (500 μA constant current three-wire type) JIS C 1604 : 2013, IEC 60751:2008	

TEDS function	**TEDS**	**Standard**	IEEE 1451.4 Class 2 compatible (Template No. 33)
		Function	Reading and setting of sensor information
Auto power OFF function			When no command is received from the operation or interface for an arbitrary set time, the power is turned OFF automatically. (The auto power off function can be set to ON / OFF.)

* The TEDS function can only be used in the single channel mode.

TC-37K (Handheld)

Check function

Insulation check	**Function**	Checks the insulation resistance between the connected sensor and the test specimen. Applied voltage 2.5 V
	Range	0 to 500MΩ
	Accuracy	± 20% rdg * When powered by batteries
	Resolution	0.1MΩ
	Measuring speed	About 1 s
Resistance check	**Function**	Checks the resistance between the input terminals A and B. 10 µA constant current method
	Range	0 to 30kΩ
	Accuracy	0 to 3kΩ ±(0.5% rdg + 0.2Ω) 3k to 30kΩ ±(0.5% rdg + 2Ω)
	Resolution	0.1Ω(0 to 3kΩ) 1Ω(3k to 30kΩ)
	Measuring speed	About 0.5 s
Variation check		Checks the variation of measurement values.
Lead wire resistance check		Check of the lead wire resistance divided voltage of the one-gauge method three-wire type
Bridge output check		Compensation of the one-gauge method two-wire type and one-gauge method three-wire type. Check of the bridge output voltage without calculation
Check during measurement		Open check
		Thermocouple disconnection check
Display setting list		Initial-in value
		Lead wire resistance divided voltage

Strain measurement		
Bridge power supply	DC1V 46ms (50 Hz) * DC 2 V 24 ms (50 Hz) for the four-gauge method 0-2 V mode	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002% rdg/°C	
Aging change of accuracy	±0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 30000 × 10^{-6} strain * ± 15000 × 10^{-6} strain for the four-gauge method 0-2 V mode	1 × 10^{-6} strain
	± 300000 × 10^{-6} strain * ± 150000 × 10^{-6} strain for the four-gauge method 0-2 V mode	10 × 10^{-6} strain
Accuracy (at 23°C ± 5°C) (Excluding the one-gauge method four-wire type)	±(0.08% rdg+1digit)	
Accuracy (at 23°C ± 5°C) (One-gauge method four-wire type)	±(0.28% rdg+1digit)	

Constant current strain measurement (four-gauge method only)		
Bridge power supply	DC2.86mA 46ms(50Hz)	
Bridge resistance	350Ω	
Initial value storage range	±160000×10^{-6} strain	
Temperature coefficient of accuracy	±0.002% rdg/°C	
Aging change of accuracy	±0.02% rdg/year	
Measurement range and resolution	Measurement range	Resolution
	± 30000×10^{-6} strain	1×10^{-6} strain
	±300000×10^{-6} strain	10×10^{-6} strain
Accuracy (at 23°C ± 5°C)	±(0.08% rdg+1digit)	

DC voltage measurement			
Initial value storage range			
V1/1		±160.000mV	
V1/100		±16.0000V	
Temperature coefficient of accuracy		±0.0024% rdg/°C	
Aging change of accuracy		±0.024% rdg/year	
Measurement range and resolution	**V1/1**	Measurement range	Resolution
		± 30.000mV	0.001mV
		±300.000mV	0.010mV
	V1/100	± 3.0000V	0.0001V
		±30.0000V	0.0010V
Accuracy (at 23°C ± 5°C)	**V1/1**	±(0.08% rdg+3digit)	
	V1/100	±(0.08% rdg+2digit)	

* DC Auto can only be used in the single channel mode.
* DC Auto automatically switches between V1/1 and V1/100 depending on the input voltage.

Thermocouple temperature measurement (JIS C 1602:2015, IEC 60584-1:2013)

Applicable thermocouple	**T, K, J, B, S, R, E, N**			
Linearization	**Digital calculation**			
Type	**Measurement range**	**Resolution**	**Accuracy (at 23°C ± 5°C)** (External reference junction)	**Accuracy (at 23°C ± 5°C)** (Internal reference junction)
T	- 250 to - 200C° - 200 to - 100C° - 100 to+ 400C°	0.1C° 0.1C° 0.1C°	±(0.38%rdg+0.6C°) ±(0.15%rdg+0.2C°) ±(0.10%rdg+0.2C°)	±(0.38%rdg+3.9C°) ±(0.15%rdg+1.4C°) ±(0.10%rdg+0.8C°)
K	- 210 to - 160C° - 160 to 0C° 0 to+ 960C° + 960 to+ 1370C°	0.1C° 0.1C° 0.1C° 0.1C°	±(0.19%rdg+0.3C°) ±(0.12%rdg+0.2C°) ±(0.08%rdg+0.1C°) ±(0.10%rdg+0.9C°)	±(0.19%rdg+1.6C°) ±(0.12%rdg+1.0C°) ±(0.08%rdg+0.5C°) ±(0.10%rdg+1.4C°)
J	- 200 to - 160C° - 160 to 0C° 0 to+ 700C° + 700 to+ 1200C°	0.1C° 0.1C° 0.1C° 0.1C°	±(0.16%rdg+0.2C°) ±(0.12%rdg+0.1C°) ±(0.08%rdg+0.1C°) ±(0.08%rdg+0.6C°)	±(0.16%rdg+1.2C°) ±(0.12%rdg+0.8C°) ±(0.08%rdg+0.5C°) ±(0.08%rdg+0.9C°)
B	+ 200 to+ 280C° + 280 to+ 800C° + 800 to+ 1760C°	0.5 to 0.4C° 0.3 to 0.1C° 0.1C°	±(0.04%rdg+4.0C°) ±(0.04%rdg+1.2C°) ±(0.05%rdg+0.4C°)	±(0.04%rdg+4.0C°) ±(0.04%rdg+1.2C°) ±(0.05%rdg+0.4C°)
S	- 10 to + 200C° + 200 to+ 1760C°	0.1C° 0.1C°	±(0.09%rdg+0.6C°) ±(0.07%rdg+0.4C°)	±(0.09%rdg+1.2C°) ±(0.07%rdg+0.7C°)
R	- 10 to+ 150C° + 150 to+ 1760C°	0.1C° 0.1C°	±(0.09%rdg+0.7C°) ±(0.07%rdg+0.4C°)	±(0.09%rdg+1.2C°) ±(0.07%rdg+0.7C°)
E	- 210 to+ 550C° + 550 to+ 1000C°	0.1C° 0.1C°	±(0.17%rdg+0.2C°) ±(0.09%rdg+0.4C°)	±(0.17%rdg+1.4C°) ±(0.09%rdg+0.8C°)
N	- 200 to 0C° 0 to + 1090C° +1090 to + 1300C°	0.1C° 0.1C° 0.1C°	±(0.18%rdg+0.4C°) ±(0.08%rdg+0.2C°) ±(0.08%rdg+0.9C°)	±(0.18%rdg+1.6C°) ±(0.08%rdg+0.6C°) ±(0.08%rdg+1.2C°)

* The accuracy of the sensor is not included, and thermocouple B does not use the reference junction.

Platinum resistance temperature detector temperature measurement (JIS C 1604:2013, IEC 60751:2008 Pt100)	
Applicable resistance temperature detector	Pt100
Measurement Method	3-wire type (Pt3W)
Linearization	Digital calculation
Temperature coefficient of accuracy	± 0.0020% rdg/°C
Aging change of accuracy	± 0.05% rdg/year
Measurement range	-200 to +850°C
Resolution	0.1°C
Accuracy (at 23°C ± 5°C)	± (0.08% rdg + 0.3°C)

Interval timer

Function		Measurement at the set time interval and time
Table setting	Time interval	Hour / minute / second can be set for each step up to 99 hours, 59 minutes and 59 seconds. Or 0.5-, 0.2-, or 0.1-second interval
	Real time start	Start time (day / hour / minute / second) can be set for each step.
	Number of starts	Up to 99 times per step or infinite
	Number of steps	Programmable up to 10 steps
	GOTO step	Program loop possible to one of the previous steps
Sleep function		Turns the power ON/OFF automatically when the interval is 1 minute or longer.

Time

Setting	Year, month, day, hour, minute, second
Accuracy	Daily error: ±1 sec (at 23°C ± 5°C)
Retention	About 20 days (with a full charge)

Display / operation

Display unit	LCD panel	3.0-inch semi-transparent monochrome STN LED backlight
	Resolution	255 x 160 dots
	Point defect	10 dots or less (excluding aging deterioration)
Operation		POWER key, Cross key, ESC, ENT 0-9, F1, F2, F3

Recording media

Internal memory	Function	Recording / reproduction of measurement data Saving of setting file
	Recording format	CSV format TDS format Data memory function (up to 100,000 data)
	Capacity	512 MB
SD card	Function	Recording / reproduction / copying of measurement data Saving / copying of setting file
	Physical format	FAT32
	Recording format	CSV format TDS format
	Capacity	512 MB to 16 GB (Designated by us)

Interface

USB	USB 2.0 protocol compatible USB Type-C receptacle General-purpose command compatible (various settings, measurement, data collection)
RS-232C	RS-232C compliant Baud rate 9600, 19200, 115200 bps General-purpose command compatible (various settings, measurement, data collection)

Power supply

Power supply	AA size alkaline dry-cell battery x 4 Dedicated AC adapter (CR-1869) or external power input DC 9-18 V Can be powered from USB bus power
Continuous use time	When using alkaline dry-cell batteries: About 10 hrs (When a 350 Ω bridge is connected for strain measurement)

Environment

Operating temperature / humidity range	-10ºC to +50°C 85% RH or less (No condensation)

Others

Outside dimension	102 (W) ×49 (H) ×202 (D) mm (Excluding protrusions)
Mass	About 750 g
Vibration tolerance	29.4 m/s^2 (50 Hz 0.6 mmp-p)
Shock resistance	49 m/s^2
Splash proofness	IP-54 (with connector cap attached)

Standard accessories

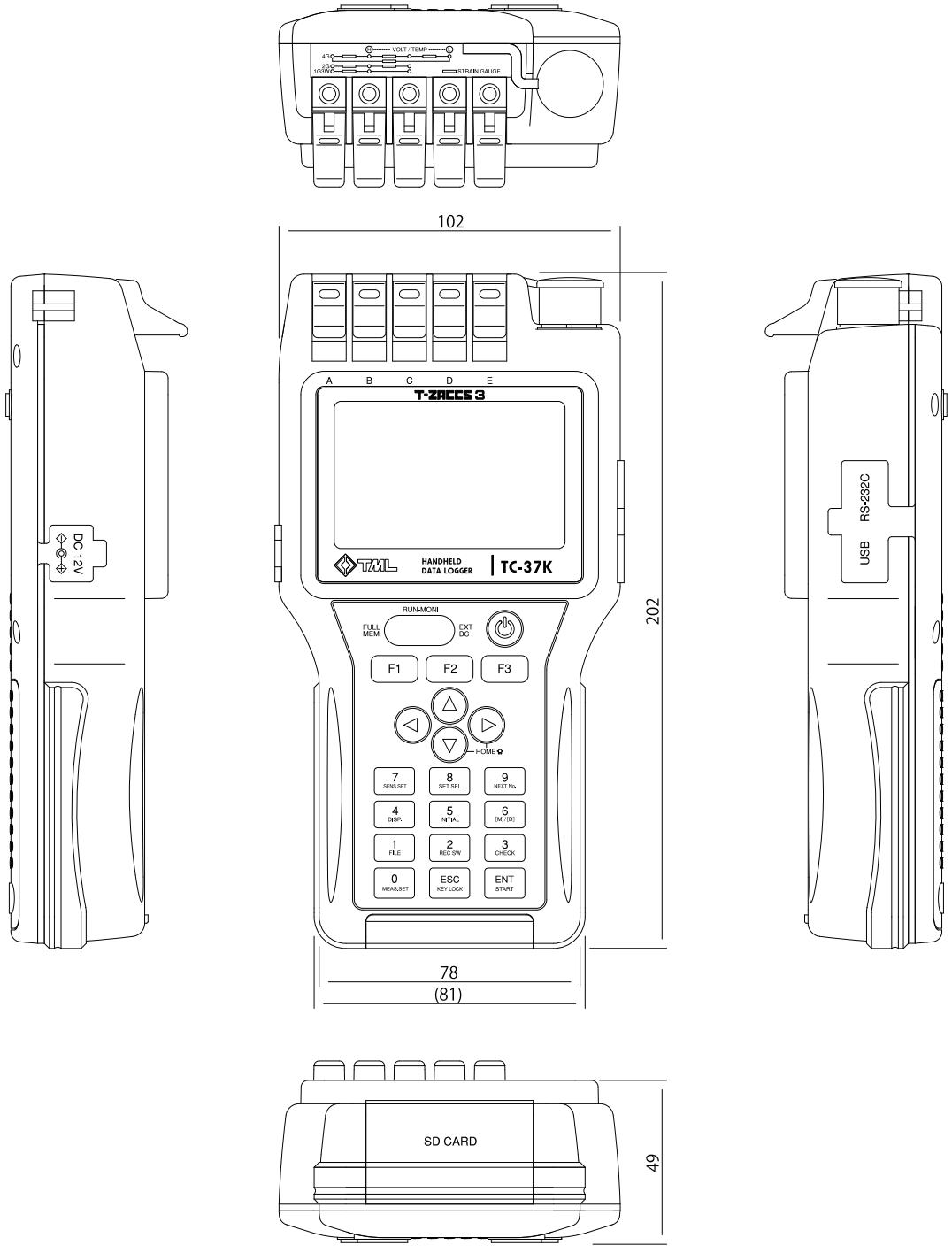
- Instruction Manual (CD) 1
- AA size alkaline dry-cell battery 4
- Shoulder belt 1
- Accessory box 1
- Warranty certificate 1

Options (Related Products)

- SD card (512MB, 4GB, 16GB)
- AC Adapter (CR-1869, [For China] (CR-1869-C))
- RS-232C cable (CR-5532 / D-sub 9P–10P (Compact Type, Crossed) Cable – 1.5 m)
- USB cable (CR-6189 / Type C-A)
- External printer (DPU-S245 (RS-232C Interface))
- Printer cable (CR-4511 / HRS 8P–10P (Compact Type, Straight) Cable – 0.5 m)
- Remote power controller (RPC-05A)
- Dedicated switch box (CSW-5B, CSW-5B-05)
- Switch box connection cable (CR-655)
- Two-axis insertion type inclinometer adapter (IA-33, IA-32)
- DC Power Cable (CR-062)

TC-37K (Handheld)

External Dimensions



Unit: mm

TC-32K (Handheld)

- Measurements of strain, DC voltage, thermocouple, and platinum resistance temperature detector
- Since this equipment can also measure insulation resistance, it can be used to check sensors.
- One-gauge method four-wire type measurement method compatible
- Equipped with Complete Compensation Method of Strain
- TEDS compatible
- One-touch connection of loose wires
- Automatic measurement using interval timer
- Low power consumption
- Powered by four AA size batteries, easy to replace in the field
- Multipoint measurement in combination with the CSW-5B switch box
- Can be combined with the IA-33/IA-32 two-axis insertion type inclinometer adapter

Strain gauge	DC voltage	Thermocouples	Platinum resistance temperature detector

Strain gauge type transducer
Load cells, displacement meters, pressure meters, inclinometers, etc.

TEDS compatible
This equipment instantly and automatically recognizes the information of a transducer having a built-in IC chip in which individual parameters of measurement capacity and rated output are recorded.

TC-32K handheld data logger

The TC-32K is a compact handheld measuring instrument that fits neatly in one hand. It has a splash-proof structure and can be used safely outdoors. The terminal section for connecting a sensor is a one-touch type (patented) that allows easy connection of both lead wires and banana plugs, allowing for speedy measurements. It is possible to set the sensor modes, coefficients, and initial values of up to 20 channels and record measurement data. This makes it easy to organize data even when collecting data while moving around multiple sites. In addition, by using the dedicated switch box CSW-5B, automatic measurement of 5 points is possible. It is possible to record using an interval timer, data memory and CF card, and it can also be connected to a PC for control and data transfer. The check functions for resistance and insulation resistance allow it to be used to check strain gauges, transducers, etc.

High-brightness LCD, easy operation with Japanese display

LCD with backlight
Resolution: 255 x 160 dots
Main display content
Measurement data, setting list, graphic display of time series data, etc.

CF card

It is possible to record the measurement data and setting content on a CF card. It is also possible to upgrade the firmware version from the card.
Supported card capacity: Max. 2 GB

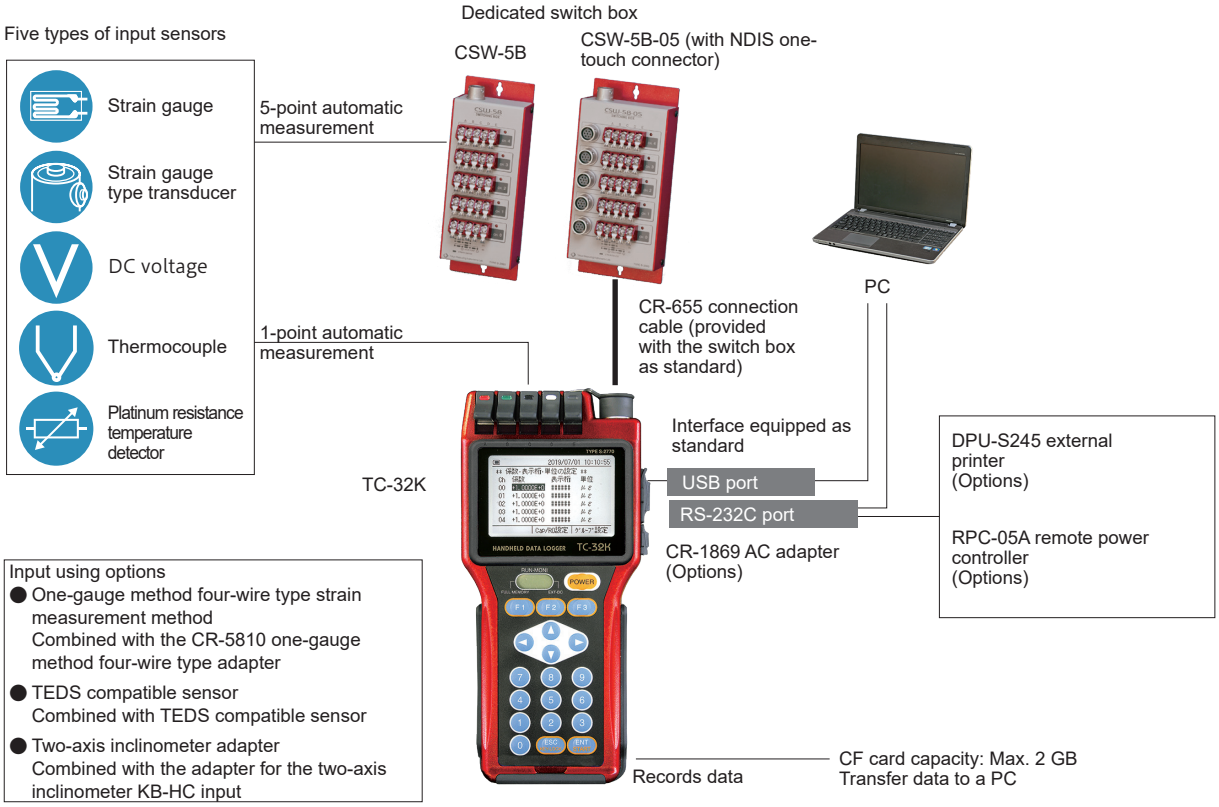
Interface: RS-232C and USB

Interface
Control and data transfer via RS-232C and USB
The USB driver is included in the separately sold Instruction Manual: Interface Edition or the monitoring measurement software Visual LOG Light.

AC adapter (optional) compatible

TC-32K (Handheld)

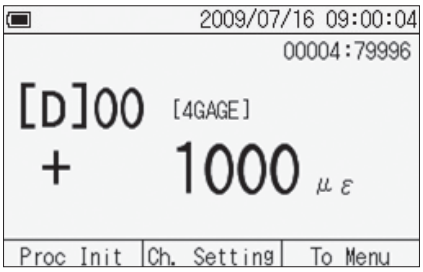
System Block Diagram



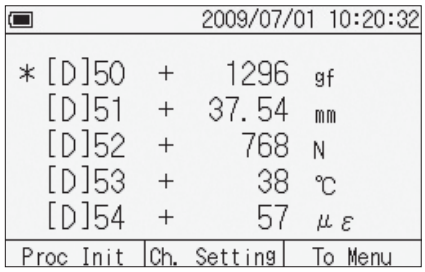
Easy operation with Japanese display

Operation screen examples

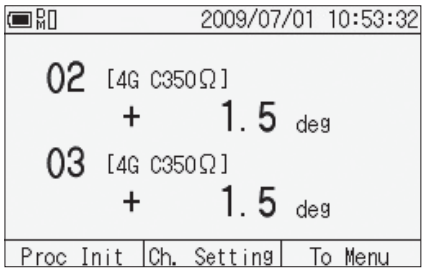
[Monitor screen, single]



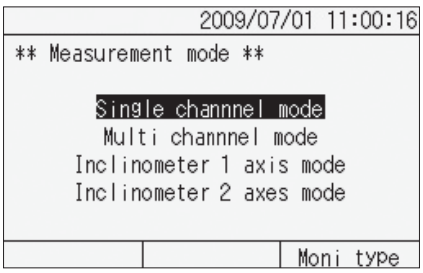
[Monitor screen, multi]



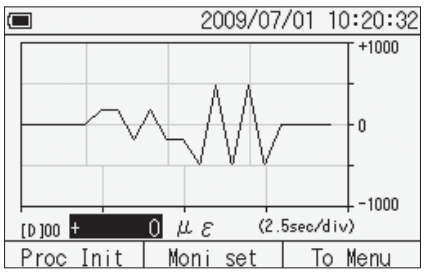
[Inclinometer, two-axis mode]



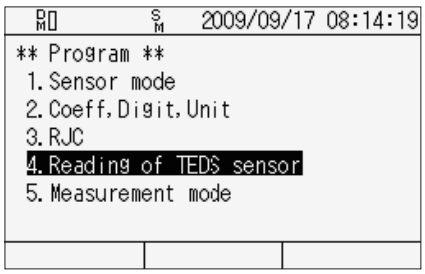
[Measuring mode switching]



[Waveform monitor]



[Program menu]



Specifications

Number of measuring points

1 point	Stand-alone	Sensor input from NDIS or one-touch terminal
5 points	When combined with CSW-5B	CSW-5B, CSW-5B-05

Applicable sensor

Strain measurement	One-gauge method four-wire type 120Ω One-gauge method four-wire type 240Ω One-gauge method four-wire type 350Ω	* 1: The one-gauge method four-wire type uses the optional adapter. Bridge voltage DC 1 V 44 ms (50 Hz)
	One-gauge method three-wire type 120Ω One-gauge method three-wire type 240Ω One-gauge method three-wire type 350Ω	
	Two-gauge method 120 - 1000Ω Four-gauge method 120 - 1000Ω Four-gauge method constant current 350Ω	
	Four-gauge method 0-2 V 120 - 1000Ω	*1: The one-gauge method four-wire type uses the optional adapter. Bridge voltage DC 1 V 44 ms (50 Hz)
Thermocouple measurement	T, K, J, B, S, R, E, N	Linearization digital calculation JIS C 1602-1995
Voltage measurement	DC 300 mV ± 300 mV DC 30 V ± 30 V DC Auto ± 30 V ＊1	Input impedance V 1/1 500MΩ or more V 1/100 1MΩ or more
Platinum resistance temperature detector	Platinum temperature measurement 3-wire type	Linearization digital calculation JIS C 1604-1997 Pt100

* 1: Only 1CH measurement from the main unit

Measurement range

Measurement item	Range	Measurement range	Initial value storage range	Sampling speed
Strain measurement	×1 ×10	±30000×10^{-6} strain ±300000×10^{-6} strain	±160000 ×10^{-6} strain	80 ms (50 Hz area) 67 ms (60 Hz area)
DC voltage measurement	×1 ×10	V 1/1 ± 30.000mV ±300.000mV	V 1/1 ±160.000mV	
	×1 ×10	V 1/100 ± 3.0000 V ±30.0000 V	V 1/100 ± 16.0000 V	
Thermocouple temperature measurement	-	T: -250 to +400C° K: -210 to +1370C° J: -200 to +1200C° B: +200 to +1760C° S: -10 to +1760C° R: -10 to +1760C° E: -210 to +1000C° N: -200 to +1300C°	-	
Platinum resistance temperature detector	-	- 200 to +850C°	-	

The measurement range of the four-gauge method 0-2 V mode (supporting our differential transformer displacement meter, etc.) is as follows.
x1 : ±15000×10^{-6} strain, x10 : ±150000×10^{-6} strain

Thermocouple measurement accuracy

Type	Measurement range	Resolution	Accuracy (at 23°C ± 5°C) (External reference junction)	Accuracy (at 23°C ± 5°C) (Internal reference junction)
T	- 250 to - 200C° - 200 to - 100C° - 100 to+ 400C°	0.1C° 0.1C° 0.1C°	±(0.38%rdg+0.6C°) ±(0.15%rdg+0.2C°) ±(0.10%rdg+0.2C°)	±(0.38%rdg+3.9C°) ±(0.15%rdg+1.4C°) ±(0.10%rdg+0.8C°)
K	- 210 to - 160C° - 160 to 0C° 0 to+ 960C° + 960 to+ 1370C°	0.1C° 0.1C° 0.1C° 0.1C°	±(0.19%rdg+0.3C°) ±(0.12%rdg+0.2C°) ±(0.08%rdg+0.1C°) ±(0.10%rdg+0.9C°)	±(0.19%rdg+1.6C°) ±(0.12%rdg+1.0C°) ±(0.08%rdg+0.5C°) ±(0.10%rdg+1.4C°)
J	- 200 to - 160C° - 160 to 0C° 0 to+ 700C° + 700 to+ 1200C°	0.1C° 0.1C° 0.1C° 0.1C°	±(0.16%rdg+0.2C°) ±(0.12%rdg+0.1C°) ±(0.08%rdg+0.1C°) ±(0.08%rdg+0.6C°)	±(0.16%rdg+1.2C°) ±(0.12%rdg+0.8C°) ±(0.08%rdg+0.5C°) ±(0.08%rdg+0.9C°)
B	+ 200 to+ 280C° + 280 to+ 800C° + 800 to+ 1760C°	0.5 to 0.4C° 0.3 to 0.1C° 0.1C°	±(0.04%rdg+4.0C°) ±(0.04%rdg+1.2C°) ±(0.05%rdg+0.4C°)	±(0.04%rdg+4.0C°) ±(0.04%rdg+1.2C°) ±(0.05%rdg+0.4C°)
S	- 10 to + 200C° + 200 to+ 1760C°	0.1C° 0.1C°	±(0.09%rdg+0.6C°) ±(0.07%rdg+0.4C°)	±(0.09%rdg+1.2C°) ±(0.07%rdg+0.7C°)
R	- 10 to+ 150C° + 150 to+ 1760C°	0.1C° 0.1C°	±(0.09%rdg+0.7C°) ±(0.07%rdg+0.4C°)	±(0.09%rdg+1.2C°) ±(0.07%rdg+0.7C°)
E	- 210 to+ 550C° + 550 to+ 1000C°	0.1C° 0.1C°	±(0.17%rdg+0.2C°) ±(0.09%rdg+0.4C°)	±(0.17%rdg+1.4C°) ±(0.09%rdg+0.8C°)
N	- 200 to 0C° 0 to + 1090C° +1090 to + 1300C°	0.1C° 0.1C° 0.1C°	±(0.18%rdg+0.4C°) ±(0.08%rdg+0.2C°) ±(0.08%rdg+0.9C°)	±(0.18%rdg+1.6C°) ±(0.08%rdg+0.6C°) ±(0.08%rdg+1.2C°)

* The accuracy of sensor is not included, and thermocouple B does not use the reference junction.

Measurement accuracy

Sensor mode	Range	Resolution	Accuracy (23°C ± 5°C)	Temperature coefficient of accuracy (% rdg/C°)	Aging change of accuracy (% rdg/year)
Strain (Excluding the One-gauge method four-wire type)	×1 ×10	1×10^{-6} strain 10×10^{-6} strain	± (0.08%rdg+1digit) ± (0.08%rdg+1digit)	±0.002 ±0.002	±0.02 ±0.02
Strain (One-gauge method four-wire type)	×1 ×10	1×10^{-6} strain 10×10^{-6} strain	± (0.28%rdg+1digit) ± (0.28%rdg+1digit)	±0.002 ±0.002	±0.02 ±0.02
Voltage V1/1	×1 ×10	0.001mV 0.010mV	± (0.08%rdg+3digit) ± (0.08%rdg+3digit)	±0.0024 ±0.0024	±0.02 ±0.02
Voltage V1/100	×1 ×10	0.0001V 0.0010V	± (0.08%rdg+2digit) ± (0.08%rdg+2digit)	±0.002 ±0.002	±0.02 ±0.02
latinum resistance temperature detector Pt100 3W	-	0.1C°	± (0.08%rdg+0.3C°)	±0.0020	±0.05

The range is automatically switched. For the resistance measurement 2-wire type, lead wire resistances are not included.

Lead wire resistance compensation Comet B (One-gauge method three-wire type)	Gauge resistance	Lead wire resistance value compensation range
	120Ω 240Ω 350Ω	About 100 Ω or less About 200 Ω or less About 300 Ω or less

Check function

Insulation check	Checks the insulation resistance between the connected sensor and the test specimen.
Resistance check	Checks the resistance between the input terminals A and B.
Variation check	Checks the variation of measurement values.
Coefficient setting check	Checks the coefficient calculation results when there are inputs equivalent to 100, 1000 and 10000 μV.

Item	Insulation resistance	Resistance measurement
Range	0–500 MΩ	0–30 kΩ
Accuracy	±20% rdg *When powered by batteries	0–3 kΩ ± (0.5% rdg + 0.2 Ω) 3 k–30 kΩ ± (0.5% rdg + 2 Ω)
Resolution	0.1 MΩ	0–3 kΩ 0.1 Ω 3 k to 30 kΩ 1 Ω
Sampling speed	About 1s	About 0.5 s
Remarks	Applied voltage 2.5 V	10 μA constant current method

Display / function

Display	Display unit	LCD with backlight
	Resolution	255 x 160 dots
	Display content	Measurement data, setting list, Y-T monitor
Time	Setting	Year, month, day, hour, minute, second
	Accuracy	Daily error: ±1 sec (at 23°C ± 5°C)
Interface	USB, RS-232C	
	Function	Receiving of commands, sending of measurement data, etc.
Measuring mode	Initial, direct or measure can be set for each point. (For temperature measurement, direct only)	
Measuring point switching method	Scanning	Automatic switching measurement from the first channel*0 to the last channel*4 (Jump possible only when CSW-5B is connected)
	Monitor	Repeated measurement of monitor channels Graphic monitor for time change
Measurement start	Start key switch, interval timer, RS-232C	
Program setting	Can be set for each point	
	Coefficient	± (0.0001-99999)
	Unit	40 types including με, mV, °C, kN, mm
	Decimal point	Display after the decimal point is set arbitrarily with 0 to 6 digits
	Initial value	To be written by arbitrarily measurement channel
	Sensor mode	The type of sensor to be connected is set.
Simple measure	Coefficient	1.0000
	Unit	Interlocked with sensor mode
	Decimal point	Interlocked with sensor mode
Self-diagnosis function	Version display, battery, variation, burnout	
TEDS function	Standard: IEEE 1451.4, Class 2 Function: Reading of TEDS sensor information	
Interval timer	Function	Automatic start at the set time interval and time
	Interval	Hour / minute / second can be set for each step up to 99 hours, 59 minutes, and 59 seconds.
	Number of starts	Up to 99 times per step or infinite
	Number of steps	Programmable up to 5 steps
	Real time start	Start time (hour / minute / second) is set for each step
	GOTO step	Program loop possible to one of the previous steps
	Sleep function	The power is turned on 5 sec before the measurement time and automatically turned OFF after the measurement is completed. Sleep function can be set to ON/OFF.
Data memory	Function	Recording / reproduction of measurement data
	Recording content	Measuring mode, channel number, measurement data, time data, data number
	Data capacity	Up to about 80000 units
	Data retention period	About 20 days (with full charge)

TC-32K (Handheld)

Memory card	Card standard	CF card
	Card capacity	Up to 2 GB
Auto power OFF	When no command is received from the key operation / each interface for 10 minutes, the power is turned OFF automatically. Auto power OFF function can be set to ON/OFF.	

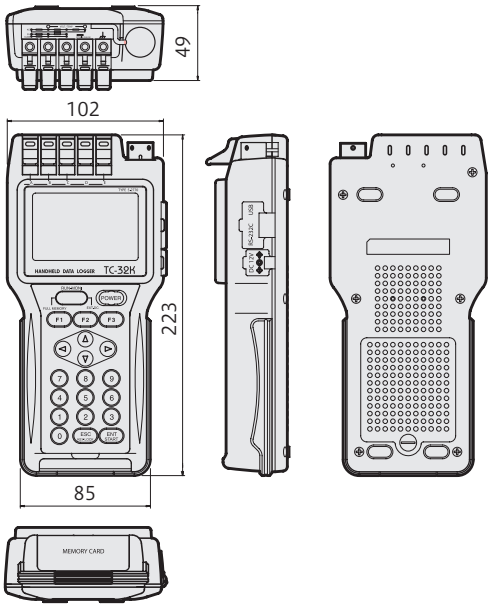
General specifications

Vibration tolerance	29.4 m/s^2 (50 Hz 0.6 mmp-p)
Shock resistance	49 m/s^2
Splash proofness	IP-54 (with connector cap attached)
Continuous use time	When using alkaline dry-cell batteries About 10 hrs (When a 350 Ω bridge is connected for strain measurement)
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Storage temperature range	-20 to +60C°
Power supply	AA size alkaline dry-cell battery x 4, dedicated AC adapter CR-1867 or external power input DC 9-18 V
Outside dimension	102 (W) × 49 (H) × 223 (D) mm
Mass	Approx. 800 g

Standard accessories

AA size alkaline dry-cell battery 4
Shoulder belt 1
Accessory box 1
Instruction Manual..... 1
Warranty certificate 1

External Dimensions



Options

AC Adapter (CR-1869)
AC Adapter [For China] (CR-1869-C)
DC Power Cable (CR-062)

TC-37K / TC-32K Related Products

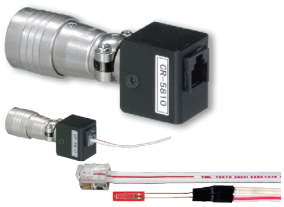
DPU-S245 external printer

The measurement data of the TC-37K / -32K is printed out. The TP-S245L-1 recording paper (optional) is used.

CR-4511 printer cable
Dsub9P- 10P (small)
Straight 0.5 m
(Dedicated for the TC-37K / -32K)

CR-5810 one-gauge method four-wire type dedicated adapter

With One-gauge method four-wire type strain gauge modular plug
(One-touch connection type)



RPC-05A remote power controller

By combining with this remote power controller, the sleep function of the TC-37K / -32K is utilized to enable long-term measurement powered by an external battery.

TEDS compatible sensor

The TC-37K/-32K can use TEDS compatible sensors. Connect a transducer, such as a TEDS compatible load cell or displacement meter. These transducers have a built-in IC chip in which individual parameters of measurement capacity and rated output are recorded.

IC chip built-in load cell
TCLZ

CR-5532 RS-232C cable

This is a D-sub 9P-10P (small) cross 1.5 m cable (dedicated for the TC-37K / -32K) to be used to connect to a PC.

CR-1869 AC adapter

This equipment is connected to AC 100 V to supply the power.

CR-6187 USB cable (TC-32K)

miniB-A (with ferrite core) 1.5 m (dedicated for the TC-32K)
This cable is used to connect to a PC.

CF card (TC-32K)

Supported card capacity: 128 MB, 512 MB, 1 GB, 2 GB (designated by us)

CR-6189 USB cable (TC-37K)

Type C-A

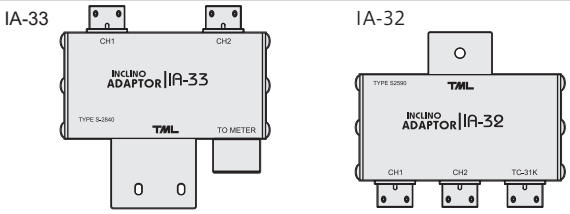
SD card (TC-37K)

Supported card capacity: 512 MB, 4 GB, 16 GB (designated by us)

IA-33 / IA-32 two-axis insertion type inclinometer adapter

The IA-33 is a measurement adapter for a two-axis insertion type inclinometer that can be easily attached to the NDIS connector part of the TC-37K / -32K and can be mounted with two screws.
The IA-32 is a measurement adapter for a stationary two-axis insertion type inclinometer that connects to the TC-37K / -32K with a dedicated cable.
When the measurement mode of the TC-37K / -32K is set to a two-axis insertion type inclinometer, the X- and Y-axes can be monitored at the same time.
By using the separately sold IMP-7210 insertion type inclinometer management software, it is possible to obtain the section displacement and cumulative displacement at each depth from the accumulated measurement data to output graphs of comparison chart / distribution chart and data list.

External Dimensions



Specifications

Applicable measuring instrument	TC-37K / -32K
Number of measuring points	2 points
Measurement accuracy	Equivalent to TC-37K / -32K
Power supply	Supply from TC-37K / -32K, DC 5 V, 100 mA or less
Operating temperature / humidity range	-10 to +50C° 85% or less (No condensation)
Outside dimension	IA-33: 95 (W) × 41 (H) × 50 (D) mm IA-32: 95 (W) × 42 (H) × 50 (D) mm (Excluding protrusions)
Mass	Approx. 300 g

CSW-5B/CSW-5B-05 switch box

- Measurements of strain, voltage, thermocouple, and platinum resistance temperature detector are possible.
- The sensor mode is set with the TC-37K / -32K.
- Terminals can be screwed or soldered.
- Compact and lightweight

Combination with the TC-37K / -32K

This equipment is a switch box for expanding the number of measuring points in combination with the TC-37K / -32K handheld data logger. The number of measuring points is 5, and measurements of strain, DC voltage, thermocouple and platinum resistance temperature detector are possible.
* The CSW-5B-05 is a connector combination type equipped with NDIS one-touch connector receptacles on all points.

Specifications

Applicable measuring instrument	TC-37K / -32K
Number of measuring points	5 points
Strain measurement	
Applicable wiring method, gauge resistance	One-gauge method three-wire type: 120, 240, 350 Ω
	One-gauge method four-wire type: 120, 240, 350 Ω
	Two-gauge method: 120–1000 Ω
	Four-gauge method: 120–1000 Ω
	Four-gauge method constant current: 350 Ω (Cable round-trip resistance: 200 Ω or less)
	Four-gauge method 0-2 V: 120–1000 Ω
Measurement range	Depends on the data logger combined
Decrease in sensitivity	×1 ± (0.08% rdg + 1 digit) - 0.33% rdg or less
	×10 ± (0.08% rdg + 2 digit) - 0.33% rdg or less
DC voltage measurement	
Measurement range	Equivalent to the TC-37K / -32K
Voltage measurement	±300mV ±30V
Allowable input voltage	300 mV range ±5V 30 V range ±35V
Thermocouple temperature measurement	T, K, J, B, S, R, E, N
Measurement range	Equivalent to the TC-37K / -32K
Platinum resistance temperature detector temperature measurement	
Measurement range	Equivalent to the TC-37K / -32K
Measurement Method	Three-wire type
Measuring point number	Fixed (CH0 - CH4)
Measuring point display	Red LED at each point
Switch	Semiconductor relay
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Power supply	Supplied by the TC-37K / -32K
Outside dimension	CSW-5B: 75 (W) × 35 (H) × 204 (D) mm (Excluding protrusions) CSW-5B-05: 95 (W) × 35(H) × 204 (D) mm (Excluding protrusions)
Mass	CSW-5B: Approx. 500 g CSW-5B-05: Approx. 650 g

Standard accessories

Instruction Manual..... 1
CR-655 connection cable 1
Accessory box 1
Warranty certificate 1

RPC-05A (Remote power controller)

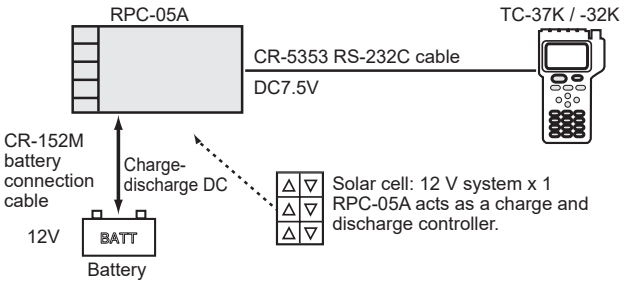
This equipment is a power controller that enables battery operation of our data loggers, digital strainmeters (TDS-150, TC-37K / -32K), and network handheld measuring instruments (TC-35N) in locations where AC power is unavailable. It is equipped with a battery charger function and unmanned measurement over a long period of time can be easily performed by simply connecting a solar cell. In addition, it is equipped with a function for turning on/off the power of measuring instruments, and the power of the measuring instruments can be controlled on the PC side by connecting it to a PC via an RS-232C interface. Therefore, even when the sleep interval (automatic measurement function that reduces power consumption by going into a standby state when not measuring) is set, the power of the measuring instruments can be turned on to perform data collection, etc. Furthermore, by using a wireless telephone line system (such as mobile phone + modem) for the connection part to a PC (RS-232C interface), various controls (measurement, turning on/off of the power of measuring instrument, data collection, etc.) can be performed from a location far away from the measuring instruments.

Data loggers and digital strainmeters supported by RPC-05A
TC-37K / -32K, TC-35N, TDS-150

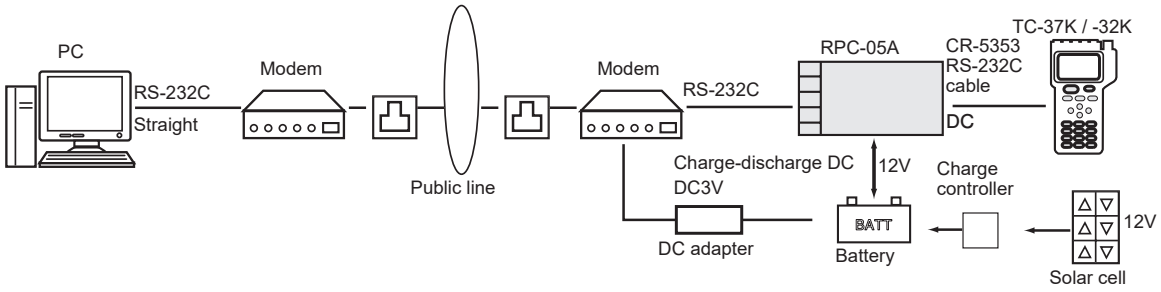
PC-05A remote power controller

System Block Diagram

In the case of offline measurement



When using a general telephone line



Specifications

Connectable instrument to this software	TC-37K / -32K, TC-35N, TDS-150
12 V BATT. IN	
Battery input voltage	DC 10 to 18 V
Charging voltage	13.65 V ± 1%
Charging current limit value	About 350 mA
CHARGE IN	
Input voltage	18 V max
Power output for measuring instrument	
Output voltage	DC 7.5 V ± 1 V
Output current (Minimum guaranteed value)	350 mA
ON pulse output	33 ms ±10% positive pulse When ESC + 0 + N is received from RS-232C IN, the above-mentioned pulse is generated on the ON pulse output line of RS-232C OUT.

Control signal	RS-232C
Baud rate	1200, 2400, 4800, 9600 dps
Bit length	8-bit
Parity	None
Self-consumption current	5 mA or less
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Outside dimension	80 (W) × 35 (H) × 169 (D) mm
Mass	Approx. 320 g

Standard accessories

Instruction Manual..... 1
Battery connection cable (CR-152M)..... 1
Connection cable
(CR-5353 for the TC-37K / -32K or CR-5351 for the TC-31K/TC-35N) 1
Battery connection fitting: for + leg, for - leg..... 1
Warranty certificate 1

TML-NET

- Easy connection and branching
- Easy installation due to compact and lightweight module part
- No decrease in sensitivity due to cable extension
- Highly resistant to noise due to digital processing near a sensor
- No influence due to decrease in insulation resistance
- Total extension distance of network module: 2 km or less (When using ND-100, NIF-100, TC-35N)
- Total extension distance between a data logger and ND-100: 2 km or less
- Can also be used in combination with a switch box. Each measuring instrument is insulated from the others.
- Conventional type and low power consumption type can be mixed.

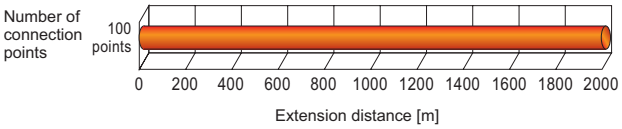
The TML-NET is our unique network that enables measurement control and data transfer via a two-wire type network line and supplies the power. It is also our unique network in which commands and data are transferred on the network along with a clock to enable two-way communication. The network module configures a measurement circuit near a strain gauge, DC voltage signal, and T-type thermocouple, and digitizes the measurement data. The digitized data is transferred to a data logger by a network driver connected to the network. (The network interface allows direct connection to a PC.) This is a low-power consumption network module that consumes 1/10 the power of the conventional type and allows for more connections and longer extension distance than the conventional network module. The data is transferred via digitized signals, allowing for stable measurements over a long period of time without influences by decreased sensitivity and cable insulation degradation due to cable extension. In addition, there is an advantage that, with simple wiring, correlations between strain, strain gauge type transducer, voltage, temperature, etc. can be measured, processed, and recorded in a lump sum for the required number of channels.

TML-NET (Network part) Specifications

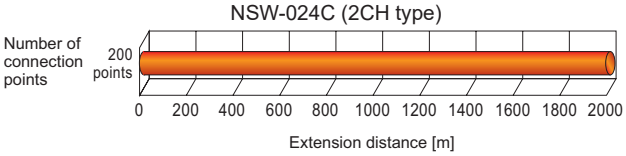
Communication part specifications (2-wire type)

Transmission method	Two-wire type, bidirectional serial transfer
Number of connection points	Max. 100 points per system, max. 1000 points can be connected
Standard cable used	Dedicated 2-core shielded cable (2-1.25L1)
Total extension distance	2 km or less per system (Refer to the figure below.)
Measurement time	200 ms/point (including transfer time)
Loop connection	Possible
Terminator	Not required

Network module Two-wire type Extension distance:
NSW-011C, NSW-014C, NSW-01 VC, NSW-01TC, NSW-01CC

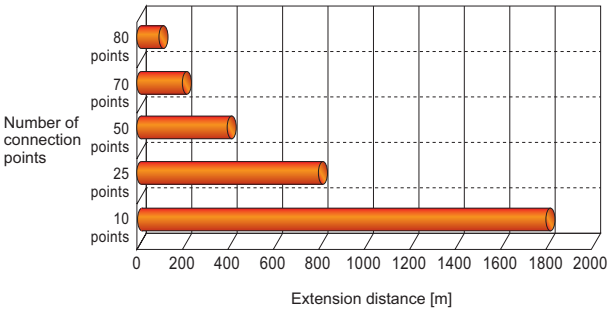


Network module Two-wire type Extension distance:
NSW-024C (2CH type)



Dedicated shielded cable used, 2-wire type: 1

Network module Two-wire type Extension distance:
Conventional type module



ND-100 (Network driver)

NEW

ND-100 network driver

This equipment is a driver interface that drives each module from the system of the switch box extension cable of the TDS series measuring instrument.

Specifications

Number of connectable units		Up to 100 units * 1
Extension distance		2 km*1
Connectable data logger		TDS-540
TML-NET connection		Terminal block: PRC03-23A10-3AF connector for dedicated two-core shielded cable connection
Function		Conversion of three-wire signals to two-wire signals Power supply to network modules
Power supply		Supplied by data logger * Booster power supplies are required when extending multiple systems.
Booster Power supply	AC power supply	Rated voltage: AC 100 to 240 V, 50/60 Hz Maximum power consumption: 80 VA max
	DC power supply	Rated voltage: DC 9 to 18 V Maximum power consumption 2.0 A max
Operating temperature / humidity range		0 to +50C° 85% RH or less (No condensation)
Outside dimension		150 (W) × 45 (H) × 100 (D) mm(Excluding protrusions)
Mass		Approx. 500 g

*1. When using a low-power consumption type network module

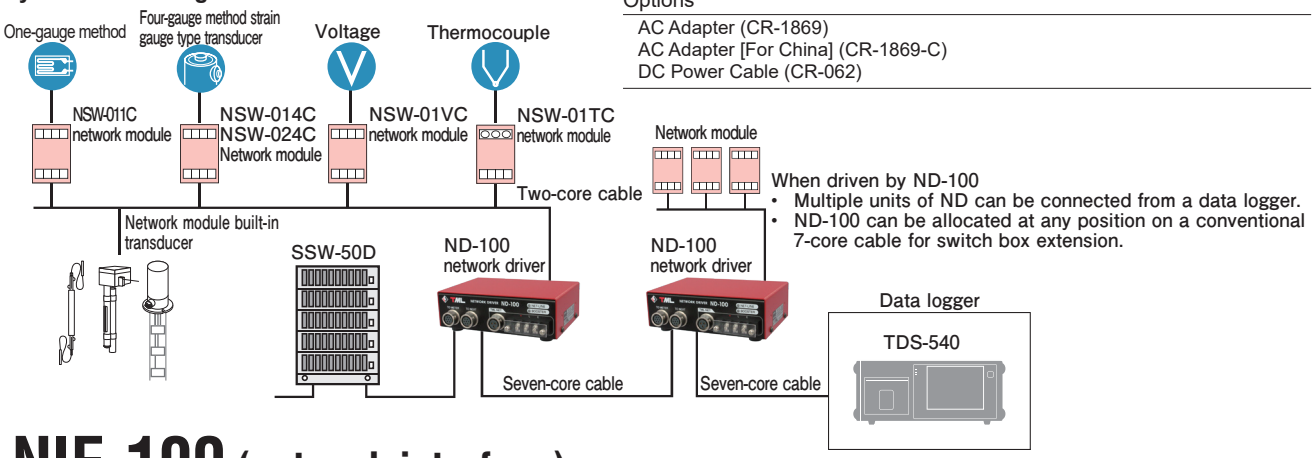
Standard accessories

Instruction Manual..... 1
Warranty certificate 1
AC power cable (CR-03) 1
Connection cable 1.5 m (CR-65) 1

Options

AC Adapter (CR-1869)
AC Adapter [For China] (CR-1869-C)
DC Power Cable (CR-062)

System Block Diagram



When driven by ND-100
- Multiple units of ND can be connected from a data logger.
- ND-100 can be allocated at any position on a conventional 7-core cable for switch box extension.

NIF-100 (network interface)

NIF-100 network interface

Driver interface for directly driving each module from a PC

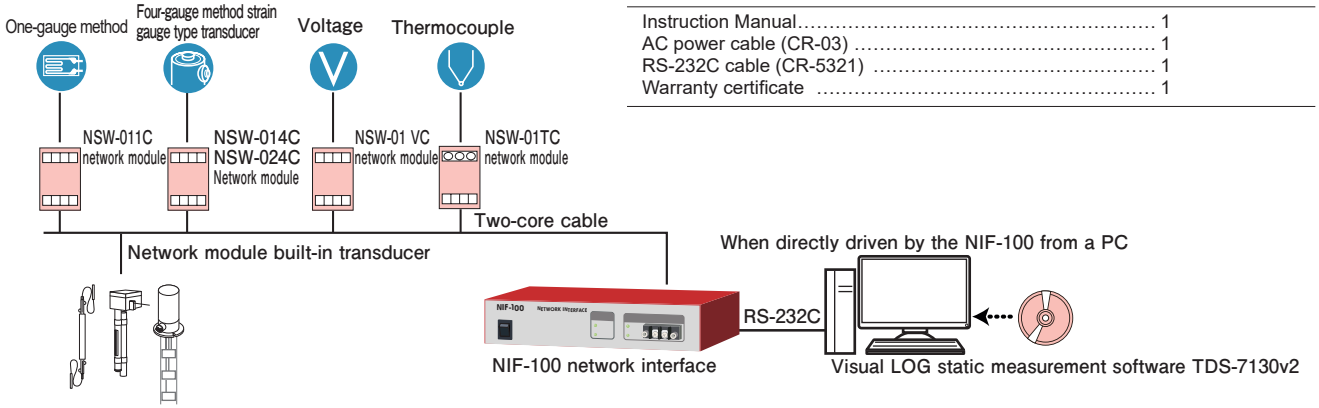
Specifications

Number of connectable units	When using a low-power consumption network module 100 units When using a conventional network module 80 units
Extension distance	When using a low-power consumption network module 2 km When using a conventional network module 1.8 km (with a limit on the number of units used)
Interface	RS-232C compliant, baud rate: 300, 600, 1200, 2400, 9600, 19200 bps
TML-NET connection	Terminal block
Function	Scanning measurement, monitor measurement, module check, ID check, channel setting of network module, power supply to network module
Power supply	AC power supply Rated voltage: AC 100 to 240 V, 50/60 Hz Allowable voltage: AC 85 to 250 V, 50/60 Hz Maximum power consumption: 90 VA max
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Outside dimension	235 (W) ×50 (H) ×160 (D) mm (Excluding protrusions)
Mass	Approx. 1.2 kg

Standard accessories

Instruction Manual..... 1
AC power cable (CR-03) 1
RS-232C cable (CR-5321) 1
Warranty certificate 1

System Block Diagram



TC-35N (Handheld)

TC-35N network handheld measuring instrument

The TC-35N network handheld measuring instrument receives and processes digitized strain data from a network module. It is small and lightweight, has a splashproof structure, and operates on AA size alkaline batteries. Therefore, it can be used for on-site checks and measurements as a small-scale measuring system. In addition, long-term automatic measurement is possible using the sleep interval. Measured data can be transferred to a PC via the RS-232C interface or recorded in data memory or on a CF card.

Related Products

CR-183B AC adapter
This equipment is connected to AC 100 V to supply the power.
RS-232C cable CR-553B (25P), CR-5531 (9P)
This cable is used to connect to a PC.
DPU-S245 external printer
The measurement data of the TC-35N is printed.
CR-4512 printer cable
This is a dedicated cable for connecting to the TC-35N printer.
RPC-05A remote power controller
This enables long-term measurements powered by an external battery.

Specifications

Number of connectable units	When using a low-power consumption network module 50 units When internal AA size batteries or AC adapter is used 100 units When external DC input 24 V is supplied When using a conventional network module 5 units When internal AA size batteries or AC adapter is used 100 units When external DC input 24 V is supplied (200 m or less)
Extension distance	When using a low-power consumption network module 50 m or less When internal AA size batteries or AC adapter is used 2 km or less When external DC input 24 V is supplied When using a conventional network module 50 m or less When internal AA size batteries or AC adapter is used 2 km or less When external DC input 24 V is supplied (15 units or less)
Cable used	Dedicated two-core shielded cable
Applicable transducer	Equivalent to a network module
Measurement range, resolution, accuracy	Equivalent to a network module
Data acquisition speed	About 0.2 s/CH
External DC input	DC 12 to 28 V, 1 A max. External input of DC power supplied to TML-NET
Data memory	About 23000 data (at the time of 1 ch measurement)
Memory card	CF card (PC card adapter required) 128 MB
Number of transducer setting points	1000 points Setting record contents: Coefficient, unit, decimal point, initial value
Function	Scanning measurement, monitor measurement, module check function, ID check function, channel setting function of network module
Interval timer function	Function : Automatic start at the set time interval and time Time : Year, month, day, hour, minute, second Time accuracy : Daily error: ±2 sec (at 25°C ± 5°C) Interval : Hour / minute / second can be set for each step up to 99 hours, 59 minutes, and 59 seconds. Number of starts : Up to 99 times per step or infinite Number of steps : Programmable up to 10 steps Real time start : Start time (hour / minute / second) can be set for each step. GOTO step : Program loop possible to one of the previous steps. Sleep function : The power is turned on 10 sec before the measurement time and turned OFF after the measurement is completed. (Sleep can be set to ON/OFF.)
Auto power OFF function	The power is turned OFF about 10 min after the last key operation.
Interface function	RS-232C Function: Receiving of control, measurement data, etc. Baud rate: 4800, 9600, 19200, 38400 bps
Display	128 x 64 dot LCD with backlight
Vibration tolerance	30 m/s^2 Shock resistance: 50 m/s^2
Splash proofness	IP-54 (with connector cap attached)
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Power supply	AA size alkaline dry-cell battery (LR-6) x 4 or AC adapter (CR-183B, optional)
Outside dimension	102 (W) × 55 (H) × 223 (D) mm
Mass	Approx. 850 g

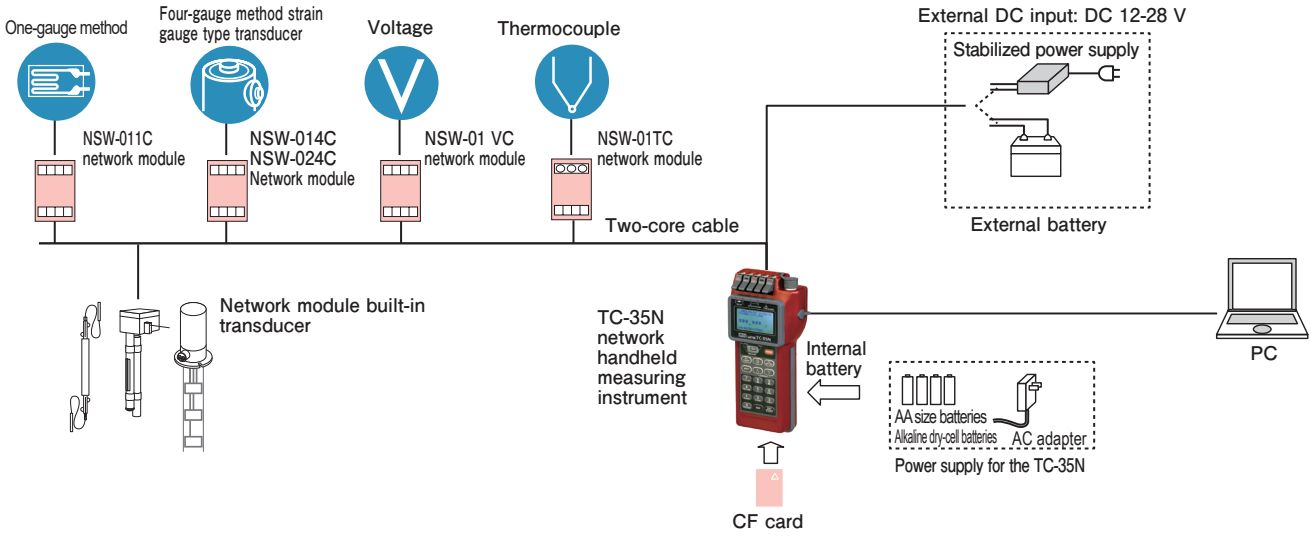
Standard accessories

Instruction Manual..... 1
Shoulder belt 1
AA size alkaline dry-cell battery 4
Accessory box 1
Warranty certificate 1

Options

AC Adapter (CR-185B)
AC Adapter [For China] (CR-185B-C)

System Block Diagram



MD-111 (monitoring system controller)

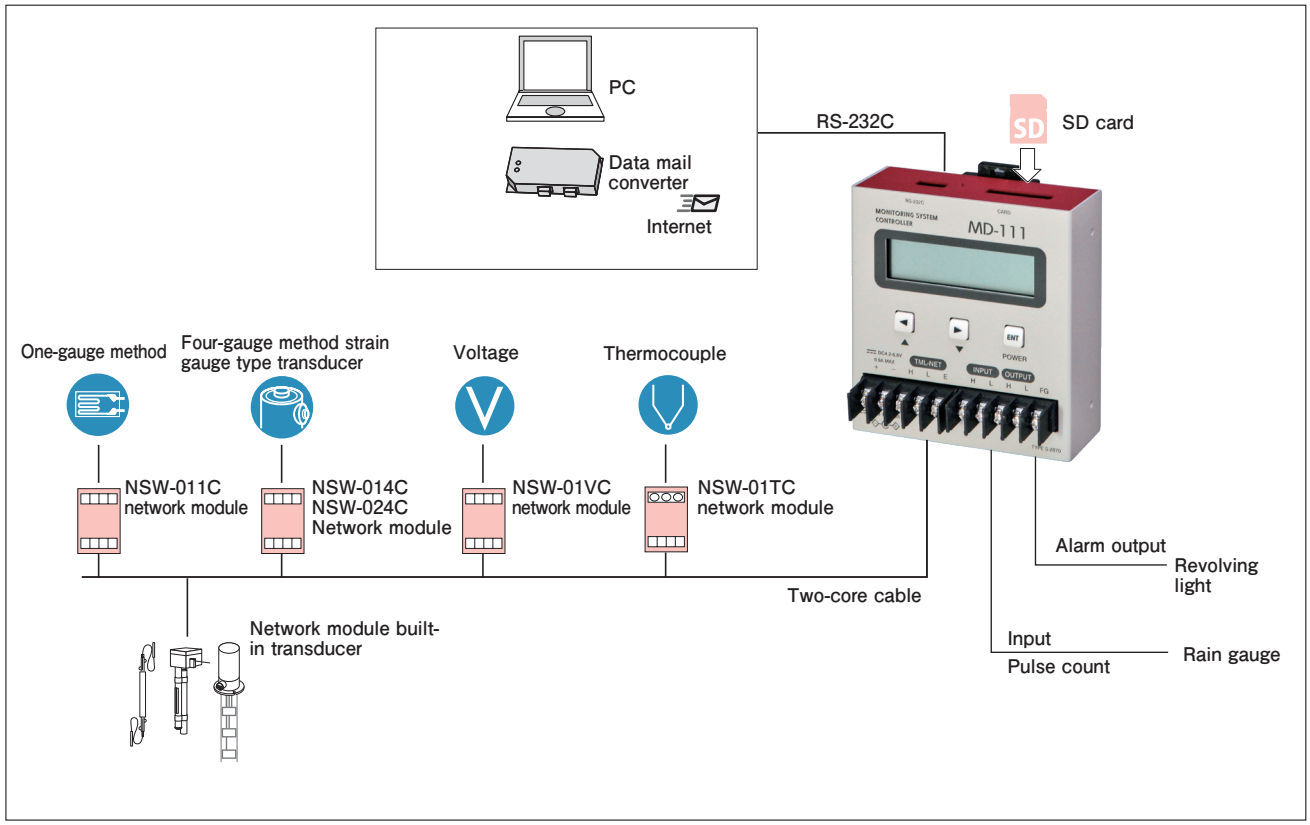
Disaster prevention systems can be constructed by alarm output with contact output.

- Automatic measurement with sleep interval, battery powered
- Distributed measuring system
- Easily expansion of the number of measuring points using TML-NET
- Recording of measurement data using an SD card
- Counting and recording the pulses of rain gauge pulses with contact input
- Alarm transmission with contact output
- Easy installation on DIN rails due to compact and lightweight design
- By connecting to a data mail converter, data management from a remote location is easy.

MD-111 monitoring system controller

This monitoring system is a disaster prevention system that utilizes the TML-NET network measuring system. It consists of a controller, network modules, and TML-NET compatible transducers. The controller controls the network modules and TML-NET compatible transducers at a specified measurement interval and records the measurement data on an SD card. Its shape is suitable for stationary application, and it is equipped with interfaces for contact input/output and data mail converter and allows the building of a relatively small-scale disaster prevention system at low cost.

System Block Diagram



Specifications

TML-NET drive unit

Target model	NSW series
Number of connectable units	When using a low-power consumption network module 100 units
	When using a conventional network module Up to 20 units (Connection distance: 150 m or less)
Total extension distance	When using a low-power consumption network module 1 km or less
	When using a conventional network module 1 km or less (up to 10 units)
Connection cable	Dedicated two-core shielded cable

Function

Number of measuring points	100 points
Function	Interval measurement, monitor
Setting	First channel, last channel
Measuring mode	Simple measure mode
TML-NET setting function	Channel number setting of network module (Only when 1 unit is connected)

Interval timer

Function	Measurement at the set time interval
Time interval	1, 2, 5, 10, 15, 20, 30 min. 1, 2, 3, 4, 6, 12, 24 hrs (Measurement start time can be specified)
Sleep function	When the sleep function is enabled, the power is automatically turned on/OFF during interval measurement.

Clock

Function	Year, month, day, hour, minute, second
Accuracy	Daily error: ± 3 sec (at 23°C ± 5°C)
Retention	About 1 hr (with full charge)

Display / operation

Display unit	Seven-segment LCD
Operation key	Operated by the key switch

Memory

Function	Recording of measurement data, recording of setting file Readout
Applicable card	SD card (Designated by us)
Applicable physical format	FAT16
Recording format	CSV format
Card capacity	512 MB

Contact input

Number of contacts	1
Input signal	Non-voltage contact, open collector signal
Response pulse width	0.01 s or more
Measurement range	0 to 31,999 count
Accuracy	±1 digit or less
Recording content	Records a pulse integration value at each recording interval
Measurement data	Integrated count

Contact output

Number of contacts	1
Contact	Semiconductor relay
Contact capacity	AC 140 V / DC 200 V max Rated current: 0.5 A max. Inrush current: 1.5 A max
Output format	a-contact
Comparison format	Relative value, upper / lower limits

Battery power supply

Rated power supply voltage	DC 4.2 to 6.8 V
Battery life	About 3 months Conditions Battery : D size alkaline dry-cell battery x 4 Atmospheric temperature : 23°C ± 5°C Measurement : 1-hour interval Number of connectable units : 10 units
Consumption current	Sleep current: 1 mA max Operating current 300 mA max (when driving 1 unit) 360 mA max (When driving 10 units) 900 mA max (When driving 100 units)

External DC power supply

Rated power supply voltage	DC 9 to 18 V
Consumption current	Sleep current 1 mA max Operating current 500 mA max (when driving 100 unit)

Interface

RS-232C	RS-232C compliant Baud rate: 9600, 19200, 38400 bps For various settings, measurement, data collection

Environment

Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Outside dimension	95 (W) × 30 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 200 g

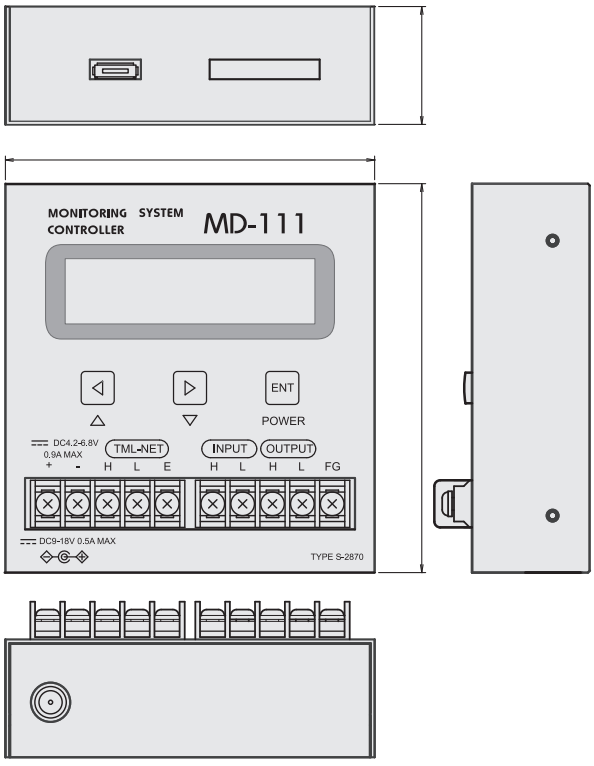
Standard accessories

Instruction Manual..... 1
SD card (512 MB) 1
Warranty certificate 1

Options

AC Adapter (CR-1869)
AC Adapter [For China] (CR-1869-C)
DC Power Cable (CR-062)

External Dimensions



NSW Series (Network Modules)

NSW-011C and NSW-014C common specifications (low-power consumption type)

Number of measuring points	1 point
Measurement time	200 ms/point (including transfer time)
Program setting	Channel number: 000-999
Power supply voltage	DC 10 to 28 V
Consumption current	During standby 1 mA max During measurement 36 mA max
Operating temperature / humidity range	-20 to +60C° 85% RH or less (No condensation)
Outside dimension	50 (W) × 20 (H) × 100 (D) mm
Mass	Approx. 250 g

Standard accessories

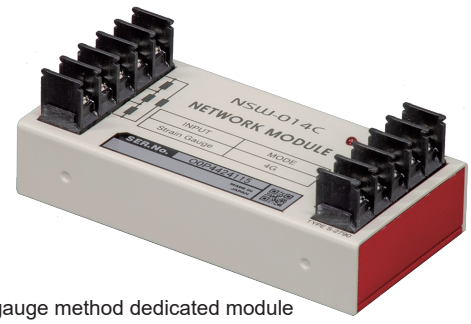
Instruction Manual..... 1
Warranty certificate 1

NSW-011C one-gauge method dedicated strain module

One-gauge method dedicated module

Measuring mode	One-gauge method three-wire type
Applicable gauge resistance	120 Ω/350 Ω (fixed at the time of shipment)
Bridge excitation	DC 1 V 60 ms (50 Hz)
Measurement range	± 30000 × 10^{-6} strain
Resolution	1 × 10^{-6} strain
Accuracy	± (0.05% rdg + 2 digits) (23C° ± 5C°) * Decrease in sensitivity due to lead wire is not included.
Temperature coefficient	0.005% rdg/°C
Aging change	0.05% rdg/year
Check function	Over check, sensitivity check, open check

NSW-014C four-gauge method dedicated strain module



Four-gauge method dedicated module
Strain gauge type transducers, etc. are connected.

Measuring mode	Four-gauge method
Applicable gauge resistance	120–1000 Ω
Bridge excitation	DC 1 V 60 ms (50 Hz)
Measurement range	± 30000 × 10^{-6} strain
Resolution	1 × 10^{-6} strain
Accuracy	± (0.05% rdg + 2 digits) (23C°±5C°) * Decrease in sensitivity due to lead wire is not included.
Temperature coefficient	0.002% rdg/°C
Aging change	0.05% rdg/year
Check function	Over check, sensitivity check, open check

2-ch network module NSW-024C

Number of measuring points	2 points
Measurement time	200 ms/point (including transfer time)
Program setting	Channel number: INPUT 0 000-998 INPUT 1 INPUT 0 +1
Measuring mode	Four-gauge method
Applicable gauge resistance	120–1000 Ω
Bridge excitation	DC 1 V 60 ms (50 Hz)
Measurement range	± 30000 × 10^{-6} strain
Resolution	1 × 10^{-6} strain
Accuracy	± (0.05% rdg + 2 digits) (23C° ± 5C°) * Decrease in sensitivity due to lead wire is not included.
Temperature coefficient	0.002% rdg/°C
Aging change	0.05% rdg/year
Check function	Over check, sensitivity check, open check
Power supply voltage	DC 10 to 28 V
Consumption current	During standby 1 mA max During measurement 36 mA max
Operating temperature / humidity range	-20 to +60C° 85% RH or less (No condensation)
Outside dimension	95 (W) × 20 (H) × 100 (D) mm
Mass	Approx. 300 g

Standard accessories

Instruction Manual..... 1
Warranty certificate 1

NSW-01 VC voltage module

DC voltage measurement module

Measuring mode	DC voltage

Input terminal	Measurement range	Resolution	Input resistance
V1	±2.5000 V	0.1 mV	About 2 MΩ
V2	±25.000 V	1 mV	

Accuracy	± (0.08% rdg + 3 digits)
Zero stability	± 0.1 mV/°C (V1 mode) ±1 mV/°C (V2 mode)
Sensitivity stability	0.01% rdg/C°
Aging change	0.1% rdg/year
Check function	Over check, sensitivity check

NSW-01TC thermocouple module

T-type thermocouple temperature measurement module

Applicable thermocouple	T [JIS C 1602-2015]
Reference junction	Internal temperature compensation method
Linearization	Digital calculation
Measurement range	−100 to +200°C
Resolution	0.1°C
Accuracy (at 23°C ± 5°C)	External reference junction: ± (0.11% rdg + 0.2°C) Internal reference junction ± (0.11% rdg + 0.9°C)
Temperature coefficient of accuracy	0.01%rdg/°C
Aging change of accuracy	0.1% rdg/year
Zero-point temperature coefficient	0.03C°/C°
Check function	Sensitivity check

NSW-01CC counter module NEW

This equipment is a module that counts rainfall, flow rate, quantity, number of passing vehicles, number of machine operations, etc. using non-voltage contact or open collector input.
The built-in backup batteries allow continuous counting even when the power is not supplied.

Number of measuring points	1 point	
Measurement time	200 ms/point (including transfer time)	
Program setting	Channel number: 000-999	
Power supply voltage	DC 10 to 28 V	
Consumption current	During standby	12mA MAX.
	During measurement	12mA MAX.
Maximum number of connectable units	Up to 10 units of NSW-01CC can be connected out of 100 units with an extension of 2 km.	
Input signal	Non-voltage contact/open collector signal, rectangular wave	
Input waveform	Counted by the edge at the time of close	
Input pulse width	0.01 s or more	
Input contact current	About 120 μA	
Count direction	Up count	
Measurement data	Integrated count	
Measurement range	0 to 31,999 count	
Resolution	±1 count	
Measurement accuracy	±1 digit or less	
Overflow processing	0 reset	
Check function	Sensitivity check (10000 fixed value return)	
Reset function	Full count/external reset	
Backup power supply	AA size alkaline dry-cell battery x 3 About 3 months	
Operating temperature / humidity range	-20 to +60°C 85% RH or less (No condensation)	
Outside dimension	95 (W) × 35 (H) × 100 (D) mm (Excluding protrusions)	
Mass	About 250 g (Excluding 3 AA size alkaline dry-cell batteries: 70 g)	

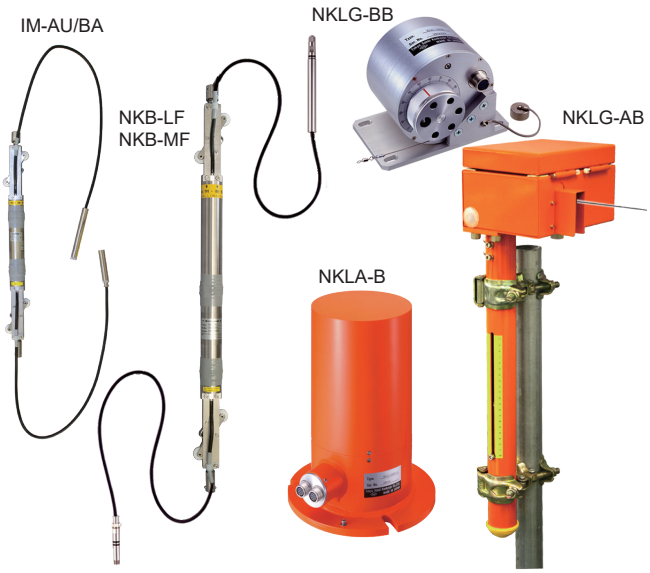
Standard accessories

Instruction Manual 1
Warranty certificate 1
AA size alkaline dry-cell battery 4

*** Connect H of the TML-NET connection terminal to H (hot side) of the network driver and connect L to L (cold side) of the network driver. When connected in reverse, the module will not operate.**
*** Up to 10 units of NSW-01CC can be connected out of 100 units with an extension distance of 2000 m.**

TML-NET Compatible Transducers

- Built-in digital conversion module for the TML-NET
  A low power consumption type network module is adopted to support multipoint / wide-range measurements. The ND-100 network driver is required separately to connect to a data logger. Refer to page 266 for details on ND-100. In addition, contact us for compatible data loggers and measuring instruments.
- No influence of reduced sensitivity or insulation
  Since data is transferred using digital signals, there is no influence of reduced sensitivity or insulation due to cable extension.
- Easy wire connection
  Data can be transferred simply by using a two-wire cable instead of the conventional seven-core cable. In addition, temperature measurements using conventional strain gauge type transducers, thermocouples and platinum resistance temperature detectors can be used together via a switch box.
- Equipped with insulation check function
  A measurement function for insulation resistance values is available as an indicator of the soundness in the state of transducer installation. In addition, contact us for compatible data loggers and measuring instruments.

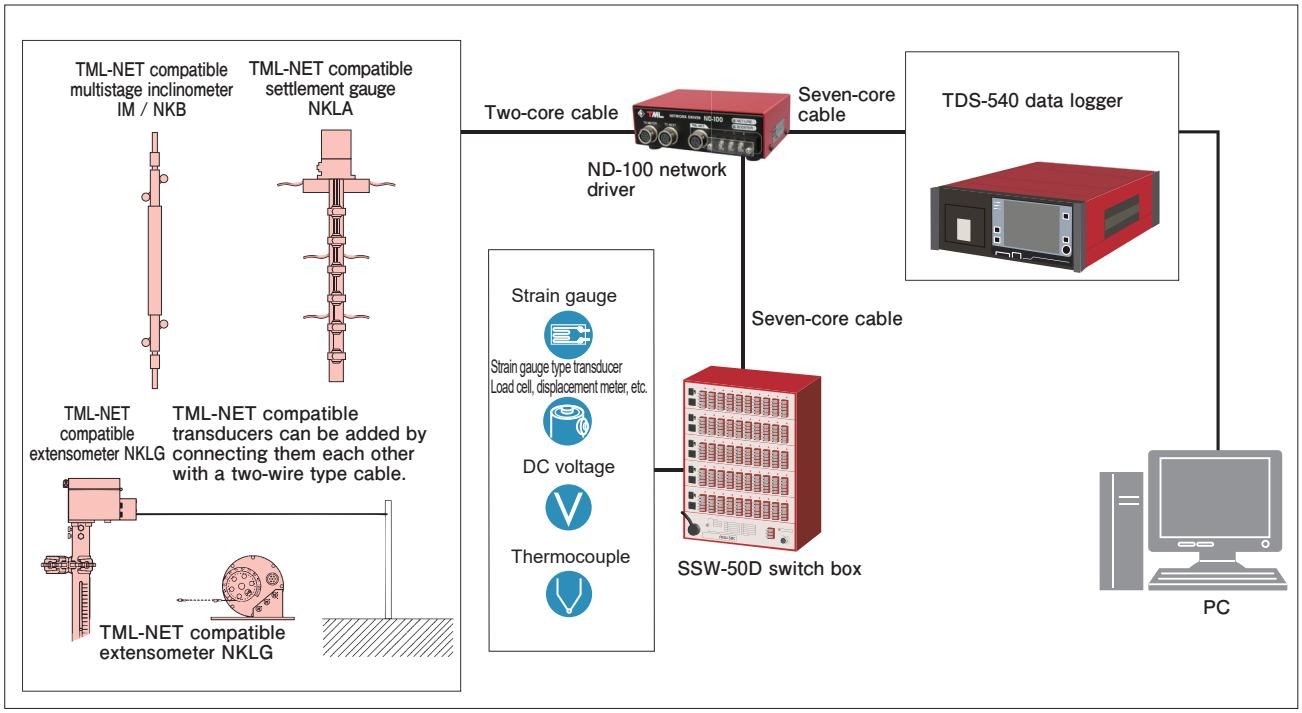


This equipment is a strain gauge-type-based transducer with a built-in digital conversion module designed for network measurement. Data can be transferred by connecting to a network driver or a measuring instrument that supports the TML-NET. Using a two-wire type cable, it is possible to easily add TML-NET compatible transducers or a network module to build a measuring system. In addition, conventional strain gauges, transducers, thermocouples, and platinum resistance temperature detectors can also be used by incorporating them into the network system using a switch box.

Supported transducers	Multistage inclinometer	NKB-LF/-MF, IM-AU/BA
	Settlement gauge	NKLA-B
	Extensometer	NKLG-AB/-BB (with built-in arrester)

System Block Diagram

● TML-NET digital network system examples



NNZ-2A (Lightning arrester for the TML-NET)

Prevents breakdown of measuring system due to induced lightning.

- When waiting for measurement, the relay is disconnected automatically to prevent induced current.
- Power supply from the network line
- The voltage of network line and the current of network modules are monitored to immediately shut off them in the event of an abnormality.

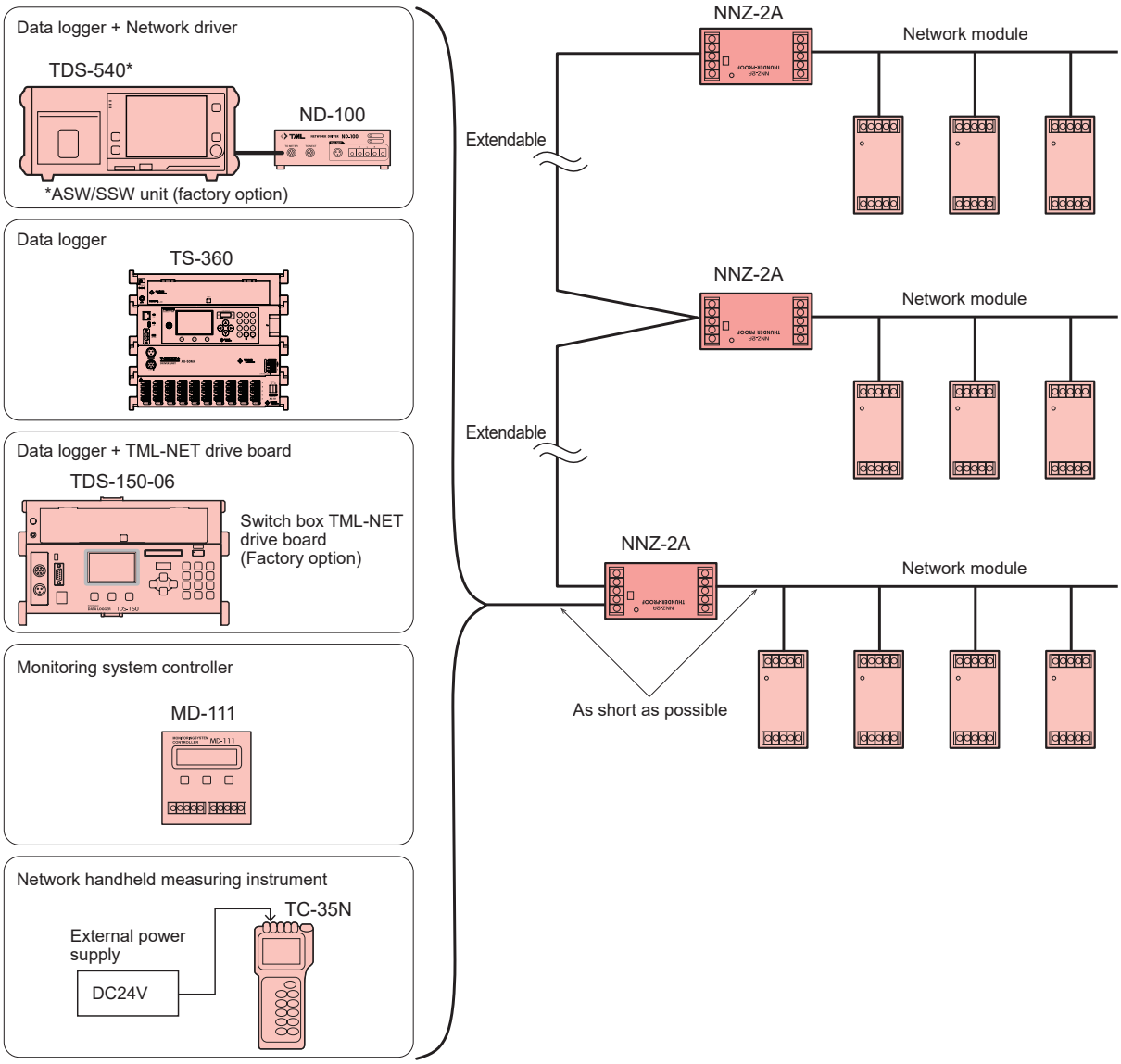
Specifications

Surge withstand	100 A (8/20 μs impulse)
Number of usable units	NNZ-2A: 10 units Low-power consumption network module: 100 units
Rated power supply voltage	DC 18 to 24 V
Standard cable used	Dedicated two-core shielded cable Total extension distance: 2 km or less (When power supply voltage of DC 24 V is used) 1 km or less (When power supply voltage of DC 18 V is used)
Display function	Voltage drop on network line Overcurrent of the network module (overcurrent causes the network module to be isolated)
Operating temperature / humidity range	-20 to +60C° 85% RH or less (No condensation)
Outside dimension	50 (W) × 28 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 120 g

NNZ-2A Lightning arrester for the TML-NET

This equipment protects the TML-NET network measuring system from induced lightning. In areas prone to lightning, when cables for measuring instruments, network modules etc. are subjected to induced lightning, the induced current can cause failures in the network drivers and network modules connected to the network line. When this equipment is connected to both ends of the network line to be extended and when this equipment is on standby for measurement, the network line is disconnected automatically to prevent induced current when the network line is struck by inductive lightning to protect the network driver and network module.

System Block Diagram



* TDS-150 and MD-111 use AC power adapters.

Dynamic Strainmeters

We offer a wide range of dynamic strainmeters, from basic types for 1 point to multifunction types capable of various digital processing. Please select the model based on the scale of measurement, measurement frequency, data processing method, etc.

Model List

Digital type

Model name	Number of measuring points	Bridge excitation	Response frequency	Output	Records data	Interface	Other functions	Page
DS-50A	50	2 V DC	DC to 100 Hz * Variable depending on the number of connected units	-	PC storage Direct	LAN	Up to 20 units synchronized (1000 ch) Built-in bridge box Voltage measurement unit Thermocouple unit	276
DRA-162B	16	0.5, 2 Vrms 5 kHz	DC to 2.5 kHz	±10 V (5 kΩ load)	PC storage Direct	LAN	Data processing TEDS compatible	279
DC-204R	4	0.5, 2 V DC	DC to 10 kHz	-	CF card	USB	Up to 8 units synchronized (Up to 32 ch)	283
DC-204Ra				±5 V (5 kΩ load)				
DC-004P	4	0.5, 2 V DC	DC to 2 kHz	-	PC storage Direct	USB	PC control TEDS compatible	288
DH-14A	4	0.5, 2 V DC	DC to 1 kHz	-	CF card	-	AA size dry-cell battery powered Handheld use TEDS compatible	291
TMR-300	8-80	Depends on the unit	DC to 10kHz	±10 V, ±5 V alarm	SD card	LAN USB Wireless LAN	Various sensor input units such as strain, temperature, voltage, and pulse can be combined, and the units can be arranged in a distributed manner.	307

Analog type

Model name	Number of measuring points	Bridge excitation	Response frequency	Output	Other functions	Page
DA-17A	1	0.5, 2 Vrms 5kHz	DC to 2.5kHz	±10V ±20mA	Digital monitor Level meter Digital sensitivity setting PC control (when stored in the dedicated case)	294
DA-18A	1	0.5, 2 Vrms 5kHz	DC to 2.5kHz	±10V ±10V	Digital monitor Level meter Digital sensitivity setting TEDS compatible	295
DA-37A	1	0.5, 2 Vrms 20 kHz	DC to 10kHz	±10V ±50mA	High response frequency of 10 kHz Digital monitor Level meter Digital sensitivity setting PC control (when stored in the dedicated case)	296
DA-38A	1	0.5, 2 Vrms 20 kHz	DC to 10kHz	±10V ±10V	High response frequency of 10 kHz Digital monitor Level meter Digital sensitivity setting TEDS compatible	297
DC-96A	1	0.5, 1, 2, 5, 10 V DC	DC to 200kHz	±10V ±50mA	Broadband response frequency 200 kHz Digital sensitivity setting	298
DC-97A	1	0.5, 1, 2, 5, 10 V DC	DC to 500kHz	±10V ±50mA	Broadband response frequency 500 kHz Digital sensitivity setting	298

Major Functions

●Number of measuring points

The number of points (channels) that can be measured with 1 measuring instrument is indicated.

Although DA-17A/-18A/-37A/-38A and DC-96A/-97A are designed for one channel use when used alone, they can be configured for multichannel use by incorporating them into a case or rack.

●Bridge excitation and response frequency range

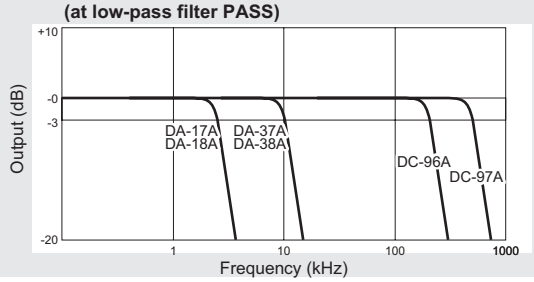
There are two types: the carrier type which uses AC as the bridge excitation and the DC type that uses DC.

The carrier type is characterized by a high signal-to-noise ratio and excellent stability and is the most widely used method for dynamic strainmeters. The response frequency is up to about half the carrier frequency and there are two types: 2.5 kHz type and 10 kHz type.

The DC type is characterized by a high response frequency and has excellent linearity as well. DC-96A provides a response frequency of 200 kHz and DC-97A provides a response frequency of 500 kHz.

The voltage of bridge excitation can be switched between two to five levels depending on the model. The magnitude of the output relative to the input strain, in other words, the sensitivity, is proportional to the bridge excitation, so it is advantageous to increase the bridge voltage in that respect. However, the current flowing through the strain gauge will be larger and the influence of the resulting heat generation will also be greater. Therefore, 2 V shall be the standard for normal measurements, and a lower voltage of 0.5 V shall be chosen when measuring materials with poor heat dissipation, such as plastic, or when measuring strain gauges with very small gauge lengths. For DC-96A/-97A, 5 V or 10 V can be set to obtain higher sensitivity.

Frequency characteristics of dynamic strainmeters (at low-pass filter PASS)



●Constant current bridge excitation method

Most dynamic strainmeters use the constant voltage method in which the bridge excitation voltage is kept constant, but DC-96A/-97A can be used by switching between the constant voltage method and the constant current method.

The constant current method keeps the current of the bridge excitation constant and has an advantage that there is almost no apparent decrease in sensitivity due to the resistance of the cable connecting the bridge circuit (bridge box, transducer, etc.) and the measuring instrument. However, with the constant current method, the bridge resistance value that can be connected is limited.

●Output

There are various types of recorders, including data recorders, which record the output signals of dynamic strainmeters.

Analog type dynamic strainmeters have two voltage output terminals and two recorders can be connected at the same time.

●Records data

This function not only outputs measurement data as an analog signal but also digitizes and records it. This makes it possible to capture dynamic phenomena without using an analog recorder. The DC-204R, DH-14A, and TMR-300 series record data on a memory card and transfer it to a PC after measurement is completed. The DRA-162B, DS-50A, DC-004P, and TMR-300 series record data on a PC in real time. Data analysis can be easily performed on a PC.

●Interface

This is an interface for communicating with a PC.

The TMR-311, DRA-162B, DS-50A, DC-004P, and DC-204 are set and operated from a PC via the built-in interface. In addition, it is also possible to transfer the setting status to a PC.

●Automatic balancing

Dynamic strainmeters require balancing of the bridge resistance (resistance balancing). In addition, carrier type dynamic strainmeters also require balancing of the capacity (capacity balancing). Both measuring instruments are equipped with a function to perform these balancing operations automatically.

Resistance balancing is a method in which the input during balancing operation is digitized and recorded, then converted back to an analog quantity again and subtracted from subsequent inputs. Since the balancing operation can be performed almost instantly, and simultaneous operations of multiple points are also possible, this is particularly useful when there are many measuring points. Capacity balancing is performed to cancel the output generated by imbalance in the capacitance of the lead wires connecting a strain gauge etc. to a measuring instrument. It detects the output due to capacity imbalance contained in the strain input and feeds it back to the input to balance it. This operation is performed automatically throughout the measurement, not only eliminating the need for balance adjustment operation but also enabling extremely stable measurements without influence of capacity change during the measurement.

●Low-pass filter

This filter is effective in removing high frequency components unnecessary for the measurement, such as electrical noise and mechanical micro vibrations, and is available on all models of dynamic strainmeters. The cutoff frequency can be selected from four to eight levels.

●High-pass filter

This filter removes frequency components lower than the cutoff frequency from the measurement signal. It is used in dynamic strainmeters to remove slow unnecessary components such as thermal output and drift of strain gauges. It is possible to set this filter to ON/OFF for each channel.

●Reading of TEDS sensor

The TEDS (Transducer Electronic Data Sheet) has a sensor information stored on an IC chip inside the sensor. This function allows a TEDS compatible measuring instrument to automatically recognize a sensor by reading the parameters from this information.

Compatible measuring instruments
DRA-162B, DC-004P, DH-14A, DA-18A, DA-38A, MM-014L

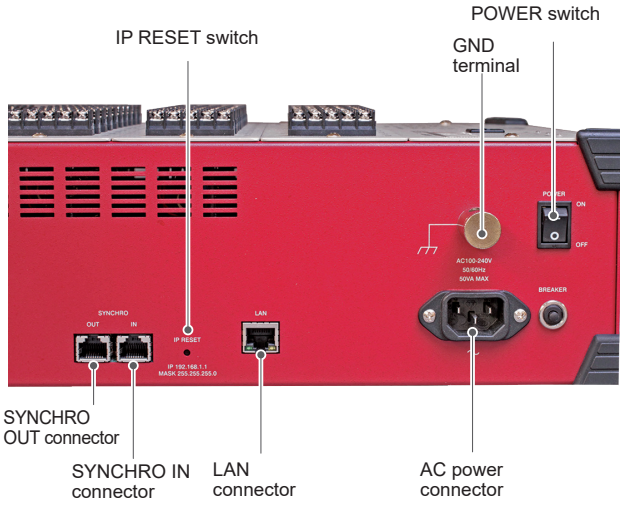
DS-50A (Multichannel)

- Synchronized measurement of up to 20 units (1000 channels) is possible.
- Maximum sampling rate of 1 kHz
- Equipped with bridge box
- Strain, voltage and thermocouple units can be mixed
- Measurement software (DS-750) included as standard

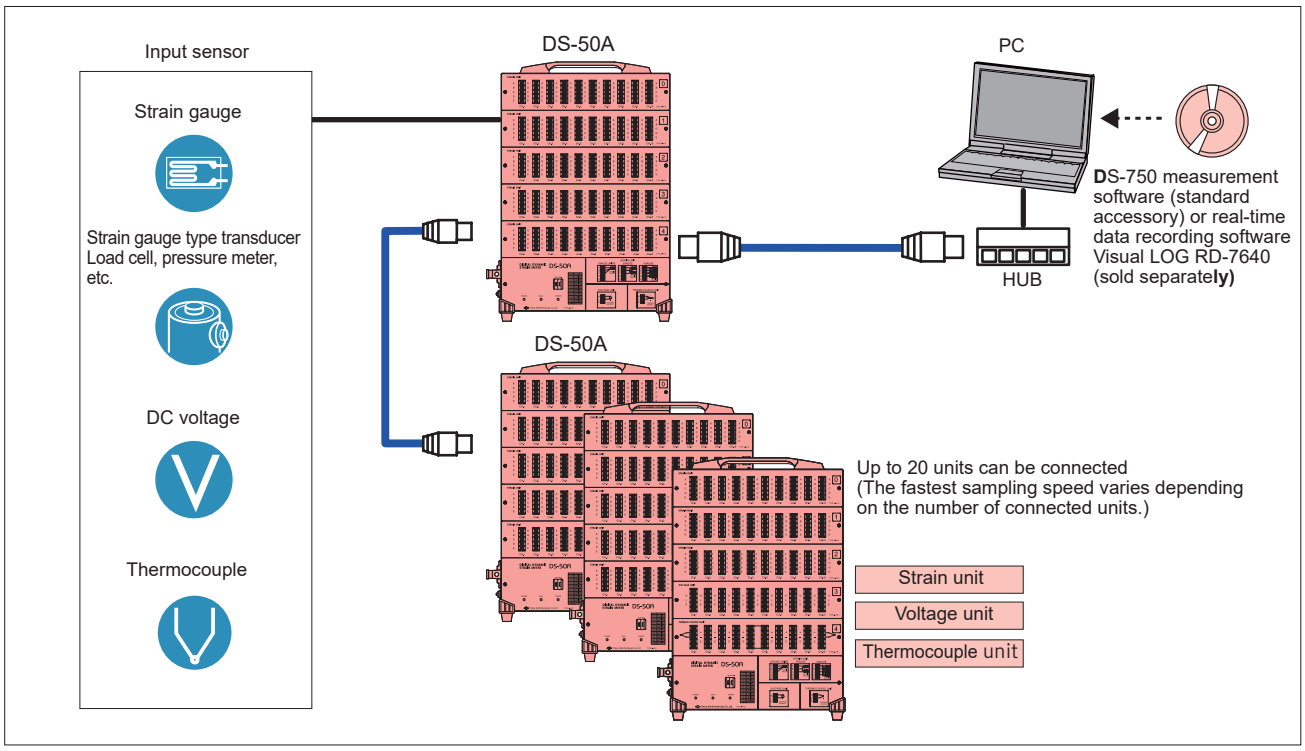
DS-50A multichannel digital dynamic strainmeter

The DS-50A is a multichannel digital dynamic strainmeter for online measurement with a PC. Each unit can measure 50 points and, by connecting up to 20 units with cables, it is possible to perform simultaneous sampling measurements of up to 1000 points. With a maximum sampling rate of 1 kHz, it supports measurement of phenomena of around 100 Hz. In addition, the devices can be separated by up to 100 m with connecting cables, and it is possible to measure multipoint dynamic strain distributed over a wide area, which was difficult with conventional dynamic strainmeters.

Side control panel



System Block Diagram



Specifications

DS-50A (Main unit)	
Number of measuring points	Up to 50 points Strain, voltage and thermocouple units can be mixed. 1 unit: 10 points
Synchronization	Up to 20 units (1000 points)
Sampling	1–10000 ms*1
Interface	LAN (100BASE-TX)
Operating temperature / humidity range	0C° to +50C° 5% RH or less (No condensation)
AC power supply	Rated voltage: 100 to 240 V, 50/60 Hz Allowable voltage: 90 to 264 V, 50/60 Hz Maximum power consumption 50 VA max
Outside dimension	420 (W) × 110 (H) × 298 (D) mm (Excluding protrusions)
Mass	Approx. 5 kg

Standard accessories

- Instruction Manual 1
- AC power cable (CR-03) 1
- LAN power cable, 3 m (CR-6462) 1
- DS-750 measurement software (CD- ROM) 1
- Phillips screwdriver 1
- Warranty certificate 1

*1: The fastest sampling speed is increased by 1 ms for each 1 connected unit.

Strain unit	
Number of measuring points	10 points
Applicable gauge resistance	One-gauge method three-wire type: 120 Ω, 350 Ω Two-gauge method: 120-1000 Ω Four-gauge method: 120-1000 Ω
Bridge excitation	DC 2 V
Measurement accuracy	± 0.05% FS (23C°±5C°)
Measurement range	± 25000 × 10^{-6} strain
Resolution	1 × 10^{-6} strain
Balancing method	Electronic automatic
Balancing accuracy	± 3 × 10^{-6} strain or less
Balancing range	± 10000 × 10^{-6} strain
Response frequency	DC to 100 Hz
Low-pass filter	
Cutoff frequency	Digital filter 1 Hz to 100 Hz (Can be set in 1 Hz increments) -3 dB ± 1 dB
Cutoff property	-48 dB ± 1 dB/oct, Butterworth property
High-pass filter	
Cutoff frequency	Digital filter 0.2 Hz, 1 Hz or OFF

Voltage unit	
Number of measuring points	10 points
Input format	Single end (unbalanced)
Input impedance	About 100 kΩ
Measurement range	±20 V
Measurement accuracy	± 0.05% FS (23C°±5C°)
Resolution	1 mV
Response frequency	DC to 100 Hz
Low-pass filter	
Cutoff frequency	Digital filter 1 Hz to 100 Hz (Can be set in 1 Hz increments) -3 dB ± 1 dB
Cutoff property	-48 dB ± 1 dB/oct, Butterworth property
High-pass filter	
Cutoff frequency	Digital filter 0.2 Hz, 1 Hz or OFF

Thermocouple unit			
Number of measuring points			10 points
Measurement range			T: -250 to +400C° K: -210 to +1370C° J: -200 to +1200C°
Measurement accuracy	Internal reference junction	T	-250 to -200C°± (0.5% rdg + 6C°) -200 to -100C°± (0.5% rdg + 3C°) -100 to +400C°± (0.5% rdg + 2C°)
		K	-210 to 0C°± (0.5% rdg + 3C°) 0C° to +1370C°± (0.5% rdg + 2C°)
		J	-200 to 0C°± (0.5% rdg + 3C°) 0C° to +1200C°± (0.5% rdg + 2C°)
	External reference junction		± (0.5%rdg + 1C°)
Resolution			0.1C°
Response frequency			DC to 10 Hz

DS-750 measurement software (attached software)	
System	
OS	Windows 7(SP1)/8.1/10/11
Computer	The above-mentioned OS environment is recommended and a PC equipped with dual-core or higher CPU is recommended.
Interface	LAN (100BASE-TX)
Basic specifications	
Compatible measuring instruments	DS-50A *Number of connectable units: 2
Measurement	Balance measurement, monitor measurement, manual measurement
Display	Numerical monitor, T-Y monitor, T-Y graph
Data format	DADiSP format *Can be converted to text file (CSV) format.
Data processing	T-Y graph display and print, numerical value list display

Related Products

Measurement software Visual LOG

●Real-time data recording software Visual LOG RD-7640

This measurement software controls up to 20 DS-50A units and performs the monitor, manual, data trigger, and interval measurements of 1 to 1000 measurement channels and up to 1000 expansion channels. It also supports our measuring instrument TMR-311. A version that supports video capture, RD-7640-M, is also available.

●Real-time data recording software Visual LOG RD-7640WF

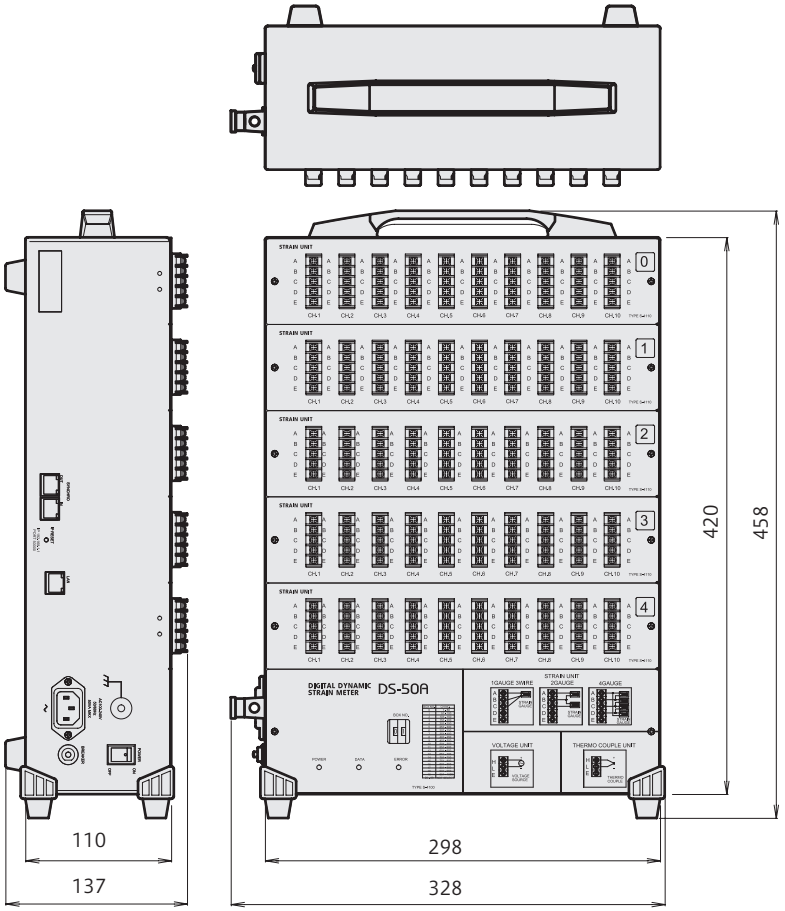
This is a great value package that bundles the WF-7630 waveform display software for data processing of the RD-7640.

●Waveform display software Visual LOG WF-7630

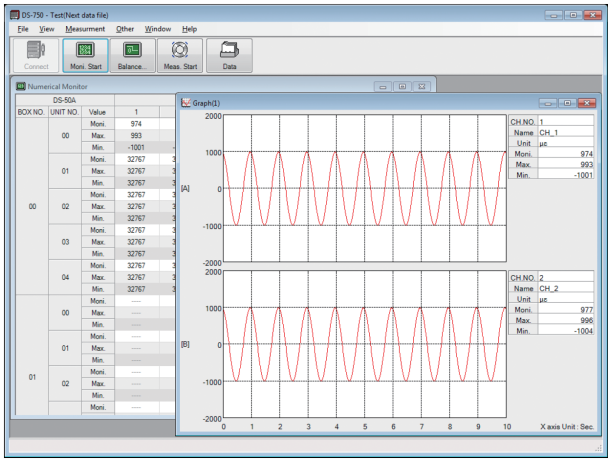
This software is used for post-processing the data file recorded with the RD-7640. With the frequency processing compatible version of the WF-7630-H, it is possible to set frequency analysis conditions and perform frequency analysis of waveform data.

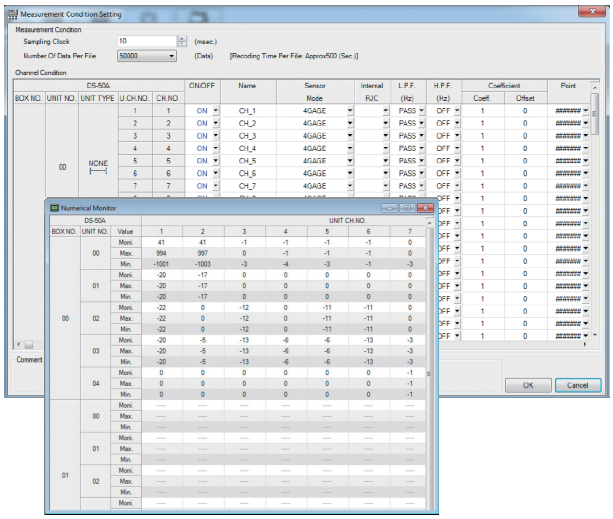
DS-50A (Multichannel)

External Dimensions



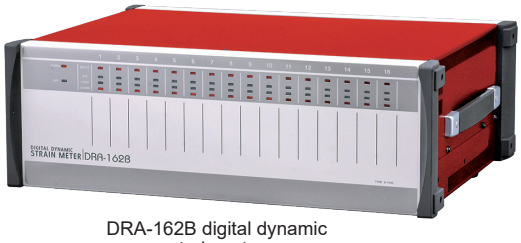
DS-750 measurement software display examples



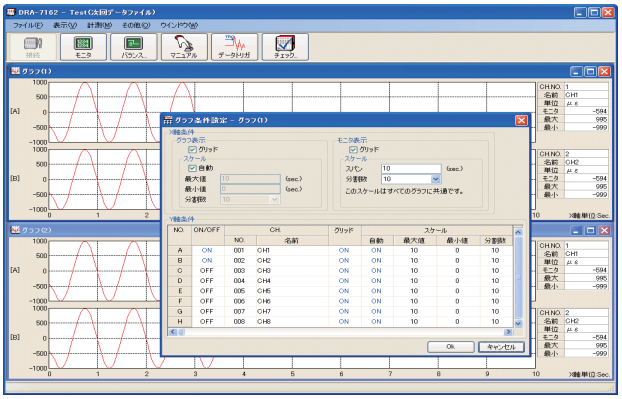


DRA-162B (Digital dynamic strainmeter)

- Built-in 16-bit A/D converter for each channel and waveform recording by digital values.
- Equipped with 256 k word/channel memory.
- No decrease in sensitivity when the cable is extended (up to 100 m) because of remote sensing of the bridge voltage.
- Each setting can be computer controlled.
- Bridge excitation switching (AC 0.5, 2 V) can be set independently for each channel.
- TEDS standard compliant, easy setting of supported transducers (dedicated software required).
- High-speed transfer of about 500 K word/second when transferring recorded binary data via LAN.
- Internal structure is card-type to support improvement of serviceability.
- Synchronized measurement of up to 16 units (256 channels) connected is possible.
- DRA-7162 measurement software included as standard (only one unit is supported).

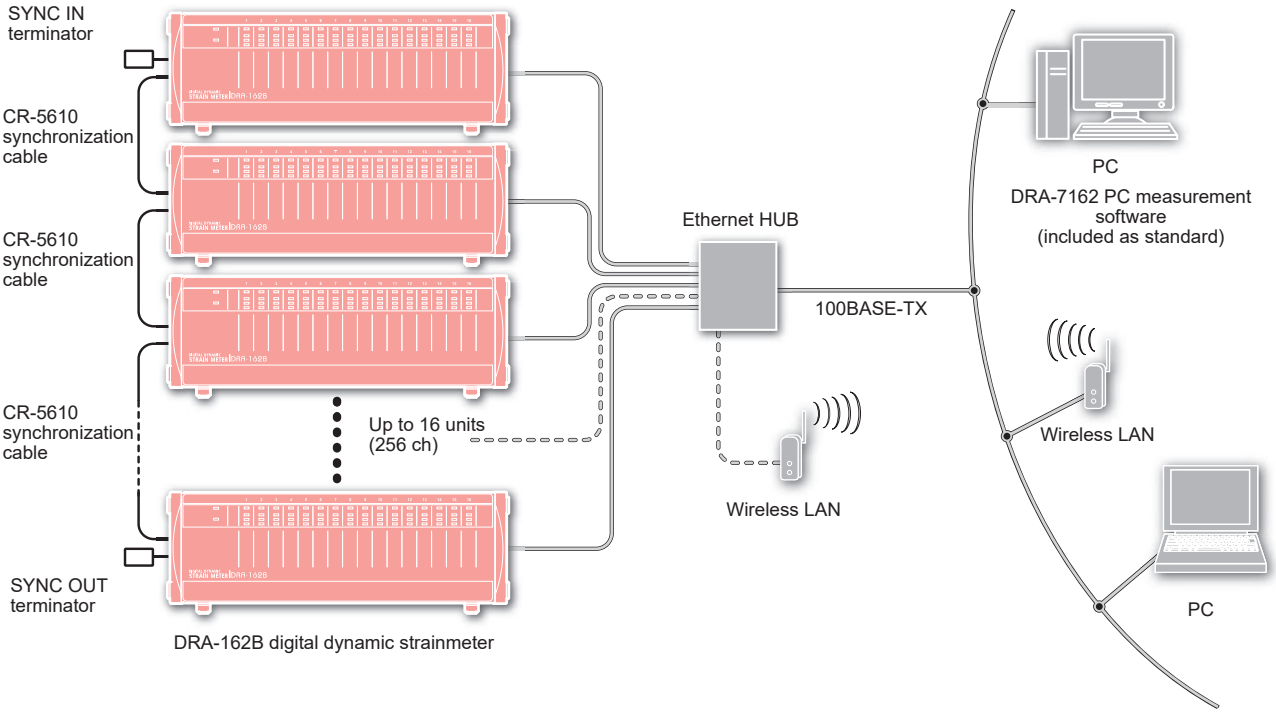


DRA-162B digital dynamic strainmeter

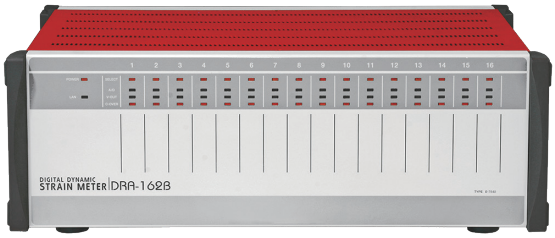


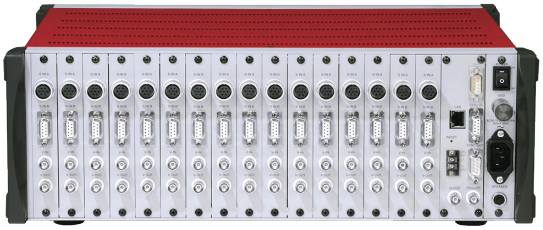
The DRA-162B is a highly reliable 16-channel carrier type dynamic strainmeter. Each channel has 256 k words of memory, and the data is always backed up. The sensor signal input to this equipment is internally amplified and filtered, then A/D converted, and sent to a PC. In addition, an analog voltage can be output at the same time for external devices. All operations of this equipment, such as amplification degree, filter frequency, and balance, can be performed from a PC.

Synchronized measurement of up to 16 units (256 channels) connected is possible.

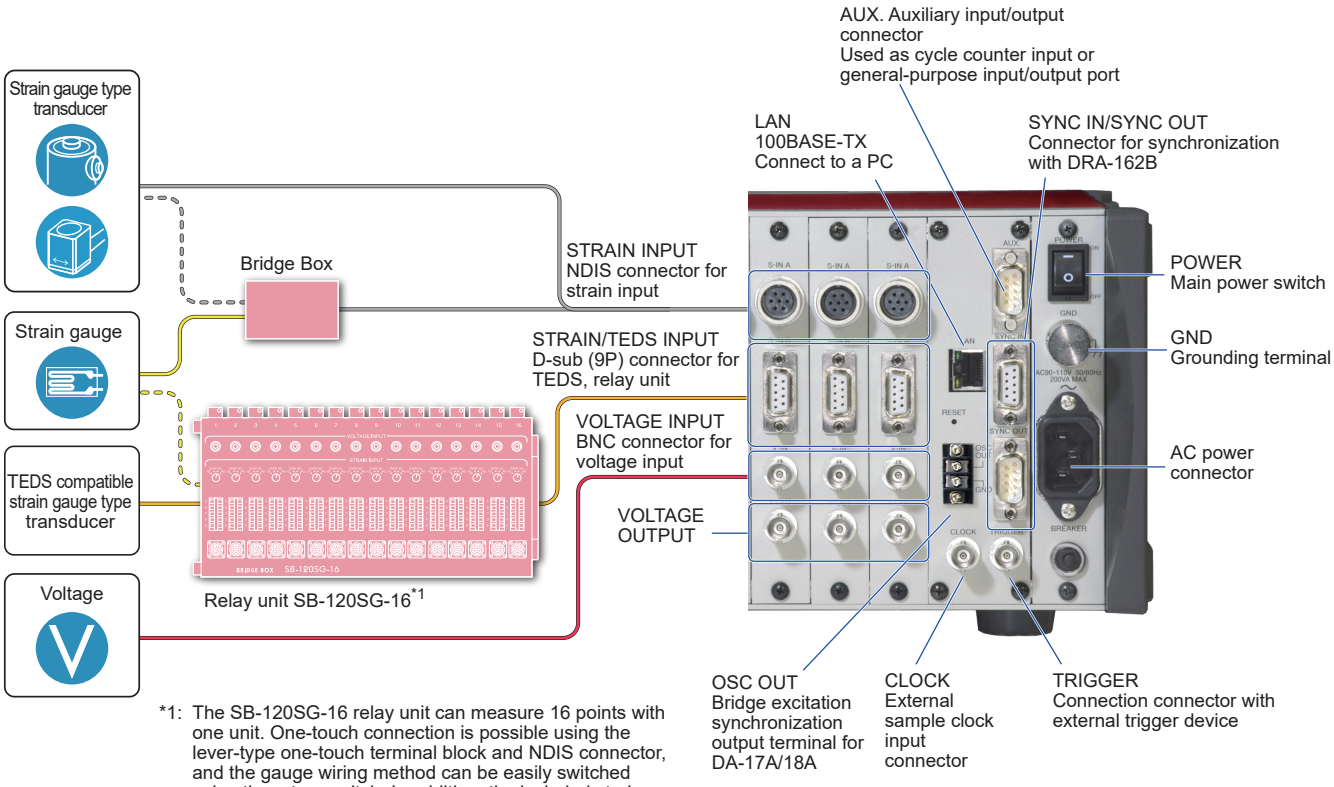


DRA-162B





System Block Diagram



*1: The SB-120SG-16 relay unit can measure 16 points with one unit. One-touch connection is possible using the lever-type one-touch terminal block and NDIS connector, and the gauge wiring method can be easily switched using the rotary switch. In addition, the included strain relay cable has remote sensing and TEDS sensor compatibility functions (made-to-order product).

Specifications

Number of measuring points	16 points (1 to 16 points can be selected at the time of order)
Input connector	NDIS, Dsub (9P) * NDIS does not support TEDS; only remote sensing is supported.
Applicable sensor	Strain gauge (120 to 350 Ω), strain gauge type transducer
Strain measurement	
Measurement range	± 32000 × 10^{-6} strain
Bridge excitation	0.5, 2 Vrms (5 kHz)
Balancing range	Resistance : ±10000 × 10^{-6} strain Capacity : 5000 pF
Balancing method	Pure electronic automatic
Balancing accuracy	± 2 × 10^{-6} strain
Stability	Zero point: ± 0.1×10^{-6} strain/°C ± 0.5×10^{-6} strain/8 H Sensitivity: ± 0.05%/°C ± 0.2% /8 H
Remote sense	Sensitivity decrease 0.5% or less (gauge resistance: 120 Ω) 1.0% or less (gauge resistance: 350 Ω) When extended to 100 m (when using 0.5 mm2 extension cable)
Response frequency range	DC to 2.5 kHz (−3 dB ± 1 dB)
Voltage measurement	
Input format	Single end type (unbalanced)
Input impedance	100 kΩ
Measurement range	±32 V
Stability	Zero point: ± 0.1 mV/°C 0.5 mV/8 H Sensitivity: ± 0.05%/°C ± 0.2%/8 H
Response frequency range	DC to 5 kHz (-3 dB ± 1 dB)
Low-pass filter	
Cutoff frequency	10, 30, 100, 300, 1 kHz (-3 dB ± 1 dB)
Cutoff property	Butterworth type
Slope	-12 dB ± 1 dB/oct
TEDS function	IEEE 1451.4 Class 2 Multiwire interface
A/D converter	
A/D conversion method	Successive approximation
Resolution	16-bit
Measurement accuracy	± (0.5% rdg + 3 digits)
Sampling format	All points simultaneous sample hold
Sampling clock	Internal Low speed--- 1 to 32,767 ms (can be set in 1 ms increments) High speed---------- 0.1 to 0.9 ms (can be set in 0.1 ms increments) External Low speed--- 1 ms or more High speed -- 0.1 ms or more
Trigger function	Data trigger, command trigger, external contact trigger
Analog output	
Output connector	BNC
Maximum output	±10 V FS (5 kΩ load)
Sensitivity regulator **At the time of strain input** **At the time of voltage input**	100, 200, 500, 1000, 2000, 5000 × 10^{-6} strain/V 0.1, 0.2, 0.5, 1.0, 2.0, 5.0 V/V
Calibration output	
Strain	Range: ± (100 to 10000 × 10^{-6} strain) Accuracy: ± (0.5% +1 × 10^{-6} strain)
Voltage	Range: ± (100 to 10000 mV) Accuracy: ± (0.5% + 1 mV)
Nonlinearity	± 0.1% FS or less
S/N ratio	56 dBp-p or more (Range: 200 x 10^{-6} strain/V)
Stability	Zero point: ± 0.5 mV/°C ± 4 mV/8 H Sensitivity: ± 0.05%/°C ± 0.2%/8 H
Check function	ROM, RAM, insulation, direct value, initial-in value, amplifier sensitivity, input open, input over
Data processing function	Averaging Maximum, minimum, and average values (processing after recording, at output)
Data memory	The number of memory words per channel varies depending on the number of implemented channels.

Number of implemented channels	Number of memory words
1	4,194,304
2	2,097,152
3, 4	1,048,576
5, 6, 7, 8	524,288
9, 10	419,430
11, 12, 13, 14, 15, 16	262,144

The number of pre-trigger data can be set arbitrarily.
Retention time when power is OFF: 72 hours (when fully charged)

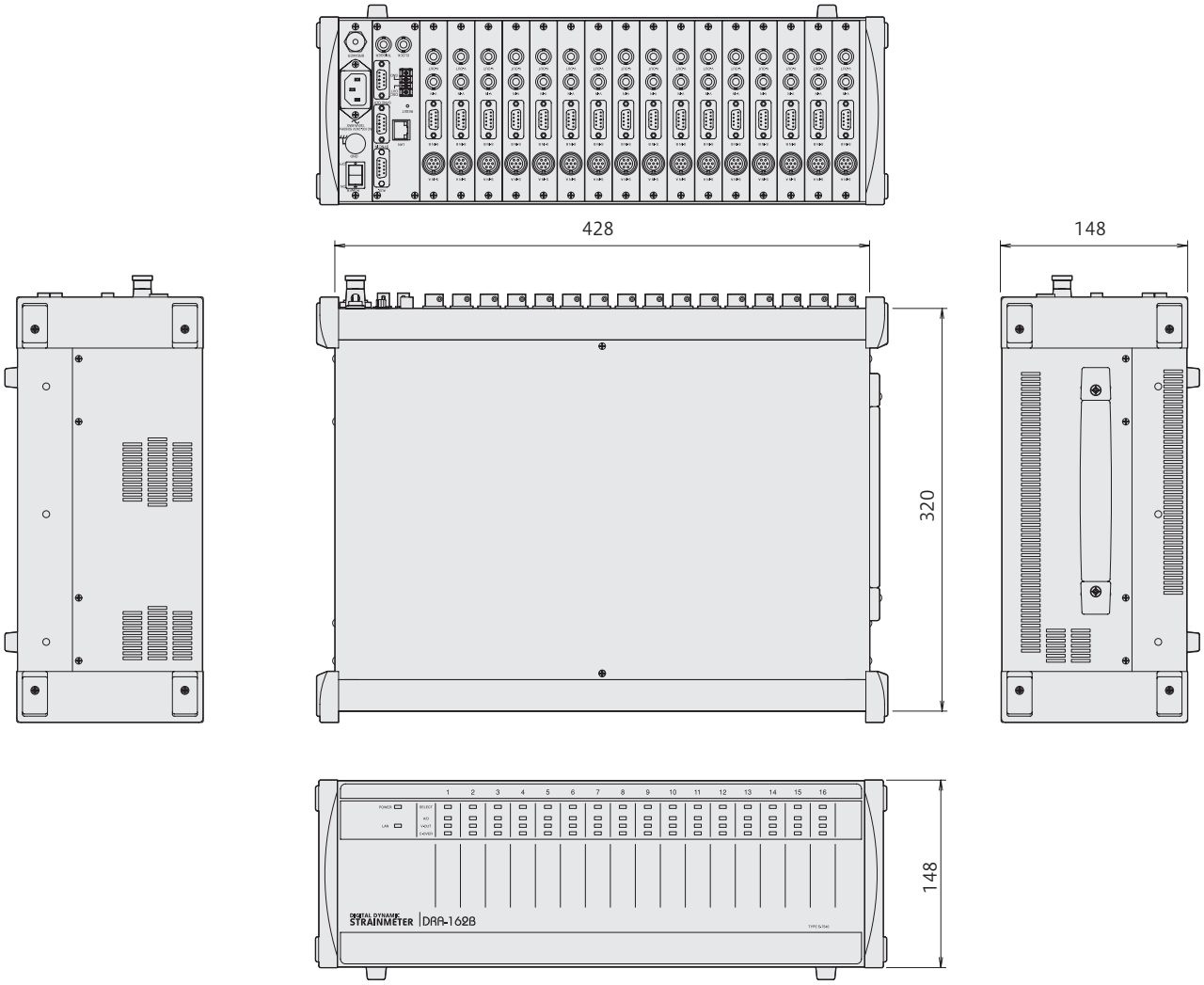
Interface	LAN (100BASE−TX) Recorded binary data transfer speed: About 500 k word/second
Trigger input	Negative logic Contact input possible
External sampling clock input	
Input	Negative logic (edge detection) Input frequency: 10 kHz or less
Sampling error	10 µs or less
Alarm output	Upper limit, lower limit (Negative logic)
Auxiliary input/output (compatible with cycle counter)	
Input part	Number of input points Two points Count Max. measurement frequency -- 1 kHz Max. number of counts ---------- 4,294,967,295
Output part	Number of output points Four points
Synchronization input/output	Number of connectable units: Up to 16 units
External synchronization output	100 units of DA-16A/17A/18A can be connected
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
AC power supply	
Rated voltage **Allowable voltage** **Maximum power consumption**	AC 100 to 240 V 50/60 Hz AC 90 to 264 V 50/60 Hz 130 VA max
Outside dimension	About 428 (W) x 148 (H) x 320 (D) mm (Excluding protrusions)
Mass	Approx. 11 kg

Standard accessories

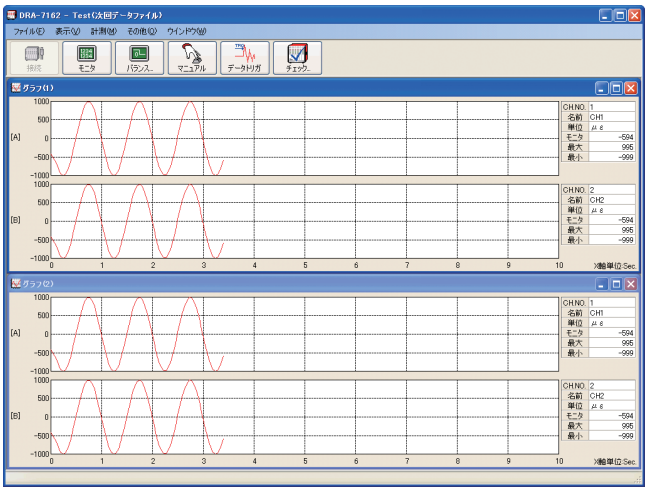
- Instruction Manual (CD-ROM) 1
- AC power cable (CR-03) 1
- SYNC IN terminator 1
- SYNC OUT terminator 1
- DRA-7162 measurement software (CD-ROM) 1
- Vinyl cover 1
- Warranty certificate 1

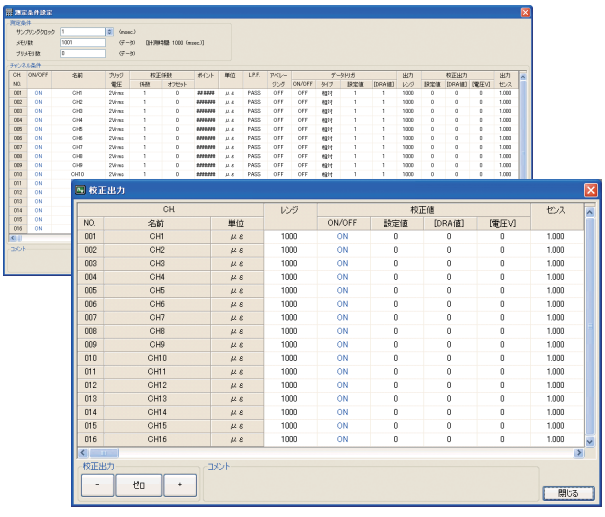
DRA-162B

External Dimensions



DRA-7162 measurement software display examples





DC-204R / DC-204Ra (Ultraminiature)

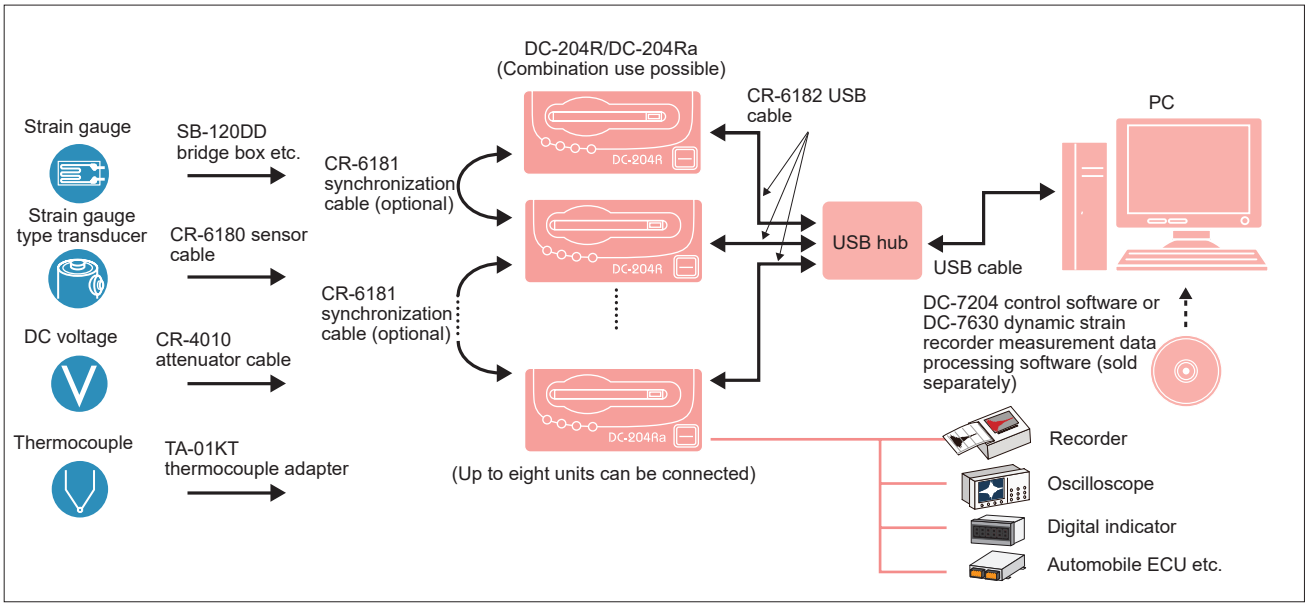
- Miniature size of 84 (W) x 42 (H) x 157 (D) for four channels.
- 200 kHz sampling (at the fastest in the one channel mode).
- Four-channel simultaneous sampling at 50 kHz.
- Large strain measurement up to ±80000 μ strain is possible (when using a 0.5 V carrier).
- Synchronized connection of eight units is possible with simultaneous sampling of up to 32 channels.
- Supports CF card with up to 2 GB and can store a large amount of data.
- Measurement data is compatible with the DADiSP format.
- External start/stop and external triggers are available.
- Equipped with a sensor open check function.
- Equipped with a USB interface and control software included as standard.

DC-204R smart dynamic strain recorder

DC-204Ra smart dynamic strain recorder (with analog output)

This equipment is a high-speed, compact, four-channel dynamic strain recorder of a CF card recording type. High-speed sampling of 200 kHz is possible in the one-channel mode, and by synchronously connecting eight units, simultaneous sampling of up to 32 channels is possible.
This equipment is connected to a PC via a USB interface and controlled using the standard included software.
Measurements can be performed using the START/STOP button on the front panel. It is also possible to start measurements by trigger setting and to control using an external trigger and external start/stop signals.
Measurement data is saved in DADiSP format on a CF card. This data can be processed using DADiSP compatible software or the standard included software. In addition, by performing the CSV conversion using the standard included software, the data can be processed using spreadsheet software, such as Excel.

System Block Diagram



DC-204R / DC-204Ra (Ultraminiature)

Specifications

Measurement part	
Number of measuring points	4 points
Input	Strain, voltage (using option CR-4010)
Strain measurement	
Applicable gauge resistance	120 to 1000 Ω (4 G bridge)
Bridge excitation	DC 2 V, DC 0.5 V, ON/OFF control
Measurement range	Five ranges of 1000, 2000, 5000, 10000, 20000 x 10^{-6} strain (when using 2 V bridge excitation)
Measurement range	± 20000 × 10^{-6} strain (when using 2 V bridge excitation) ± 80000 × 10^{-6} strain equivalent (when using 0.5V bridge excitation)
Measurement accuracy	± 0.2% FS
Voltage measurement (when using option CR-4010)	
Measurement range	Five ranges of 1 V, 2 V, 5 V, 10 V, and 20 V
Measurement range	± 20 V
Measurement accuracy	± 0.3% FS (when using CR-4010)
Low-pass filter	10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz (Bessel filter)
Response frequency range	DC to 10 kHz (−3 dB ± 1 dB)
Temperature coefficient	Zero stability: ±1 x 10^{-6} strain/°C (at max. sensitivity) Sensitivity stability: ± 0.01%/°C (at max. sensitivity)
Balancing method	Electronic
Balancing range	± 10000 × 10^{-6} strain
Balancing accuracy	± 0.06% FS
Balancing time	About 1 sec/CH
A/D conversion	16-Bit (Successive approximation type)
Resolution	1000 x 10^{-6} strain range 1 or 0.1 x 10^{-6} strain 2000 x 10^{-6} strain range 1 or 0.1 x 10^{-6} strain 5000 x 10^{-6} strain range 1 x 10^{-6} strain 10000 x 10^{-6} strain range 1 x 10^{-6} strain 20000 x 1^{-6} strain range 1 x 10^{-6} strain
Sampling method	Simultaneous sampling
Sampling speed	One-channel mode fastest 5 µs (200 kHz) Two-channel mode fastest 10 µs (100 kHz) Four-channel mode fastest 20 µs (50 kHz)
Measurement function	
Start	Possible from front panel key, external signal, and PC
Stop	Possible from front panel key, external signal, and PC
Manual trigger	Possible from front external signal and PC
Balance/open check	Possible from front panel key and PC
Synchronized measurement	Simultaneous sampling of up to eight units or 32 channels * By matching the settings, synchronized measurements with the DC-104R/-104Ra are possible.
Display function	
LED	Power status, synchronization status, USB communication status, and measurement status are indicated.
Setting part	
Setting method	Setting via USB communication (dedicated software)
Channel setting	One-, two- and four-channel mode
Trigger setting	
Trigger mode	SINGLE, CONTINUE, and FREE RUN
Trigger level	± (0% to 100%) of full scale in 0.1% increments
Slope	UP, DOWN

Recording part	
Recording media	CF card Up to 2 GB (Designated by us)
Recording format	DADiSP compliant
Recording speed (Sampling interval)	5 µs[*1], 10 µs[*2], 20 µs, 50 µs, 100 µs, 200 µs, 500 µs, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1s *1 When one channel is used only. *2 When one or two channels are used only. Other speed can be used up to four channels.
Recording size	1 k, 2 k, 4 k, 8 k, 16 k, 32 k, 64 k, 128 k, 256 k, 512 k, 1 M, 2 M, 3 M, 4 M, 6 M, 8 M, 12 M, 16 M, 24 M, 32 M, 48 M, 60 M, 120 M[*1], 240 M[*2] data *1 When one or two channels are used only. *2 When one channel is used only. Other speeds can be used for up to four channels. * When sampling at high speed, the recording size is 64 K or more.
Pre-area	Can be set from 0% to 100% in 10% increments (up to 256 k [one channel])
Number of files created	Up to 255 files
Analog output part [DC-204Ra only]	
Output level	± 5 V (5 kΩ load) ±1 mA
Voltage output accuracy	± 0.3% FS
Voltage output balancing accuracy	Within ± 5 mV (at 5000 × 10^{-6} strain range)
Zero stability	± 2 mV/°C (at max. sensitivity)
Calibration output	±1 V (superimposed on input value)
Low-pass filter	10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz, 3 kHz, 10 kHz (Bessel filter)
S/N ratio	DC - 100 Hz 53 dB or more DC - 1 kHz 46 dB or more DC - 10 kHz 38 dB or more (All in the ±1000 × 10^{-6} strain range)
Basic part	
Power supply Rated voltage Maximum consumption current	DC10 to DC16V DC-204R MAX0.4A DC-204Ra MAX0.4A
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	49 m/s^2 (5-55 Hz, three directions)
Outside dimension	84 (W) × 42 (H) × 157 (D) mm (Excluding protrusions)
Mass	500g

Standard accessories

Instruction manual (included in CD-ROM)	1
Warranty certificate	1
Power cable (CR-1310)	1
Sensor input cable CR-6180	4
USB power cable CR-6182	1
CF card (high-speed type) 512 MB	1
Control software CD-ROM DC-7204v2	1
CR-3610 output cable *[DC-204Ra only]	1

Options

AC Adapter (CR-1868)
AC Adapter [For China] (CR-1868-C)

CF card
Use one of the card products designated by us.
Up to 2 GB capacity is supported.

Status LED
Indicates each operating status.
MES / During measurement
USB / Communication status via USB cable
SYNC / Synchronized status with two or more recorders connected
PWR / Powered ON status
In the balance mode, each LED flashes.

START/STOP
Start and stop of measurement

Balanced state
Press and hold the above button for 3 seconds or longer to put the recorder into the balance mode.

DC-204R

USB interface
Connect the USB cable (CR-6182). The measurement setup and data are transferred to a PC.

Power supply part
This equipment is powered by DC power supply. Connect the battery and this equipment with the power cable (CR-1310). An AC power supply can also be used with the separately sold AC adapter set CR-1866.

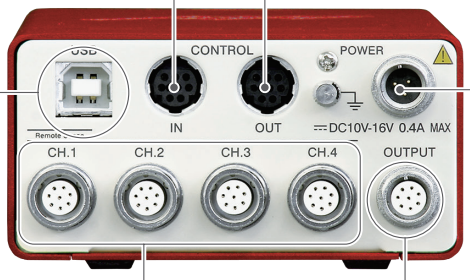
Control part

Input channels
Connect strain gauges / various strain gauge type transducers with a sensor input conversion cable (CR-6180). The voltage input attenuator cable (CR-4010, optional) and TA-01KT thermocouple adapter (optional) can also be connected.

DC-204Ra

Control part
Synchronization is performed when two or more units are connected. The synchronization cable (CR-6181) is required separately.

USB interface



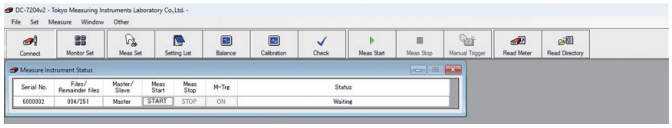
Power supply part

Analog output [DC-204Ra only]
This is the analog output installed on DC-204Ra. By connecting the included analog output cable (CR-3610), raw waveforms can be output to an external recorder.

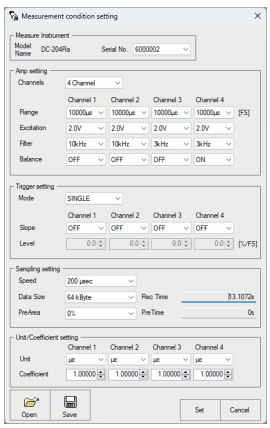
Measurement software

DC-7204v2 controller (included as standard)

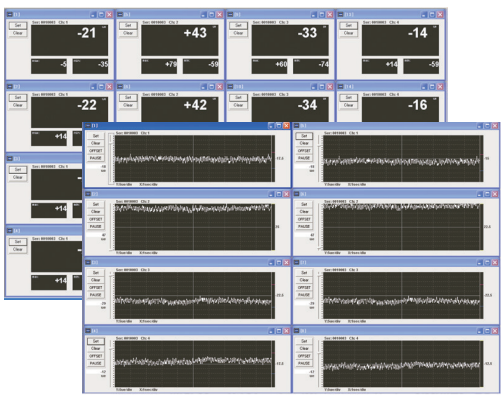
Tool bar



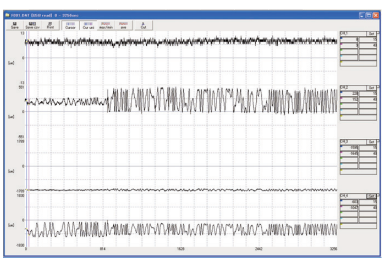
Setting up of measurement conditions



Monitoring

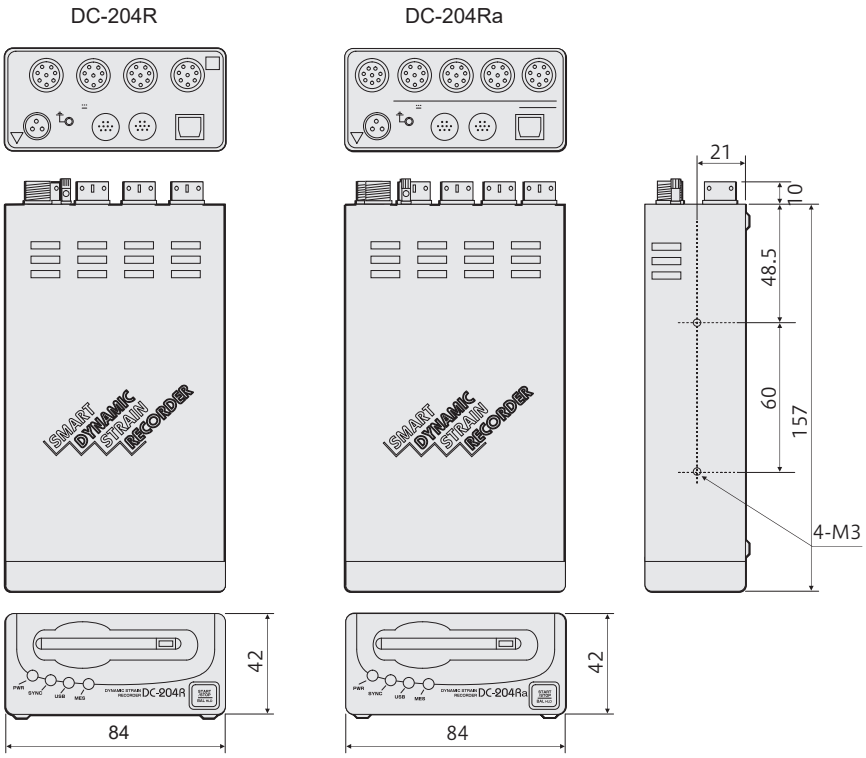


Data processing



DC-204R/DC-204Ra (Ultraminiature)

External Dimensions



Back Port Functions

Control part

Connection of up to 32 CH/ 8 units

When connecting two or more units of the DC-204R/DC-204Ra, simultaneous sampling is possible using the CR-6181 synchronization cable (optional). At this time, power must be supplied to all recorders.

CR-6181 synchronization cable

External start/stop, external trigger

Connect the inputs, such as the external start/external stop of an external control signal and external trigger to CONTROL IN. Configure a switch using the CR-6183 external control cable (optional).

Power supply part

DC power supply

DC power DC 10 to 16 V

Use the included CR-1310 cable.

Battery powered

This recorder can be powered by battery when combined with the BA-104 battery pack (optional).

AC power supply

Power can also be supplied from an AC power source using the CR-1866 AC adapter set (optional).

USB interface part

The DC-204R/DC-204Ra is connected to a PC using the CR-6182 USB cable included with the recorder main unit.

Analog output part [DC-204Ra only]

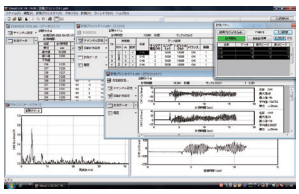
The DC-204Ra has an analog output part and a voltage output of 0 to ± 5 V can be obtained by connecting the included CR-3610 output cable. The output connector is a four-channel centralized connector and can output voltages for four channels from one output cable to an external recorder.

Related Products

Measurement software Visual LOG

●DC-7630 dynamic strain recorder measurement / data processing software

This software performs online/offline automatic measurements in addition to calculation expansion channels. It is equipped with a measurement data extraction function and thinning function. It is also possible to display a real-time graph during sampling.



●WF-7630 waveform display software

This is software to display measurement data in the DADiSP format as a list or waveform. This software can combine, cutout, thin, and conversion of data files to CSV, as well as perform calculations of maximum / minimum values, FFT analysis and expansion channels, and draw graphs (X-Y, T-Y, spectrum). With the frequency processing compatible version WF-7630-H, it is possible to set frequency analysis conditions and perform frequency analysis of waveform data.

●DFA-7610 FFT analysis processing software

In addition to the standard included software DC-7204 v2, the separately sold software DC-7630 performs FFT analysis and frequency analysis of recorded data files.

CF card

High-speed sampling compatible CF cards 128 MB to 2 GB (sold by us)

CA-10A carrying case

This is an aluminum carrying case that enhances mobility and portability.
It is used to store the recorder, bridge boxes, cables, etc.
Size: 390 (W) X 310 (D) X 110 (H) mm

CR-1866 AC adapter set

This equipment is connected to AC 100 V to supply the power.

BA-104 battery pack

It is possible to power by battery in combination with the BA-104 battery pack.

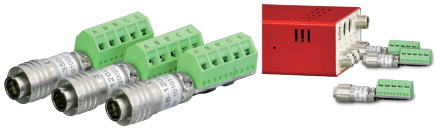
10 AA size dry-cell batteries are used
About 5 hours of measurement possible with nickel-metal hydride batteries (20°C)
About 3 hours of measurement possible with alkaline dry-cell batteries (20°C)

SB-120DD/-350DD bridge box

These are bridge boxes (optional) dedicated for the DC-204R/DC-204Ra recorder.

SB-120DD-1R	One-gauge method three-wire type	: 120 Ω
	Two-gauge method	: 120 Ω/350 Ω
SB-350DD-1R	One-gauge method three-wire type	: 350 Ω
	Two-gauge method	: 120 Ω/350 Ω
SB-120DD-4R	Four-gauge method	: 120-1000 Ω

In addition, the CR-6185 remote sense cable (optional) is also available to compensate for the sensitivity decrease because of the connection of an extension cable.



TA-01KT thermocouple adapter

This is an adapter that enables temperature measurement using the type T/type K thermocouples. No external power supply is required, and the connection is made via the CR-6180 sensor input conversion cable included with this equipment.

CR-4010 attenuator cable

This cable is used to perform voltage measurements. The measurement range of voltage signal is ± 20 V. The voltage signal is attenuated to 1/1000 and input to this equipment.

CR-6180 sensor input conversion cable

This cable is used when connecting a strain gauge transducer with NDIS connector (load cell, displacement meter, pressure meter, accelerometer, etc.). (Included as standard)

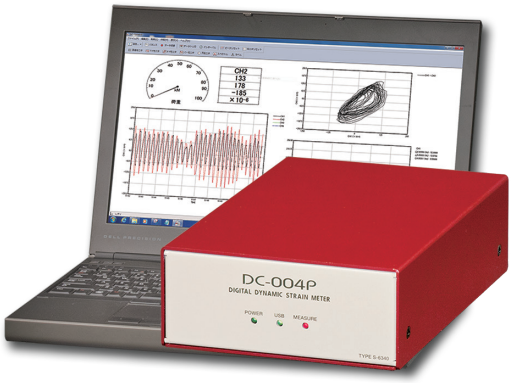
CR-6181 synchronization cable

This cable enables simultaneous sampling by connecting two or more units of DC-204/DC-104 series.

DC-004P (PC control type)

Direct writing of data to a PC's storage
Easy-to-use control software

- Manual, data trigger, and interval measurements can be performed simultaneously.
- 50 kHz sampling (at the fastest in the one channel mode).
- Four-channel simultaneous sampling (12.5 kHz).
- Capable of measuring large strain equivalent to ±80000 × 10^{-6} (when using 0.5 V bridge excitation).
- Long time recording by direct writing to the PC side.
- Powered by USB bus power.
- Available in four-channel type and two-channel type.
- Measurement data is compatible with the DADiSP format.
- TEDS compatible.
- Control software is included as standard (DC-7004P).

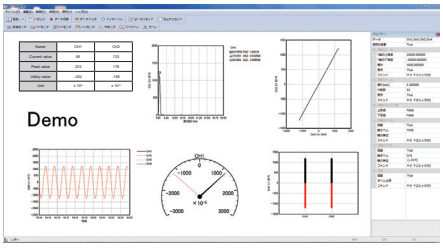


DC-004P PC control type dynamic strainmeter

This is a dynamic strainmeter that does not have recording media and records measurement data sequentially to a PC via USB connection. Since continuous recording is possible, it is ideal for measurements such as material testing.
It supports high-speed sampling and consists of two software programs to perform simple measurement operations.

DC-7004P-T measurement software

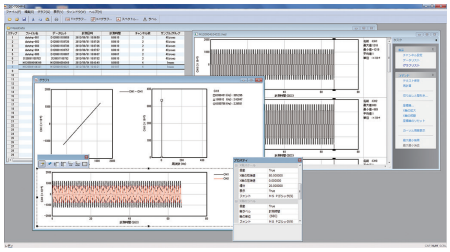
DC-7004P-T is software dedicated for measurements that controls the DC-004P PC control type dynamic strainmeter to monitor and record the measurement values.



- Manual, data trigger, and interval measurements can be performed simultaneously.
- Calculations using the four arithmetic operations, trigonometric functions and special calculation functions are possible.
- Numerical monitor, T-Y monitor, X-Y monitor, bar monitor, spectrum, circle monitor, label, OLE object

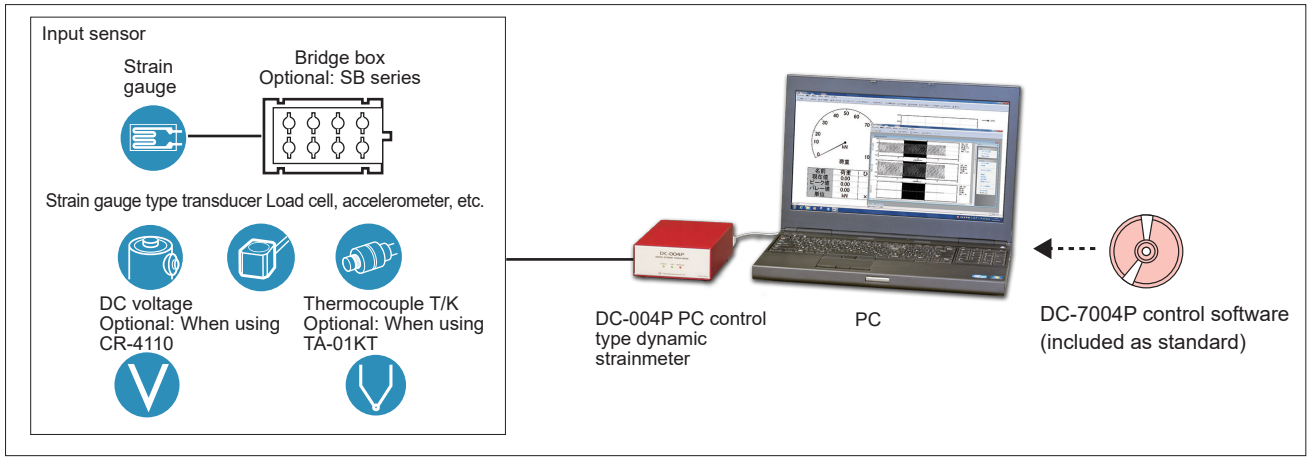
DC-7004P-E data editing software

DC-7004P-E checks the measurement data recorded by DC-7004P-T and performs data processing, such as text conversion.



- Data file management
- Data file editing
- Graph display function

System Block Diagram

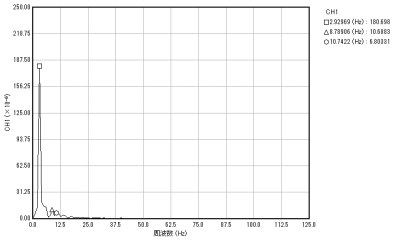


Screen display examples

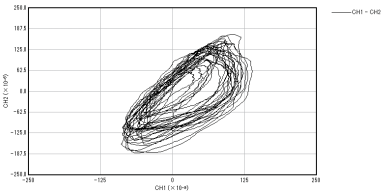
Numerical monitor

Name	CH1	CH2
Current value	66	133
Peak value	225	178
Valley value	-254	-185
Unit	x 10^{-6}	x 10^{-6}

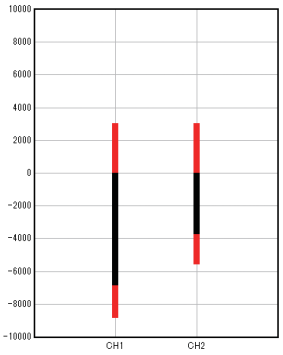
Spectrum



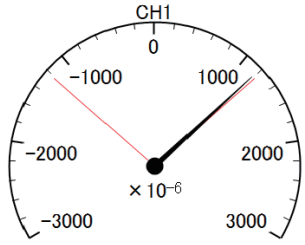
X-Y monitor



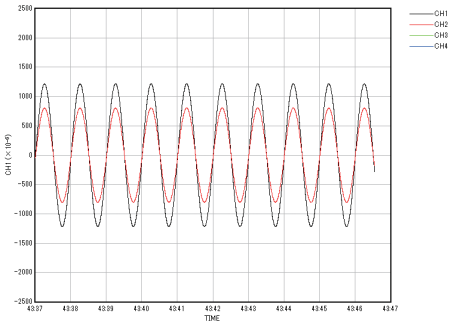
BAR monitor



Circle monitor



T-Y monitor

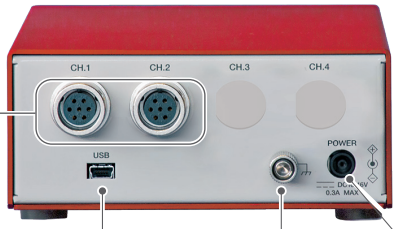


Function

Status LED	Each operating state is displayed by the LEDs.
POWER	Lights up in green when the powered is turned ON.
USB	When the USB cable is connected: Lights up in green During USB communication: Blinking in green
MEASURE	During measurement: Lights up in red

Four-channel type DC-004P

Two-channel type DC-004P (-2)



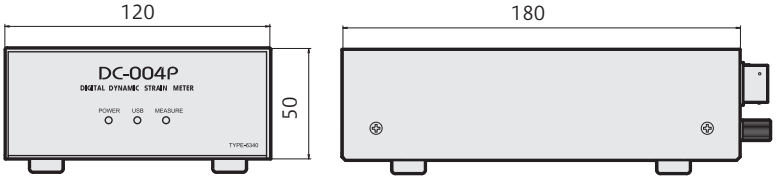
Input channels

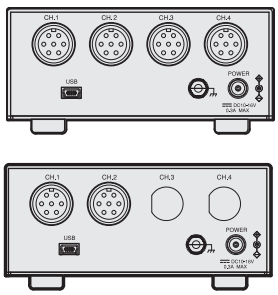
USB interface GND terminal Power connector

USB interface GND terminal Power connector

Input channel	Connection of various sensors (four-channel type and two-channel type)
USB interface	Connection to a PC using the included USB cable
GND terminal	Frame grounding terminal
Power connector	Connection of the AC adapter (optional)

External Dimensions





4 CH type

2CH type

DC-004P (PC control type)

Specifications / DC-004P PC control type dynamic strainmeter

Number of measuring points	4 points (4-channel type), 2 points (2-channel type)
Input	Strain Voltage *Optional CR-4110 (1/1000 attenuator cable) required
Strain measurement	
Applicable gauge resistance	120 Ω, 350 Ω (4 G bridge)
Bridge excitation	DC 2 V, DC 0.5V
Measurement range	± 20000 × 10^{-6} strain (1 range) (When using 2 V bridge excitation)
Measurement range	± 20000 × 10^{-6} strain (when using 2 V bridge excitation) ± 80000 × 10^{-6} strain (when using 0.5 V bridge excitation)
Measurement accuracy	± 0.3% FS
Voltage measurement	*Optional: When CR-4110 (1/1000 attenuator cable) is used
Measurement range	± 20 V (1 range)
Measurement range	± 20 V
Measurement accuracy	± 0.3% FS
Response frequency	DC to 2 kHz
Temperature coefficient	Zero point: ± 0.5 × 10^{-6} strain/°C Sensitivity: ± 0.05% FS/°C
Balancing method	Digital calculation method
Balancing range	± 10000 × 10^{-6} strain (at bridge excitation DC 2 V)
Low-pass filter	Analog filter: 2 kHz, -3 dB ± 1 dB Digital filter: 1 Hz to 1 kHz (Can be set in 1 Hz increments)
High-pass filter	Cutoff frequency 0.6 Hz
A/D conversion	24-bit
Sampling method	Simultaneous sampling
Display function	LED power status, communication status
Interface	USB 2.0
Function	TEDS compatible
Setting function (Setting via USB communication)	Channel mode: One, two, and four channels LPF setting: 0 to 1 kHz (0 is Pass) HPF setting: ON/OFF Bridge power setting: 0.5/2.0 V Balance setting: ON/OFF
Recording speed (Sampling interval)	20 µs*1, 40 µs*2, 50 µs*2, 80 µs, 100 µs, 200 µs, 500 µs, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 50 ms, 100 ms, 200 ms, 500 ms, 1s *1 Only for one-channel measurement *2 Only for one- or two- channel measurement Other speeds can be used up to four channels.
Power supply Rated voltage Maximum consumption current	DC 10 to 16 V 0.3 A max (when powered from the DC jack) * Can be powered from USB bus power
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Outside dimension	120 (W) × 50 (H) × 180 (D) mm (Excluding protrusions)
Mass	Four-channel type: About 600 g Two-channel type: About 500 g

Standard accessories

DC-7004P Control software CD-ROM 1
CR-6187 USB cable (miniB-A) 1
Warranty certificate 1

Specifications/ DC-7004P-T measurement software/ DC-7004P-E data editing software

System	
Compatible measuring instruments	DC-004P PC control type dynamic strainmeter x 1
OS	Windows 7/8/8.1/10/11
Computer	CA model with 2 or more CPUs (Core Duo equivalent or better Clock speed: 600 MHz or more)
Disk capacity	5 GB or more of free space * A warning is displayed when the free space falls below 5 GB.
Monitor resolution	1,024 x 768 pixels or more
Interface	USB 2.0
DC-7004P-T measurement software	
Measurement conditions	
Number of measuring points	1 to 4 points (When measuring 3 points, measure 4 points and record 3 points.)
Sampling	According to the measuring instrument
Recording time	Select with or without recording time specifications. For measurement time specification, specify the number of data sets per channel in the range from 1 to 1 G (1,073,741,824). When not specified, it depends on the capacity of the recording media (hard disk).
Channel conditions	Name, bridge voltage, low-pass filter, high-pass filter, balance coefficient, rated output, capacity, offset, unit, format, upper limit, lower limit
Data reading from sensor	Settings of TEDS information reading from sensor, coefficient, and unit
Expansion Channel	Number of points (up to 10 points), name, function, unit, format, upper limit, lower limit
Version upgrade of measuring instrument	Upgrade the firmware version of measuring instrument
Measurement method	al measurement, data trigger measurement and interval measurement These three types of measurements can be performed simultaneously.
Data file	DADiSP format
Monitor	The measurement value is always displayed while the measuring instrument is connected. * When sampling is slower than 1 ms, the value measured at 1 ms sampling is displayed.
Monitor display items	Numerical monitor, T-Y monitor, X-Y monitor, bar monitor, spectrum, circle monitor, label, OLE object
DC-7004P-E data editing software	
Data file management	List display of all data files in the folder in which the data files are recorded
Management items	Display of files, change of file names, move of files, combining of files, text conversion (save format, splitting, thinning)
Data file processing	Channel setting, expansion channel: up to 10 points (name, function, unit, format), data list, graph list, max/min search, cutout (thinning), text conversion (save format, splitting, thinning, range specification, cursor display), print
Graph display	Displays a graph of any channel selected from the data file in a window. Multiple graphs can be added in one window.
Graph display items	T-Y graph, X-Y graph, spectrum, label, OLE object
Edit items	Save, save text, graph copy, image save (bitmap, enhanced metafile, PNG), print

Related Products

CR-1869 AC adapter	Power supply to DC jack
CR-4110 attenuator cable	Used for voltage measurement
TA-01KT thermocouple adapter	Temperature measurement adapter for type T/ type K thermocouples
Bridge box SB series	For the one-gauge method connection of strain gauge
DC-7972 concrete static elastic modulus test software	Static elastic modulus test for concrete

Options

AC Adapter (CR-1869)
AC Adapter [For China] (CR-1869-C)
DC Power Cable (CR-062)

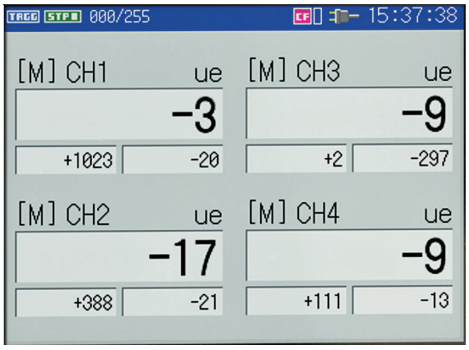
DH-14A (Handheld)

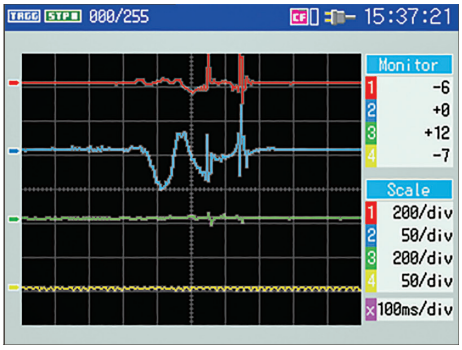
Mobile dynamic measurements

- Four-channel handheld dynamic strainmeter
- four-channel simultaneous sampling
- Sampling speed: up to 50 µsec (20 kHz)
- (One-channel mode)
- Measurements of strains, strain gauge type converters, DC voltages, thermocouples
- Continuous use time up to 6 hours with 4 AA size dry-cell batteries
- Clear numerical and waveform monitor (color LCD display)
- Shoulder bag suitable for handheld use is included as standard.

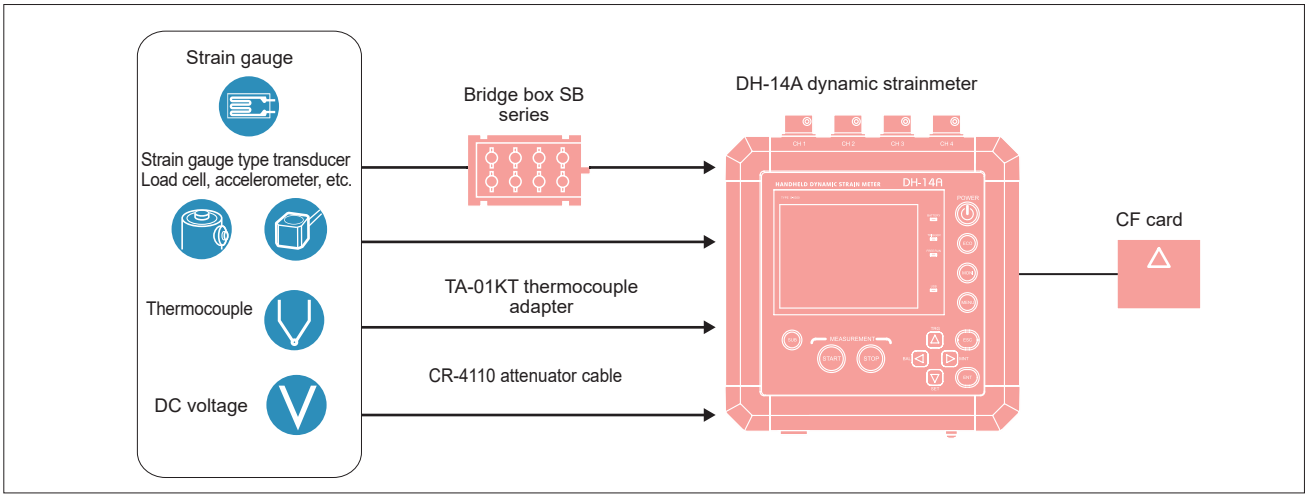
DH-14A handheld dynamic strainmeter

DH-14A is a battery powered handheld dynamic strainmeter. This equipment has four measurement channels and measurement modes, such as trigger measurement and free-run measurement, and is capable of easy dynamic strain measurements while monitoring the numerical value and waveform. It can be utilized in various measurement scenes, such as fieldwork, measurement of moving objects, and as a checker to check the sensors and noise. Four AA size dry-cell batteries allow for continuous measurement for 4 hours (up to 6 hours in power saving mode).





System Block Diagram



DH-14A (Handheld)

Applications

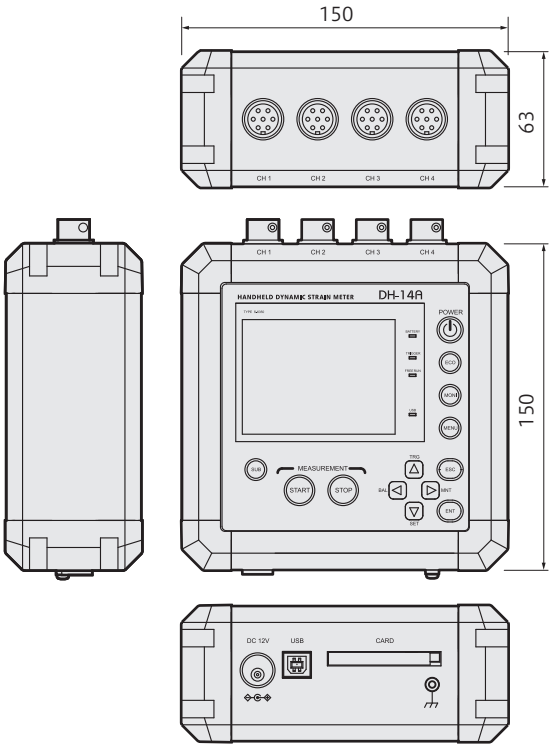
Measurements in combination with the strain checker FGMH series

By combining the DH-14A handheld dynamic strainmeter with the strain checker FGMH series, dynamic strains occurring in steel materials, such as bridges, can be easily measured while moving. The strain checker FGMH series measures a strain by the friction generated at the boundary surface by pressing the sensing part against a structure using the attractive force of a magnet.

Dynamic strain measurements in various scenes
This equipment can be utilized to measure hydraulic pressure, vibration, and load of moving objects.

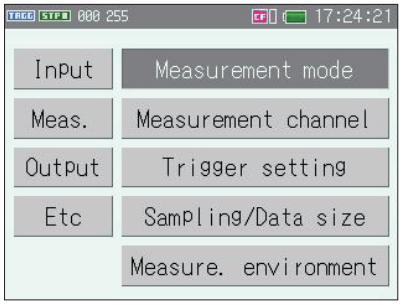
Sensor operation check
It is also effective for checking the operation and noise of sensors, such as accelerometers and pressure meters, before testing.

External Dimensions

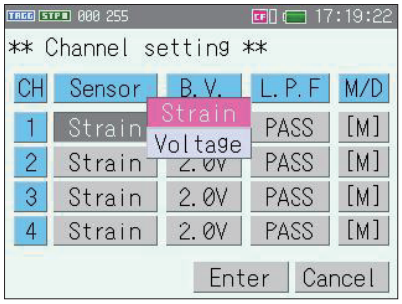


Screen display examples

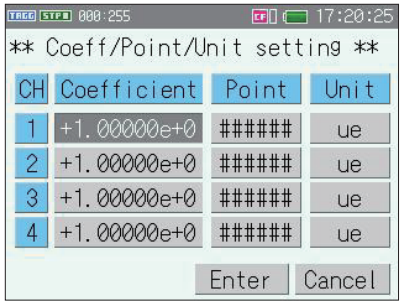
Menu display



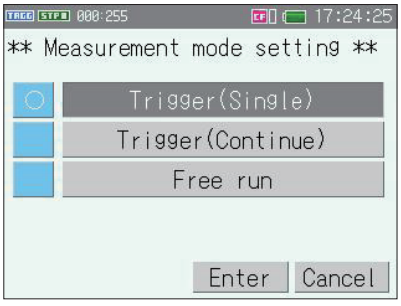
Channel setting



Coefficient decimal point setting



Measuring mode selection



Related Products

CR-1869 AC adapter	Power supply to DC jack
CR-4110 attenuator cable	Used for voltage measurement
TA-01KT thermocouple adapter	Temperature measurement adapter for type T/type K thermocouples
Bridge box SB series	For one-gauge method connection of strain gauge
WF-7630 waveform display software	Measurement data edit

Options

AC Adapter (CR-1869)
AC Adapter [For China] (CR-1869-C)
DC Power Cable (CR-062)

Specifications

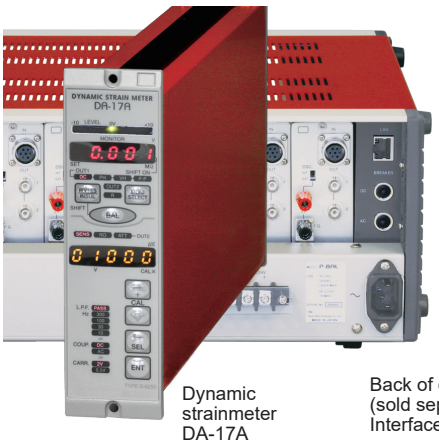
Measurement part	
Number of measuring points	4 points
Input	Strain Voltage (when using the CR-4110 optional attenuator cable)
Strain measurement	
Applicable gauge resistance	120-350 Ω
Bridge excitation	DC 2 V, DC 0.5V
Measurement range	± 20000 × 10^{-6} strain (Bridge excitation DC 2 V) ±80000 × 10^{-6} strain (Bridge excitation DC 0.5 V)
Measurement accuracy	± 0.2% FS
Voltage measurement	(when using the CR-4110 optional attenuator cable, including the error of CR-4110)
Measurement range	± 20 V
Measurement accuracy	± 0.3% FS
Low-pass filter	10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz (Bessel filter)
Response frequency	DC to 1 kHz (−3 dB ± 1 dB)
Temperature coefficient	
Zero stability	± 1 × 10^{-6} strain/C°
Sensitivity stability	± 0.01% rdg/C°
Balancing range	± 10000 × 10^{-6} strain
Balancing accuracy	± 3 × 10^{-6} strain or less
Balancing time	About 1 sec
Resolution	Strain: 1 × 10^{-6} strain Voltage: 1 mV
Sampling method	Simultaneous sampling
Sampling speed	One-channel mode fastest 50 µsec (20 kHz) Two-channel mode fastest 100 µsec (10 kHz) Four-channel mode fastest 200 µsec (5 kHz) Maximum 1 sec (Trigger measurement, free-run measurement)
Measurement function	Trigger measurement, free-run measurement, open check
Display function	
Display unit	3.5-inch color LCD display
Resolution	320 x 240 dots
Menu	Various settings, file management, etc.
Value monitor	Display of set channel, monitor value, peak value
Waveform monitor	Display of set channel
Data file	Numerical display, waveform display
LED	Battery level, trigger measurement status, free-run measurement status
Setting part	
Channel setting	Coefficient, decimal point, unit, measure/direct Reading of TEDS sensor
Trigger setting	
Trigger mode	SINGLE, CONTINUE
Trigger level	-full scale to +full scale
Trigger slope	UP, DOWN
Pre-area	Can be set from 0% to 100% in 10% increments (Up to 256 k data [one channel])
Energy-saving setting	ECO mode: 5 levels
Recording part	
Recording media	CF card, 512 MB to 2 GB (Designated by us)
Recording format	DADiSP compliant
Number of files created	Up to 255 files
Basic part	
Power supply	AA size dry-cell battery x 4 AC adapter (optional)
Vibration tolerance	29.4 m/s^2 (50 Hz, 0.6 mmp-p) three directions
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation * When using dry batteries, the operating temperature range of the dry batteries shall not be exceeded.
Outside dimension	150 (W) × 63 (H) × 150 (D) mm (Excluding protrusions)
Mass	Approx. 1 kg

Standard accessories

Instruction Manual..... 1
DH-714 v2 (CSV conversion software) CD-ROM 1
AA size alkaline dry-cell battery 4
Shoulder bag 1
Warranty certificate 1

DA-17A (Carrier type)

- Digital sensitivity setting method
- Electronic automatic balancing
- Input/output isolation
- Automatic tracking type capacity balancing
- Equipped with digital monitor function
- Dual output method
- Built-in low-pass filter
- Equipped with strain bridge insulation check function
- Capable of external control of balance and calibration output
- Dual power supply method of AC and DC



Dynamic strainmeter DA-17A

Back of dedicated case (sold separately) Interface part

This is a carrier type dynamic strainmeter that can be externally controlled via a PC. A digital sensitivity setting method is adopted for sensitivity adjustment to easily perform accurate sensitivity adjustments. In addition, such functions as automatic tracking capacity balancing and digital monitoring of measurement values enable highly reliable dynamic strain measurements. Although this equipment is designed for one channel use when used alone, it can be configured for multichannel use by incorporating it into the dedicated case or rack.

Specifications

Number of measuring points	1 point
Applicable gauge resistance	60–1000 Ω
Gauge factor	2.00
Bridge excitation	2 or 0.5 Vrms (5 kHz)
Balancing method	
Resistance	Electronic automatic (remote control possible) Adjustment time: About 2 seconds Using nonvolatile memory
Capacity	Electronic automatic tracking
Balancing range	
Resistance	± 10000 × 10^{-6} strain
Capacity	5000 pF
Balancing accuracy	± 1 × 10^{-6} strain or less (Bridge excitation 2 Vrms, SENS of 200 x 10^{-6} strain or less)
Rated output (RO)	1 to 10 V can be set in 1 V steps
Sensitivity adjustment (SENS)	For rated output of 1 V, 50 to 5000 × 10^{-6} strain For rated output of 10 V, 500 to 10000 × 10^{-6} strain Both can be set in 1 x 10^{-6} strain steps (Bridge excitation 2 Vrms)
Fine adjustment (ATT)	0 to 1 times (OUT 2 only)
Sensitivity	50 × 10^{-6} strain, at bridge excitation of 2 Vrms
OUT V	1 V (5 kΩ load)
OUT I	12 mA or more (30 Ω load)
Measurement range	± 50000 × 10^{-6} strain (bridge excitation 2 Vrms)
Nonlinearity	± 0.1% FS
Maximum output	
OUT V	±10 V (5 kΩ load)
OUT I	± 20 mA (30 Ω load) or ±10 V (100 kΩ load)
Output shift	-10 to +10 V or OFF (can be set in 1 mV steps)
Calibration output	
Voltage	± (RO, RO/2)
Accuracy	± 0.5% RO
Response frequency range	DC to 2.5 kHz (−3 dB ± 1 dB) (Low pass filter: PASS, with coupling DC)
Low-pass filter	
Cutoff frequency	10, 30, 100, 300 Hz (-3 dB ± 1 dB) and PASS
Cutoff property	Butterworth property −12 dB ± 1 dB/oct (10 Hz to 300 Hz)
High-pass filter	Coupling AC mode
Cutoff frequency	About 0.3 Hz
S/N ratio	For bridge excitation 2 Vrms, maximum output 10 V 60 dBp-p or more (SENS = 100 x 10^{-6} strain or more, RO = 1 V, LPF = PASS) 64 dBp-p or more (SENS = 200 x 10^{-6} strain or more, RO = 1 V, LPF = PASS)
Stability	
Zero point	0.1 × 10^{-6} strain/°C (at max. sensitivity) ± 0.5 × 10^{-6} strain/24 h (at max. sensitivity) (Bridge excitation 2 Vrms)
Sensitivity	± 0.05% FS/C° ± 0.2% FS/24h
Output monitor	Four-digit 1/2 digital display (Maximum/minimum values and over display function available) 21-point LED level meter
Vibration tolerance	29.4 m/s^2 (50 Hz, 0.6 mmp-p) three directions
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Power supply	
AC power supply	(1) Rated voltage: AC 100 V, 50/60 Hz Allowable voltage: AC 90 to 132 V, 50/60 Hz (2) Rated voltage: AC 200 V to 240 V, 50/60 Hz Allowable voltage: AC 180 to 250 V, 50/60 Hz (Either (1) or (2) as specified by the customer) Maximum power consumption: 7.5 VA max. (AC 100 V)
DC power supply	Rated voltage: DC 12 to 24 V Allowable voltage: DC 10 to 30 V Maximum power consumption: 0.25 A max. (DC 12 V)
Outside dimension	40 (W) × 140 (H) × 266 (D) mm (Excluding protrusions)
Mass	Approx. 870 g

Standard accessories

Instruction Manual	1
AC power cable (CR-04)*	1
Output cable (CR-31)	2
Accessory box	1
Dedicated mounting screw (M3 bind screw)	2
Vinyl washer	2
Warranty certificate	1

* CR-061 included with DC power supply specification

DA-18A (Carrier type)

Pursuing ease of use
Resistant to noise
Carrier type

- Carrier type bridge excitation system that is resistant to noise
- Equipped with two types of display units: level meter and digital value
- Low power consumption, 20% less than conventional products
- Automatic tracking type capacity balancing
- Reading of TEDS sensor information and automatic setting function
- Dual output method
- Built-in low-pass filter
- External control of balance and calibration output

Dynamic strainmeter DA-18A

This is a carrier type dynamic strainmeter that is designed for ease of use and resistance to noise. A digital setting method is adopted for sensitivity adjustment to easily perform accurate sensitivity adjustments. In addition, highly reliable dynamic strain measurement is possible with such functions as digital monitoring of measurement values. It can be configured for multichannel use by incorporating it into the case or rack.

Specifications

Number of measuring points	1 point
Applicable gauge resistance	60–1000 Ω
Gauge factor	2.00
Bridge excitation	2 or 0.5 Vrms (5 kHz)
Balancing method	
Resistance	Electronic automatic (remote control possible) Adjustment time: About 2 seconds Using nonvolatile memory
Capacity	Electronic automatic tracking
Balancing range	
Resistance	± 10000 × 10^{-6} strain
Capacity	3000 pF
Balancing accuracy	± 1 × 10^{-6} strain or less (Bridge excitation 2 Vrms, SENS of 200 x 10^{-6} strain or less)
Rated output (RO)	1 to 10 V can be set in 1 V steps
Sensitivity adjustment (SENS)	For rated output of 1 V, 50 to 5000 × 10^{-6} strain For rated output of 10 V, 500 to 10000 × 10^{-6} strain Both can be set in 1 x 10^{-6} strain steps (Bridge excitation 2 Vrms)
Sensitivity	50 × 10^{-6} strain, at bridge excitation of 2 Vrms
OUT 1	1 V (5 kΩ load)
OUT 2	1 V (5 kΩ load)
Measurement range	± 50000 × 10^{-6} strain (bridge excitation 2 Vrms)
Nonlinearity	± 0.1% FS
Maximum output	
OUT 1	±10 V (5 kΩ load)
OUT 2	±10 V (5 kΩ load)
Calibration output	
Voltage	±RO
Accuracy	± 0.5% RO
Response frequency	DC to 2.5 kHz (−3 dB ± 1 dB) (Low pass filter: PASS, with coupling DC)
Low-pass filter	
Cutoff frequency	10, 30, 100, 300 Hz (-3 dB ± 1 dB) and PASS
Cutoff property	Butterworth property −12 dB ± 1 dB/oct (10 to 300 Hz)
High-pass filter	Coupling AC mode
Cutoff frequency	About 0.3 Hz
S/N ratio	For bridge excitation 2 Vrms, maximum output 10 V 60 dBp-p or more (SENS = 100 x 10^{-6} strain or more, RO = 1 V, LPF = PASS) 64 dBp-p or more (SENS = 200 x 10^{-6} strain or more, RO = 1 V, LPF = PASS)
Stability	
Zero point	± 0.1 × 10^{-6-6} strain/°C (at max. sensitivity) ± 0.5 × 10^{-6} strain/24 h (at max. sensitivity)
Sensitivity	± 0.05% FS/C° ± 0.2%/FS/24h
TEDS	Reading of TEDS sensor information, automatic setting of coefficients, display of physical quantities
Output monitor	Four-digit 1/2 digital display (Voltage output, physical quantity, TEDS information display and over display function available) 21-point LED level meter
Vibration tolerance	29.4 m/s^2 (50 Hz, 0.6 mmp-p) three directions
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Power supply	
AC power supply	(1) Rated voltage AC 100 V, 50/60 Hz Allowable voltage: AC 90 to 110 V, 50/60 Hz (2) Rated voltage AC 220 V, 50/60 Hz Allowable voltage: AC 198 to 242 V, 50/60 Hz (Either (1) or (2) as specified by the customer) Maximum power consumption 6 VA max. (AC 100 V)
DC power supply	Rated voltage DC 12 to 24 V Allowable voltage DC 10 to 30 V Maximum power consumption 0.25 A max. (DC 12 V)
Outside dimension	40 (W) × 140 (H) × 266 (D) mm (Excluding protrusions)
Mass	Approx. 870 g

Standard accessories

Instruction Manual	1
AC power cable (CR-04)*	1
Output cable (CR-31)	2
Accessory box	1
Dedicated mounting screw (M3 bind screw)	2
Vinyl washer	2
Warranty certificate	1

* CR-061 included with DC power supply specification

DA-37A (Carrier type)

- High response frequency of 10 kHz
- Digital sensitivity setting method
- Electronic automatic balancing
- Input/output isolation
- Automatic tracking type capacity balancing
- Equipped with digital monitor function
- Dual output method
- Built-in low-pass filter
- Equipped with strain bridge insulation check function
- Capable of external control of balance and calibration output
- Dual power supply method of AC and DC

This is a carrier type dynamic strainmeter that can be externally controlled via a PC. A digital sensitivity setting method is adopted for sensitivity adjustment to easily perform accurate sensitivity adjustments. It is a high-response type with a response frequency of 10 kHz. In addition, such functions as automatic tracking capacity balancing and digital monitoring of measurement values enable highly reliable dynamic strain measurements. Although this equipment is designed for one channel use when used alone, it can be configured for multichannel use by incorporating it into the dedicated case or rack.

Dynamic strainmeter DA-37A

Specifications

Number of measuring points	1 point
Applicable gauge resistance	60–1000 Ω
Gauge factor	2.00
Bridge excitation	2 or 0.5 Vrms (20 kHz)
Balancing method	
Resistance	Electronic automatic (remote control possible) Adjustment time: About 2 seconds Using nonvolatile memory
Capacity	Electronic automatic tracking
Balancing range	
Resistance	± 10000 × 10^{-6} strain
Capacity	5000 pF
Balancing accuracy	± 1 × 10^{-6} strain or less (Bridge excitation 2 Vrms, SENS of 200 x 10^{-6} strain or less)
Rated output (RO)	1 to 10 V can be set in 1 V steps
Sensitivity adjustment (SENS)	For rated output of 1 V, 50 to 5000 × 10^{-6} strain For rated output of 10 V, 500 to 10000 × 10^{-6} strain Both can be set in 1 x 10^{-6} strain steps (Bridge excitation 2 Vrms)
Fine adjustment (ATT)	0 to 1 times (OUT 2 only)
Sensitivity	50 × 10^{-6} strain, at bridge excitation of 2 Vrms
OUT 1	1 V (5 kΩ load)
OUT 2	12 mA or more (30 Ω load)
Measurement range	± 50000 × 10^{-6} strain (bridge excitation 2 Vrms)
Nonlinearity	± 0.2% FS
Maximum output	
OUT 1	±10 V (5 kΩ load)
OUT 2	± 20 mA (30 Ω load) or ±10 V (100 kΩ load)
Output shift	
Shift range	-10 to +10 V or OFF (can be set in 1 mV steps)
Calibration output	
Voltage	± (RO、RO/2)
Accuracy	±0.5%RO
Response frequency	DC to 10 kHz (−3 dB ± 1 dB) (Low pass filter: PASS, with coupling DC)
Low-pass filter	
Cutoff frequency	10 Hz, 30 Hz, 100 Hz, 300 Hz, 1 kHz (-3 dB ± 1 dB) and PASS
Cutoff property	Butterworth property −12 dB ± 1 dB/oct (10 to 1 kHz)
High-pass filter	Coupling AC mode
Cutoff frequency	About 0.3 Hz
S/N ratio	For bridge excitation 2 Vrms, maximum output 10 V 56 dBp-p or more (SENS = 100 x 10^{-6} strain or more, RO = 1 V, LPF = PASS) 62 dBp-p or more (SENS = 200 x 10^{-6} strain or more, RO = 1 V, LPF = PASS)
Stability	
Zero point	± 0.1 × 10^{-6} strain/°C (at max. sensitivity) ± 0.5 × 10^{-6} strain/24 h (at max. sensitivity) (Bridge excitation 2 Vrms)
Sensitivity	± 0.05% FS/C° ± 0.2%/FS/24 h
Output monitor	Four-digit 1/2 digital display (Maximum/minimum values, open and over display function available) 21-point LED level meter
Vibration tolerance	29.4 m/s^2 (50 Hz, 0.6 mmp-p) three directions
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Power supply	
AC power supply	(1) Rated voltage AC 100 V, 50/60 Hz Allowable voltage: AC 90 to 110 V, 50/60 Hz Power consumption 9.2 VA max. (AC 100 V) (2) Rated voltage AC 110 to 120 V, 50/60 Hz Allowable voltage AC 99 to 132 V, 50/60 Hz Power consumption 9.8 VA max. (AC 120 V) (3) Rated voltage AC 200 to 240 V, 50/60 Hz Allowable voltage AC 180 to 264 V, 50/60 Hz Power consumption 14 VA max. (AC 240 V) (Either (1) or (3) as specified by the customer)
DC power supply	Rated voltage DC 12 to 24 V Allowable voltage DC 10 to 30 V Maximum power consumption 0.35 A max. (DC 12 V)
Outside dimension	40 (W) × 140 (H) × 266 (D) mm (Excluding protrusions)
Mass	Approx. 750 g

Standard accessories

Instruction Manual	1
AC power cable (CR-04)*	1
Output cable (CR-30)	2
Accessory box	1
Dedicated mounting screw (M3 bind screw)	2
Vinyl washer	2
Warranty certificate	1

* CR-061 included with DC power supply specification

Digital monitor

Monitor selection

DC	OUT1 average voltage value
PH	+ peak value of OUT1 from balancing or P/V reset
VH	- peak value of OUT1 from balancing or P/V reset
P-P	- Difference between PH and VH from balancing or P/V reset
OUT2	OUT2 average voltage value
R	Bridge insulation resistance

DA-38A (Carrier type)

- High response frequency of 10 kHz
- Carrier type bridge excitation system that is resistant to noise
- Equipped with two types of display units: level meter and digital value
- Low power consumption, 20% less than conventional products
- Automatic tracking type capacity balancing
- Reading of TEDS sensor information and automatic setting function
- Dual output method
- Built-in low-pass filter
- External control of balance and calibration output

Dynamic strainmeter DA-38A

This is a carrier type dynamic strainmeter that is compact and designed for ease of use. A digital sensitivity setting method is adopted for sensitivity adjustment to easily perform accurate sensitivity adjustments. It is a high-response type with a response frequency of 10 kHz. In addition, highly reliable dynamic strain measurement is possible with such functions as digital monitoring of measurement values. It can be configured for multichannel use by incorporating it into the case or rack.

Specifications

Number of measuring points	1 point
Applicable gauge resistance	60–1000 Ω
Gauge factor	2.00
Bridge excitation	2 or 0.5 Vrms (20 kHz)
Balancing method	
Resistance	Electronic automatic (remote control possible) Adjustment time: About 2 seconds Using nonvolatile memory
Capacity	Electronic automatic tracking
Balancing range	
Resistance	± 10000 × 10^{-6} strain
Capacity	3000 pF
Balancing accuracy	± 1 × 10^{-6} strain or less (Bridge excitation 2 Vrms, SENS of 200 x 10^{-6} strain or less)
Rated output (RO)	1 to 10 V can be set in 1 V steps
Sensitivity adjustment (SENS)	For rated output of 1 V, 50 to 5000 × 10^{-6} strain For rated output of 10 V, 500 to 10000 × 10^{-6} strain Both can be set in 1 x 10^{-6} strain steps (Bridge excitation 2 Vrms)
Sensitivity	50 × 10^{-6} strain, at bridge excitation of 2 Vrms
OUT 1	1 V (5 kΩ load)
OUT 2	1 V (5 kΩ load)
Measurement range	± 50000 × 10^{-6} strain (bridge excitation 2 Vrms)
Nonlinearity	± 0.2% FS
Maximum output	
OUT 1	±10 V (5 kΩ load)
OUT 2	±10 V (5 kΩ load)
Output shift	
Shift range	-10 to +10 V or OFF (can be set in 1 mV steps)
Calibration output	
Voltage	±RO
Accuracy	± 0.5% RO
Response frequency	DC to 10 kHz (−3 dB ± 1 dB) (Low pass filter: PASS, with coupling DC)
Low-pass filter	
Cutoff frequency	30 Hz, 100 Hz, 300 Hz, 1 kHz (-3 dB ± 1 dB) and PASS
Cutoff property	Butterworth property −12 dB ± 1 dB/oct (30 Hz to 1 kHz)
High-pass filter	Coupling AC mode
Cutoff frequency	About 0.3 Hz
S/N ratio	For bridge excitation 2 Vrms, maximum output 10 V 56 dBp-p or more (SENS = 100 x 10^{-6} strain or more, RO = 1 V, LPF = PASS) 62 dBp-p or more (SENS = 200 x 10^{-6} strain or more, RO = 1 V, LPF = PASS)
Stability	
Zero point	± 0.1 × 10^{-6} strain/°C (at max. sensitivity) ± 0.5 × 10^{-6} strain/24 h (at max. sensitivity)
Sensitivity	± 0.05% FS/C° ± 0.2%/FS/24 h
TEDS	Reading of TEDS sensor information, automatic setting of coefficients, display of physical quantities
Output monitor	Four-digit 1/2 digital display (Voltage output, physical quantity, TEDS information display and over display function available) 21-point LED level meter
Vibration tolerance	29.4 m/s^2 (50 Hz, 0.6 mmp-p) three directions
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Power supply	
AC power supply	Rated voltage AC 100 to 240 V, 50/60 Hz Allowable voltage AC 90 to 264 V, 50/60 Hz Maximum power consumption 8.5 VA max (AC 100 V) 13 VA max (AC 240 V)
DC power supply	Rated voltage DC 12 to 24 V Allowable voltage DC 10 to 30 V Maximum power consumption 0.27 A max. (DC 12 V)
Outside dimension	40 (W) × 140 (H) × 266 (D) mm (Excluding protrusions)
Mass	Approx. 750 g

Standard accessories

Instruction Manual	1
AC Power Cable(CR-04)*	1
DC Power Cable(CR-061)*	1
Output cable (CR-31)	1
Accessory box	1
Dedicated mounting screw (M3 bind screw)	2
Vinyl washer	2
Warranty certificate	1

* Specify CR-041 or CR-061 when ordering

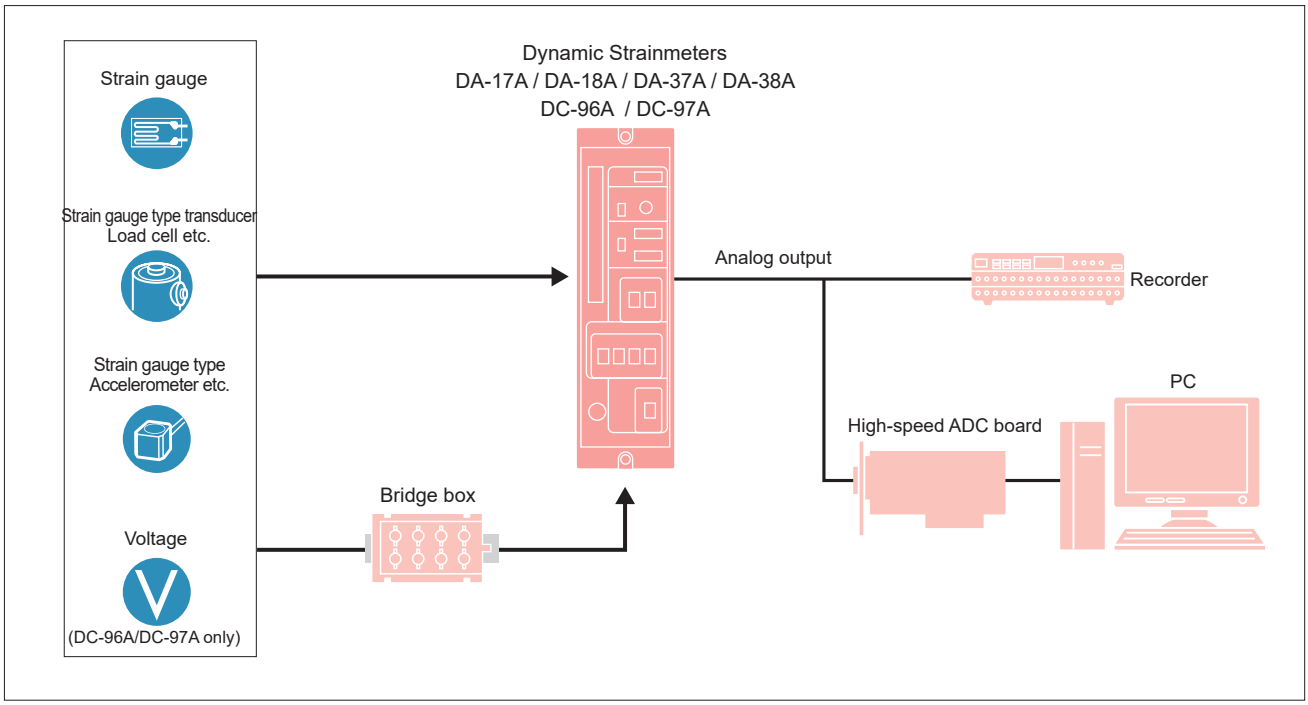
DC-96A / DC-97A (DC type)

- Broadband response frequency
  DC-96A: DC to 200 kHz
  DC-97A: DC to 500 kHz
- Digital sensitivity setting. (The amplifier sensitivity is set by selecting the amplifier's rated output (RO) in the range from 1 to 10 V and then setting the corresponding strain on the four-digit digital setting unit.)
- Improved performance of electronic automatic balancing. (The balancing range is 10000 x 10^{-6} strain and the balancing accuracy is 5 x 10^{-6} strain.)
- As for the temperature stability of zero-point, high accuracy of 0.5 x 10^{-6} strain/°C is achieved.
- Can be used as a DC amplifier.
- Bridge excitation can be switched between constant voltage and constant current.
- Dual output system equipped with conventional output terminals of two systems, voltage and current.
- Built-in low-pass filter and high-pass filter.
- Capable of external control of balance and calibration output.
- Dual power supply method of AC and DC.

Dynamic strainmeter DC-96A

This is a broadband DC type dynamic strainmeter that is compact and designed for ease of use. A digital sensitivity setting method is adopted for sensitivity adjustment to perform accurate sensitivity adjustments. The range and accuracy of electronic automatic balancing are improved compared to the conventional ones, allowing it to be used for a wide range of measurements. In addition, capacity balancing is not required because this is a DC type. Furthermore, the bridge excitation can be selected from either the constant voltage type or the constant current type. When the constant current method is used for the bridge excitation, there is no sensitivity decrease because of the resistance of the connection cable to the strain gauge type transducer, and bridge box. Although this equipment is designed for one channel use when used alone it can be configured for multichannel use by incorporating it into the dedicated case or rack.

System Block Diagram



Specifications

Number of measuring points	1 point
Applicable gauge resistance	
Constant voltage	60 to 1000 Ω (Bridge excitation 2 V)
Constant current	120, 350 Ω
Gauge factor	2.00
Bridge excitation	
Constant voltage	DC 0.5, 1, 2, 5, 10 V
Constant current	DC about 4.2, 8.3, 17, 42 mA (Bridge resistance 120 Ω) DC about 1.4, 2.9, 5.7, 14, 29 mA (Bridge resistance 350 Ω)
Input resistance	10 MΩ + 10 MΩ (Balanced differential input)
Balancing method	Electronic automatic (remote control possible) Adjustment time: About 2 seconds Using nonvolatile memory
Balancing range	± 10000 × 10^{-6} strain
Balancing accuracy	± 5 × 10^{-6} strain or less
Rated output (RO)	1 to 10 V is set in 1 V steps (Bridge excitation 2 V, SENS of 500 x 10^{-6} strain or more)
Sensitivity adjustment (SENS)	For rated output of 1 V, 50 to 10000 × 10^{-6} strain For rated output of 10 V, 500 to 10000 × 10^{-6} strain Both can be set in 1 x 10^{-6} strain steps (Bridge excitation 2 V)
As DC amplifier	For rated output of 1 V, 0.050 to 10.000 mV For rated output of 10 V, 0.500 to 10.000 mV Both can be set in 0.001 mV steps
Fine adjustment (I.SENS)	1/10 to 1 (OUT I only)
Sensitivity	50 × 10^{-6} strain, at bridge excitation of 2 V
OUT V	1 V (5 kΩ load)
OUT I	12 mA or more (30 Ω load)
As DC amplifier	At 0.05 mV
OUT V	1 V (5 kΩ load)
OUT I	12 mA or more (30 Ω load)
Measurement range	±100000 × 10^{-6} strain (Bridge excitation 2 V)
As DC amplifier	±100 mV
Nonlinearity	OUT V ± 0.02% FS or less OUT I ± 0.2% FS or less
Maximum output	
OUT V	±10 V (5 kΩ load)
OUT I	± 50 mA (30 Ω load, when using 120 Ω bridge) or ±10 V (5 kΩ load)
Output shift	
Function	Shifts the output with a multi-turn potentiometer.
Shift range	-10 to 10 V or OFF
Calibration output	
Voltage	± (RO, RO/2)
Accuracy	± 0.5% RO
Response frequency range	DC-96A: DC to 200 kHz (-3 dB± 1 dB) DC-97A: DC to 500 kHz (-3 dB± 1 dB) (Low pass filter: PASS, with coupling DC)
Low-pass filter	
Cutoff frequency	10, 30, 100, 300 Hz, 1 k, 3 k, 10 k, 30 kHz (-3 dB ± 1 dB) and PASS
Cutoff property	Bessel property −12 dB ± 1 dB/oct

High-pass filter	Coupling AC mode		
Cutoff frequency	0.05 Hz ± 0.015 Hz (−3 dB)		
Cutoff property	−6 dB ± 1 dB/oct		
S/N ratio	For bridge excitation 2, maximum output 10 V		
		DC-96A	DC-97A
	PASS	28 dBp-p or more	30 dBp-p or more
	DC to 10 kHz	40 dBp-p or more	46 dBp-p or more
	DC to 1 kHz	44 dBp-p or more	50 dBp-p or more
	DC to 100 Hz	50 dBp-p or more	56 dBp-p or more
	(SENS = 100 × 10^{-6} strain, RO = 1 V)		
Stability			
Zero point	± 0.5 × 10^{-6} strain/°C (at max. sensitivity) ± 5 × 10^{-6} strain/24 h (at max. sensitivity) (Bridge excitation 2 V)		
Sensitivity	± 0.01%/C° ± 0.05%/24 h		
As DC amplifier			
Zero point	± 0.5 μV/°C (at max. sensitivity) ± 5 μV/24 h (at max. sensitivity)		
Sensitivity	± 0.01%/C° ± 0.05%/24 h		
Output monitor	41-point LED level meter (with over display function)		
Self-diagnosis function	Amplifier sensitivity Bridge excitation Open over		
Common mode rejection ratio	60 dB or more		
Vibration tolerance	29.4 m/s^2 (50 Hz, 0.6 mmp-p) three directions		
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)		
Power supply			
AC power supply	(Either (1) or (2) as specified by the customer)		
(1) Rated voltage	AC 100 V 50/60 Hz		
Allowable voltage	AC 90 to 132 V 50/60 Hz		
(2) Rated voltage	AC 200 to 240 V 50/60 Hz		
Allowable voltage	AC 180 to 250 V 50/60 Hz		
Maximum power consumption	16 VA max		
DC power supply			
Rated voltage	DC 12 to 24 V		
Allowable voltage	DC 10 to 30 V		
Maximum consumption current	0.7 A max		
Outside dimension	40 (W) × 140 (H) × 266 (D) mm (Excluding protrusions)		
Mass	Approx. 1.2 kg		

Standard accessories

- Instruction Manual 1
- AC power cable (CR-04)* 1
- Output cable (CR-30)..... 2
- Flathead screwdriver 1
- Accessory box 1
- Warranty certificate 1

* CR-061 is included when the DC power option is specified.

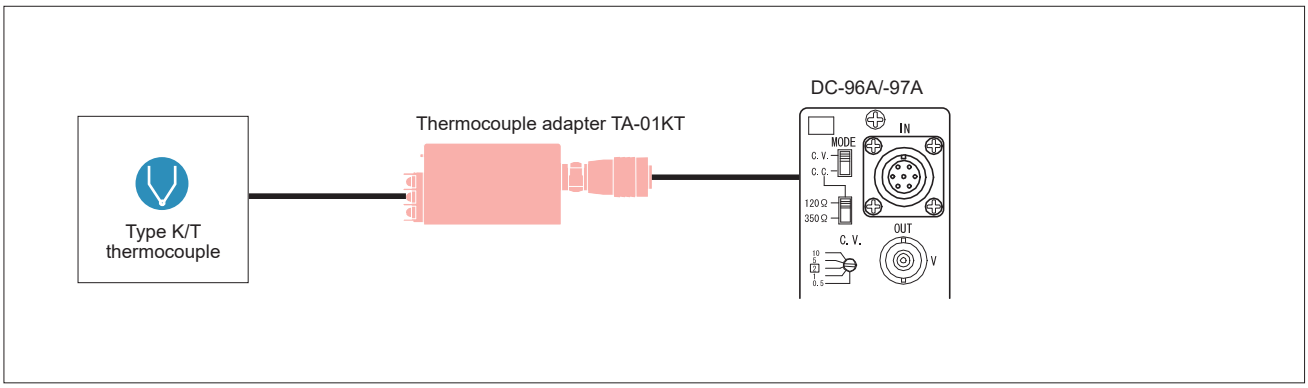
TA-01KT

- Compact and lightweight
- No external power supply required
- Built-in reference junction
- Isolated Input and output
- Digital linearization provides better linearity than analog linearization
- Built-in burnout function
- Calibration output function enables setting check of strainmeters

TA-01KT thermocouple adapter

The TA-01KT is a K/T thermocouple adapter to perform temperature measurement with a DC bridge excitation type strainmeter.
Since a power supply from the main unit of the measuring instrument is used, no external power supply is required, and K/T thermocouple temperature measurement is possible with most strainmeters of the DC bridge excitation method. It has a thin shape and can be directly connected to the connector of strainmeter, so it does not take up much space.

System Block Diagram



Specifications

Number of measuring points	1 point
Applicable thermocouple	K, T
Measurement temperature range	K: -50C° to +1000C°, T: -50C° to +300C°
Response time	20 ms or less (0 → 90%)
Burnout	Upper scale out (Output of +1050°C or mode)
Sensitivity	10 μV/°C (When bridge excitation is 2 V, 10 x 10^{-6} strain/°C)
Accuracy	± (0.2% + 1.0°C) (Ambient temperature: +20 to +30°C) ± (0.4% + +1.5°C) (Ambient temperature: 0 to +50°C)
Internal reference junction accuracy	± 0.7°C (Ambient temperature: +20 to +30°C) ± 1.0°C (Ambient temperature: 0 to +50°C)
Allowable conductor resistance	500 Ω or less
Allowable input voltage	±30 V
Input/output insulation resistance	100 Ω or more (at DC 500 V)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Power supply (Bridge excitation)	DC 1.95 to 5.3 V (Constant voltage method)
Consumption current	16 mA max
Outside dimension	22 (W) × 41 (H) × 70 (D) mm (Excluding protrusions)
Mass	Approx. 100 g

Compatible measuring instruments

DC type dynamic strainmeters
DC-204R ／ -204Ra、DC-004P
DH-14A
DC-96A ／ -97A
DS-50A
TMR-321

Bridge Box

The bridge box is used when connecting a strain gauge using the one-gauge method, two-gauge method to a measuring instrument that supports the four-gauge method, such as a dynamic strainmeter.
Resistors for bridge configuration are provided inside. In addition, even in the case of a four-gauge method transducer, a bridge box is used to connect it to the terminal when the tip is a loose wire. Depending on the connection method to a terminal, various bridges can be configured.
(Refer to page 14 of “Strain Gauge Bridge Circuit”)

Model name	Number of measuring points	Applicable gauge resistance value*1	Bridge configuration						Other functions
			four-gauge method	one-gauge method three-wire type	one-gauge method two-wire type	two-gauge method	Opposite side two-gauge method	Opposite side two-gauge method three-wire type	
SB-122A	2,4,6,8,10	120Ω	●	●	●	●			One-gauge method two-wire type compatible
SB-123A	1	120Ω	●	●	●	●	●	●	General-purpose compact one-touch terminal
SB-353A	1	350Ω	●	●	●	●	●	●	
SB-120SB	2,4,6,8,10	120Ω	●	●	●*3	●			Connector connection compatible
SB-120PY	2,4,6,8,10	120Ω	●	●	●*3	●			Plastic region measurement compatible
SB-120B	1	120Ω	●	●	●	●	●	●	
SB-350B	1	350Ω	●	●	●	●	●	●	
SB-128A	8	120Ω	●	●	●	●	●	●	
SB-128A-10	10	120Ω	●	●	●	●	●	●	
SB-358A	8	350Ω	●	●	●	●	●	●	
SB-120DD-1R	1	120Ω		●		●			Connector direct connection for DC-204R/ TMR*4
SB-120DD-4R	1	-	●						
SB-350DD-1R	1	350Ω		●		●			
SB-120DG-1R2	1	120Ω			●				NDIS connector direct connection one-touch terminal
SB-120DG-1R3	1	120Ω		●					
SB-120DG-4R	1	-	●						
SB-350DG-1R2	1	350Ω			●				
SB-350DG-1R3	1	350Ω		●					

*1: The values apply to the one-gauge method or opposite side two-gauge method. The values for the two-gauge method and four-gauge method depend on the measuring instrument.
*2: This is supported by the included short bar.
*3: This is supported by shorting B-C.
*4: When using DC-204R/-204Ra, remote sensing is supported by the dedicated extension cable.

Precautions when using the one-gauge method two-wire type

In the one-gauge method, the increase in resistance due to the length of the lead wire of the two-wire type reduces the sensitivity and increases the initial imbalance. Furthermore, fluctuations in the cable resistance due to temperature changes are a major unstable factor in measurements. To reduce the effect, make lead wires as thick and short as possible and use the product in a place where temperature changes do not occur.
For cases where temperature changes or the lead wires are long, we recommend the one-gauge method three-wire type. The three-wire type has half the sensitivity decrease because of the lead wire length as the two-wire type and offsets the effect on the initial unbalance and fluctuations in the lead resistance due to temperature. Therefore, it is an excellent wiring method for stable measurements.

SB-122A

One-gauge method two-wire type compatible

SB-122A-2

- one-gauge method two-wire type compatible
- Easy to switch the gauge method by using switch

The gauge method can be easily switched using a changeover switch and four types of methods, or one-gauge method two-wire type, one-gauge method three-wire type, two-gauge method and four-gauge method, are supported.
As for the number of input points per unit, there are five types from 2 to 10 points.

Specifications

Number of measuring points	2 points: SB-122A-2 4 points: SB-122A-4 6 points: SB-122A-6 8 points: SB-122A-8 10 points: SB-122A-10
Input terminal	M3 x 3P, terminal bind screw x 2
Input	One-gauge method two-wire type: 120 Ω One-gauge method three-wire type: 120 Ω
	Two-gauge method: 60-1000 Ω Four-gauge method: 60-1000 Ω
Switch	Compact toggle switch
Connection terminal	Soldering, screw attachment
Operating temperature / humidity range	-20 to +60C° 85% RH or less (No condensation)

Outside dimension and mass

SB-122A-2	About 55 (W) ×35 (H) ×100 (D) mm	Approx. 0.4 kg
SB-122A-4	About 105 (W) ×35 (H) ×100 (D) mm	Approx. 0.6 kg
SB-122A-6	About 155 (W) ×35 (H) ×100 (D) mm	Approx. 0.8 kg
SB-122A-8	About 205 (W) ×35 (H) ×100 (D) mm	Approx. 1.0 kg
SB-122A-10	About 255 (W) ×35 (H) ×100 (D) mm	Approx. 1.2 kg

Standard accessories

- Mounting bracket ..... 1 set
- Instruction Manual..... 1
- Warranty certificate 1

* The connection cable CR-612 is available as an option.

SB-123A/SB-353A

- Compact and lightweight
- One-touch terminal
- Supports all wiring methods
- Easy to switch the gauge method by using a switch
- Easy to multi-channelize

This is a compact general-purpose bridge box that adopts one-touch terminals. All strain gauge wiring methods, or the one-gauge method, opposite side two-gauge method, two-gauge method, and four-gauge method, can be supported.

Specifications

Number of measuring points	1 point
Input	One-gauge method two-wire type, one-gauge method three-wire type, two-gauge method, opposite side two-gauge method, opposite side two-gauge method three-wire type SB-123A 120 Ω SB-353A 350 Ω
	two-gauge method, four-gauge method 60 to 1000 Ω
Switch	Compact slide switch
Connection terminal	Clamp type one-touch terminal
Operating temperature / humidity range	-20 to +60C° 85% RH or less (No condensation)
Outside dimension	30 (W) × 30 (H) × 90 (D) mm (Excluding protrusions)
Mass	Approx. 100 g

Standard accessories

- DIN rail mounting part 1
- M3 x 6 panhead screw 4
- Instruction Manual..... 1

* The connection cable CR-612 is available as an option.

Bridge Box

SB-120SB

- Equipped with NIDS connector
- Easy to switch the gauge method by a slide switch

The SB-120SB is a bridge box that can also relay a strain gauge type transducer using the NDIS connector with one unit. Easy to switch the gauge method with a slide switch. The lead wires can be connected either by soldering or screw attachment.
As for the number of input points per unit, there are five types from 2 to 10 points.

Specifications

Number of measuring points	2 points: SB-120SB-2 4 points: SB-120SB-4 6 points: SB-120SB-6 8 points: SB-120SB-8 10 points: SB-120SB-10
Input connector	Terminal : M3 x 5P terminal bind screw Connector : NDIS 7P connector
Input	One-gauge method (B-C shorted), one-gauge method three-wire type: 120 Ω Two-gauge method, four-gauge method: 60 to 1000 Ω
Switch	Compact slide switch
Connection terminal	Screw attachment, soldering, NDIS connector
Operating temperature / humidity range	-20 to +60C° 85% RH or less (No condensation)

Outside dimension and mass

SB-120SB-2	About 55 (W) ×35 (H) ×100 (D) mm	Approx. 0.6 kg
SB-120SB-4	About 105 (W) ×35 (H) ×100 (D) mm	Approx. 0.8 kg
SB-120SB-6	About 155 (W) ×35 (H) ×100 (D) mm	Approx. 1.0 kg
SB-120SB-8	About 205 (W) ×35 (H) ×100 (D) mm	Approx. 1.2 kg
SB-120SB-10	About 255 (W) ×35 (H) ×100 (D) mm	Approx. 1.4 kg

Standard accessories

- Mounting bracket ..... 1 set
- Instruction Manual..... 1
- Warranty certificate 1

* The connection cable CR-612 is available as an option.

SB-120PY

Plastic region measurement compatible

SB-120PY-2

- Plastic region measurement compatible
- Easy to switch the gauge method by using a switch

This is a bridge box that can measure plastic region strain using the one-gauge method. The switch enables to switch among the one-gauge method three-wire type, two-gauge method and four-gauge methods, as well as between normal measurement and plastic region measurement. In plastic region measurement, the sensitivity becomes 1/10 and up to 200000×10^{-6} strain can be measured using a dynamic strainmeter with a measurement range of 20000×10^{-6} strain.
As for the number of input points per unit, there are five types from 2 to 10 points.

Specifications

Number of measuring points	2 points: SB-120PY-2 4 points: SB-120PY-4 6 points: SB-120PY-6 8 points: SB-120PY-8 10 points: SB-120PY-10
Input terminal	M3 x 5P terminal bind screw
Input Normal measurement	One-gauge method two-wire type: 120 Ω (by shorting B-C) One-gauge method three-wire type: 120 Ω
	Two-gauge method, four-gauge method 60 to 1000 Ω
Input Plastic region measurement	One-gauge method two-wire type: 120 Ω (by shorting B-C) One-gauge method three-wire type: 120 Ω
Switch	Slide switch × 2, toggle switch
Connection terminal	Soldering, screw attachment
Operating temperature / humidity range	-20 to +60C° 85% RH or less (No condensation)

Outside dimension and mass

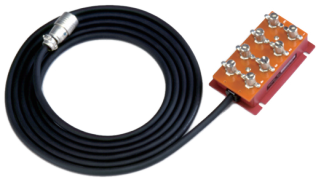
SB-120PY-2	About 55 (W) ×35 (H) ×100 (D) mm	Approx. 0.4 kg
SB-120PY-4	About 105 (W) ×35 (H) ×100 (D) mm	Approx. 0.6 kg
SB-120PY-6	About 155 (W) ×35 (H) ×100 (D) mm	Approx. 0.8 kg
SB-120PY-8	About 205 (W) ×35 (H) ×100 (D) mm	Approx. 1.0 kg
SB-120PY-10	About 255 (W) ×35 (H) ×100 (D) mm	Approx. 1.2 kg

Standard accessories

- Mounting bracket ..... 1 set
- Instruction Manual..... 1
- Warranty certificate 1

* The connection cable CR-612 is available as an option.

SB-120B/SB-350B



- Supports all wiring methods
- No mechanical parts and high durability

This is a 1-point type bridge box. Depending on the connection method to the terminals, various types of bridges, or the one-gauge method, opposite side two-gauge method, two-gauge method and four-gauge method, can be configured using strain gauges. The lead wires can be connected either by soldering or screw attachment.

Specifications

Number of measuring points	1 point
Input	One-gauge method, one-gauge method three-wire type, opposite side two-gauge method, opposite side two-gauge method three-wire type 120 Ω (SB-120B), 350 Ω (SB-350B)
	Two-gauge method, four-gauge method: 60 to 1000 Ω
Connection terminal	Dual-purpose for screw attachment and soldering
Operating temperature / humidity range	-10 to +50C° 85% RH or less (No condensation)
Input/output cable	φ9 mm, 4-core shielded cable, 3 m, tip NDIS plug
Outside dimension	65 (W) × 40 (H) × 110 (D) mm (Excluding protrusions)
Mass	Approx. 0.7 kg

SB-128A/SB-128A-10/SB-358A

- Supports all wiring methods

Specifications

Number of measuring points	8 points (SB-128A/SB-358A), 10 points (SB-128A-10)
Input	One-gauge method, one-gauge method three-wire type, opposite side two-gauge method, opposite side two-gauge method three-wire type 120 Ω (SB-128A/SB-128A-10) 350 Ω (SB-358A)
	Two-gauge method, four-gauge method 60 to 1000 Ω
Connection terminal	Dual-purpose for screw attachment and soldering
Operating temperature / humidity range	-20 to +60C° 85% RH or less (No condensation)
Outside dimension	SB-128A/SB-358A: 240 (W) × 33 (H) × 150 (D) mm SB-128A-10: 300 (W) × 33 (H) × 150 (D) mm (Excluding protrusions)
Mass	Approx. 2 kg

Standard accessories

- Instruction Manual..... 1
- Warranty certificate 1

* The connection cable CR-612 is available as an option.

SB-120DD-1R/4R/ SB-350DD-1R

- One-touch connection to measuring instruments with mini plug connector
- Compact space-saving and lightweight
- Easy connection o loose wire transducers (SB-120DD-4R)

This is a bridge box for the measuring instruments, DC-204R smart dynamic strain recorder and TMR-321/-323/-221/-223 multi-recorders that adopt mini plugs (PRC07-P8M). Since no cables are required to the measuring instrument, the area around the measuring instrument can be set up compactly. The SB-120DD-1R and SB-350DD-1R are compatible with the one-gauge method three-wire type (the one-gauge method two-wire type is supported by shorting B-B') and the two-gauge method, and the SB-120DD-4R is compatible with the four-gauge method.

In addition, when using the DC-204R/-204Ra, the remote sensing function between the measuring instrument and bridge box is enabled by using the CR-6185 sensor cable. This eliminates error factors due to cable conductor resistance and ambient temperature changes to achieving highly accurate measurements.

Specifications

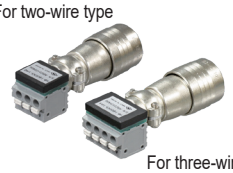
Number of measuring points	1 point	
Measurement method		
one-gauge method three-wire type*	SB-120DD-1R SB-350DD-1R	120Ω 350Ω
two-gauge method	SB-120DD-1R SB-350DD-1R	120、350Ω 120、350Ω
four-gauge method	SB-120DD-4R	120 ～ 1000Ω
Connection terminal	Screw attachment	
Operating temperature / humidity range	0 to +50C°	85% RH or less (No condensation)
Outside dimension	14 (W) ×19 (H) ×59 (D) mm (Excluding protrusions)	
Mass	Approx. 22 g	

Standard accessories

Instruction Manual..... 1

SB-120DG-1R2/1R3/4R SB-350DG-1R2/1R3

For two-wire type



For three-wire type

- One-touch connection to measuring instruments with NDIS connector plug
- One-touch terminals allow easy connection of lead wires
- Compact and lightweight

This is a bridge box that can be connected to a measuring instrument with one touch. Since no cables are required to the measuring instrument, the area around the measuring instrument can be set up compactly. The SB120DG-1R2 and SB-350DG-1R2 are compatible with the one-gauge method two-wire type, and the SB120DG-1R3 and SB-350DG-1R3 are compatible with the one-gauge method three-wire type.

Specifications

Number of measuring points	1 point
Input	SB-120DG-1R2/SB-350DG-1R2 One-gauge method two-wire type SB-120DG-1R3/SB-350DG-1R3 One-gauge method three-wire type SB-120DG-4R Four-gauge method
Applicable gauge resistance	SB-120DG-1R2/-1R3 120 Ω SB-350DG-1R2/-1R3 350 Ω
Connection terminal	touch
Operating temperature / humidity range	-20 to +60C° 85% RH or less (No condensation)
Outside dimension SB-120DG-1R2 / SB-350DG-1R 17 (W) × 18 (H) × 63 (D) mm (Excluding protrusions) SB-120DG-1R3 / SB-120DG-4R / SB-350DG-1R3 22 (W) × 18 (H) × 63 (D) mm (Excluding protrusions)	
Mass	Approx. 50 g

Standard accessories

Instruction Manual..... 1

Related Products (for dynamic strainmeters)

Carrying case

P-4B P-6B P-8B

This case is used to configure the DA series and DC series as multichannel type. It is equipped with a power switch, calibration strain generation switch, and balance button that allow simultaneous operation of all channels.

Model name	Number of channels	Outside dimension (W x H x D mm)
P-4B	4	208×148×308
P-6B	6	288×148×308
P-8B	8	368×148×308
P-10B	10	448×148×308

(Excluding protrusions)

LAN compatible carrying case for DA-37A/DA-17A

P-8AL with 1 unit of dynamic strainmeter incorporated

Back of case
LAN interface
DC and AC power switches

This case is used to configure the DA-37A and DA-17A as multichannel types. Various settings of the gain, low-pass filter, etc., operations of balance and calibration strain generation, each setting value, and monitor values can be obtained via the LAN interface from a PC. It is equipped with a power switch, calibration strain generation switch, and balance button that allow simultaneous operation of all channels.

Specifications

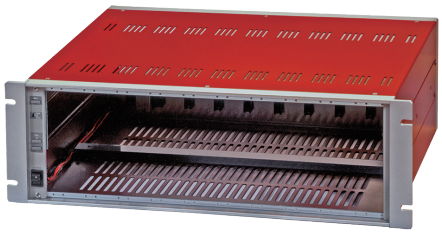
Number of measuring points	4 units: P-4AL 8 units: P-8AL	6 units: P-6AL 10 units: P-10AL
Interface	Ethernet IEEE 802.3, RJ-45 connector 10BASE-T/100BASE-TX	
Operation switch	Balance, calibration strain generation, power supply * Simultaneous operation of all channels	
External control	Balance, calibration strain generation, power supply * Simultaneous operation of all channels	
Rated voltage	AC 100 V 50/60 Hz 8 VA max DC 12/24 V 0.25 A max. (DC 12 V) * Power consumption is rack only.	
Allowable voltage	AC 90 to 132 V 50/60 Hz DC 10 to 30 V	
Operating temperature / humidity range	-10 to +50C°	85% RH or less (No condensation)

Outside dimension and mass

P-4AL	208 (W) × 148 (H) × 308 (D) mm	Approx. 2.3 kg
P-6AL	288 (W) × 148 (H) × 308 (D) mm	Approx. 2.7 kg
P-8AL	368 (W) × 148 (H) × 308 (D) mm	Approx. 3.1 kg
P-10AL	448 (W) × 148 (H) × 308 (D) mm	Approx. 3.5 kg

* Excluding protrusions. Mass is case only.

Rack



R-10B

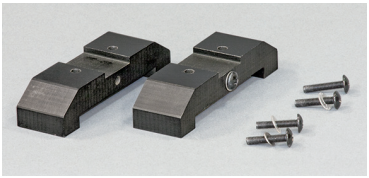
This is a JIS standard rack that stores the DA series, DC series, and other series in a 10-channel configuration. It is equipped with a power switch, calibration strain generation switch, and balance button that allow simultaneous operation of all channels.

Model name	Number of channels	Outside dimension (W x H x D mm)
R-10B	10	480×149×311

(Excluding protrusions)

Dynamic strainmeter fixing base

This is a base when using the DA series, DC series, and other series for one channel alone. It is used by attaching it to the bottom of the measuring instrument.



Applicable measuring instrument

Dynamic strainmeter DA series DC type dynamic strainmeter DC series

SB-OT1B one-touch terminal

This terminal block allows one-touch connection of input lead wires. It is used by attaching to the input terminal of the switch box and bridge box (SB-120SB / SB-120PY / SB-122A). One is used per lead wire (sold in units of five).

DT-221T/DT-281R (Telemetry system)

2.4 GHz advanced low-power data communication

System as a whole

- Using the 2.4 GHz band for the wireless band
- High-speed sampling of 10 kHz (100 µs)

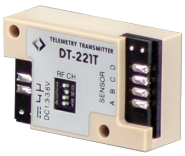
DT-221T (Transmitter)

- Transmitting strain values as digital values
- No calibration is required since the strain value is pre-calibrated.
- Robust due to the use of materials with high mechanical strength
- Easy wiring due to unique terminal block
- Built-in transmitting antenna
- Compact: 36 (W) ×12.5 (H) ×22.5 (D) mm

DT-281R (Receiver)

- Outputs a voltage equivalent to the strain value.
- No calibration is required since the voltage output is pre-calibrated.
- The voltage output range can be switched among three types: ± 5000, ±10000 and ± 25000 x 10^{-6} strains.
- Model DT-281R (-04) that supports the voltage output ranges of ± 500, ±1000 and ± 2500 x 10^{-6} is available.

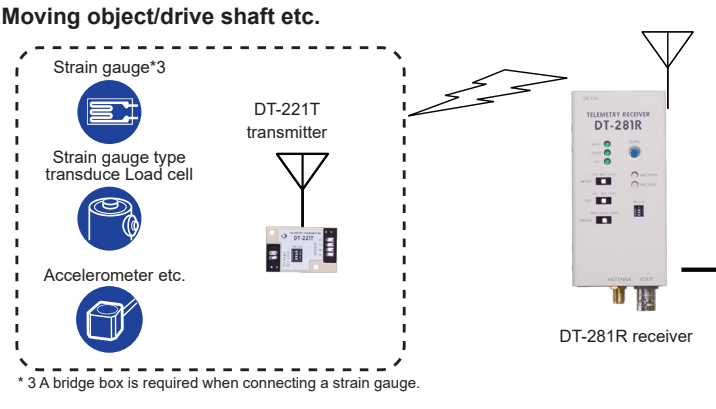
DT-281R receiver



DT-221T transmitter

This system is a telemetry system developed to perform strain measurements of rotating object, moving object, etc., which are difficult to measure with wires. It is effective for measurements when the target object is large, such as a large machine tool and when the range of movement is large, resulting in a large distance between the transmitter and receiver.

System Block Diagram

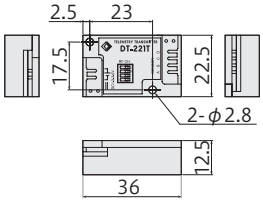


* 3 A bridge box is required when connecting a strain gauge.

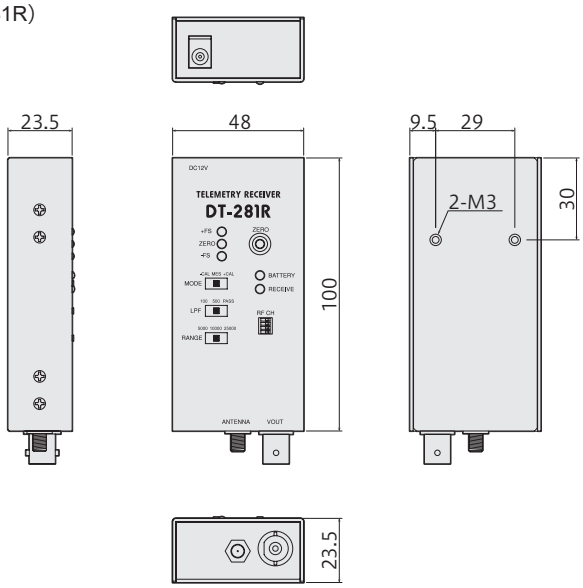
DT-221T/DT-281R

External Dimensions

Transmitter
(DT-221T)



Receiver
(DT-281R)



Specifications

Transmitter (DT-221T)

Strain measurement part	
Number of measuring points	1 point
Applicable gauge resistance	120 to 1000 Ω (4 G bridge)
Bridge excitation	2.0 V ± 8%
Measurement range	± 25000 × 10^{-6} strain (including initial imbalance)
Measurement accuracy	± 0.2% FS
Sampling frequency	10 kHz (100 µs)
Response frequency	DC to 1 kHz (−3 dB ± 1 dB)
Resolution	1 × 10^{-6} strain
Stability Zero point	± 0.8 × 10^{-6} strain/C°
Stability Sensitivity	± 0.01% FS/C°
Power supply voltage measurement part	
Number of measuring points	1 point
Measurement range	DC 1.3 to 3.6 V
Wireless part	
Wireless specifications	2.4 GHz advanced low-power data communication system
Number of channels	16 channels
Antenna	Built-in
Display/operation	Wireless channel changeover switch
General	
Power supply voltage	DC 1.3 to 3.6 V
Consumption current	75 mA max (DC 3 V supplied, 120 Ω gauge, +23°C ± 5°C)
Operating temperature / humidity range	-30 to +80C°, 85% RH or less (No condensation, excluding batteries)
Vibration tolerance	100 m/s^2, three directions
Centrifugal acceleration resistance	10000 m/s^2, height direction
Outside dimension	36 (W) x 12.5 (H) x 22.5 (D) mm (Excluding protrusions)
Chassis material	Resin
Mass	Approx. 17 g

Standard accessories

Instruction Manual..... 1
Warranty certificate 1

Receiver (DT-281R)

Wireless part	
Wireless specifications	2.4 GHz advanced low-power data communication system
Number of channels	16 channels
Antenna connection terminal	SMA connector
Display/operation	Receiving signal strength LED / transmitter battery voltage LED / wireless channel changeover switch
Voltage output part	
Voltage output connector	BNC connector
Voltage output	± 5 V Select with the strain output range changeover switch ± 25000 × 10^{-6} strain ± 10000 × 10^{-6} strain ± 5000 × 1^{-6}strain
Voltage output accuracy	± 0.5% FS (System as a whole)
Stability Zero point	± 0.55 mV/C°
Stability Sensitivity	± 0.05% FS/C°
S/N ratio	47 dB (System as a whole)
Calibration output	± 5 V
Low-pass filter	100 Hz, 500 Hz, PASS (1 kHz) (–3 dB ± 1 dB)
Balancing range	6000 × 10^{-6} strain
Balancing accuracy	± 5 mV
Display/operation	Strain output range changeover switch LPF changeover switch / calibration outputchangeover switch Balancing switch / output level LED
General	
Power supply voltage	DC 9 to 16 V
Consumption current	80 mA max (DC 12 V supplied, +23°C ± 5°C)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Outside dimension	48 (W) x 23.5 (H) x 100 (D) mm (Excluding protrusions)
Mass	Approx. 140 g

Standard accessories

Instruction Manual..... 1
Warranty certificate 1
BNC coaxial cable (CR-31) 1
DC power cable (CR-062) 1
Receiving antenna 1

Options

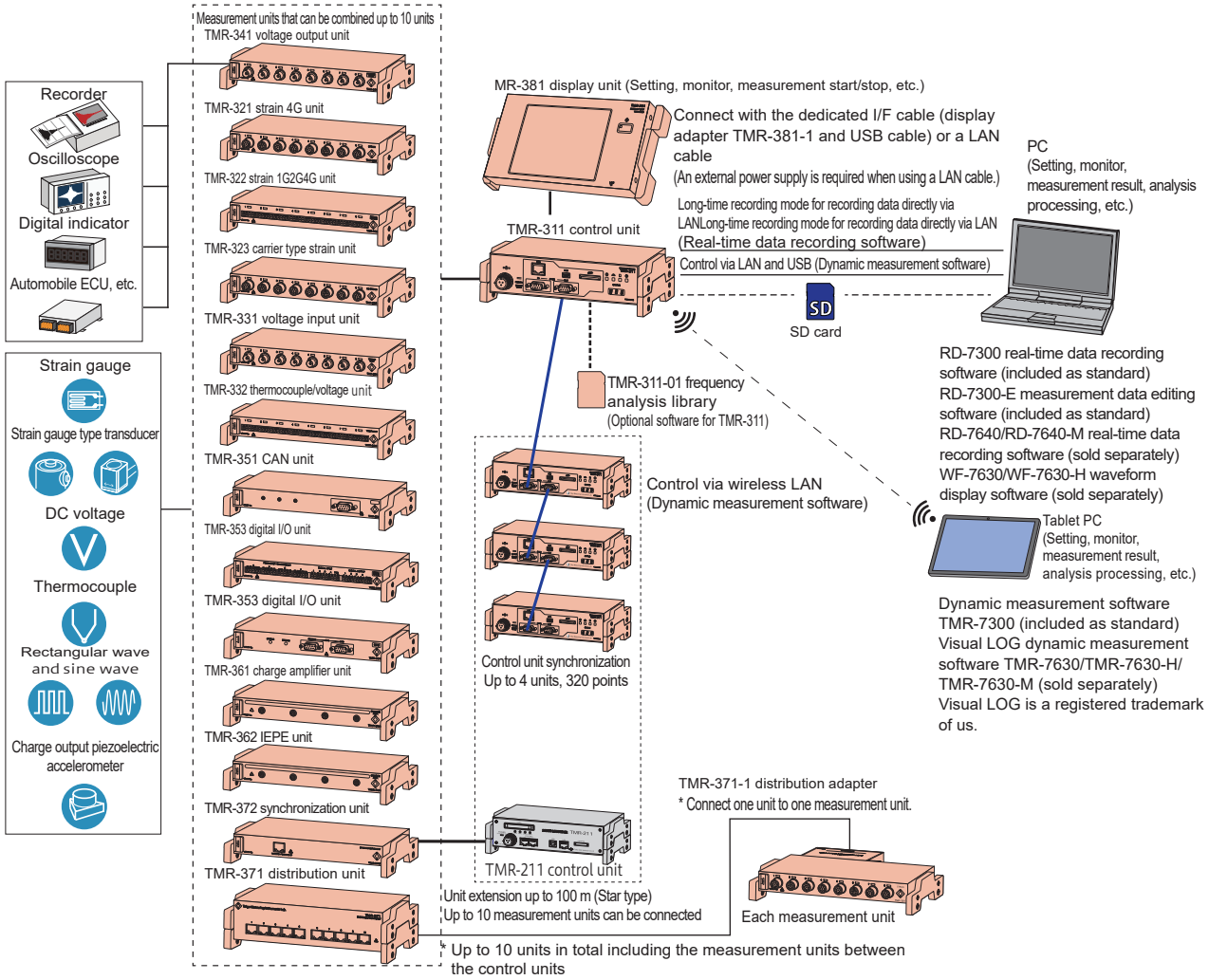
2.4 GHz telemeter antenna cable, 1 m (CR-4701)
2.4 GHz telemeter antenna cable, 3 m (CR-4703)
2.4 GHz telemeter antenna cable, 5 m (CR-4705)
AC Adapter (CR-1869)
AC Adapter [For China] (CR-1869-C)

TMR-300 series

- A wide variety of sensor input/output units can be combined.
- Equipped with high-resolution range (strain 4G unit, strain 1G2G4G unit).
- High-speed sampling of 100 kHz.
- Up to 80 measuring points, up to 320 points with four units connected synchronously.
- Supports distributed connection of up to 100 m between the control unit and measurement unit.
- Vibration tolerance and compact size suitable for vehicle installation.
- Suitable for vehicle installation due to DC power operated.
- Data recovery during power outages and measurement resumption function when power is restored.
- Supports data storage on SD card (up to 32 GB).
- Built-in wireless LAN (Only in Japan).
- Real-time frequency analysis processing (optional) possible.
- Equipped with long-time recording mode that records data directly to a PC via LAN.
- TMR-321 supports remote sense and cancels a conductor resistance change in the sensor input conversion cable.

The multi-recorder TMR-300 series is a compact multichannel data recording system that can easily combine measurement units for various sensor inputs according to the purpose. Since it is compact and lightweight, it can be easily installed and used for measurements not only on existing structures (equipment machinery, bridges, etc.) with limited installation space but also on such moving objects as automobiles, aircraft, and ships. The measurement unit, which serves as the input for various sensors, supports strain gauges, DC voltages, thermocouples, etc., and can measure up to 80 points. In addition to waveform recording, real-time frequency analysis processing (optional) is possible. The control unit and up to 10 measurement units can be connected to be installed in a space-saving manner. In addition, the units can also be distributed and installed close to the sensors. The control unit is equipped with various interfaces, and various settings and measurement start are operated from a PC or the display unit. Using the built-in wireless LAN, operation and monitor display are possible using a tablet PC. In addition, by connecting the display unit, it is possible to control the multi-recorder in a stand-alone manner, including the setting of various units, measurement control, monitor, and setting file management.

System Block Diagram



TMR-311 (control unit)

Controls up to 80 input points (10 various measurement units), equipped with USB, LAN, and wireless LAN interfaces

This is a central unit of the multi-recorder compact multichannel data recording system. It controls various input/output units, supplies the power, and collects data. One unit of this equipment can perform measurement of up to 10 various input/output units, up to 80 points. Equipped with wireless LAN*1, its operation and monitoring are possible using a tablet PC.
*1: Wireless LAN is only available in Japan.

Supports SD cards of up to 32 GB capacity

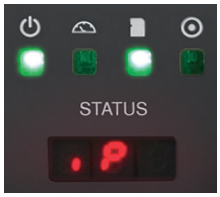
Measurement data is saved on an SD card. It supports SD cards of up to 32 GB capacity that enables long-time continuous data recording and supports recording in the high-speed mode of 0.01 ms.

Recording time of 16 GB SD card (included as standard)
Automatic measurement mode Free run
Sampling 1 ms

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

Three-digit, seven-segment LED to display the status of measuring instrument

The three-digit, seven-segment LED on the front of the TMR-311 displays the settings of IP address and errors, so the status of this unit can be checked easily.



Display contents of the seven-segment LED display
IP address
UPS charging rate
WLAN status
Serial number
SD card information
Power reduction
Error

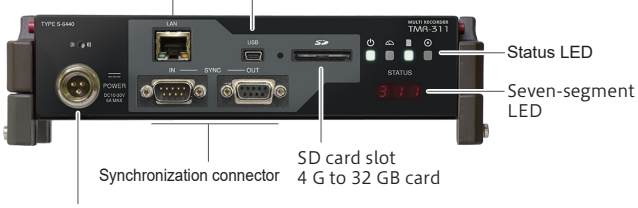
Histogram recording system

By adding the TMR-311-01 frequency analysis library (software option) to the control unit TMR-311, the multi-recorder system becomes a histogram recording system that digitally processes the measurement data according to a preset program and records it as a frequency count.
The frequency analysis result is recorded in real time, so the results can be checked immediately.

Front

LAN port
Connect to a PC using a LAN cable with RJ-45 connector. (For direct connection, a cross cable is used.)

USB port
Connect the CR-6187 USB cable included with this unit. Install the USB driver in the software included.



DC power connector
Connect the CR-10 DC power cable included with this unit. No power ON/OFF switch is provided. The unit operates at the same time when the power is connected.

TMR-311 control unit

Specifications (TMR-311)

Number of measuring points	Up to 80 points
Sampling	0.01 to 0.09 ms (0.01 ms increments) 0.1 to 0.9 ms (0.1 ms increments) 1 to 1000 ms (1 ms increments) 512 Hz, 1024 Hz, 2048 Hz, 4096 Hz, 8192 Hz
Data memory	128 M words (when used in the high-speed mode and no SD card inserted) The data is divided by the recording points in eight-point increments. When recorded eight points or less: 16 M data/point, when recorded 16 points or less: 8 M data/point When recorded 32 points or less: 4 M data/point, when recorded 64 points or less: 2 M data/point When recorded 80 points or less: 1.6 M data/point
Trigger function	
Data trigger	Data of arbitrary channel (Arbitrary input level, relative level from the start)
Command trigger	Command from interface
Timer trigger	Actual time, interval
External trigger	External trigger input from TMR-353
Synchronization of multiple units	Sampling and trigger synchronization up to TMR-311 x 4 sets (up to 320 points) Up to 100 m between control units
Recording media	SD card, 4 GB to 32 GB (SDHC high-speed mode, class 10)
Interface	LAN, USB, wireless LAN (AP mode, fixed IP)*1
Display	Status LED (Status display, IP address, etc.)
Power supply	DC 10 to 30 V, 0.6 A max (when 12 V is supplied, stand-alone) AC 100 to 240 V, 50/60 Hz, 100 VA max (when using the optional AC adapter CR-1895)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	29.4 m/s² (10-55 Hz) three directions
Outside dimension	200 (W) × 50 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 900 g (Including rubber protectors)

Standard accessories

Instruction Manual..... 1
Warranty certificate 1
Power cable (CR-10)* 1
Ground wire (CR-2020) 1
CR-6187 USB cable 1
SD card (16 GB) 1
TMR-7300 dynamic measurement software
RD-7300 real-time data recording software
RD-7300-E measurement data editing software (CD-ROM) ... 1
Software instruction manual (included in CD-ROM) 1

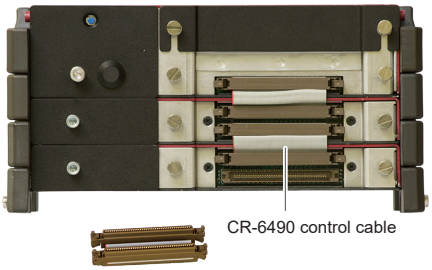
*CR-1011 is included for CE-compliant countries

Options

AC Adapter (CR-1897)
AC Adapter [For China] (CR-1897-C)

Back

The back of this unit is equipped with a flat cable connector for cascade connection of up to 10 measurement units. Connect using the CR-6490 control cable provided with the measurement unit.



TMR-381 (Display unit)

Stand-alone control of the TMR-311

Specifications for the TMR-381

Display unit	Color TFT LCD display, 320 x 240 dots (with touch panel)
Function	Various settings Control of measurement start / stop / balance Numerical monitor / waveform monitor Frequency monitor Measurement data display / frequency analysis result display
Interface	Dedicated I/F, LAN
Power supply	Supplied from TMR-311 using the dedicated I/F Or USB power feeding (Micro USB B connector)
Power supply voltage	DC 5 V
Consumption current	0.6 A max
Operating temperature / humidity range	0 to +50C° 5% RH or less (No condensation)
Outside dimension	200 (W) × 30 (H) × 110 (D) mm (Excluding protrusions)
Mass	Approx. 750 g (Including rubber protectors)

Standard accessories

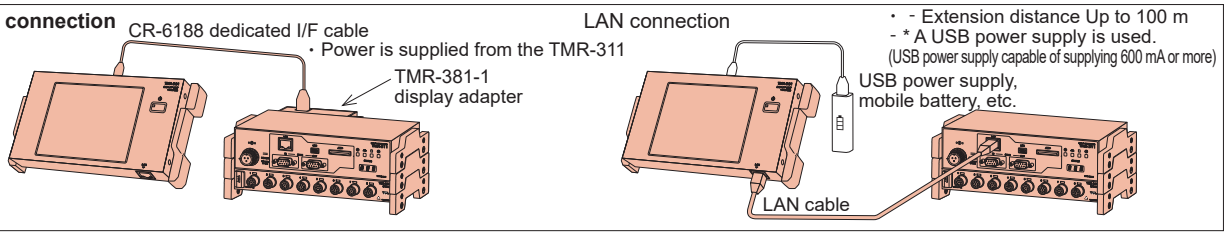
Instruction Manual	1
Warranty certificate	1
CR-6188 dedicated I/F cable	1
TMR-381-1 display adapter	1

TMR-381 display unit

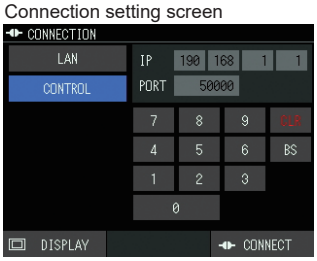
By connecting the TMR-381 display unit, it is possible to control the multi-recorder in a stand-alone manner, including the setting of various units, measurement control (balance / measurement start and stop / automatic measurement setting), monitor (T-Y Sweep / Y-T Cont. / X-Y / numerical / frequency) and setting file management. When using the dedicated I/F cable, no external power supply is required, and this unit is powered by the power supplied from the TMR-311 control unit. In addition, it also supports connection via a LAN cable, allowing for extension up to 100 m. As for power supply, it can be powered by a USB mobile battery. Additionally, the display unit is powered independently of the TMR-311 control unit. Even if the power supply of the display unit is turned OFF after automatic measurement was started, the measurement is continued. It is possible to connect when stopping the measurement or checking the data. Graph display of the measurement data recorded on an SD card and display of the frequency analysis result are possible.

Connection examples of the TMR-381 display unit

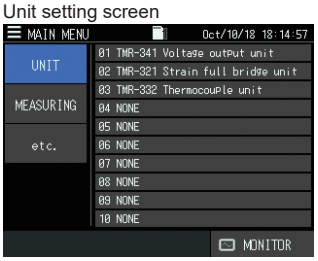
Control connection



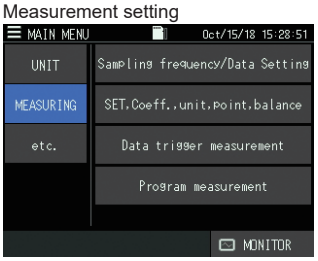
Connection setting screen



Unit setting screen



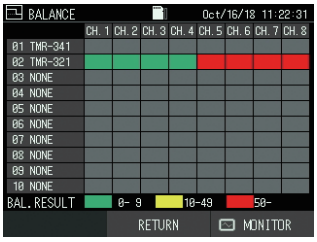
Measurement setting



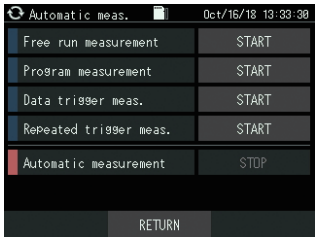
Others

Setting screen by unit

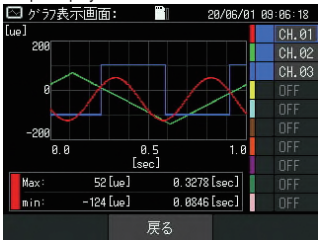
Balance result screen



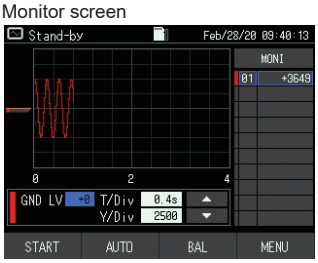
Automatic measurement menu



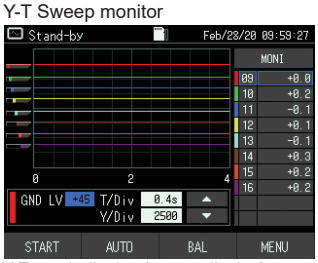
Graph display function of measurement data



Monitor screen

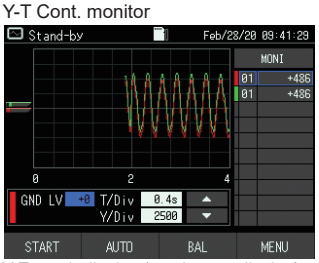


Y-T Sweep monitor



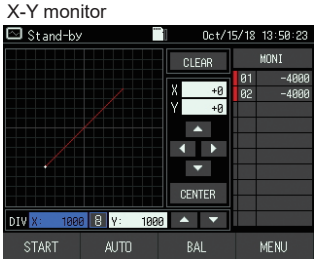
Y-T graph display (sweep display)

Y-T Cont. monitor



Y-T graph display (continuous display)

X-Y monitor



TMR-300 series (Various units)

TMR-321 strain 4G unit

Input unit for strain gauge type transducers and DC voltage
8 points/unit

TMR-321

Specifications for the TMR-321

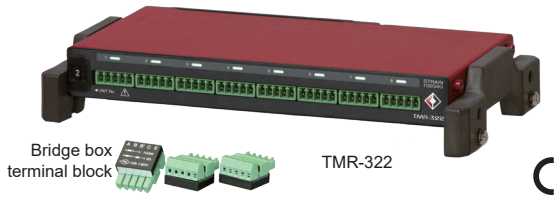
Number of measuring points	8 points
Input	Strain, voltage (when using option “CR-4010”)
Strain measurement	
Applicable gauge resistance	120 to 1000 Ω
Bridge excitation	DC 0.5 V, 2 V
Measurement range	± 20000 × 10^{-6} strain (Bridge excitation DC 2 V) ±80000 × 10^{-6} strain (Bridge excitation DC 0.5 V)
Measurement accuracy	± 20000/10000/5000 × 10^{-6} strain range ± 0.1% FS (at 23ºC ± 5C°) ± 2000 × 10^{-6} strain range ± 0.2% FS (at 23ºC ± 5C°)
Measurement range	± 20000/10000/5000/2000 × 10^{-6} strain range
Resolution	± 20000/10000/5000 × 10^{-6} strain range 1 × 10^{-6} strain (Bridge excitation 2 V) 4 × 10^{-6} strain (Bridge excitation 0.5 V) ± 2000 × 10^{-6} strain range 0.1 × 10^{-6} strain (Bridge excitation 2 V) 0.4 × 10^{-6} strain (Bridge excitation 0.5 V)
Balancing method	Electronic automatic
Balancing range	± 10000 × 10^{-6} strain
Balancing accuracy	± 3 × 10^{-6} strain or less
Zero stability	±1 × 10^{-6} strain/°C (at max. sensitivity)
Sensitivity stability	± 0.05%/°C (at max. sensitivity)
Voltage measurement	(When using the option CR-4010)
Measurement range	±20V
Measurement accuracy	± 20/10/5 V range ± 0.2% FS (at 23ºC ± 5°C) ± 2 V range ± 0.3% FS (at 23ºC ± 5°C)
Measurement range	± 20/10/5 V range (1 mV resolution) ± 2 V range (0.1 mV resolution)
Response frequency	DC to 10 kHz
Low-pass filter	
Cutoff frequency	Digital filter 1 Hz to 1 kHz (Can be set in 1 Hz increments) and PASS (Analog filter 10 kHz) -3 dB ± 1 dB
Cutoff property	1 Hz to 1 kHz: -12 dB/oct or -48 dB/oct Butterworth filter or Bessel filter PASS (10 kHz): -12 dB/oct Bessel filter
High-pass filter	
Cutoff frequency	Digital filter 0.2 Hz, 1 Hz and PASS
A/D converter	24bit
Display	Channel LED (Open, over, etc.) Unit number setting switch
Power supply	DC 10 V to 30 V, 0.2 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	29.4 m/s^2 (10-55 Hz) three directions
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 550 g (Including rubber protectors)

Standard accessories

Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1
CR-6186 sensor input conversion cable 8

TMR-322 strain 1G2G4G unit

Various strain measurement bridge circuit compatible one-gauge method, two-gauge method and four-gauge method



Bridge box terminal block

TMR-322

Specifications for the TMR-322

Number of measuring points	8 points
Input	Strain
Strain measurement	
Applicable gauge resistance	120 to 1000 Ω
Bridge excitation	DC 0.5 V, 2 V
Measurement range	± 20000 × 10^{-6} strain (Bridge excitation DC 2 V) ±80000 × 10^{-6} strain (Bridge excitation DC 0.5 V)
Measurement accuracy	± 20000/10000/5000 × 10^{-6} strain range ± 0.1% FS (at 23ºC ± 5C°) ± 2000 × 10^{-6} strain range ± 0.2% FS (at 23ºC ± 5C°)
Measurement range	± 20000/10000/5000/2000 × 10^{-6} strain range
Resolution	± 20000/10000/5000 × 10^{-6} strain range 1 × 10^{-6} strain (Bridge excitation 2 V) 4 × 10^{-6} strain (Bridge excitation 0.5 V) ± 2000 × 10^{-6} strain range 0.1 × 10^{-6} strain (Bridge excitation 2 V) 0.4 × 10^{-6} strain (Bridge excitation 0.5 V)
Balancing method	Electronic automatic
Balancing range	± 10000 × 10^{-6} strain
Balancing accuracy	± 3 × 10^{-6} strain or less
Zero stability	±1 × 10^{-6} strain/°C (four-gauge method, at max. sensitivity)
Sensitivity stability	± 0.05%/°C (four-gauge method, at max. sensitivity)
Response frequency	DC to 10 kHz
Low-pass filter	
Cutoff frequency	Digital filter 1 Hz to 1 kHz (Can be set in 1 Hz increments) and PASS (Analog filter 10 kHz) -3 dB ± 1 dB
Cutoff property	1 Hz to 1 kHz: -12 dB/oct or -48 dB/oct Butterworth filter or Bessel filter PASS (10 kHz): -12 dB/oct Bessel filter
High-pass filter	
Cutoff frequency	Channel LED (Open, over, etc.) Unit number setting switch
A/D converter	24bit
Display	Channel LED (Open, over, etc.) Unit number setting switch
Power supply	DC 10 V to 30 V, 0.2 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	29.4 m/s^2 (10-55 Hz) three directions
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 550 g (Including rubber protectors)

Standard accessories

Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1
Four-gauge terminal block 8
Small flathead screwdriver 1
SB-120T, SB-350T bridge box ..... 8 (factory selection)

TMR-323 carrier type strain unit

A carrier-type dynamic strain measurement unit ideal for measurement sites with a lot of induction noise, commercial power noise, etc.

TMR-323

CE

Specifications for the TMR-323

Number of measuring points		8 points
Input		Strain
Strain measurement		
Applicable gauge resistance		120 to 350 Ω
Bridge excitation		0.5 Vrms, 2 Vrms, 5 kHz
Measurement range		± 20000 × 10^{-6} strain (Bridge excitation 2 Vrms) ±80000 × 10^{-6} strain (Bridge excitation 0.5 Vrms)
Measurement accuracy		± 0.3% FS (at 23ºC ± 5C°)
Measurement resolution		1 x 10^{-6} strain (Bridge excitation 2 Vrms) 4 x 10^{-6} strain (Bridge excitation 0.5 Vrms)
Balancing range	Resistance	± 10000 × 10^{-6} strain
	Capacity	3000pF
Balancing method		Software type
Zero stability		± 0.1 × 10^{-6} strain/C° or less
Sensitivity stability		± 0.05% FS/ C° or less
Response frequency		DC to 2.5 kHz
Low-pass filter		
Cutoff frequency		Digital filter 5 Hz to 1 kHz (Can be set in 1 Hz increments) and PASS (Analog filter 2.5 kHz) -3 dB ± 1 dB
Cutoff property		5 Hz to 1 kHz: -48 dB ± 1 dB/oct Butterworth filter or Bessel filter PASS (2.5 kHz): Butterworth filter
High-pass filter		
High-pass filter		Digital filter 0.2 Hz, 1 Hz and PASS
A/D converter		18-bit
Display		Channel LED (Set, over, etc.) Unit number setting switch
Power supply		DC 10 V to 30 V, 0.3 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range		0 to +50C° 85% RH or less (No condensation)
Vibration tolerance		29.4 m/s^2 (10-55Hz) three directions
Outside dimension		200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)
Mass		Approx. 660 g (Including rubber protectors)

Standard accessories

Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1
CR-6186 sensor input conversion cable 8

TMR-331 voltage input unit

Measures DC voltage ± 52 V

TMR-331

CE

Specifications for the TMR-331

Number of measuring points	8 points (BNC connector)
Input	Voltage
Input method	Single end (unbalanced) Inter-channel insulation
Input impedance	About 100 kΩ
Measurement range	± 52 V
Measurement accuracy	± 0.2% FS (at 23ºC ± 5C°)
Measurement range	± 52 V range (5 mV resolution) ± 20 V range (2 mV resolution) ±10 V range (1 mV resolution) ± 5 V range (0.5 mV resolution) ±1 V range (0.1 mV resolution)
Zero stability	± 0.1 mV/°C (at max. sensitivity)
Sensitivity stability	± 0.05%/°C (at max. sensitivity)
Response frequency	DC to 10 kHz
Low-pass filter	
Cutoff frequency	Digital filter 1 Hz to 1 kHz (Can be set in 1 Hz increments) and PASS (Analog filter 10 kHz) -3 dB ± 1 dB
Cutoff property	1 Hz to 1 kHz: -12 dB/oct Butterworth filter or Bessel filter PASS (10 kHz): -12 dB/oct Bessel filter
A/D converter	24-bit
Display	Channel LED (Set, over, etc.) Unit number setting switch
Power supply	DC 10 V to 30 V, 0.25 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	29.4 m/s^2 (10-55 Hz) three directions
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 550 g (Including rubber protectors)

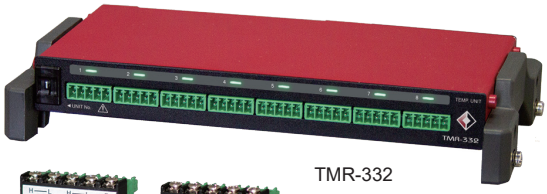
Standard accessories

Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1

TMR-300 series (Various units)

TMR-332 thermocouple voltage unit

Temperature measurements with thermocouples T, K and J, and measurements of DC voltage ± 20 V



TMR-332

TA-02T thermocouple measurement terminal block

VA-02T voltage measurement terminal block

Specifications for the TMR-332

Thermocouple measurement		
Number of measuring points	8 points (when using the thermocouple measurement terminal block)	
Applicable thermocouple	T, K, J	
Measurement range	T	-200 to 400C°
	K	-200 to 1300C°
	J	-200 to 1200C°
Measurement range	T	-200 to 400°C 0.1°C resolution
	K, J	-200 to 600°C 0.1°C resolution
		-200 to 1300°C 0.2°C resolution
Measurement accuracy	External reference junction	± (0.5% rdg + 1C°) (23C°± 5C°) ± (0.5% rdg + 2C°)
	Internal reference junction	± (0.5% rdg + 1.5C°) (23C°± 5C°) ± (0.5% rdg + 2.5C°)
Response frequency	DC to 10 Hz	
Linearization	Digital calculation	
Voltage measurement		
Number of measuring points	8 points (when using the voltage measurement terminal block)	
Input method	Single end (unbalanced) Inter-channel insulation	
Input impedance	About 100 kΩ	
Measurement range	± 20 V	
Measurement range	± 20 V range, 2 mV resolution	
Measurement accuracy	± 0.5% FS	
Zero stability	± 2 mV/°C (at max. sensitivity)	
Sensitivity stability	± 0.05%/°C (at max. sensitivity)	
Response frequency	DC to 10 kHz	
Low-pass filter		
Cutoff frequency	Digital filter 1 Hz to 1 kHz (Can be set in 1 Hz increments) and PASS (Analog filter 10 kHz) -3 dB ± 1 dB	
Cutoff property	1 Hz to 1 kHz: -12 dB/oct Butterworth filter or Bessel filter PASS (10 kHz): -12 dB/oct Bessel filter	
A/D converter	24-bit	
Display	Channel LED (Set, over, etc.) Unit number setting switch	
Power supply	DC 10 V to 30 V, 0.25 A max (12 V) (Supplied from TMR-311)	
Operating temperature / humidity range	0 to +50C° 5% RH or less (No condensation)	
Vibration tolerance	29.4 m/s^2 (10-55 Hz) three directions	
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)	
Mass	Approx. 550 g (Including rubber protectors)	

Standard accessories

Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1
TA-02T thermocouple measurement terminal block 4
VA-02T voltage measurement terminal block 4

Thermocouple measurement terminal block "TA-02T"

Number of measuring points	2 points
Applicable thermocouple	T, K, J
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Outside dimension	42 (W) × 14 (H) × 25 (D) mm (Excluding protrusions)
Mass	Approx. 20 g

Voltage measurement terminal block "VA-02T"

Number of measuring points	2 points
Input impedance	About 100 kΩ
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Outside dimension	42 (W) × 14 (H) × 25 (D) mm (Excluding protrusions)
Mass	Approx. 20 g

TMR-341 voltage output unit

Performs analog conversion of strain and temperature data measured by other measurement units to output as voltages.

TMR-341

* Connect the voltage output unit directly below the control unit.

Specifications for the TMR-341

Number of output points	8 points (BNC connector)
Output signal	Voltage output of the measurement data of another measurement unit (corresponding measuring points are set arbitrarily), output of addition/ subtraction results for up to 4 points
Output level	±10 V, ± 5 V, 0 to +5 V (5 kΩ load)
Output accuracy	± 0.5% FS
Calibration output	Arbitrary output at zero and within the output level range
Output accuracy	± 0.5% FS
S/N ratio	50 dBp-p or more (for maximum output 10 V)
Zero stability	± 0.5 mV/C°
Sensitivity stability	± 0.05%/°C
Display	Channel LED (Set, over, etc.) Unit number setting switch
Power supply	DC 10 V to 30 V, 0.3 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	29.4 m/s^2 (10-55 Hz) three directions
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 550 g (Including rubber protectors)

Standard accessories

Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1

TMR-351 CAN unit

Built-in CAN interface allows data recording / output via CAN bus

Simultaneous measurements of vehicle integrated control signals and acceleration / torque / stress are possible, enabling analysis of control systems.

TMR-351

CAN signal
Data reception Number of recordable IDs: 0 to 64
Data transmission Number of signals: 0 to 8

Specifications for the TMR-351

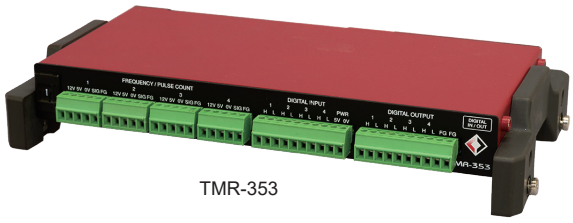
Supported protocol	CAN Specification V2.0B active compliant ISO 11898 (High Speed)
Communication speed	10 k to 1 Mbps
Number of messages	Up to 64 (Receiving: up to 64, sending: up to 62)
Number of signals	Up to 512
Data receiving	Records the message with the specified ID Number of recordable IDs: 0 to 64 Data length: 1 to 8 Byte When monitoring / recording with TMR-311, up to 80 signals (80 channels) (The maximum number of recordable signals depends on the unit configuration.)
Data sending	Data output of the specified channels Potential output of data 0 to 64 Data length: 16-bit (2 Byte)
Recording	Up to 32 Mbytes (Internal RAM) After recording data of other measurement units with TMR-311, all messages are recorded separately.
Function	Data bit specification, endianness setting For the sent message, data frame, remote frame, or return when receiving remote frame can be selected. The message sending cycle can be selected. The listen-only mode can be selected.
Display	Unit number setting switch CAN SIGNAL: CAN bus signal RECEIVE: Receiving SEND: Sending
Connector	D-Sub 9-pin connector (male) CAN input withstand voltage -27 V to 40 VDC (max)
Power supply	0.5 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	29.4 m/s² (10-55 Hz) three directions
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 530 g (Including rubber protectors)

Standard accessories

- Operation manual (A3 folded in one-eighth)..... 1
- Warranty certificate 1
- CR-6490 control cable 1
- CR-6480 CAN power cable 1

TMR-353 digital I/O unit

Equipped with functions for counting and frequency conversion of digital pulse signals of rotary encoders, speed sensors, etc. In addition, digital inputs and outputs required for various measurements, such as trigger (measurement start) signal input, sampling clock signal input/output and alarm (upper and lower limit setting) output, are possible.



TMR-353

Specifications for the TMR-353

Frequency measurement and pulse count part			
Number of input points	4 points		
Input signal waveform	Rectangular wave or sine wave		
Maximum input voltage	±15 V		
Measurement voltage range	Minimum input signal: 50 mVp-p	Maximum input signal: ±12 V	
Response frequency	1 Hz to 100 kHz		
Threshold level	Low	High level +15 mV	Low level -15 mV
	Middle	High level +100 mV	Low level -100 mV
	High	High level +1.0 V	Low level -1.0 V
	Digital	TTL, CMOS	
	Arbitrary	Setting range: ±10 V	Can be set in 0.1 V increments
Threshold level accuracy	±15 mV: ± (15 mV + 5 mV) Other than the above: ± (1% rdg + 50 mV)		
Frequency measurement accuracy	± 0.1% FS		
Frequency range	100 kHz range (10 Hz resolution), 50 kHz range (5 Hz resolution), 10 kHz range (1 Hz resolution), 5 kHz range (0.5 Hz resolution), 1 kHz range (0.1 Hz resolution), 500 Hz range (0.05 Hz resolution), 100 Hz range (0.01 Hz resolution)		
Power output	Output voltage: 5 V/12 V Output current: 5 V/50 mA, 12 V/25 mA (It is not possible to use 5 V and 12 V at the same time.)		
Count range	0 to 29,999 count 0 to 899,999,999 count (1CH + 2CH, 32-bit counter mode)		
Function	Frequency measurement, count measurement, rotary encoder calculation A-phase/B-phase count calculation, A-phase/B-phase/Z-phase angle calculation		
Digital input part			
Number of input points	4 points		
Insulation method	Photocoupler insulation		
Maximum applied voltage	15 V		
Operating current	4 mA to 25 mA		
Input pulse width	0.5 ms or more (Response frequency: 1 kHz or less), negative logic		
Power output	Output voltage: 5 V Output current: 50 mA		
Function	Trigger input, external sampling input, marker signal input, balance signal input, calibration output signal input (zero/+/-), measurement start (RUN), measurement stop (HALT), measurement pause (PAUSE) (Can be set arbitrarily for each input)		
Digital output part			
Number of output points	Trigger signal output: 1 point	Sampling signal output: 1 point	
	Alarm (upper limit): 1 point	Alarm (lower limit): 1 point	
Output format	Open collector output Maximum applied voltage: 15 V Maximum load current: 5 mA Maximum voltage when ON: 0.5 V or less		
Sampling output	Output signal frequency: 1 kHz or less		
Display	Unit number setting switch		
Power supply	0.5 A max (12 V) (Supplied from TMR-311)		
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)		
Vibration tolerance	29.4 m/s² (10-55 Hz) three directions		
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)		
Mass	Approx. 550 g (Including rubber protectors)		

Standard accessories

- Operation manual (A3 folded in one-eighth)..... 1
- Warranty certificate 1
- CR-6490 control cable 1
- Small flathead screwdriver 1
- Frequency/pulse count terminal block 4
- Digital input/output terminal block 2

TMR-300 series (Various units)

TMR-354 GPS unit

Records a satellite-based positioning system, such as the GPS, and time adjustment using the GPS is also possible.
Behavior understanding during long-distance transport using position information and timing synchronization with other equipment and images using accurate time data are possible.

TMR-354

Related Products

GPS receiver --- TMR-GPSC

* Contact us for compatible GPS receivers.

Specifications for the TMR-354

Maximum number of connectable units	1 unit for TMR-311
Supported GPS receiver	General-purpose RS-232C type Communication speed: 11520 bps NMEA protocol (without power supply) CAN type Communication speed: 250 kbps (with power supply)
Position measurement accuracy	GPS/Galileo/GLONASS/BeiDou Positioning accuracy: 2.5 m CEP Update cycle: 1 Hz * Depends on the GPS receiver used.
GPS data	Longitude in 0.0000001° units, latitude in 0.0000001° units Altitude in 1 m units, time in 0.1 sec units, speed in 0.1 km/h units, distance in 1 m units, azimuth direction in 0.1° units *Depends on the GPS receiver used.
GPS time adjustment	TMR-311 time adjustment with the GPS time data * The regional time is used.
Data receiving	Recording of the received GPS data When monitoring / recording with TMR-311, the GPS data is selected. (The maximum number of recordable data depends on the unit configuration.)
Recording	Up to 32 Mbytes (Internal RAM) After recording data of other measurement units with TMR-311, all GPS data are recorded separately.
Function	Setting of channels to be monitored / recorded Setting of recording format Setting of regional time Setting of the TMR-311 time adjustment
Display	Unit number setting switch STATUS: GPS receiver signal RECEIVE: Receiving
Connector	D-Sub 9-pin connector (male) RS-232C compliant x 1 CAN compliant x 1
Power supply	0.2 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range	0 to +50C° 5% RH or less (No condensation)
Vibration tolerance	29.4 m/s² (10-55 Hz) three directions
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 530 g (including rubber protectors)

Standard accessories

Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1
* GPS receiver and connection cable are sold separately.

TMR-361 charge amplifier unit

Compatible with piezoelectric accelerometers that are characterized by high frequency characteristics and a high operating temperature range.

TMR-361

Specifications for the TMR-361

Number of input points	4 points	
Compatible piezoelectric accelerometer	Charge output accelerometer, charge sensitivity 0.1 to 10 pC (m/s²)	
Input connector	10-32UNF miniature connector	
Allowable charge input	10000 pC	
Measurement accuracy	± 3% FS (100 Hz, at 23ºC ± 5C°)	
Measurement range	250 pC range	0.01 pC resolution Equivalent to 250 m/s² at charge sensitivity 1 pC/(m/s²)
	2500 pC range	0.1 pC resolution Equivalent to 2500 m/s² at charge sensitivity 1 pC/(m/s²)
	10000 pC range	0.4 pC resolution Equivalent to 10000 m/s² at charge sensitivity 1 pC/(m/s²)
Response frequency	1 Hz to 10 kHz	

Low-pass filter	
Cutoff frequency	Digital filter 1 Hz to 1 kHz (Can be set in 1 Hz increments) and PASS (Analog filter 10 kHz) -3 dB ± 1 dB
Cutoff property	1 to 1 kHz: -12dB ± 1 dB/oct Butterworth filter or Bessel filter PASS (10 kHz): Bessel filter
High-pass filter	
Cutoff frequency	Digital filter 1 Hz fixed
Display	Channel LED (Set, over, etc.) Unit number setting switch
Power supply	0.35 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	29.4 m/s² (10-55 Hz) three directions
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 550 g (including rubber protectors)

Standard accessories

Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1

Connector shapes of compatible accelerometers
The input connector of the TMR-361 is a 10-32UNF miniature connector. It can be connected if the cable connector of the charge output accelerometer is the 10-32UNF (male type).

TMR-362 IEPE unit

This is an IEPE sensor unit designed for use with the TMR-300 Series Multi Recorder.
It is compatible with ICP® / IEPE Sensors.
***IEPE: Integrated Electronic Piezo-Electric.**

TMR-362

- Supports up to 4 measurement channels
- Two selectable measurement ranges: ±5000 mV and ±500 mV (for high-resolution measurements)
- High-speed mode with a maximum sampling rate of 1 MHz and frequency response up to 100 kHz

Specifications for the TMR-362

Number of measuring points		4
Applicable Sensors		Integrated Piezoelectric Sensors with Built-in Amplifier (IEPE)
Input Connector		BNC Connecto
Sensor Power Supply		Constant Current Supply (4 mA, DC 24 V)
Measuring range		±5000 mV
Measurement Accuracy		±3%FS (at 23±5C°)
Measurement Range		±5000 mV range ±500 mV range
Resolution		0.25 mV resolution (at ±5000 mV range) 0.025 mV resolution (at ±500 mV range)
Frequency Response		0.02Hz to 100kHz
Low-Pass Filter	**Cutoff Frequency**	Digital Filter 10 Hz to 10 kHz (adjustable in 10 Hz increments) and PASS (analog filter at 100 kHz) -3 dB ±1 dB
	Cutoff Characteristics	10 Hz to 10 kHz: -12 dB/oct or -48 dB/oct Butterworth or Bessel filters PASS (100 kHz): -12 dB/oct Bessel filter
A/D Converter		16bit
Sampling Rate		Low Speed 0.01msec to 0.09msec 0.1msec to 0.9msec 1msec to 1000msec High Speed 0.001 msec (1MHz) 0.002msec (0.5MHz) 0.005msec (0.2MHz)
Data Memory (Used when sampling interval is less than 0.01 ms)		16M Words (divided among channels) Recording 1 channel: 16M data points per channel Recording 2 channels: 8M data points per channel Recording 4 or fewer channels: 4M data points per channel
Display		Channel LEDs (e.g., Set, Overload indicators) Unit Number Setting Switch
Power Supply		0.4 A MAX (12 V) (Supplied from TMR-311)
Operating Temperature and Humidity Range		0 to +50C°, up to 85% RH (non-condensing)
Vibration Resistance		29.4 m/s^2 (10–55 Hz), 3 direction
Dimensions		200 (W) × 25 (H) × 100 (D) mm (excluding protrusions)
Weight		Approx. 550 g (including rubber protector)

Standard accessories

Operation manual (A3 folded in one-eighth) ····· 1
Warranty certificate ····· 1
CR-6490 control cable ····· 1

* After recording, data is transferred to the control unit, so continuous measurement is not possible.
When the maximum memory is full, each unit requires about 10 minutes before the next measurement.
Sampling below 0.01 ms prevents recording from other units.

Note: Synchronized measurement with multiple TMR-311 units is not supported.

TMR-300 series (Various units)

TMR-371 distribution unit

The measurement units are distributed to realize a wide range of dynamic measurements.

TMR-371

The TMR-371 distribution unit and the TMR-371-1 distribution adapter are units that enable distribution and extension of the measurement units of the TMR-300 series. By connecting the distribution unit to the control unit and connecting the distribution adapter to the measurement unit to be extended, the distance between the control unit (distribution unit) and the measurement unit (distribution adapter) can be extended up to 100 m.
Up to 10 measurement units can be connected to one distributed unit. With 10 measurement units distributed and extended, sampling of up to 100 kHz is possible, the same as when not extended. Since power supply to the measurement units is performed from the distribution unit via the connection cables, one connection cable enables communication, synchronization, and a power supply.

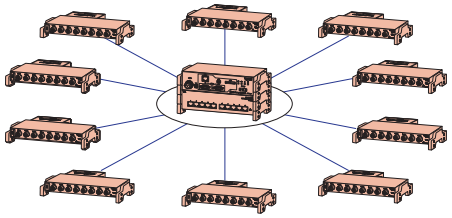
Specifications for the TMR-371

Number of distribution unit connections	1 unit (for 1 unit of the TMR-311)
Number of measurement unit connections	10 units (including the measurement unit that is connected directly to TMR-311)
Power supply	0.2 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	29.4 m/s^2 (10-55 Hz) three directions
Outside dimension	200 (W) × 50 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 800 g (including rubber protectors)

Standard accessories

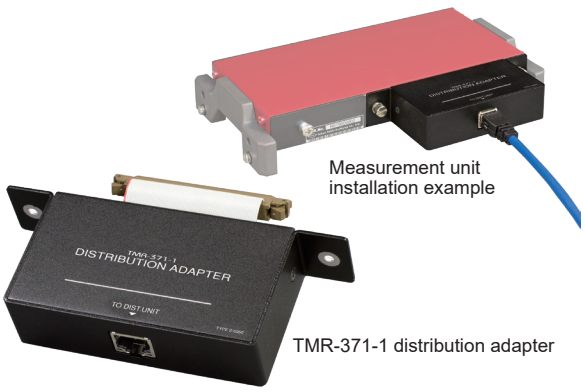
Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1

- Measurement units can be distributed and arranged in a star configuration.
  The distance between the TMR-371 distribution unit and each measurement unit (TMR-371-1 distribution adapter) can be extended (up to 100 m) using the STP cable, and synchronized measurements of sensors scattered over a wide area is realized easily.
- Power supply from the distribution units
  Each distributed and allocated measurement unit is powered by the power supply from the TMR-371 distribution unit, so there is no need to install power supply equipment.
- Wiring saving
  Since the measurement unit can be allocated near the sensor, wiring saving of the sensor cables is possible and the digital signal from the measurement unit enables stable measurement.
- The number of measurement unit connections is up to 10 units.
  Up to 10 units in total including the measurement units between the control units can be connected. In addition, one distribution unit can be connected to one control unit.



TMR-371-1 distribution adapter

Extends the distance between the distribution unit and the measurement unit to up to 100 m.
Wiring saving is possible because the measurement unit can be installed near the sensors.



Measurement unit installation example

TMR-371-1 distribution adapter

Specifications for the TMR-371-1

Number of distribution adapter connections	10 units (for one unit of the TMR-371)
Number of measurement unit connections	1 unit
Extension distance	100 m
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Vibration tolerance	29.4 m/s^2 (10-55 Hz) three directions
Outside dimension	130 (W) × 25 (H) × 50 (D) mm (Excluding protrusions)
Mass	Approx. 150 g

Standard accessories

Warranty certificate 1

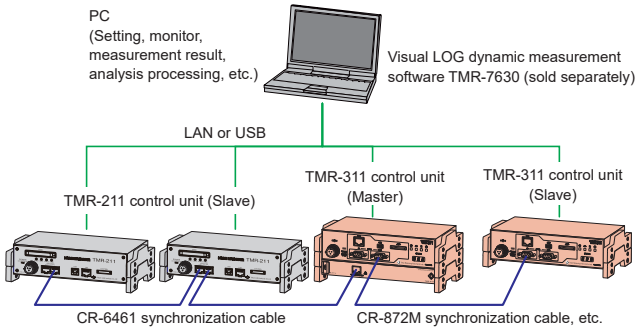
TMR-372 synchronization unit

Realization of synchronized measurement with the TMR-211

TMR-372

Connection of synchronization unit

The TMR-372 synchronization unit is a unit that enables synchronized measurement of the TMR-300 series and the TMR-200 series. By combining the TMR-211 control units, sampling and trigger synchronized measurement of up to four units is possible.



Specifications for the TMR-372

Synchronizable unit	TMR-211
Number of the TMR-211 connections	Up to 3 units
Synchronization of multiple units	Up to 4 units (including master) • TMR-311 x 1 + TMR-211 x 3 • TMR-311 x 2 + TMR-211 x 2 • TMR-311 x 3 + TMR-211 x 1 * Only one TMR-372 can be used in one system. When there are multiple TMR-311s, connect them to the master side. * As for the TMR-311 to which TMR-372 is connected, the number of units that can be connected is limited to 9.
Delay time	When measurement is started from the TMR-311 with the fastest sampling rate of 100 kHz (10 µs), the TMR-311 data will be delayed by 390 µs relative to the TMR-211 data. When measurement is started from the TMR-211, the TMR-311 data will be delayed by 350 µs relative to the TMR-211 data.
Display	Unit number setting switch
Power supply	0.25 A max (12 V) (Supplied from TMR-311)
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Earthquake resistance	29.4 m/s² (10-55 Hz) three directions
Outside dimension	200 (W) × 25 (H) × 100 (D) mm (Excluding protrusions)
Mass	Approx. 500 g (Including rubber protectors)

Standard accessories

Operation manual (A3 folded in one-eighth)..... 1
Warranty certificate 1
CR-6490 control cable 1
CR-6461 synchronization cable 1

* When using the synchronization unit, use the TMR-7630 measurement software.

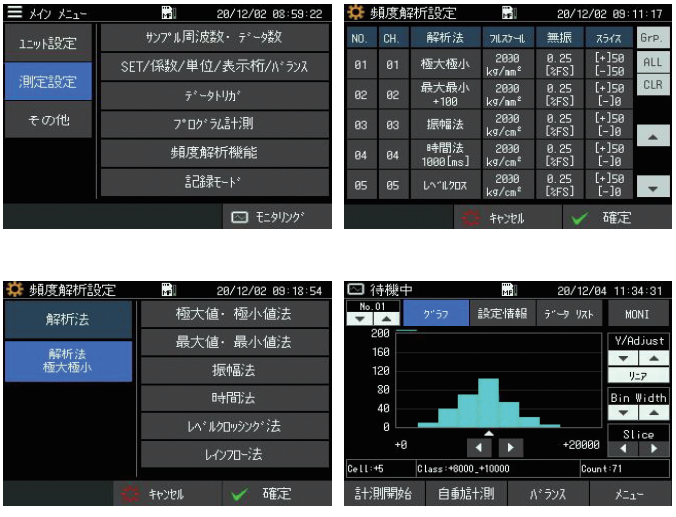
TMR-311-01 frequency analysis library (Software option of the TMR-311)

This is a software option to add the frequency analysis function to the TMR-300 multi-recorder system series. It realizes a histogram recording system that digitally processes measurement data according to a pre-set program and records it as a frequency count.
Before conducting measurements, it is necessary to see the frequency measurement. Specify the channel to perform frequency measurement and set the analysis method, slice level, full scale, etc. Frequency measurement can perform up to 80 analyses in low-speed mode with a sampling interval of 1 ms or more. In addition, it is also possible to set multiple analysis methods for the same channel.

Specifications for the TMR-311-01

Analysis method	Peak-valley method, max-min method, time method, amplitude method, level crossing method, rain flow method
Number of analyzes	80 analyses (arbitrary channel)
Number of slices	Up to 100 (Arbitrary setting for up to 100 slices within the range of ±100)
Full scale	200 to 20000 x 10^{-6} strain
Count capacity	About ± 4.2 billion count / slice
Invalid amplitude	4 to 5000 x 10^{-6} strain (Effective for analyses other than the time method)
File function	File recording frequency data (Frequency data files at regular intervals and cumulative frequency data files can be created)

*As analysis conditions, the sampling speed is slower than 1 ms and an SD card is inserted.



Frequency measurement setting screen and graph display screen using the TMR-381 display unit

TMR-300 series (Various units)

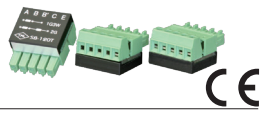
Related Products (For multi-recorders)

CR-1897 *AC Adapter for China (CR-1897-C)

This product connects the TMR-311 to AC 100 V to supply the power.

SB-120T / SB-350T bridge box

This is a bridge box for the TMR-322 strain 1G2G4G unit.



Number of measuring points	1 point
Applicable gauge resistance	120 Ω (SB-120T) 350 Ω (SB-350T)
Wiring method	one-gauge method three-wire type, two-gauge method
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Outside dimension	20 (W) × 14.5 (H) × 25 (D) mm (Excluding protrusions)
Mass	Approx. 10 g

Handle

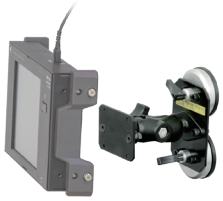
This is a handle for transport and fixing.
(Dedicated screws included)

Bracket

This is an L bracket for installation.
(Dedicated screws included)

Display unit mounting stand

Attraction type stand
This is an attraction stand that fixes the display unit to the windshield, etc.
(Dedicated screws included)



Tilt type fixing stand
This stand is installed on the recorder main unit and the angle of the display unit can be adjusted freely. (Dedicated screws included)

CR-4010 attenuator cable

This cable is used when performing voltage measurements with the TMR-321.
Voltage measurement range: ± 20 V

BNC connector

Extension control cable

This cable is used to extend the connection between the control unit and the measurement unit. It can be used up to extension of 5 m in total.

CR-6491

Model name	Cable length
CR-6491	1 m
CR-6493	3 m
CR-6495	5 m

Distribution adapter extension cable (STP cable)

This is an STP (Shielded Twisted Pair) cable that connects the TMR-371 distribution unit and the TMR-371-1 distribution adapter. It can be extended up to 100 m.

CR-8899

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

Control unit synchronization cable

This is a synchronization cable that connects between the TMR-311 control units. It can be extended up to 100 m.

CR-8701

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

Attached Software

TMR-7300 Dynamic measurement software

The TMR-7300 dynamic measurement software controls one TMR-311 and can perform online and offline measurements. It is possible to perform data monitoring, data collection, data editing (table creation, drawing), data processing, and calculations using expansion CHs. In offline measurement, it is possible to perform the free-run, data trigger and program measurements.

RD-7300 real-time data recording software

The RD-7300 real-time data recording software collects and records the data measured by the TMR-300 series directly to a PC. It can perform long-time and large-capacity measurements without depending on the data memory or SD card capacity of the TMR-311. In addition, the RD-7300-E measurement data editing software, which is also attached, is used for data processing.

RD-7300-E measurement data editing software

This software is used to perform data processing such as management of data files recorded by the RD-7300, batch processing of multiple data files and drawing

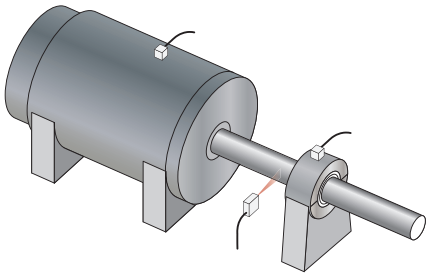
Compatible software	Standard attached software	Optional software
Dynamic measurement software	TMR-7300	MR-7630 TMR-7630-H (Frequency processing) TMR-7630-M (Video compatible)
Real-time data recording software	RD-7300	RD-7640
Measurement data editing software	RD-7300-E	WF-7630

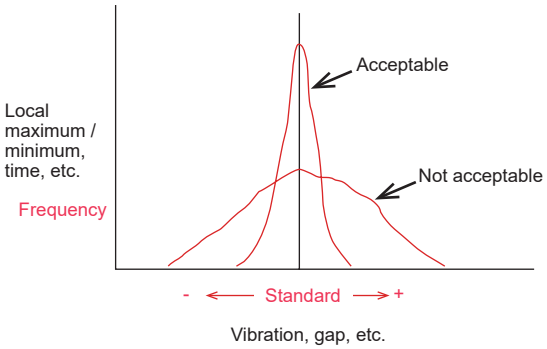
Stress Frequency Analysis

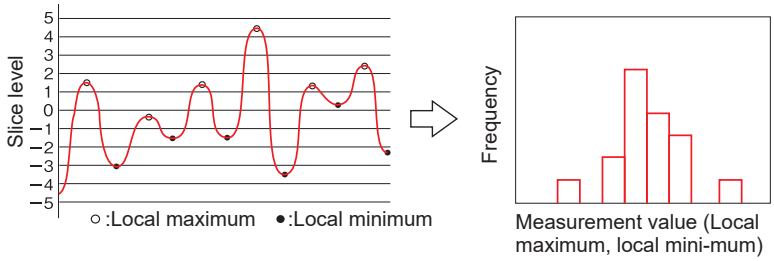
What is frequency analysis?

There are many phenomena around us that change over time. There are many cases where the physical quantities handled by measuring instruments change over long periods of time, such as the behavior of machine / structure, or changes in the surrounding environment, such as temperature and humidity. In order to accurately grasp the meanings of such quantities, it is necessary to know not only the change in waveform but also the frequency distribution and the correlation between two quantities. That is, what quantities and proportions occurred in changing phenomena over a long period of time, or how two phenomena occurred with what relationship.

For example, when the bearings of a rotating machine deteriorate, phenomena, such as greater variation in the gap between the rotor and stator and increased vibrations associated with rotation appear. Frequency analysis can be used to quantitatively grasp the phenomena to determine whether or not the parts need to be replaced or repaired. Accelerometers are used to measure vibrations and gaps, and the frequencies of local maximum / minimum valuesand time frequency are obtained. By reading out the frequencies at regular intervals, when the distribution exceeds a certain range, it can be determined that a repair is required. Therefore, the analysis is effective to optimize the replacement timing of machine parts.







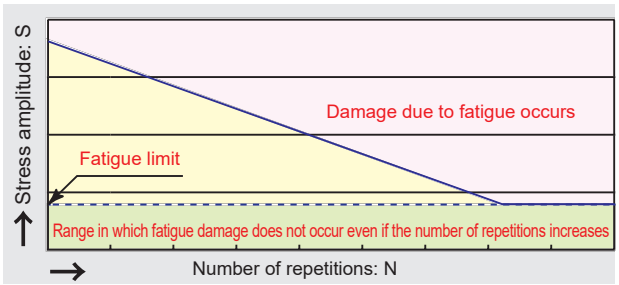
When considering commonly existing phenomena like this, a histogram, or frequency distribution, has very important implications.
In order to know the frequency distributions of various phenomena, physical quantities are continuously measured by suitable sensors and recorded on a recorder. Next, the required frequency distribution is calculated from the quantities, but this is usually a very complicated task. Typically, the longer the measurement time, the greater the amount of processing, and the analysis also takes a considerable amount of time.
Frequency analysis using spreadsheet software is a complicated and time-consuming task. We offer various measurement software programs equipped with frequency processing functions. By using the TMR-7630-H dynamic measurement software (frequency processing), the WF-7630-H waveform processing software (frequency processing), and the DFA-7610 FFT analysis processing software, frequency analysis can be performed in post-processing from the data recorded by dynamic strainmeters, such as a multi-recorder.

The histogram (frequency) of the stress generated in a member is obtained by frequency analysis of dynamic waveform data recorded by dynamic strainmeters.
The TMR-300 multi-recorder system series offers a Frequency Analysis Library (optional) that eliminates such time and labor and records the frequency analysis results in real time. The histogram recording system function with which a histogram can be obtained immediately after measurement with simple initial settings is added to the multi-recorder. Once measurement is started, data is collected continuously, and the specified analysis processing is performed at the same time. The processed data is recorded in the form of counts for each level of physical quantity. Long-term measurement exceeding a year is also possible.

Fatigue Life Estimation and Features

Stress frequency measurement reveals the frequency distribution of stress intensity occurring in a member.
It is possible to evaluate the presence or absence of damage to the member, the effectiveness of repair, and the degree of fatigue damage (estimation of fatigue life) using the cumulative fatigue damage law.
The fatigue life when subjected to an irregular fluctuating load can be estimated using the cumulative fatigue damage law from the frequency processing result of the actual operating waveform generated in the member and the and S-N diagram.

The S-N diagram is data that shows the number of times a material breaks because of repeated stress for each stress value. Various levels of stress are applied to actual structures, and the magnitude and number of times are quantified to give the stress frequency result. The degree of cumulative fatigue damage is the result of accumulating damage from each level of stress and the number of repetitions, and when the cumulative value reaches 1, the member will be destroyed. The presumption leading the destruction is made by stress frequency measurement.



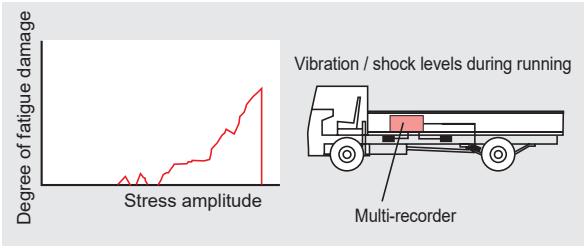
Fatigue S-N diagram

Stress Frequency Analysis

Application Examples of Histogram Recording

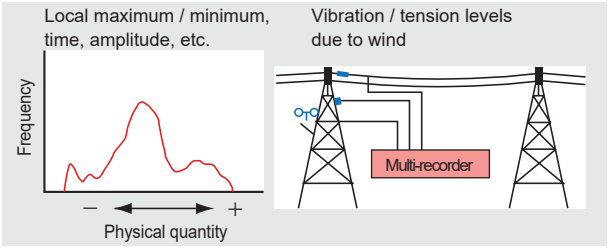
● Estimation of material fatigue life

It is well known that a material eventually breaks when repeatedly subjected to a load above a certain level, and that there is a certain relationship between the magnitude of the load that causes the destruction and the number of repetitions. Random loads are constantly acting on the members that make up vehicles, machines, building structures, etc. and it is important to know what sort of fatigue damage these loads cause to the members. By measuring the actual operating stress that a material is subjected to and performing frequency analysis, it is possible to evaluate the fatigue life from the S-N diagram of the material and the linear cumulative damage law.



● Behavioral measurement of structures

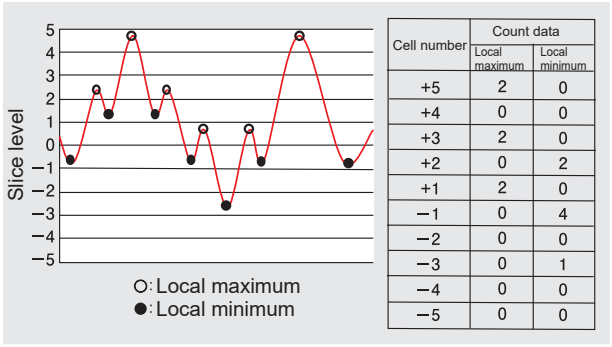
Outdoor structures, such as steel towers, are subject to various influences from weather conditions. By using appropriate sensors and multi-recorder system, frequency data on wind speed, direction and temperature can be obtained, along with the stress of structural member, wire tension, and vibration. Data on the micromotions that occur in normal times, maximum tension that occur during strong winds, and vibrations are obtained in the form of organized histograms. Therefore, it is useful for measuring the behavior of structure under actual operational conditions.



Main Frequency Analysis Methods

● Peak-valley method (PEAK-VALLEY)

This method is used to measure quantities that fluctuate in a short period, such as mechanical vibrations.



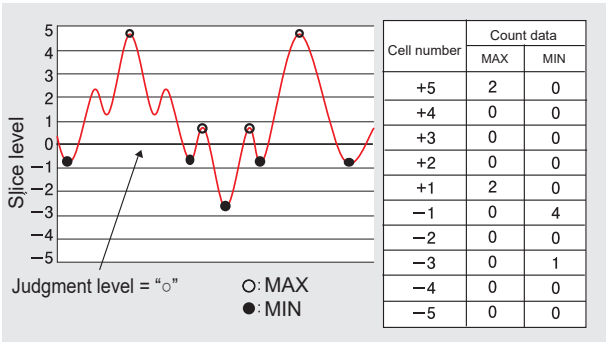
Cell number	Count data	
	Local maximum	Local minimum
+5	2	0
+4	0	0
+3	2	0
+2	0	2
+1	2	0
−1	0	4
−2	0	0
−3	0	1
−4	0	0
−5	0	0

Local maximum
When the signal wave changes from a positive slope to a negative slope, this is defined as a local maximum. When the local maximum is positive, the frequency of the local maximum between slice levels N-1 and N is accumulated in cell number N. When the local maximum is negative, the frequency of the local maximum between slice levels N+1 and N is accumulated in cell number N. In practice, by setting invalid amplitude X, the data is valid only when it reaches amplitude X+1 or more on a positive slope and then reaches amplitude of X+1 or more on the next negative slope.

Local minimum
When the signal wave changes from a negative slope to a positive slope, this is defined as a local minimum. When the local minimum is positive, the frequency of the local minimum between slice levels N-1 and N is accumulated in cell number N. When the local minimum is negative, the frequency of the local minimum between slice levels N+1 and N is accumulated in cell number N. As with the local maximum, the invalid amplitude becomes valid.

Overcount
When the local maximum / minimum exceeded the full scale, it is accumulated in the maximum cell number and the overcount data.

● Max-min method (max-min)



Cell number	Count data	
	MAX	MIN
+5	2	0
+4	0	0
+3	0	0
+2	0	0
+1	2	0
−1	0	4
−2	0	0
−3	0	1
−4	0	0
−5	0	0

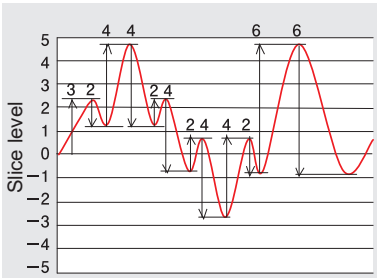
Max
The maximum value is defined as the highest level reached while the signal wave passes through the judgment level with a positive slope and then passes through the judgment level with a negative slope, and the frequency of the maximum value between slice levels N-1 and N is accumulated in cell number N. In practice, by setting invalid amplitude X, the data is valid only when it reaches amplitude X+1 or more on a positive slope and then reaches amplitude of X+1 or more on the next negative slope.

Min
The minimum value is defined as the lowest level reached while the signal wave passes through the judgment level with a negative slope and then passes through the judgment level with a positive slope, and the frequency of the minimum value between slice levels N +1 and N is accumulated in cell number N. As with the maximum value, the invalid amplitude becomes valid.

Overcount
When the maximum / minimum values exceeded the full scale, it is accumulated in the maximum cell number and the overcount data.

● Amplitude method (AMP)

The number of repetitions of phenomenon and fluctuation range can be known.



Cell number	Count data	
	Positive amplitude	Negative amplitude
10	0	0
9	0	0
8	0	0
7	0	0
6	1	1
5	0	0
4	2	3
3	1	0
2	2	2
1	0	0

Positive amplitude

When the signal wave changes from a positive slope to a negative slope, this is defined as a local maximum, and when it changes from a negative slope to a positive slope, this is defined as a local minimum. However, in practice, invalid amplitude X is set. As for a local maximum, the data is valid only when it first reaches amplitude X+1 or more with a positive slope and then reaches amplitude X+1 or more with a negative slope. As for a local minimum, the data is valid only when it first reaches amplitude X+1 or more with a negative slope and then reaches amplitude X+1 or more with a positive slope. Therefore, the amplitude difference between the local minimum and the next local maximum is defined as a positive amplitude, and when the absolute value of this amplitude difference corresponds to the slice level between N-1 and N, the frequency of this positive amplitude is accumulated in cell number N.

Negative amplitude

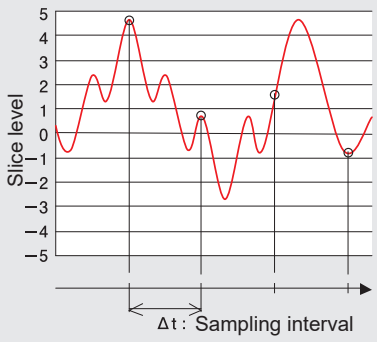
When the order of occurrence of the local minimum and local maximum in the above definition is reversed, that is, the amplitude difference between the local maximum and the next local minimum is defined as a negative amplitude, and when the absolute value of this amplitude difference corresponds to the slice level between N-1 and N, the frequency of this negative amplitude is accumulated in cell number N.

Overcount

When the local maximum / minimum exceeded the full scale, it is accumulated in the overcount data.

● Time method (TIME)

This method is useful to know within what range the phenomenon occurred.



Cell number	Count data
+5	1
+4	0
+3	0
+2	1
+1	1
−1	1
−2	0
−3	0
−4	0
−5	0

Time

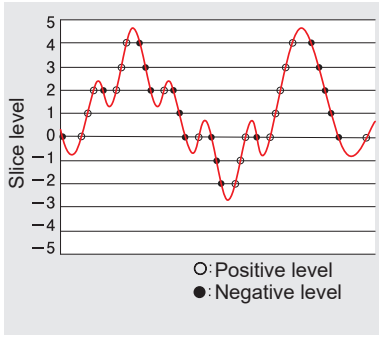
When the data during the sampling interval Δt is positive and is between slice levels N-1 and N, it is accumulated in cell number N. When it is positive and is between slice levels N+1 and N, it is accumulated in cell number N. Additionally, the setting of invalid amplitude X is ignored.

Overcount

When the sampling data exceeded the full scale, it is accumulated in the maximum cell number and the overcount data.

● Level crossing method (LEVEL)

Each time the input waveform passes through a slice level, the corresponding slice level is counted.



Cell number	Count data	
	Positive level	Negative level
+5	2	0
+4	2	2
+3	4	2
+2	2	4
+1	5	2
−1	1	5
−2	1	1
−3	0	1
−4	0	0
−5	0	0

Positive level crossing

When the signal wave passes through positive slice level N with a positive slope, it is accumulated into cell number N+1. (N ≧ 0)
When the signal wave passes through negative slice level N with a positive slope, it is accumulated into cell number N. (N < 0)

Negative level crossing

When the signal wave passes through positive slice level N with a negative slope, it is accumulated into cell number N. (N > 0)
When the signal wave passes through negative slice level N with a negative slope, it is accumulated into cell number N-1. (N ≦ 0)

Level crossing method

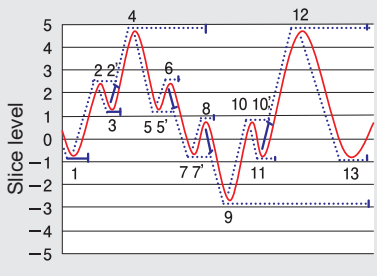
When the signal is positive, it is accumulated in the crossing frequency of positive level (N ≥ 0), and when the signal is negative, it is accumulated in the crossing frequency of negative level (N < 0).

Overcount

When the local maximum / minimum exceed the full scale, it is accumulated into the maximum cell number and the overcount data.

● Rain flow method (RAIN)

This method is a type of amplitude method and is used to estimate the degree of fatigue damage of a material subjected to repeated loads.



Cell number	Count data
10	0
9	0
8	2
7	0
6	2
5	0
4	0
3	0
2	9
1	0

The rain flow method is an analysis method that separates and accumulates small amplitude components and large amplitude components from the entire input waveform. In the waveform analysis using the rain flow method, the peaks and valleys of strain change are continuously connected with the passage of time on the vertical axis, and the straight lines between each peak and valley and between each valley and peak are regarded as multiple roofs; imagine a raindrop flowing off a peak (or valley) at a high position of one roof. The flow of raindrops is deemed to stop when any of the following three conditions are met. The horizontal axis of the path of the flow is measured to calculate amplitude.

"Three conditions for raindrops to stop flowing"

A raindrop flowing upward stops flowing when a peak (or valley) appears below the peak (or valley) where the flow began. (1-2-2'-4, 5-6, 7-8, 9-10-10'-12) A raindrop flowing downward stops flowing when a peak (or valley) appears above the peak (or valley) where the flow began. (0-1, 2-3, 4-5-5'-7-7'-9, 10-11, 12-13) No two raindrops flow off one roof. The raindrop that starts flowing first has priority, and when it meets the path of another raindrop, its flow stops. (3-2', 6-5', 8-7', 11-10') When the amplitude calculated as above is between slice levels N-1 and N, it is accumulated into the cell number. For the definition of amplitude, refer to the amplitude method.

Overcount

When the local maximum / minimum exceed the full scale, it is accumulated into the maximum cell number and the overcount data.

Indicators

Indicators are used to measure and display physical quantities in combination with strain gauge type transducers. These are equipped with analog outputs and upper / lower limit setting outputs. The panel mount type is used for instrumentation. Battery-powered handheld types, high-resolution, high-precision indicators, and strain converters (DSCUSB) that can be displayed on a PC are available.

There are four types of TEDS compatible models that automatically recognize converter information: TD-96A, MM-014L, MM-014, and TD-30L. The TD-30L is a high-precision indicator with a high resolution of 0.01 x 10^{-6} strain.

Model List

Model name	Shape	Display	Analog output	Digital output	Peak hold	Upper/lower limit setting	Others	Page
TD-98A	Panel mount	Digital ±99999	● ▲D/A converter	●RS-232C ▲B.C.D	●	●	Color TFT	323
TD-96A	Panel mount	Digital ±99999	●	▲RS-485	●	●	TEDS compatible Remote sensing	324
DSCUSB	Terminal type	Software	-	●USB			PC display CSV storage	325
MM-014L	Handheld	Digital ±9999999	-	●RS-232C ●SD card	●	-	Built-in battery TEDS compatible	326
MM-014	Handheld	Digital ±9999999	-	●RS-232C ●SD card	-	-	Sleep interval Built-in battery, TEDS compatible	327
MM-01V	Handheld	Digital ±9999999	-	●RS-232C ●SD card	-	-	Sleep interval Built-in battery	328
MM-01T	Handheld	Digital ±9999999	-	●RS-232C ●SD card	-	-	Sleep interval Built-in battery	329
TD-30L	Portable	Digital ±9999.99	-	●RS-232C ● LAN	-	-	TEDS compatible Remote sensing	330
TD-91B	Panel mount	Digital ±9999	●	-	●	●	-	331
TD-91BB	Desktop type	Digital ±9999	●	-	●	●	-	331

●:Standard specifications ▲: Factory option

Major Functions

● Shape

- Handheld: The shape fits neatly in one hand. This type can be easily operated while held in the hand.
- Portable: The shape enables easy carrying.
- Panel mount: This type is installed in an instrumentation panel and used for industrial measurements.
- Desktop type: This is a panel mount type housed in a dedicated case.
- Terminal type: This type uses the display of a PC as a display screen.

● Analog output

This function outputs an analog value corresponding to the measured value. There are voltage output and current output.
The types for instrumentation are available with 1 to 5 V output or 4 to 20 mA output.

● Digital output

This function is used for data transfer to a PC or connecting a printer.
In addition, DSCUSB can perform all operations and displays with the software and can save the data in the CSV format.

● Peak hold

This function detects and displays the extremum of measurement quantity that fluctuates during measurement . It is possible to know the maximum value even for high-speed phenomena that cannot be read on the display. The MM-014L, TD-98A and TD-96A can also detect local minimums.

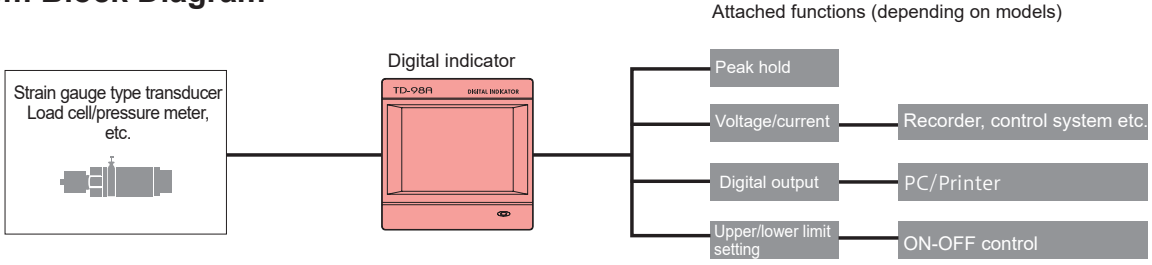
● Upper/lower limit setting

It is possible to extract a contact output by comparing the measurement value with a preset value. This function can be used to operate / stop a machine or to give an alarm based on the measurement value.

● Reading of TEDS sensor

The TEDS (Transducer Electronic Data Sheet) has the sensor information stored on an IC chip inside the sensor. This function allows a TEDS compatible measuring instrument to automatically recognize a sensor by reading the parameters from this information.

System Block Diagram



TD-98A

- High-speed processing of 2000 times/second
- Analog monitor output
- Eye-friendly large color display
- Graphic display possible
- Easy-to-operate touch panel
- Equipped with analog/digital filters
- Extensive hold functions
- Two types of holds possible at the same time

TD-98A

This is a digital indicator used for the measurement of strain gauge type transducers. It is equipped with an eye-friendly TFT color LCD and a touch panel that allows intuitive setting operations, achieving both visibility and operability. With a high-speed processing of 2000 times/second, waveform display function and upper/lower limit comparison function, it is ideal for automatic production equipment, sorting machines, testing devices, etc.

Specifications

Measurement point	1 point
Bridge excitation	Select from DC 2.5 V, 10 V (Output current: 120 mA or less)
Applicable gauge resistance	87.5 to 350 Ω
Measurement range	±6.0 mV/V (at bridge excitation DC 2.5 V) ±3.0 mV/V (at bridge excitation DC 10 V) (Including initial imbalance)
Balancing method	By digital calculation
Nonlinearity	0.02% FS ± 1 digit or less (at 3.0 mV/V input)
Zero stability	0.5 μV/°C RTI or less
Sensitivity stability	0.01%/°C or less
A/D converter	Speed: 2000 times/second Effective resolution: About 1/15000 for 6.0 mV/V input (At bridge excitation DC 2.5 V) About 1/30000 for 3.0 mV/V input (At bridge excitation DC 10 V)
Analog filter	Select from 30 Hz, 100 Hz, 300 Hz, 1 kHz
Monitor output	About 0.5 V per 1 mV/V input (at bridge excitation DC 2.5 V) About 2 V per 1 mV/V input (at bridge excitation DC 10 V) (Load resistance 2 kΩ or more)
Display unit	3.5-inch TFT color LCD module (Display area: 71 x 53 mm) 320 x 240 dots
Display range	±99999 (5 digits)
Calibration method	Equivalent input calibration, actual load calibration
Equivalent input calibration	0.5mV/V to 6.0mV/V (at bridge excitation DC 2.5 V) 0.5mV/V to 3.0mV/V (at bridge excitation DC 10 V) Error range: ± 0.1% FS or less
Hold function	1) Sample hold, 2) Peak hold, 3) Bottom hold, 4) Peak-to-peak hold, 5) Average hold, 6) Inflection point hold, 7) Local maximum hold, 8) Local minimum hold, 9) Extremum difference hold * There are a section setting for 2) to 5) (All section, external, external + time, level + time, level (peak hold/bottom hold only))
Comparison function	A higher higher limit (HH), a lower lower limit (LL), OK, higher limit (HI), lower limit (LO)
Calibration value selection	Four types of calibration values can be stored and switched.
External output	Higher / lower limit comparison output (HH, HI, OK, LO, LL), normal operation output (RUN), hold end output (H/E), graph drawing end output (EVENT) Open collector output (30 Vmax, 30 mA max)
External input	Work selection input (WORK0, WORK1, WORK2, WORK3), hold control input (T/H, SECTION), digital zero input (DZ), graph drawing control input (GRAPHTRIG), calibration value selection input (CAL0, CAL1)
Interface	RS-232C Synchronous Baud rate: 9,600 bps to 57,600 bps
Power supply voltage	DC 24 V (±15%) *** AC adapter set (CR-1812-C) required for use with AC 100V**
Operating temperature / humidity range	-10C° to +40C° 85% RH or less (No condensation)
Storage temperature / humidity range	-20C° to +60C° 85% RH or less (No condensation)
Outside dimension	96 (W) x 96 (H) x 138 (D) mm (excluding protrusions)
Panel cut dimensions	92 x 92^{+1}_{0}mm (Thickness: 1.6 to 3.2 mm)
Mass	Approx. 1.0 kg

Standard accessories

Instruction Manual..... 1
Warranty certificate 1
Connector for external input/output 1
Crimp terminal for power terminal block 2
Connector for BCD output (when the BCD option is equipped with) 1
Mini-driver (when DAV/DAI option is equipped with) 1

Options

NDIS relay connector (CR-616)
RS-232C cable (CR-5720)
AC adapter set (CR-1812-C)
One of the following 3 products can be selected.

● TD-98A BCD (BCD data output)
Open collector output (30 Vmax, 30 mAmax)
Select from output rates of 10, 20, 50, 100, 200, 500, 1000 and 2000 times/second

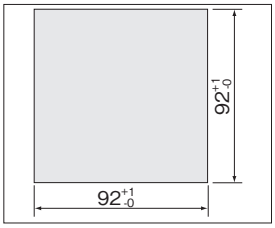
● TD-98A DAV (D/A converter voltage output)

Voltage output (DAV)	-10 V to +10 V (RL>2 kΩ)
Zero output and full scale can be digitally adjusted.	
Zero adjustment range	±10% FS
Gain adjustment range	±10% FS
Zero stability	0.6 mV/°C or less (Voltage output)
Sensitivity stability	50 ppm/°C or less
Nonlinearity	0.05% FS
Responsiveness	Depends on the A/D conversion speed of the main unit

● TD-98A DAI (D/A converter current output)

Current output (DAI)	4 to 20 mA (RL<350 Ω)
Zero output and full scale can be digitally adjusted.	
Zero adjustment range	About ±10% FS
Gain adjustment range	About ±10% FS
Zero stability	0.5 μA/°C or less (Current output)
Sensitivity stability	50 ppm/°C or less
Nonlinearity	0.05% FS
Responsiveness	Depends on the A/D conversion speed

Panel cut drawing



TD-96A

- High-speed processing of 4000 times/second
- Eye-friendly color graphic display
- Equipped with equivalent input function, easy sensitivity adjustment regardless of the actual
- Higher and lower limits, higher higher limit, and lower lower limit comparisons are possible
- Supports a variety of hold functions
- Easy setting with TEDS
- Remote sensing compatible
- Equipped with voltage / current outputs
- Ideal for incorporating into test machines due to DIN size

This is a digital indicator to measure loads, pressures, etc. using strain gauge type transducers. Since the indicated value judgment is displayed using an eye-friendly color graphic display, the operating status can be grasped intuitively. Equipped with a high-speed sampling, waveform display function and higher/lower limit comparison function, it is ideal for automatic production equipment, sorting machines, testing devices, etc.

TD-96A

Specifications

Number of measuring points	1 point
Applicable transducer	Strain gauge type transducer
Bridge excitation	DC 10 V, 2.5 V ± 10% (Current: Max. 30 mA, remote sense available)
Measurement range	±3.0mV/V
Balancing range	±2.0mV/V
Calibration	
Range	0.3 to 3.0 mV/V
Accuracy	0.1% FS However, when the sensor sensitivity is set to 0.5 mV/V or more
Method	Actual load calibration, equivalent input calibration, TEDS calibration
Accuracy	
Nonlinearity	0.01% FS + 1 digit or less (when the input is 1 mV/V or more)
Zero stability	0.5 μV/°C or less (input conversion value)
Sensitivity stability	± 0.005% FS/°C or less
A/D conversion speed	4000 times/second When using hold mode: 20000 times/second (24-bit A/D conversion)
D/A output	Insulation output Voltage output: 0±1 to ±10 V, in 1 V steps, or current output: 4 to 20 mA, 4000 times/second Depending on the setting, only one of two is output.*1
Comparison judgment output	
Number of terminals	5 points (HH, HI, OK, LO, LL)
Output format	Open collector output
Terminal capacity	Collector current: Max. 20 mA/30 V
Control signal input	
Number of terminals	6 points (hold, judgment, clear, digital zero, setting value memory selection 1, setting value memory selection 2)
Input format	Insulated from the main unit circuit by a photocoupler
Digital filter	Select from 3 Hz (-6 dB/oct), 10/30/100/300/1000 Hz (-12 dB/oct), none
TEDS function	IEEE 1451.4, class 2, mix mode interface
Hold function	Sample hold, peak hold, bottom hold, peak-to-peak hold, peak and bottom hold, average hold, section specified hold (excluding sample hold)
Comparison function	Higher higher limit (HH), lower lower limit (LL), higher limit (HI), lower limit (LO)
Display	
Display unit	320 x 240, color LCD display
Indication range	−99999 to 99999
Decimal point	Display position can be selected
Number of displays	Select from 4, 6, 10, and 20 times/second
Display mode	Standard display, bar meter display, indicated value magnified display, waveform display

Setting Item	
Calibration setting	Zero calibration/span calibration (TEDS calibration, actual load calibration, equivalent input calibration)
Function setting	Higher limit, lower limit, higher higher limit, lower lower limit, comparison mode, hysteresis, near zero, moving average processing, low-pass filter, motion detect, zero tracking, static strain, digital zero, digital taring, section specification, hold mode, key lock, minimum scale, display count, bridge voltage, digital zero limit, digital zero clear, comparison output pattern, comparison output control, data output selection, D/A converter, and remote sense
Power supply voltage	AC 100 to 240 V, 12 W (when using the included AC adapter) DC 12 to 24 V 9 W
Operating temperature / humidity range	0C° to +40C° 85% RH or less (No condensation)
Storage temperature / humidity range	-20C° to +60C° 85% RH or less (No condensation)
Outside dimension	About 96 (W) x 53 (H) x 132 (D) mm (Excluding protrusions)
Panel cut dimensions	92^{+1}_{0} (W)× 45^{+1}_{0} (H)mm (Thickness: 0.8 to 5 mm)
Mass	Approx. 300 g

Standard accessories

Instruction Manual..... 1
Warranty certificate 1
AC Adapter [Type A Plug] 1
Panel mounting bracket 2
DIN rail mounting bracket 1
Connector for external input/output 2
Micro flathead screwdriver 1

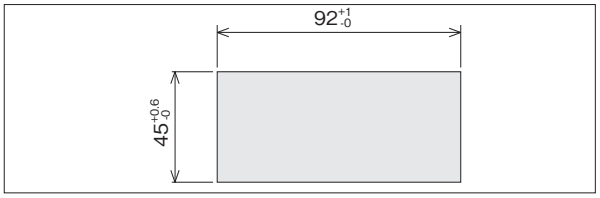
* When installed in the optional case, only voltage output can be used.

Options

AC Adapter	(CR-1869)
AC Adapter [For China]	(CR-1869-C)
DC Power Cable	(CR-062)
RS-485 output option	
TD-96A dedicated case	For 1 input

* When using the dedicated case, the RS-485 output option cannot be used.

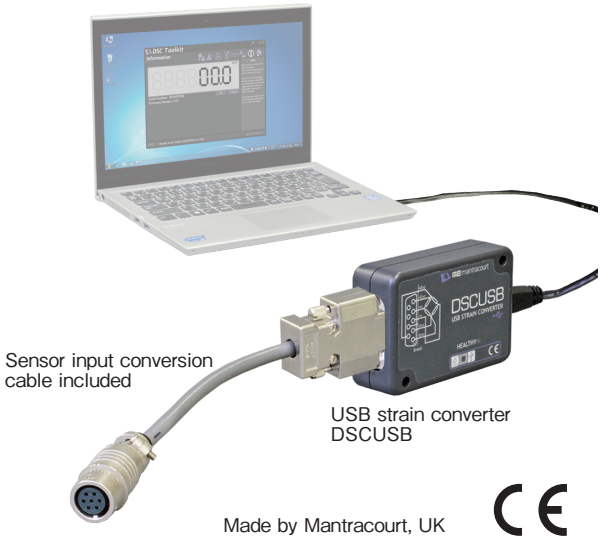
Panel cut drawing



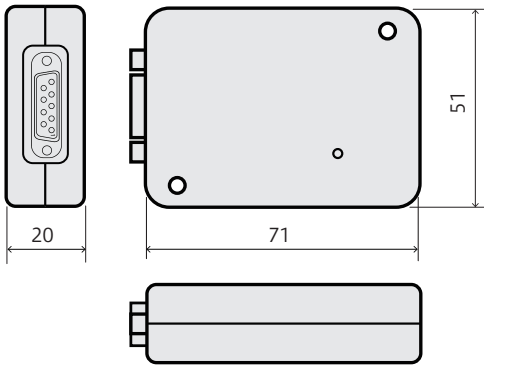
DSCUSB

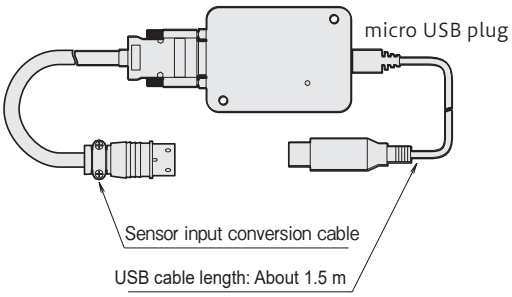
Displaying on a PC or display Data writing to a PC online

- Pocket-sized and weighs just 45 grams
- No power supply required (USB bus power used)
- Recording in the CSV format. Data reduction using spreadsheet software you are familiar with
- Measurements with multiple units also possible (using a USB hub)
- Conversion cable with NDIS connector included



External Dimensions





DSCUSB is an online type measuring instrument that connects to a PC via a USB interface. A sensor input conversion cable is included, allowing direct connection of a strain gauge type transducer. It is compact and no power supply required. Measurements can be performed easily, and a report can be created immediately.

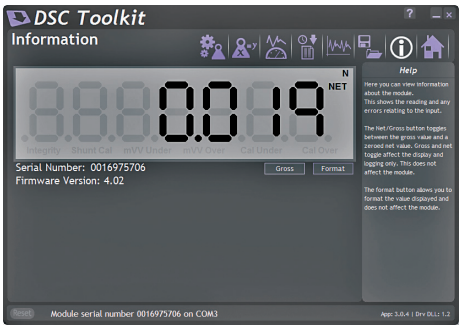
Specifications

Number of measuring points	1 point (Multiple units can be used)
Applicable transducer	Strain gauge type transducer (four-gauge method, 80 to 5000 Ω)
Bridge excitation	DC 5 V
Measurement range	± 3 mV/V (± 6000 × 10^{-6} strain)
A/D conversion	24-bit
Sampling frequency	1, 2, 5, 10, 20, 50, 60, 100, 200 Hz
Recording interval	Can be set to any value between 10 ms and 32 s.
Filter	Recursive filter (IIR) programming possible
Interface	USB
OS	Windows 7/8/8.1/10/11
Operating temperature / humidity range	-40C° to +85C° 95% RH or less (No condensation)
Outside dimension	71 (W) x 20 (H) x 51 (D) mm (Excluding the connector)
Mass	45 g (Main unit only)

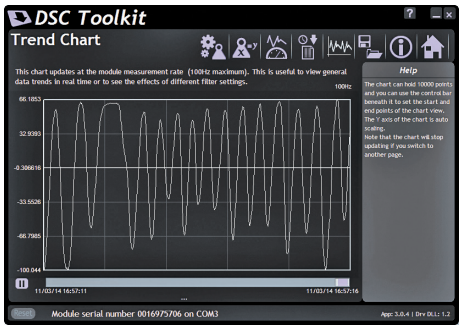
Standard accessories

Instruction Manual (Japanese simplified version) 1
Sensor input conversion cable 1
USB cable (microB-A 1.5 m) 1

Download the standard software DSCUSB Toolkit from the URL below.
URL: http://www.mantracourt.com/



Value monitor



Waveform

MM-014L

T-ZACCS 3

- Direct reading measurements of load, displacement, etc.
- Compact, lightweight, and easy to carry
- Peak hold function
- Simultaneous display of monitor value and peak value
- Retains settings for up to 20 transducers for easy setting
- Collective setting of coefficient, unit, display digit and offset value using the “sensor ID”
- TEDS sensor compatible
- Easy data collection using an SD card

T-ZACCS3
MM-014L pocket load meter

This is a compact, lightweight, and easy-to-carry handheld type measuring instrument that can directly read physical quantities by simply combining it with a strain gauge type transducer, such as a load cell or displacement meter, and setting the capacity and rated output. The peak hold function allows measurement values and peak values to be displayed and recorded. The measured data can be saved in the built-in data memory and on an SD card, allowing for easy and smooth data collection. A reflective color LCD is adopted for the display screen to provide excellent visibility even outdoors. Function switches linked to the icon displays in the screen are used for the operation, allowing intuitive operation.

Specifications

Strain measurement			
Number of measuring points	1 point		
Bridge excitation	Constant voltage method: DC 2 V Constant current method: 5.7 mA (2 V with 350 Ω bridge)		
Applicable transducer	Strain gauge type transducer (four-gauge method)		
Applicable gauge resistance	Constant voltage method: 120 to 1000 Ω Constant current method: 350 Ω		
Constant current mode extension Distance	Cable round-trip resistance: 45 Ω or less		
Measurement range	± 30000 × 10^{-6} strain		
Resolution	1 × 10^{-6} strain		
Sampling speed	0.2 seconds		
Balancing range	± 16000 × 10^{-6} strain		
Input	Terminal block/connector (EPRC07)		
Peak hold			
Peak hold contents	+peak value, -peak value		
Peak hold method	Analog detection, digital hold		
Peak hold accuracy	DC to 100 Hz ±1% FS 100 to 200 Hz ± 3% FS 200 to 300 Hz ± 5% FS (when the low-pass filter is set to PASS)		
Low-pass filter	30, 100, 300 Hz and PASS -3 dB ± 1 dB		
Function			
Measuring mode	Initial, direct, measure		
Program setting	Coefficient	± (0.00001 to 999999) (CAP, RO setting)	
	Unit	40 types including με, kgf, N, Pa, mm	
	Decimal point	Display after the decimal point can be set arbitrarily with 0 to 5 digits	
	Number of settings	20 points	
	Offset	To be written arbitrarily	
Sensor ID	Sensor ID	Function	Reading and setting of sensor ID Writing of sensor ID
	TEDS	Standard:	IEEE 1451.4, class 2 compatible (Template No. 33)
		Function	Reading and setting of sensor information
Interval function	Function	Measurement at the set time interval	
	Set time	1, 2, 3, 5, 10, 20, 30 sec 1, 2, 5, 10, 15, 20, 30 min	
Zero tracking function	When the value is equal to or less than the set value within the set time, it is regarded as zero sequentially. Set time 10 to 60 sec 10 sec intervals Set the value 1 to 10 digits 1-digit intervals		
Automatic power OFF	When no operation is received for an arbitrary set time, the power is turn off automatically (ON/OFF setting of the automatic power OFF function is possible)		
Display/operation			
Display unit	2.7-inch TFT LCD display		
Resolution	400 x 240 dots		
Point defect	10 dots or less (excluding aging deterioration)		
Operation	Function key: 1/2/3, UP/DOWN keys, ENTER key, power key		

Recording		
Built-in memory	Function	Recording of measurement data Saving and reading of the setting
	Capacity	Up to 6000 data
	Recording method	Interval timer, ENTER key (Manual)
SD card	Function	Recording of measurement data Recording and reading of setting file
	Physical format	FAT 16/32
	Recording format	CSV format
	Capacity	512 MB (Designated by us)
Interface		
RS-232C	RS-232C compliant (various settings, measurement, data collection)	
Built-in battery		
Built-in battery	Lithium-ion battery	
Battery capacity	1900mAh	
Continuous use time	About 6 hours * Conditions: Atmospheric temperature: 23°C ± 5°C Measurement: Monitor (350 Ω bridge)	
Charging time	Approx. 3 hours	
External power supply		
Power supply	Dedicated USB type AC adapter AC 100 to 240 V 50 Hz/60 Hz	
Connection terminal	USB Type-C (1.5A max @DC5V)	
Environment		
Operating temperature / humidity range	-10 to +50C°	85% RH or less (No condensation)
Charging temperature / humidity range	0 to +40C°	85% RH or less (No condensation)
Others		
Outside dimension	136 (W) × 32 (H) × 71 (D) mm (Excluding protrusions)	
Mass	Approx. 300 g	

Standard accessories

Instruction Manual..... 1
Warranty certificate 1
NDIS conversion cable (CR-8140)..... 1
4G Terminal block 1
AC Adapter (CR-1970) [Type A Plug]..... 1

Options

SD card (512 MB)
External printer (Applicable models: DPU-S245)
NDIS conversion cable (Remote sense) (CR-8141)
RS-232C cable (CR-5532)
Printer cable (CR-4511)

MM-014

T-ZACCS 3

- Adopted a reflective color LCD display that is clearly visible even outdoors on a sunny day (supports Japanese / English display)
- Long-time operation by battery (8 hours continuous operation)
- Equipped with automatic measurement function (equipped with sleep function, 2,800 hours of measurement possible with 1 hour interval measurement)
- Collective setting of coefficient, unit, decimal point, and sensor type by Sensor ID
- TEDS sensor compatible
- Secure data retention by recording to the built-in data memory
- Easy data collection using an SD card

This equipment is a compact and lightweight measuring instrument that can easily perform strain measurements. Our unique measurement method enables highly accurate and stable measurements. Adoption of a reflective color LCD screen provides excellent visibility and long-term operation with low power consumption. It is compact with low power consumption and is equipped with a highly accurate sleep function, enabling stable automatic measurement over a long period of time. Function switches linked to the icon displays in the screen allow intuitive operation. By connecting to a sensor, it is possible to check the numerical value of the signal being measured in real time. SD cards are adopted to record all measurement data, allowing for easy and smooth data collection.

T-ZACCS3
MM-014 strain measurement
pocket data logger

Specifications

Strain measurement			
Number of measuring points	1 point		
Bridge excitation	DC 1 V		
Applicable transducer	Strain gauge type transducer (four-gauge method)		
Applicable gauge resistance	120 to 1000 Ω		
Measurement range	± 30000 × 10^{-6} strain		
Resolution	1 × 10^{-6} strain		
Initial value storage range	± 16000 × 10^{-6} strain		
Input	Terminal block/connector (EPRC07)		
Function			
Measuring mode	Initial, direct, measure		
Program setting	Coefficient	± (0.00001-999999)	
	Unit	41 types including με, mm, N, Pa	
	Decimal point	Display after the decimal point can be set arbitrarily with 0 to 5 digits	
	Offset	To be written arbitrarily	
Simple measure	Coefficient: +1.00000 Unit: με Decimal point: 0		
GL input function	Water level measurement function GL - Offset of water surface depth		
Sensor ID	Sensor ID	Function	Reading and setting of sensor ID Writing of sensor ID
	TEDS	Standard:	IEEE 1451.4, class 2 compatible (Template No. 33)
		Function	Reading and setting of sensor information
Auto power	When no operation is received for an arbitrary set time, the power is turn off automatically (ON/OFF setting of the automatic power OFF function is possible)		
Interval timer			
Function	Measurement at the set time interval		
Time interval	1, 2, 5, 10, 15, 20, 30 min 1, 2, 3, 4, 6, 12, 24 hours (Measurement start time can be specified)		
Sleep function	Turns the power ON/OFF automatically from the end of scanning to the start of scanning		
Clock			
Setting	Year, month, day, hour, minute, second		
Display/operation			
Display unit	2.7-inch TFT LCD display		
Resolution	400 x 240 dots		
Point defect	10 dots or less (excluding aging deterioration)		
Operation	Function key: 1/2/3, UP/DOWN keys, ENTER key, power key		

Recording		
Built-in memory	Function	Recording of measurement data Recording and reading of setting file
	Capacity	Up to 10000 data
	Recording method	Interval timer, ENTER key (Manual)
SD card	Function	Recording of measurement data Recording and reading of setting file
	Physical format	FAT 16/32
	Recording format	CSV format
	Capacity	512 MB (Designated by us)
Interface		
RS-232C	RS-232C compliant (measurement data output)	
Battery		
Built-in battery	Lithium-ion battery	
Battery capacity	1900 mAh	
Continuous use time	About 8 hours (Conditions: Atmospheric temperature: 23°C ± 5°C Measurement: Monitor (350 Ω bridge))	
Charging time	About 3 hours (at standby)	
External power supply		
Power supply	Dedicated USB type AC adapter AC 100 to 240 V 50 Hz/60 Hz	
Connection terminal	USB Type-C (1.5A max @DC5V)	
Environment		
Operating temperature / humidity range	-10 to +50C°	85% RH or less (No condensation)
Charging temperature / humidity range	0 to +40C°	85% RH or less (No condensation)
Others		
Outside dimension	136 (W) × 32 (H) × 71 (D) mm (Excluding protrusions)	
Mass	Approx. 300 g	

Standard accessories

Instruction Manual..... 1
Warranty certificate 1
NDIS conversion cable (CR-8140)..... 1
4G Terminal block 1
AC Adapter (CR-1970) [Type A Plug]..... 1

Options

SD card (512 MB)
External printer (Applicable model: DPU-S245)
NDIS conversion cable (Remote sense) (CR-8141)
RS-232C cable (CR-5532)
Printer cable (CR-4511)

MM-01V

T-ZACCS 3

- Adopted a reflective color LCD display that is clearly visible even outdoors on a sunny day (supports Japanese / English display)
- Long-time operation by battery (8 hours continuous operation)
- Equipped with automatic measurement function (equipped with sleep function, 2,800 hours of measurement possible with 1 hour interval measurement)
- Secure data retention by recording to the built-in data memory
- Records up to 10000 measurement data in the built-in memory

This equipment is a compact, lightweight, and easy-to-carry handheld measuring instrument for measuring DC voltages.
The measured data can be saved in the built-in data memory and on an SD card, allowing for easy and smooth data collection. A reflective color LCD is adopted for the display screen to provide excellent visibility even outdoors.
Function switches linked to the icon displays in the screen are used for the operation, allowing intuitive operation.

T-ZACCS3
MM-01V voltage measurement pocket data logger

Specifications

DC voltage measurement		
Number of measuring points	1 point	
Measurement range	± 30.000 V	
Resolution	0.001 V	
Initial value storage range	±16.000 V	
Accuracy	± (0.08% rdg + 3 digits)	
Temperature coefficient of accuracy	± 0.002% rdg/C°	
Aging change of accuracy	± 0.05% rdg/year	
Input	Terminal block	
Function		
Measuring mode	Initial, direct, measure	
Program setting	Coefficient	± (0.00001 to 999999)
	Unit	40 types including με, °C, kgf, mm
	Decimal point	Display after the decimal point can be set arbitrarily with 0 to 5 digits
	Offset	To be written arbitrarily
Simple measure	Coefficient	+0.001
	Unit	V
	Decimal point	Three digits displayed after the decimal point
Auto power OFF	When no command is received from the operation or interface for an arbitrary set time, the power is turned OFF automatically (Auto power OFF function can be set to ON/OFF.)	
Others		

Standard accessories

Instruction Manual..... 1
Warranty certificate 1
AC Adapter (CR-1970) [Type A Plug]..... 1

Interval timer		
Function	Measurement at the set time interval	
Time interval	1, 2, 5, 10, 15, 20, 30 min 1, 2, 3, 4, 6, 12, 24 hours (Measurement start time can be specified)	
Sleep function	Turns the power ON/OFF automatically from the end of scanning to the start of scanning	
Clock		
Setting	Year, month, day, hour, minute, second	
Accuracy	Daily error: ±1 sec (at 23 ± 5°C)	
Display/operation		
Display unit	2.7-inch TFT LCD display	
Resolution	400 x 240 dots	
Point defect	10 dots or less (excluding aging deterioration)	
Operation	Function key: 1/2/3, UP/DOWN keys, ENTER key, power key	
Recording		
Built-in memory	Function	Recording of measurement data Recording and reading of setting file
	Capacity	Up to 10000 data
	Recording method	Interval timer, ENTER key (Manual)
SD card	Function	Recording of measurement data Recording and reading of setting file
	Physical format	FAT 16/32
	Recording format	CSV format
	Capacity	512 MB (Designated by us)
Interface		
RS-232C	RS-232C compliant (measurement data output)	
Battery		
Built-in battery	Lithium-ion battery	
Battery capacity	1900 mAh	
Continuous use time	Approx. 8 hours * Condition: Atmospheric temperature: 23°C ± 5°C Measurement: During monitor MM-01V (+10 V input)	
Charging time	About 3 hours (at standby)	
External power supply		
Power supply	Dedicated USB type AC adapter AC 100 to 240 V, 50 Hz/60 Hz	
Connection terminal	USB Type-C	
Consumption current	1.5 A max@DC5V	
Environment		
Operating temperature / humidity range	-10 to +50C°	85% RH or less (No condensation)
Charging temperature / humidity range	0 to +40C°	85% RH or less (No condensation)
Others		
Outside dimension	136 (W) × 32 (H) × 71 (D) mm (Excluding protrusions)	
Mass	Approx. 300 g	

Options

SD card (512 MB)
External printer (Applicable models: DPU-S245)
RS-232C cable (CR-5532)
Printer cable (CR-4511)

MM-01T

T-ZACCS 3

- Adopted a reflective color LCD display that is clearly visible even outdoors on a sunny day (supports Japanese / English display)
- Long-time operation by battery (8 hours continuous operation)
- Equipped with automatic measurement function (equipped with sleep function, 2,800 hours of measurement possible with 1 hour interval measurement)
- Secure data retention by recording to the built-in data memory
- Records up to 10000 measurement data in the built-in memory

This equipment is a compact, lightweight, and easy-to-carry handheld measuring instrument for measuring thermocouples.
The measured data can be saved in the built-in data memory and on an SD card, allowing for easy and smooth data collection.
A reflective color LCD is adopted for the display screen to provide excellent visibility even outdoors.
Function switches linked to the icon displays in the screen are used for the operation, allowing intuitive operation.

T-ZACCS3
MM-01T temperature measurement pocket data logger

Specifications

Thermocouple temperature measurement (JIS C 1602 - 1995)			
Number of measuring points	1 point		
Applicable thermocouple	T, K, J		
Measurement range	T: -130C° to +400C° K:-140C° to +1,370C° J:-180C° to +1,200C°		
Accuracy (at 23°C ± 5°C) (External reference junction)		Measurement range	Accuracy
	T	-130C° to +400C°	± (0.11% rdg + 0.2C°)
	K	-140C° to +1,370C°	± (0.11% rdg + 0.2C°)
	J	-180C° to +1,200C°	± (0.13% rdg + 0.2C°)
Accuracy (at 23°C ± 5°C) (Internal reference junction)		Measurement range	Accuracy
	T	-130C° to +400C°	± (0.11% rdg + 0.9C°)
	K	-140C° to +1,370C°	± (0.11% rdg + 0.9C°)
	J	-180C° to +1,200C°	± (0.13% rdg + 1.1C°)
Resolution	0.1C°		
Temperature coefficient of accuracy	± 0.002% rdg/C°		
Aging change of accuracy	± 0.05% rdg/year		
Input	Terminal block		

Function	
Sensor mode	T, K, J
Reference junction	Internal junction, external junction
Auto power OFF	When no command is received from the operation or interface for an arbitrary set time, the power is turned OFF automatically (Auto power OFF function can be set to ON/OFF.)

Others		
Interval timer		
Function	Measurement at the set time interval	
Time interval	1, 2, 5, 10, 15, 20, 30 min	1, 2, 3, 4, 6, 12, 24 hours (Measurement start time can be specified)
Sleep function	Turns the power ON/OFF automatically from the end of scanning to the start of scanning	
Clock		
Setting	Year, month, day, hour, minute, second	
Accuracy	Daily error: ±1 sec (at 23°C ± 5°C)	
Display/operation		
Display unit	2.7-inch TFT LCD display	
Resolution	400 x 240 dots	
Point defect	10 dots or less (excluding aging deterioration)	
Operation	Function key: 1/2/3, UP/DOWN keys, ENTER key, power key	
Recording		
Built-in memory	Function	Recording of measurement data Recording and reading of setting file
	Capacity	Up to 10000 data
	Recording method	Interval timer, ENTER key (Manual)
SD card	Function	Recording of measurement data Recording and reading of setting file
	Physical format	FAT 16/32
	Recording format	CSV format
	Capacity	512 MB (Designated by us)
Interface		
RS-232C	RS-232C compliant (measurement data output)	
Battery		
Built-in battery	Lithium-ion battery	
Battery capacity	1900 mAh	
Continuous use time	Approx. 8 hours *Condition: Measurement: During monitor	Atmospheric temperature: 23°C ± 5°C MM-01V (+10 V input)
Charging time	About 3 hours (at standby)	
External power supply		
Power supply	Dedicated USB type AC adapter	AC 100 to 240 V, 50 Hz/60 Hz
Connection terminal	USB Type-C	
Consumption current	1.5 A max@DC5V	
Environment		
Operating temperature / humidity range	-10 to +50C°	85% RH or less (No condensation)
Charging temperature / humidity range	0 to +40C°	85% RH or less (No condensation)
Others		
Outside dimension	136 (W) × 32 (H) × 71 (D) mm (Excluding protrusions)	
Mass	Approx. 300 g	

Standard accessories

Instruction Manual..... 1
Warranty certificate 1
AC Adapter (CR-1970) [Type A Plug]..... 1

Options

SD card (512 MB)
External printer (Applicable models: DPU-S245)
RS-232C cable (CR-5532)
Printer cable (CR-4511)

TD-30L (High-precision)

TD-30L high-precision digital indicator

The TD-30L is a digital indicator that supports measurements requiring particularly high precision, such as the calibration of force standard machine in combination with load cells and other strain gauge type transducers. It has a resolution of 0.01 x 10^{-6} strain and more stable measurements can be performed by switching the bridge excitation or combining moving average.

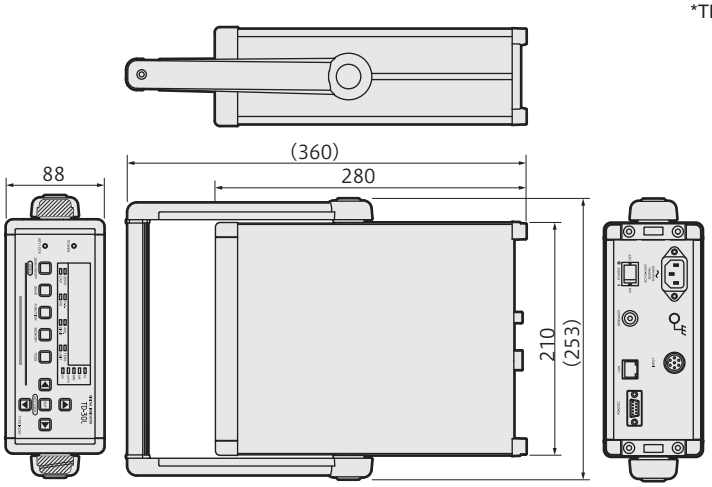
High-precision load cell (Remote sensing compatible)

Our force standard machines (Max. 10 MN)

Information on calibration contract services

We provide calibration services for various measuring instruments.
In accordance with our calibration work standards, we perform highly reliable calibration using calibration equipment and methods that are traceable to the national measurement standards.
This indicator is ideal for JCSS calibration in combination with a load cell.

External Dimensions



Ideal for calibration work with high resolution and high stability

- Excellent accuracy and stability
- High resolution of 0.01 x 10^{-6} strain
- Information of up to 8 sensors can be registered and read out by switching them
- Remote sensing compatible*
- TEDS sensor compatible*
- LAN and RS-232C interfaces are equipped as standard

Specifications

Number of measuring points	1 point
Applicable gauge resistance	350 Ω
Bridge excitation	DC 5 V (Normal), DC 10 V (High stability)
Initial value storage range	± 600.00 × 10^{-6} strain
Measurement range	± 6000.00 × 10^{-6} strain
Resolution	0.01 × 10^{-6} strain
Measuring speed	500 ms
Accuracy	± (0.01% rdg + 2 digits) 23C°± 5C°
Sensitivity stability	± 0.0002%/C°
Moving averaging	ON/OFF
Remote sensing function*	Can be extended up to 10 m (using the dedicated cables)
Display	
Display unit	7-segment LED (Polarity + 6 digits)
Unit display	LED (N, kN, MN, mV/V, με, blank display)
Status display	LED (Power, Key lock, ZERO, H.S., AVE.)
Setting	
Capacity	± 0.00001 to 999999
Rated output	± 0.00001 to 9.99999 (mV/V)
Decimal point	Display after the decimal point can be set arbitrarily with 0 to 6 digits
Unit	N, kN, MN, mV/V, με, blank
Memory	Eight types of sensor settings can be registered and switched * Reading of initial value, capacity, rated output, decimal point, and unit settings
TEDS function*	Reading and setting of TEDS sensor information
Interface	LAN, RS-232C
Power supply	
Rated voltage	AC 100 V - 240 V 50/60 Hz
Allowable voltage	AC 90 - 264 V 50/60 Hz
Maximum power consumption	40 VA
Operating temperature range	0 to +50C° 85% RH or less (No condensation)
Outside dimension	210 (W) × 88 (H) × 280 (D) mm (Excluding protrusions)
Mass	Approx. 3 kg

Standard accessories

Instruction Manual..... 1
Warranty certificate 1
AC power cable (CR-03) 1
Ground wire (CR-20) 1

*TEDS and remote sensing cannot be used simultaneously.

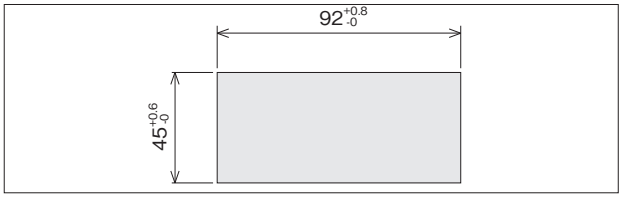
TD-91B (for instrumentation) /TD-91BB (desktop type)

- Compact and lightweight
- Equipped with analog peak hold function and upper / lower limit setting function
- Wide balancing range
- Easy operation with jog dial
- Direct reading and display of physical quantities possible by equivalent input calibration
- Eye-friendly monitor with wide viewing angle
- Equipped with voltage / current outputs
- Panel mount (TD-91BB: Desktop type)

Instrumentation
TD-91B

Desktop type
TD-91BB

Panel cut drawing



This equipment is an instrumentation digital indicator to measure loads, displacements, and pressures using strain gauge type transducers. Equipped with an LED display with character height of about 20 mm and a jog dial, achieving an indicator with excellent operability. Equivalent input calibration and actual load calibration allow easy setting of input range and physical quantity display. In addition, the upper and lower limits and the measured value are compared to output the result as an open collector signal. The TD-91B is a panel mount type and the TD-91BB is a tabletop type.

Specifications

Measurement part	
Number of measuring points	1 point
Bridge excitation	DC 5 V± 5% 60 mA
Applicable sensor range	120 Ω, 350 Ω, 350 Ω sensor x 4
Zero adjustment range	-3 mV/V to +3 mV/V
Measurement range	-3 mV/V to +3 mV/V
Accuracy	SPAN/SPIN × 0.1% + 1 digit When directly reading strain ±3 digits
Sampling speed	About 2.5 times/second
Calibration value	0.5 mV/V 1.5 mV/V 2.0 mV/V
Stability	0.4 x 10^{-6} strain/C° in input conversion
Display	
Display	Red/green 7-segment LED (Character height: About 20 mm)
Display value	−9999 to +9999 (4 digits)
Decimal point	Arbitrary setting possible
Digital filter	400, 800, 1000, 2000, 5000 times moving average
Hold function	(1) Peak hold (2) Valley hold (3) Peak-valley hold (4) Start hold (5) Analog peak hold (6) Analog/digital peak hold
Comparison output part	
Comparison judgment value range	-9999 to +9999
Output circuit	Open collector output by photocoupler
Photocoupler output capacity	DC 30 V 20 mA
Comparison function	External output Upper limit setting: HI Upper limit or less, lower limit or more: GO Lower limit setting: LO *Comparison external output is only available for TD-91B.
Analog peak hold	
Response speed	Minimum input width: 2 ms
Droop speed	0.025% FS/s (1.5 x 10^{-6} strain/s)
Accuracy	± 0.5% FS

Reset control time	800 ms or more
Analog output part	
Response speed	Approx. 0.5 seconds
S/N ratio	26 dB or more (50 mVp-p)
Accuracy	± 0.5% FS
Output	Voltage output: 0 to 1 V (10 kΩ load or more) 0 to 10 V (10 kΩ load or more) 1 to 5 V (10 kΩ load or more)
External control part	Current output: 4 to 20 mA (550 Ω load or less) *The TD-91BB can only output voltage. Start hold terminal Analog peak hold terminal Digital peak hold terminal Digital zero terminal Relay reset terminal
	* The external control terminal is only available for TD-91B. * The TD-91BB has the analog peak hold control switch only.
General specifications	
Operating temperature / humidity range	-10C° to +50°C 35% to 85% RH or less (No condensation)
Power supply	
AC power supply Rated voltage Allowable voltage Maximum power consumption	AC 100 to 240 V 50/60 Hz AC 90 to 240 V 50/60 Hz 13 VA max
Warm-up time	30 minutes
Outside dimension	TD-91B 48: 48 (H) x 96 (W) x 99.5 (D) mm (Excluding protrusions) TD-91BB: 81 (H) x 170.5 (W) x 120 (D) mm (Excluding protrusions)
Mass	TD-91B: Approx. 450 g TD-91BB: Approx. 1.6 kg

Standard accessories

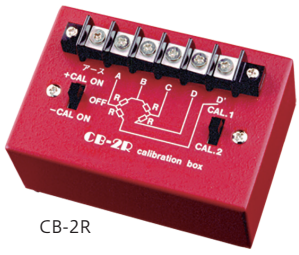
Instruction Manual..... 1
Warranty certificate 1
AC power cable (CR-05A) ..... 1 (TD-91B only)
Crimp terminal (TMEV1.25-3S) ..... 12 (TD-91B only)
Output cable (CR-30) ..... 1 (TD-91BB only)
Unit sticker 1

* Specify plug type when ordering TD-91BB

Strain checker

CB-2R

- The bridge resistance can be selected from 120 Ω or 350 Ω. (As specified at the time of order)
- The polarity of calibration strain and 2 types of calibration strain values can be selected.
- By switching the terminal connection, calibration is possible in the one-gauge method, one-gauge method three-wire type, two-gauge method, and four-gauge method.



CB-2R

This equipment is a highly stable checker used for sensitivity calibration, monitoring of zero-point movement, etc. of strainmeters. The bridge resistance is 120 Ω or 350 Ω. Two types of calibration values are generated by switching the switch.

Specifications

Bridge resistance	120 Ω or 350 Ω (As specified at the time of order)
Bridge configuration	One-gauge method, one-gauge method three-wire type, two-gauge method, four-gauge method (wire connection at the terminal)
Calibration value	Any 2 points in the 120 Ω bridge or any 2 points of the 350 Ω bridge

For 120 Ω bridge	For 350 Ω bridge
500 × 10^{-6} strain (0.25 mV/V)	-
1000 × 10^{-6} strain (0.5 mV/V)	1000 × 10^{-6} strain (0.5 mV/V)
2000 × 10^{-6} strain (1.0 mV/V)	2000 × 10^{-6} strain (1.0 mV/V)
3000 × 10^{-6} strain (1.5 mV/ V)	3000 × 10^{-6} strain (1.5 mV/V)
4000 × 10^{-6} strain (2.0 mV/V)	4000 × 10^{-6} strain (2.0 mV/V)
5000 × 10^{-6} strain (2.5 mV/V)	-
10000 × 10^{-6} strain (5.0 mV/V)	-
20000 × 10^{-6} strain (10.0 mV/V)	-

The calibration valuesfor the one-gauge method and the one-gauge method three-wire type are negative (compression) only.
The calibration valuesfor the two-gauge method and the four-gauge method are positive (tension) or negative (compression).

Accuracy	± 0.1%
Initial unbalance value	
one-gauge method	± 1000 × 10^{-6} strain or less
one-gauge method three-wire type	± 200 × 10^{-6} strain or less
two-gauge method	± 200 × 10^{-6} strain or less
four-gauge method	± 200 × 10^{-6} strain or less
Stability	
Zero point	± 1 × 10^{-6} strain/C°
Calibration value	± 0.001%/°C
Aging change	
Zero point	± 50 x 10^{-6} strain/year
Calibration value	± 0.02%/year
Operating temperature / humidity range	0 to +50C° 85% RH or less (No condensation)
Outside dimension	100 (W) × 45 (H) × 70 (D) mm (Excluding protrusions)
Mass	Approx. 500 g

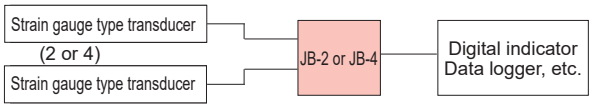
Standard accessories

Connection cable (CR-61A) 1
Instruction Manual..... 1
Warranty certificate 1

Averaging junction box

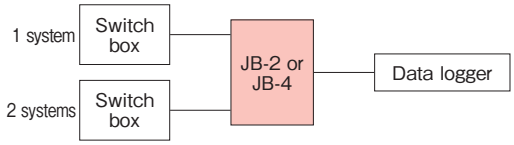
JB-2/JB-4

This equipment is used to connect two or four strain gauge type transducers to average their outputs. When combined with a digital indicator, an average value can be easily measured.



- The transducers that can be connected are limited to those with the same capacity, rated output and input/output resistance.
- The input/output resistance of transducer as seen from the measuring instrument is calculated as (Input/output resistance of transducer alone) / (Number of transducers connected). Use the equipment within the range where this value satisfies the specifications of the measuring instrument.

Example of use as branching box
Since 7 wires (A to G) are wired inside the junction box, it can also be used as a branching box when extending an ASW/SSW switch box.
(*A 7-core relay cable is required.)



Specifications

Number of input points	
JB-2	2 points
JB-4	4 points
Input connector	NDIS one-touch connector (receptacle) (Transducers with tip NDIS plug can be connected.)
Included cable	CR-611 (φ9 mm, 4-core shielded cable, 1.5 m, tip NDIS plug) (*)
Operating temperature / humidity range	0 to +50C° 5% RH or less (No condensation)
Outside dimension	80 (W) × 50 (H) × 120 (D) mm (Excluding protrusions)
Mass	Approx. 220 g

Standard accessories

Cable (CR-611 or CR-61) 1

* It can be changed to a tip loose wire when specified.

Cable/ Connector

Power Cable

Power Cable

CR-03 AC power cable Horizontal type 3P(P)-3P(J) 3 m

Data logger TS-963/-960, TDS-540
Switch box SSW, ISW, IHW, SHW
Indicator TD-30L
DS-50A dynamic strainmeter

CR-19 conversion adapter included

CR-04 AC power cable 3P(P)-12P(J) 3 m

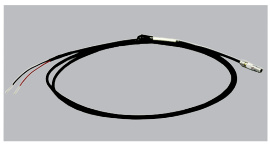
DA/ DC series dynamic strainmeter
* When storing in a case or rack, the CR-01 is used.

CR-19 conversion adapter included

CR-05A AC power cable 2P-Loose wire Crimp terminal) 2 m

TD-91B indicator

CR-1010 DC power cable 4P(J)-Loose wire 1.5 m

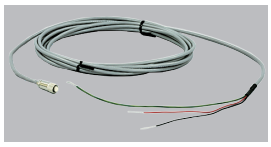


MF-660 six-component force analyzer

CR-12 DC power cable 3P(P)-3P(J) 1.5 m

Power supply relay

CR-1310 DC power cable 3P(J)-Loose wire 5 m



DC-204R smart dynamic strain recorder

CR-152M Battery connection cable Loose wire-Loose wire 1.5 m

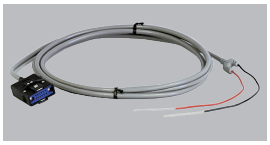
For DC power wiring

CR-02 AC power cable Vertical type 3P(P)-3P(J) 2 m

DRA-162B dynamic strainmeter
No straight type for overseas use

CR-19 conversion adapter included

CR-061 DC power cable 12P(J)-Loose wire 3 m



DA/ DC series dynamic strainmeter

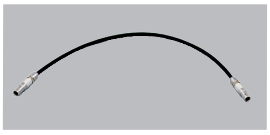
CR-10 DC power cable 3P(J)-Loose wire 5 m

TMR-311 multi-recorder

CR-11 DC power cable 3P(J)-12 V cigarette 5 m

Supplies power from the cigarette lighter of automobile
TMR-311 multi-recorder

CR-1210 DC power cable 4P-4P 0.25 m



Supplies power to the second and subsequent MF-660 six-component force analyzer

CR-1320 DC power cable 3P(J)-12 V cigarette 5 m

Supplies power from the cigarette lighter of automobile to the DC-204R smart dynamic strain recorder

CR-17 DC power branch cable 3P(P)×2-3P(J) 0.2 m

Power branching

Ground Wire / Output Cable / Attenuator

Ground Wire

CR-20 Ground wire 5 m

Various data loggers

CR-2020 TMR ground wire 5 m

Various models of the TMR-300 series

Output Cable

CR-30 Output cable BNC-Banana tip 1.5 m

Dynamic strainmeter DRA, DA and DC series
TMR-331/-341 multi-recorder

CR-31 Output cable BNC-BNC 1.5 m

Dynamic strainmeter DRA, DA and DC series
TMR-331/-341 multi-recorder

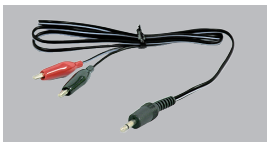
CR-33 Output cable BNC-Alligator 1.5 m

DRA, DA and DC series dynamic strainmeter
TMR-331/-341 multi-recorder

CR-3320 Output cable BNC-Loose wire 1.5 m

DRA, DA and DC series dynamic strainmeter

CR-32 Output cable Pin jack-Alligator 1 m



An analog output cable for connecting the voltage output terminal of the DC-96A / DC-97A dynamic strainmeter to an external recorder

CR-3610 Output cable 8P(P)-Loose wire 1.5 m

An analog output cable of the DC-204Ra smart dynamic strain recorder

CR-3620 Output cable 8P(P)-BNC x 4 1.5 m

Smart dynamic strain recorder
An analog output cable of DC-204Ra (four-channel)

CR-3630 Output cable 2P-Loose wire 1.5 m

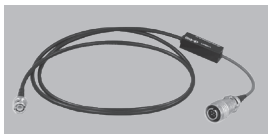
An analog output cable for connecting the output terminal of the MF-660 six-component force analyzer to an external recorder

Attenuator Cable

CR-4010 Attenuator cable

CR-4010 Attenuator cable
Attenuation rate 1/1000
DC-204R smart dynamic strain recorder, TMR-321 mul-ti-recorder

CR-4110 Attenuator cable

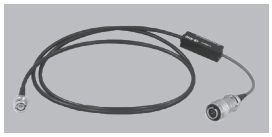


Attenuation rate 1/1000
Expands the measurement range when measuring voltage with the DC-004P / DH-14A dynamic strainmeter

CR-4020 Attenuator cable

Attenuation rate 1/100
DC-204R smart dynamic strain recorder, TMR-321 multi-recorder

CR-4120 Attenuator cable

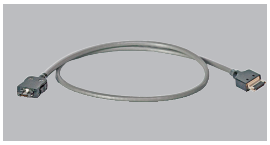


Attenuation rate 1/100
DC-004P PC control type dynamic strainmeter, DH-14A handheld dynamic strainmeter

Data Cable

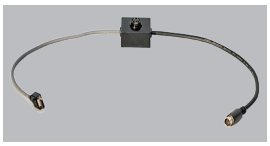
Data Cable

CR-4511 Printer cable



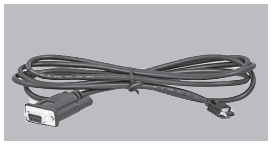
For connecting the TC-37K / -32K handheld data logger and the DPU-S245 printer

CR-4512 Printer cable



For connecting the TC-35N handheld measuring instrument and the DPU-S245 printer

CR-4530 Printer cable



For connecting the TDS-150 portable data logger or TC-351F FWD-light dedicated indicator and the DPU-S245 printer

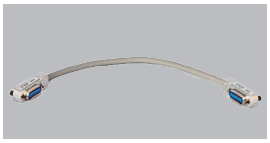
CR-50 GP-IB cable 2 m

or connecting to equipment with the GP-IB interface

CR-501 GP-IB cable 4 m

For connecting to equipment with the GP-IB interface

CR-502 GP-IB cable 0.5 m

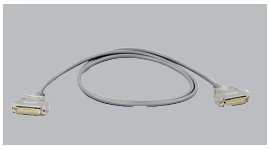


For connecting to equipment with the GP-IB interface

CR-531 RS-232C cable (A) 25P-25P 1.5 m Forward connection (Through)

For connecting to equipment with the RS-232C interface

CR-532 RS-232C cable (B) D-sub 25P-25P 1.5 m Reverse connection (Cross)



For connecting to equipment with the RS-232C interface

CR-533 RS-232C cable (C) D-sub 25P(P)×25P(J) 1.5 m

For connecting to equipment with the RS-232C interface Reverse connection (Cross)

CR-5353 RS-232C cable TC-37K / -32K-8P Forward connection (Through)

For connecting the RPC-05A remote power controller and the TC-37K / -32K handheld data logger

CR-5354 RS-232C cable D-sub 9P(J)-8P

For connecting the RPC-05A remote power controller and the TDS-150 portable data logger

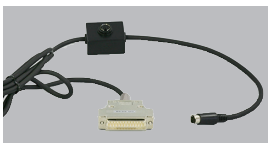
CR-5360 RS-232C cable D-sub 9P(J)-D-sub 9P(J) Reverse connection 1.5 m

For connecting the TS-360 / TDS-540 data logger or TC-351F FWD-light dedicated indicator and the RS-232C PC interface

CR-5531 RS-232C cable 8P-D-sub 9P(J) 1.5 m

For connecting the TC-35N handheld measuring instrument and a PC

CR-553B RS-232C connection cable D-sub 25P(P)-8P 1.5 m



For connecting the TC-35N handheld measuring instrument and a PC

CR-5532 RS-232C cable For TC-37K / -32K

For connecting the TS-560 data logger, T-ZACCS3 MM-014/MM-014L or TC-37K / -32K handheld data logger and the RS-232C PC interface

CR-5533 RS-232C cable For MD-111

For connecting the MD-111 monitoring system controller or TC-37K / -32K handheld data logger and the RS-232C modem interface

Data Cable

CR-5720 RS-232C cable

For connecting the TD-98A digital indicator and a PC
mini DIN-D-Sub 9P, cross, 1.5 m

CR-5810 1G4W dedicated adapter

An adapter for connecting a strain gauge with 1G4W modular connector to the TC-37K / -32K handheld data logger

CR-61 Connection cable NDIS(P)-Loose wire, 4-core 1.5 m

For the CB-2R strain checker or TGA-1A/-1B temperature gauge adapter and a measuring instrument

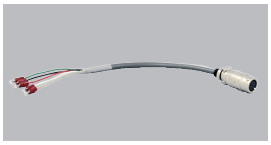
CR-611 Connection cable NDIS(P)-NDIS(P), 4-core 1.5 m

For connecting the JB-2/-4 averaging junction box and a measuring instrument

CR-612 Connection cable NDIS(P)-NDIS(P), 4-core 3 m

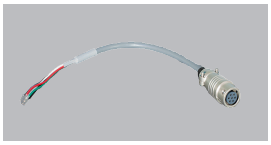
For connecting the SB-128A/-120SB bridge box and a measuring instrument

CR-615 Connection cable NDIS(J)-Loose wire, 4-core 0.2 m



A cable for connecting a transducer with tip NDIS plug to the TD-91B indicator

CR-616 NDIS relay cable NDIS(J)-Loose wire, 4-core



A cable for connecting a transducer with tip NDIS plug to the TD-96A/TD-98A indicator

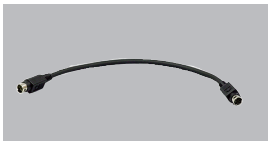
CR-6160 Remote sense cable NDIS(P)-NDIS(J), 7-core 0.2 m

For the remote sense function of the DRA-162B dynamic strainmeter

CR-6180 Sensor cable PRC8P(P)-NDIS(J)

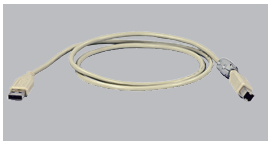
For connecting the DC-204R smart dynamic strain recorder and a transducer with the NDIS(P) connector or a bridge box

CR-6181 Sync cable



A synchronization cable for two or more DC-204R smart dynamic strain recorders

CR-6182 USB cable



For connecting the DC-204R smart dynamic strain recorder to a PC

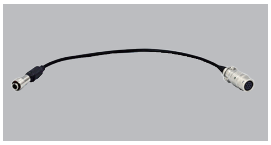
CR-6183 External control cable

For inputting external control signals to the DC-204R smart dynamic strain recorder

CR-6184 DC-204R sensor cable

This is an extension sensor cable for the DC-204R smart dynamic strain recorder and the TMR-321 multi-recorder. A change in conductor resistance for the cable is eliminated.
(Remote sense compatible)

CR-6186 Sensor cable PRC8P(P)-NDIS(J)



For connecting the multi-recorder's TMR-321/-323 strain gauge unit to a transducer with the NDIS(P) connector

Data Cable

Data Cable

CR-6185 Bridge box SB-DD sensor cable

This is an extension sensor cable for the DC-204R smart dynamic strain recorder and the TMR-321 multi-recorder dedicated SB-120DD bridge box. A change in conductor resistance for the cable is eliminated.
(Remote sense compatible)

CR-6189 USB cable USB(C)-USB(A) 1.5 m

USB Type-C compatible
For connecting T-ZACCS3 TS-360 and a PC

CR-65 Switch box connection cable NDIS(P)-NDIS(P), 7-core 1.5 m

For connecting the SSW-50D switch boxes to each other, for connecting a data logger and the SSW-50D switch box

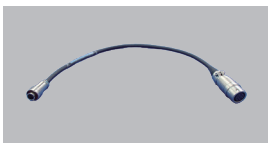
CR-670 Connection cable NDIS(P)-Loose wire, 7-core 1.5 m

For connecting the NZ-7C and the SSW switch box

CR-872M Control unit synchronization cable 2 m

This is a synchronization cable that connects between the TMR-311 control units.
It can be extended up to 100 m.
CR-875 m (5 m), CR-8701 (10 m), CR-8702 (20 m), CR-8705 (50 m), CR-8710SYNC (100 m)

CR-8141 MM-014/MM-014L cable



For connecting the MM-014/MM-014L and a transducer with NDIS(P) connector
Remote sense compatible

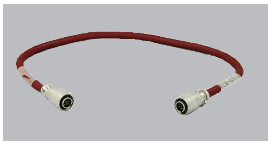
CR-6187 USB cable mini B-A 1.8 m

For connecting the TS-963/-960, TDS-540 data loggers, TC-37K / -32K handheld data logger, TDS-150 portable data logger or DC-004P PC control type dynamic strainmeter and a PC

CR-6462 LAN cable 3 m (Straight)

Used for an Ethernet Hub connection of a LAN compatible measuring instrument and as a synchronization cable of DS-50A

CR-655 Switch box connection cable NDIS(P)-NDIS(P), 7-core 0.5 m

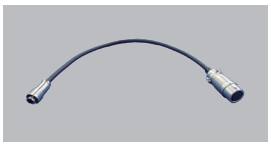


For connecting the TC-37K / -32K handheld data logger and the CSW-5B switch box

CR-671 Connection cable NDIS(J)-Loose wire, 7-core 1.5 m

For connecting the NZ-7C and the SSW switch box

CR-8140 MM-014/MM-014L cable



For connecting the MM-014/MM-014L and a transducer with NDIS(P) connector
TEDS compatible

CR-6930 Dedicated TML-NET cable 3P(P)-Loose wire, 2-core 1.5 m

For connecting the TS-360 or ND-100 and a network module

External Starter

CR-9180 External starter

A push-button switch for remote operation of measurement start of the DC-204R smart dynamic strain recorder

Switch Box Extension Cable / AC Adapter

Switch Box / Measurement Box Extension Cable

CR-892M Connection cable for EX 2 m

For connecting the EX-50 H measurement box and the TS-963/-960 data logger, and for connecting EX-50 Hs to each other
CR-895M (5 m), CR-8901 (10 m), CR-8902 (20 m), CR-8905 (50 m), CR-8910 (100 m)

CR-842M Extension optical fiber cable for ISW/IHW 2 m

For connecting the ISW/IHW switch box and the TDS-540/-630 data logger, and for connecting the ISWs/IHWs to each other
CR-845M (5 m), CR-8401 (10 m), CR-8402 (20 m), CR-8405 (50 m), CR-8410 (100 m)

CR-832M Extension cable for the ISW/IHW RS-422 2 m

For connecting the ISW/IHW switch box and the TS-560/TDS-540/-630 data logger, and for connecting ISWs/IHWs to each other

CR-872M TML-LINK connection cable 2 m

For connecting the TDS-630 data logger and the IHW-50 H switch box, and for synchronously connecting the TMR-311 multi-recorder control unit
CR-875M (5 m), CR-8701 (10 m), CR-8702 (20 m), CR-8705 (50 m), CR-8710 (100 m)

CR-800 Extension cable NDIS(P)-NDIS(J), 7-core 5 m

For connecting the switch box SSW series and a data logger
CR-801 (10 m), CR-802 (20 m), CR-803 (30 m), CR-805 (50 m), CR-810 (100 m), CR-812 (200 m)

AC adapter

CR-185B / CR-185-C AC power adapter (AC 100 to 240 V)

TC-35N handheld measuring instrument

CR-1868 / CR-1868-C AC power adapter set (AC 100 to 240 V)

DC-204R smart dynamic strain recorder

CR-1869 / CR-1869-C AC power adapter (AC 100 to 240 V)

TS-560 data logger
TS-360 T-ZACCS BOX AU-50M portable data logger
TC-37K / -32K handheld data logger
TDS-150, TS-360 portable data logger
Digital telemeter receiver
DT-281R, DT-281R-1, AU-50M, ND-100, DT-282R

CR-1870 AC power adapter (AC 100 to 240 V)

TC-351F FWD-light dedicated indicator

CR-1897 / CR-1897-C AC adapter

Output connector 3P(J)
TMR-311 multi-recorder control unit

CR-1812-C AC adapter set

For the TD-98A digital indicator

CR-1970 MM AC power adapter

MM-014/ MM-014L, MM-01T, MM-01V

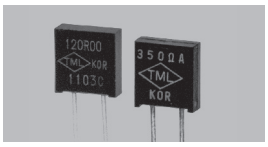
Printer Paper / Precision Fixed Resistor, Connector

Printer Paper / Precision Fixed Resistor

P-80 80 mm (Width) x 25 m (Length), 5 rolls/box

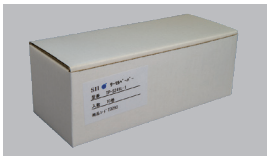
TDS-540 data logger

KOR Precision fixed resistor



Fixed resistors 120 Ω and 350 Ω used for bridge configuration

TP-S245L-1 58 mm (Width) x 19 m (Length), 10 rolls/box



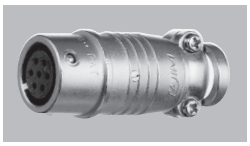
DPU-S245 printer

Connector

NDIS plug PRC03-12A10-7M

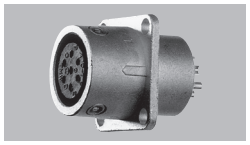
The seven-pin plug allows one-touch attachment / detachment. This connector is used at the tip of the included cable and extension cable for converters, switch boxes (ASW, SSW type) and bridge boxes.

NDIS jack PRC03-32A10-7F



This jack can be combined with the NDIS plug. It is used in combination with the NDIS plug at the tip of a converter extension cable, switch box extension cable, etc.

NDIS receptacle (Square flange) PRC03-21A10-7F

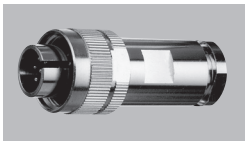


This receptacle can be combined with the NDIS plug. It is used for the input connector of dynamic strainmeters (DRA, DA and DC series).

NDIS receptacle (Round flange) PRC03-23A10-7F

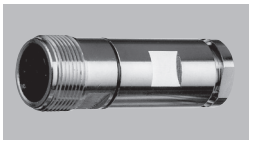
This receptacle can be combined with the NDIS plug. It is used for the input connector of switch boxes. (Optional for some models)

Waterproof plug TC1108-12A10-7M



This is a seven-pin plug. The inner circumference of the ring has a thread for mating with a jack or receptacle. It is used for the tip of a cable included with a transducer or an extension cable (on the transducer side).

Waterproof jack TC1108-32A10-7F

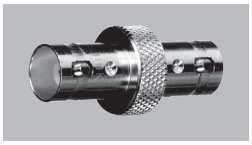


This is a jack that to be combined with a waterproof plug.

Waterproof receptacle TC1108-23A10-7F

This receptacle can be combined with a waterproof plug. It is used for the input/ output connector (on the transducer main unit side) of load cells and pressure meters.

BNC connector JJ



This connector is used to relay two BNC plugs.

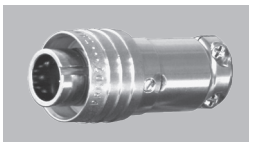
BNC connector JPJ

This connector is used to branch a BNC output terminal of a dynamic strainmeter, etc. into two.

BNC connector JJJ

This connector is used to branch a BNC plug into two.

Smart dynamic strain recorder / multi-recorder plug PRC07-P8M



This is a mini plug for the DC-204R smart dynamic strain recorder and the TMR-321 multi-recorder.

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