DATA**LOG**GER
TDS-540

High Performance, Easy Handling

◆ Tokyo Measuring Instruments Lab.

Everything inside
- "540" changes the strain measurement

The TDS-540 is a data logger incorporating every function required for static strain measurement. It accepts strain gauges, strain gauge type transducers, dc voltage, thermocouples and Pt-RTDs as inputs. Our unique measurement technique enables highly stable and accurate measurement by eliminating the effects of various thermoelectromotive forces, thermal zero shift of amplifier and power line noise. Strain measurement of up to 1000 points is possible in 0.4 seconds by combining with optional high speed switching boxes. High resolution mode of 0.1×10^{-6} strain is also possible. Furthermore, it is equipped with a newly developed remote data logger function which makes a remote control of the TDS-540 through internet browser possible. Optional wireless LAN allows measurement and monitoring of the data logger using a tablet terminal or smartphone. Other standard interfaces are Ethernet LAN, USB and RS-232C. In addition, our conventional switching boxes can be used successively. You can configure a new strain measurement system according to your measurement needs with the TDS-540.

- Strain gauge
- Strain gauge type transducer
- DC voltage
- Thermocouple
- Pt-RTD

Reliability

High accuracy and stability

Our unique measurement technique offers performance of eliminating the effects of various thermoelectromotive forces, thermal zero shift of amplifier and power line noise, that is superior to our former data logger TDS-530. More reliable and accurate measurement is realized.

Reliable data storage

A secure internal memory device is provided for backup of measurement data in case of SD card failure. In addition, uninterruptible power supply circuit is provided for holding measurement data during unexpected power failure.

Operability

Fast start

The TDS-540 starts up in 4 seconds, which is the fastest in our data loggers.

Intuitive operation

The onboard color LCD with touch panel offers excellent intuitive operability. Response of touch panel has been improved to achieve stress-free operation. Often used functions are arranged in upper hierarchies. Input procedure for interval timer measurement has been simplified and the sensor ID setting display has been improved to offer easy operation.

Innovativeness

Remote data logger function provided

Remote operation of TDS-540 through an internet browser is possible by the remote data logger function. In addition, downloading of measurement data files stored in TDS-540 is possible. The remote data logger function is available in any OS for personal computers without using dedicated software. It is applicable not only to a personal computer but also to multiple devices such as a tablet terminal or smartphone conforming to each communication mode.

Selection of option units

Option units can be chosen when ordering your TDS-540. You can build the most suitable measurement system for you with these options.

Continuity

Inherited excellent functions

Every type of switching box developed by TML in these 20 years can be used with the TDS-540. Conventional switching boxes equipped with our unique functions can be used in the same way as before utilizing the functions such as high speed scanning of 1000 points in 0.4 seconds (in combination with IHW-50G *), complete compensation method of strain, and 1-gauge 4-wire strain measurement with modular plug connection **.

- *: Automatic measurement of 1000 points in 1 second is possible in interval measurement.
- **: Measurement of strain in 1-gauge 4-wire method is a factory installed option.

Pursuit of simple operation

You can view the diagram of strain gauge connection in the display of the TDS-540. You can return to monitor screen from any screen by merely pressing the HOME key provided on the side of the display.
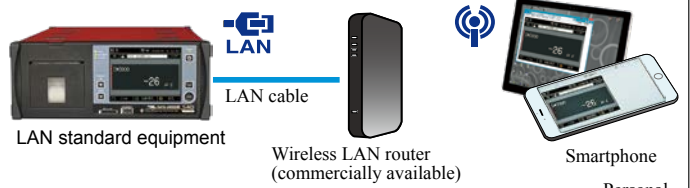
Remote data logger function

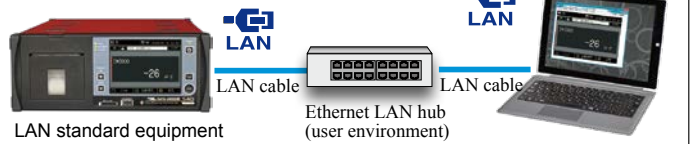### Remote operation in accordance with the communication mode of the user

The web server function (remote data logger function) is provided. Measurement and monitoring of TDS-540 are possible through an internet browser. Dedicated software is not necessary.
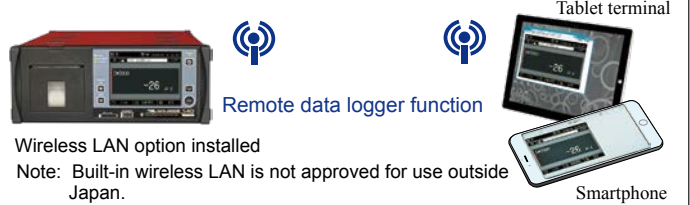
● Combination with wireless LAN router

LAN standard equipment
LAN cable
Wireless LAN router (commercially available)
Tablet terminal
Smartphone

● Ethernet LAN hub connection

LAN standard equipment
LAN cable
Ethernet LAN hub (user environment)
LAN cable
Personal computer

● Built-in wireless LAN   Factory installed option

Wireless LAN option installed
Remote data logger function
Note: Built-in wireless LAN is not approved for use outside Japan.
Tablet terminal
Smartphone

Downloading files by remote data logger function

Downloading (transferring) of measured data stored in the internal data memory or a data file stored in a SD card is possible during remote operation. Downloading of two or more files is also possible.
Note) Files stored in USB memory cannot be downloaded.

High speed scanning of 1000 points in 0.4 seconds

In combination with high speed switching box IHW-50G, scanning of 1000 points at maximum is performed in 0.4 seconds. The measurement speed is 1 second, and automatic measurement of 1000 points per every 1 second is possible using the interval timer.

Fast start in 4 seconds

Owing to the renovation of conventional starting mechanism, the TDS-540 starts only in 4 seconds after the power is turned on. This is the shortest time required in our data loggers. After the start, a monitor screen is displayed.
The right screen shows 10-channel monitoring.

FILE: data003.csv   START
[M]000 -10.75 mm   [M]005 -23 $\mu\varepsilon$
[M]001 -24 $\mu\varepsilon$ [M]006 -21 $\mu\varepsilon$
[M]002 -26 $\mu\varepsilon$ [M]007 -23 $\mu\varepsilon$
[M]003 -32 $\mu\varepsilon$ [M]008 -26 $\mu\varepsilon$
[M]004 -32 $\mu\varepsilon$ [M]009 -25 $\mu\varepsilon$
INITIAL   AUTO MEAS   SETTING
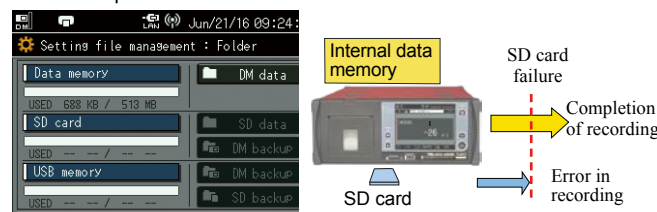
Reliable data storage

● UPS (Uninterruptible power supply)

Even if the power supply is interrupted unexpectedly during file access, the UPS works to supply power continuously to prevent damage to the file.

Power interruption
In operation → File closure
Power supply → UPS
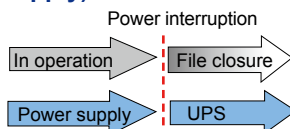
● Data backup

A SD card is used for storing measured data. By the combined use of internal data memory which features excellent durability and reliability, data backup is secured even if SD card failure occurs.

Setting file management : Folder
Data memory   DM data
USED 688 KB / 513 MB
SD card   SD data
USED --- --- / --- --- ---
USB memory   DM backup
USED --- --- / --- --- ---   SD backup

Internal data memory
SD card failure
Completion of recording
SD card
Error in recording

We supply SD cards exclusively prepared for industrial use, which have data retention period of about 10 years and are suited to repetition of writing. The USB memory is intended only for copying measured data and reading them.

LED color changes according to the type of sensor

In the built-in switching box, a connection terminal board, NDIS connector receptacle and LED are provided for each channel. The LED changes its emission color according to the type of connected sensor. You can know the type of the sensor by seeing the LED color without changing the screen to show the sensor mode.

● Red LED   : Strain measurement
● Blue LED : DC voltage measurement
● Green LED : Temperature measurement

HOME key

On the display with touch panel, various settings are made by changing the screens in several hierarchies. It may take a few steps to return to the monitor screen from a setting screen. In such case, you can return to the monitor screen by merely pressing the HOME key. Quick operation is possible since the HOME key is positioned just above the START key.

Features

Display with touch panel for easy operation

The color LCD with touch panel provides excellent visibility and intuitive operability. Response of touch panel is 30 ms which is about twice as fast as our former model. You will not feel any stress in touch panel operation including changing screens. The display language is chosen between English and Japanese.

● SETTING : RECORD

MEAS
Sensor mode, Scanning channel, Sensor ID, etc.

CHECK
Check, Output of setting list, Output of automatic measurement setting list, etc.

REC :
File management, File output, Interface selection, etc.

CONF:
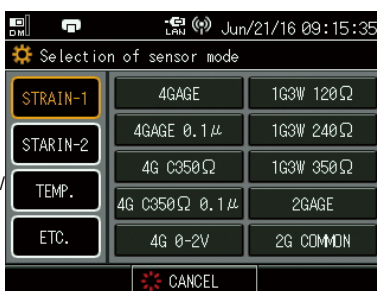Date/Time, Measurement environment, Updating, Factory setting, etc.

● Selection of sensor mode

STRAIN-1
4GAGE/4GAGE 0.1μ/1G3W/
4G C350Ω/4G C350Ω 0.1μ, etc.

STRAIN-2
1G4W 120Ω, 240Ω, 350Ω
1G3W 120Ω-T, 240Ω-T, 350Ω-T

TEMP.
T(CC)/K(CA)/J(IC)/B/S/R/N/
E(CRC)/Pt100 3W

ETC.
DC 640mV/DC 64V
TML-NET/JUMP

● Wiring diagram of the sensor

This screen shows the diagrams of connection between the sensor and the switching box.

4G: Full bridge
1G: Quarter bridge 3-wire, Quarter bridge 2-wire
2G: Half bridge
1G-T: Temperature-integrated strain gauge (quarter bridge 3-wire)
2G C: Half bridge common dummy
TC: Thermocouple
DC: DC voltage 640mV, 64V
Pt : Pt-RTD
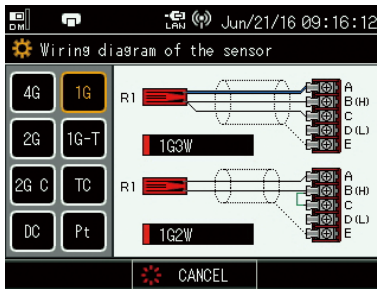
● Sensor ID setting

The TDS-540 has a function to store the sensor ID. In this function, sensor parameters including coefficient, unit, display digit and sensor types are set and stored in one package. If you want to replace some of the already set and stored sensors, you may recall the stored sensor ID and renew only the sensor parameters to be replaced, and the new setting will be completed. In the following screens, renewed sensor ID is recalled on the TDS-540 display, and the sensor ID is allocated to the specified channels.

Setting example

Renewed senor ID is recalled

Allocated to specified channels
Former setting without renewal is displayed for CH. 004 which is out of the frame.

Information of sensor ID setting can be stored in SD card or USB memory and can be edited using a personal computer. The edited setting is stored again in the memory and recalled by the TDS-540.

● Automatic measurement

Interval timer

Quick setting:
Automatic start of measurement by every 1 minute, 10 minutes or 1 hour

Setting in table:
Interval, real time start, number of repetition, step number, etc. are set.

Sleep function:
Automatic power on/off before/after scanning

Monitor comparator

Setting in table:
Automatic measurement according to comparison value, comparison method (variation or upper/lower limit value), number of start, step number, etc.

Built-in switching box of 30 points at maximum
Factory installed option

The TDS-540 is equipped with a built-in switching box unit of 10 points as its standard specifications. The number of units is expandable to 2 or 3 as factory installed option making number of points to 20 or 30. Sensors such as strain gauges, strain gauge type transducers and thermocouples are connected to the built-in switching box.

Each point (channel) is equipped with a NDIS 7-pin connector receptacle and a LED with three emission colors to show the connected sensor type in addition to an ordinary terminal board. Also a surge absorber for lightening protection is provided for each point.
The built-in switching box unit is available in normal speed mode or high speed mode for switching speed, and either mode should be specified when ordering.
A built-in switching box unit for 1-gauge 4-wire measurement is under development.

The picture on the right may differ from the actual built-in switching box unit,

High speed printer

High speed thermal printer is integrated. Its printing speed is 0.04 seconds for one line of one channel.
Applicable paper: P-80 (80 mm wide)

High resolution mode (0.1×10⁻⁶ strain) provided
High resolution mode (0.1×10^{-6} strain) provided
TEDS compatible (under development)
Accepts SD card and USB memory as recording media
Standard interface includes LAN, USB and RS-232C
Built-in wireless LAN available as factory installed option (for use in Japan only).
Applicable to network measurement system TML-NET
Available by combined use with ASW/SSW switching box control unit (factory installed option)
Complete Compensation Method of Strain provided

Front panel

Open lever
To open the printer

Color TFT LCD with touch panel
(320×240 dots)

Power key
To turn on/off the power

Internal thermal printer
Printing speed: 0.04 seconds for 1 line of 1 channel
Paper: P-80 (80 mm wide)

START key
To start scanning measurement, check, etc.

HOME key
Shortcut to monitor screen from any screen

SD CARD (Supplied by TML)
SD card slot
Saving, reading and copying of measured data
Saving and copyinf of setting file, etc.
Capacity: 512 Mbyte

USB MEMORY
USB memory slot
Copying and reading of measured data
Saving and copying of setting file, etc.

Rear panel

Built-in switching box unit
(factory installed option)
Standard 10 channels
30 channels at maximum

Cover
Folding cover for protection of built-in switching box

RS-232C interface
Connector for RS-232C

USB interface
Connector for USB

LAN interface
Connector for LAN or Wireless LAN Router

GND terminal
Terminal for frame grounding

AC BREAKER
Breaker for AC power source

AC power connector
Input connector for AC commercial power source

POWER
On/Off switch for main power

TO ISW/IHW
Control unit for connecting ISW/IHW switching boxes (factory installed option)

TO ASW/SSW
Control unit for connecting ASW/SSW switching boxes (factory installed option)

External dimensions

440

320

130

Unit: mm

Specifications

TDS-540 Main body

Measuring performance

<table>
<tr><td rowspan="3">Number of measuring point</td><td>When switching boxes are connected</td><td rowspan="2">1000 points at maximum (2000 points at maximum when temperature integrated strain gauges are used)</td></tr>
<tr><td>When switching boxes are connected and built-in switching box is used in combination</td></tr>
<tr><td>Built-in switching box</td><td>30 points at maximum (60 points at maximum when temperature integrated strain gauges are used)</td></tr>
<tr><td rowspan="6">Scanning speed (Measuring speed in parentheses)</td><td>IHW-50G</td><td>0.4 s/1000 points (1 s/1000 points)</td></tr>
<tr><td>ISW-50G</td><td>2 s/1000 points (3 s/1000 points)</td></tr>
<tr><td>ISW-50C (under development)</td><td>3 s/1000 points (5 s/1000 points)</td></tr>
<tr><td>ASW/SSW</td><td>0.08 s/1 point (80 s/1000 points)</td></tr>
<tr><td>TML-NET</td><td>0.20 s/1 point (200 s/1000 points)</td></tr>
<tr><td>Built-in switching box</td><td>0.04 s/1 point, 0.08 s/1 point</td></tr>
<tr><td>Measurement mode</td><td colspan="2">Initial, Direct, Measure (only direct for temperature measurement)</td></tr>
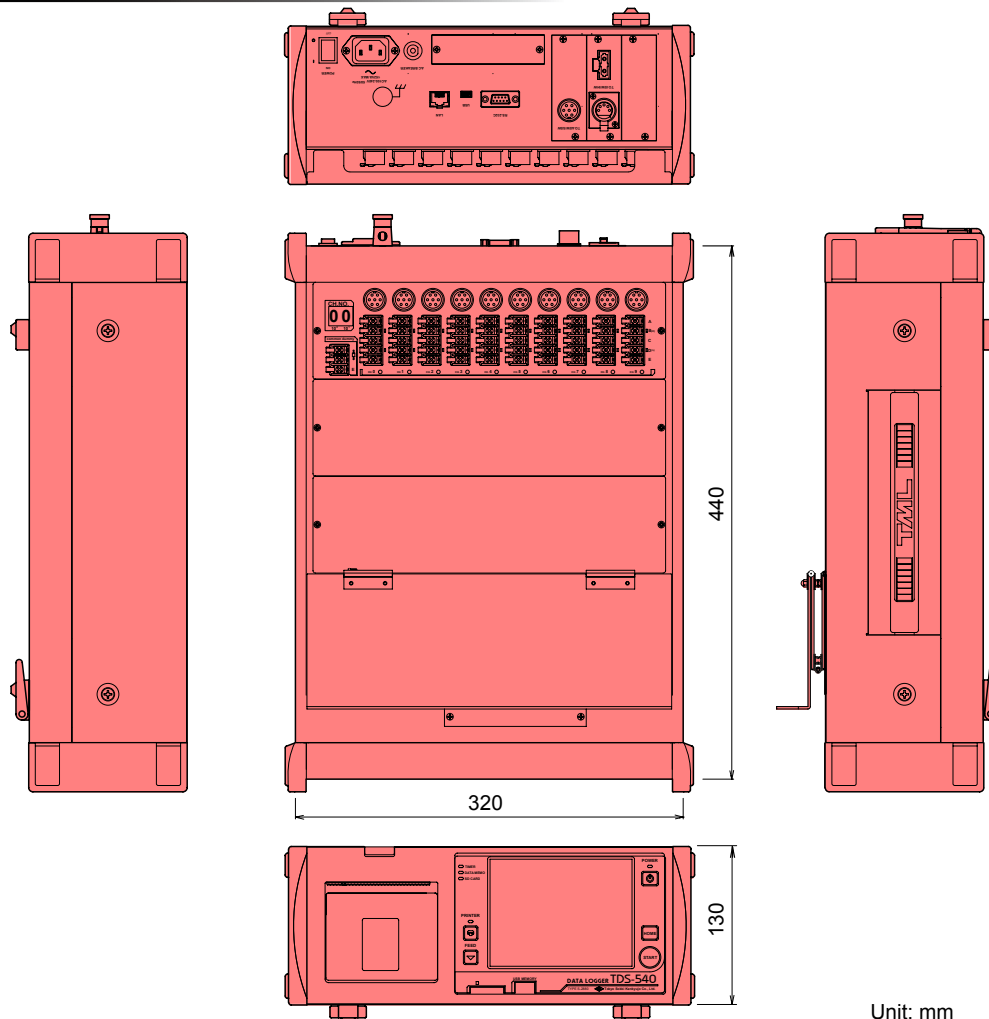<tr><td>Simple measure</td><td colspan="2">Coefficient: 1.000
Unit: Depends on sensor mode
Decimal point: Depends on sensor mode</td></tr>
<tr><td>Compensation mode</td><td colspan="2">Comet NON/Comet A/Comet B</td></tr>
<tr><td rowspan="2">Measuring point switching method</td><td>Scanning</td><td>Automatic switching from first channel to last channel (jump available)</td></tr>
<tr><td>Monitor</td><td>Repeated measurement of monitor channel (10 channels at maximum)</td></tr>
<tr><td rowspan="3">Start of scanning measurement</td><td>Manual</td><td>Start key</td></tr>
<tr><td>Automatic</td><td>Interval timer, Monitor comparator</td></tr>
<tr><td>Interface</td><td>LAN/USB/RS-232C, Wireless LAN (option)</td></tr>
<tr><td rowspan="6">Channel settings Settable for each channel</td><td>Coefficient</td><td>±(0.0001~99999)</td></tr>
<tr><td>Unit</td><td>40 kinds including με, mV, °C, kgf and mm</td></tr>
<tr><td>Decimal point</td><td>Optionally settable 0~5 digits below decimal point</td></tr>
<tr><td>Offset</td><td>Writable for each channel</td></tr>
<tr><td rowspan="2">Sensor mode</td><td>Type of connected sensor is set for each channel</td></tr>
<tr><td>Strain Quarter bridge 3-wire 120/240/350Ω
   Half bridge common dummy, Half bridge
   Full bridge, Full bridge constant current 350Ω
   Full bridge high resolution mode
   Full bridge constant current 350Ω high resolution mode
   Full bridge 0-2V mode
Temperature-integrated strain gauge 120/240/350Ω
DC voltage 640 mV, 64 V
Temperature
   Thermocouple T/K/J/B/S/R/E/N, Pt100 3W
TML-NET Various network modules</td></tr>
<tr><td rowspan="3">Sensor ID TEDS function</td><td>Sensor ID</td><td>Function</td></tr>
<tr><td colspan="2">Reading and setting of sensor ID / Writing to sensor ID</td></tr>
<tr><td>TEDS (under development)</td><td>Standards: IEEE 1451.4 Class 2 compatible (Template No. 33)
Function: Reading and setting of sensor information</td></tr>
<tr><td rowspan="2">Check function</td><td>During measurement</td><td>Open check, Thermocouple burnout check</td></tr>
<tr><td>Sensor</td><td>Insulation check, Sensitivity check, Dispersion check, Thermocouple burnout check, Leadwire resistance check, Bridge output check</td></tr>
<tr><td>TML-NET</td><td>Available when ASW/SSW control unit is equipped.</td><td>ID check, Sensitivity check, Check module, Channel setting</td></tr>
</table>

Interval timer

<table>
<tr><td>Function</td><td colspan="2">Automatic scanning measurement according to the set intervals or real time</td></tr>
<tr><td>Quick setting</td><td>Time intervals</td><td>1 minute/ 10 minutes/ 1 hour (measured at every 00 second or 00 minute)</td></tr>
<tr><td rowspan="7">Setting in table</td><td>Time intervals</td><td>Hour·Minute·Second, Settable up to 99 h 59 m 59 s for every step</td></tr>
<tr><td>Real time start</td><td>Start time (Day·Hour·Minute·Second) is settable for every step</td></tr>
<tr><td>Number of start times</td><td>Up to 99 times per step or infinite</td></tr>
<tr><td>Number of steps</td><td>Programmable up to 50 steps</td></tr>
<tr><td>GOTO step</td><td>Programmable loop to previous step</td></tr>
<tr><td>GOTO comparator</td><td>Goes to step 1 of monitor comparator</td></tr>
<tr><td>Execution item</td><td>Scanning, Insulation check, Sensitivity check, Dispersion check, Thermocouple burnout check</td></tr>
<tr><td>Sleep function</td><td colspan="2">Automatically turns power off/on when 1 minute or more is left between the end of scanning and the start of next scanning in interval timer measurement</td></tr>
</table>

Monitor comparator

<table>
<tr><td>Function</td><td colspan="2">Automatic scanning measurement according to the set variation of monitor channel (1 point)</td></tr>
<tr><td rowspan="6">Setting in table</td><td>Value for comparison</td><td>Settable for every step up to ±999999</td></tr>
<tr><td>Method for comparison</td><td>Variation or upper/lower limit value</td></tr>
<tr><td>Number of start times</td><td>Up to 99 times per step or infinite</td></tr>
<tr><td>Number of steps</td><td>Programmable up to 50 steps</td></tr>
<tr><td>GOTO step</td><td>Programmable loop to previous step</td></tr>
<tr><td>GOTO interval</td><td>Goes to step 1 of interval timer</td></tr>
</table>

Time

<table>
<tr><td>Setting</td><td>Year, Month, Day, Hour, Minute, Second</td></tr>
<tr><td>Accuracy</td><td>±1 second/day (at 23°C ±5°C)</td></tr>
<tr><td>Backup</td><td>Approx. 60 days (when battery is fully charged)</td></tr>
</table>

Display · Operation

<table>
<tr><td>Display</td><td>Color TFT liquid crystal display with touch panel, 320 ×240 dots</td></tr>
<tr><td>Operation</td><td>Touch panel, POWER key, HOME key, START key, PRINTER key, FEED key</td></tr>
</table>

Data recording

<table>
<tr><td rowspan="3">Internal data memory</td><td>Function</td><td>Recording and reading of measured data, Saving of setting file</td></tr>
<tr><td>Recording format</td><td>TDS format, CSV format, 540CSV format</td></tr>
<tr><td>Capacity</td><td>512 Mbyte</td></tr>
<tr><td rowspan="4">SD card</td><td>Function</td><td>Recording, reading and copying of measured data Saving and copying of setting file, Wring and readout of sensor ID</td></tr>
<tr><td>Physical format</td><td>FAT 16/32</td></tr>
<tr><td>Recording format</td><td>TDS format, CSV format, 540CSV format</td></tr>
<tr><td>Capacity</td><td>512 Mbyte (SD card: Specified by TML)</td></tr>
<tr><td rowspan="2">USB memory</td><td>Function</td><td>Reading and copying of measured data, Saving and copying of setting file, Saving and readout of sensor ID</td></tr>
<tr><td>Physical format</td><td>FAT 16/32</td></tr>
</table>

Printer

<table>
<tr><td>Printing content</td><td>Measured data, Set value, Check result, etc.</td></tr>
<tr><td>Printing method</td><td>Thermal printing</td></tr>
<tr><td>Printing speed</td><td>0.04 seconds for 1 line of 1 channel</td></tr>
<tr><td>Applicable paper</td><td>P-80 (80 mm wide)</td></tr>
</table>

Interface

<table>
<tr><td>Wireless LAN (factory installed option for use in Japan only)</td><td>Conforms to IEEE802.11b/g/n, General purpose commands port server function (various settings, measurement, data acquisition), Web server function (Remote data logger function), DHCP server function</td></tr>
<tr><td>LAN</td><td>10BASE-T/100BASE-TX, General purpose commands port server function (various settings, measurement, data acquisition) Web server function (Remote data logger function)</td></tr>
<tr><td>USB</td><td>Compatible with USB2.0 protocol, General purpose commands applicable (various settings, measurement, data acquisition)</td></tr>
<tr><td>RS-232C</td><td>Conforms to RS-232C, Baud rate 9600/19200/115200 bps General purpose commands applicable (various settings, measurement, data acquisition)</td></tr>
</table>

Remote data logger

<table>
<tr><td>Function</td><td>Remote operation, remote monitoring and file downloading by web server function</td></tr>
<tr><td>Connection</td><td>LAN, Wireless LAN (factory installed option)</td></tr>
<tr><td>File download</td><td>Measured data in either data memory or SD card are downloaded/transferred in multiple ZIP format to a personal computer or a tablet terminal</td></tr>
</table>

Power source

<table>
<tr><td>Rated power source voltage</td><td>AC 100~240V 50/60 Hz</td></tr>
<tr><td>Power consumption</td><td>152 VA at maximum</td></tr>
</table>

Environment

<table>
<tr><td>Operating environment</td><td>0 ~ +50°C 85%RH or less (no dew condensation)</td></tr>
</table>

Others

<table>
<tr><td>External dimensions</td><td>320(W) × 130(H) × 440(D) mm (except rubber protectors and other projections)</td></tr>
<tr><td>Weight</td><td>Approx. 8 kg (with standard built-in switching box of 10 channels)</td></tr>
</table>

Built-in switching box unit　Factory installed option

<table>
<tr><td>Number of measuring point</td><td colspan="2">30 points at maximum (standard 10 points)</td></tr>
<tr><td>Switcher</td><td colspan="2">Semiconductor relay</td></tr>
<tr><td>Lightning protection</td><td colspan="2">Surge absorber for lightening protection is provided for each channel</td></tr>
<tr><td>Input terminal</td><td colspan="2">Accepts both screwing and soldering</td></tr>
<tr><td>Connector receptacle</td><td colspan="2">NDIS 7-pin connector receptacle</td></tr>
<tr><td>Strain measurement</td><td colspan="2"></td></tr>
<tr><td rowspan="9">Applicable connection method and gauge resistance</td><td>Quarter bridge 3-wire</td><td>120/240/350Ω</td></tr>
<tr><td>Half bridge</td><td>60~1000Ω</td></tr>
<tr><td>Half bridge common dummy</td><td>60~1000Ω</td></tr>
<tr><td>Full bridge</td><td>60~1000Ω</td></tr>
<tr><td>Full bridge constant current</td><td>350Ω</td></tr>
<tr><td>Full bridge high resolution mode</td><td>120~1000Ω</td></tr>
<tr><td>Full bridge constant current high resolution mode</td><td>350Ω</td></tr>
<tr><td>Full bridge 0 - 2V mode</td><td>60~1000Ω</td></tr>
<tr><td>Temperature-integrated strain gauge mode (Quarter bridge 3-wire)</td><td>120/240/350Ω T(JIS C1602-1995、IEC 60584)</td></tr>
<tr><td rowspan="2">Sensor cable extension range</td><td>Full bridge constant current 350Ω</td><td>Total cable resistance 400Ω or less</td></tr>
<tr><td>Full bridge constant current high resolution 350Ω</td><td>Total cable resistance 400Ω or less</td></tr>
<tr><td rowspan="2">Sensitivity variation</td><td>Full bridge constant current 350Ω</td><td rowspan="2">+0.1~-0.5% for Cable total resistance 100Ω</td></tr>
<tr><td>Full bridge constant current high resolution 350Ω</td></tr>
<tr><td rowspan="3">Compensation range of lead wire resistance Comet B (quarter bridge 3-wire)</td><td colspan="2">Approx. 100 Ω or less for gauge resistance 120 Ω</td></tr>
<tr><td colspan="2">Approx. 200 Ω or less for gauge resistance 240 Ω</td></tr>
<tr><td colspan="2">Approx. 300 Ω or less for gauge resistance 350 Ω</td></tr>
<tr><td>Stability on zero</td><td colspan="2">Within ±1.0×10⁻⁶ strain / °C (quarter bridge)
Within ±0.5×10⁻⁶ strain / °C (half bridge)</td></tr>
<tr><td>Initial unbalance</td><td colspan="2">Within +750×10⁻⁶ strain (quarter bridge)
Within +500×10⁻⁶ strain (half bridge)</td></tr>
</table>

Specifications

Built-in switching box unit Factory installed option

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 ±70 V at maximum

Thermocouple temperature measurement

Applicable thermocouple	T, K, J, B, S, R, E, N JIS C1602-1995, IEC 60584

Pt-RTD temperature measurement

Applicable Pt-RTD	Pt100 (500 µA Constant current 3-wire) JIS C1604-1997, IEC 60751

Strain measurement

Bridge excitation	DC 2 V 24 ms (at power source 50 Hz)
Initial value memory range	±160000×10⁻⁶ strain
Temperature coefficient of accuracy	±0.002%rdg / °C
Secular change of accuracy	±0.02%rdg / year

Measuring range and resolution	Measuring 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 1-gauge 4-wire method)	±(0.05%rdg + 1 digit)

Strain measurement with constant current method (full bridge only)

Bridge excitation	DC6mA 24ms (at power source 50 Hz)
Bridge resistance	350Ω
Initial value memory range	±160000×10⁻⁶ strain
Temperature coefficient of accuracy	±0.002%rdg / °C
Secular change of accuracy	±0.02%rdg / year

Measuring range and resolution	Measuring 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)

Strain measurement in high resolution mode (full bridge only)

Bridge excitation	DC 5 V 48 ms (at power source 50 Hz)
Initial value memory range	±16000.0×10⁻⁶ strain
Temperature coefficient of accuracy	±0.002%rdg / °C
Secular change of accuracy	±0.02%rdg / year

Measuring range and resolution	Measuring 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+3digits)

Strain measurement with constant current method in high resolution mode (full bridge only)

Bridge excitation	DC 14 mA 48 ms (at power source 50 Hz)
Bridge resistance	350 Ω
Initial value memory range	±16000.0×10⁻⁶ strain
Temperature coefficient of accuracy	±0.002%rdg / °C
Secular change of accuracy	±0.02%rdg / year

Measuring range and resolution	Measuring 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+3digits)

DC voltage measurement

Initial value memory range	
V1/1	±160.000mV
V1/100	±16.0000V
Temperature coefficient of accuracy	±0.0024%rdg/°C
Secular change of accuracy	±0.024%rdg/year

Measuring range and resolution		Measuring range	Resolution
	V 1/1	±40.000mV	0.001mV
		±80.000mV	0.002mV
		±160.000mV	0.004mV
		±320.000mV	0.008mV
		±640.000mV	0.016mV

DC voltage measurement

Measuring range and resolution	V 1/100	Measuring range	Resolution
		±4.0000V	0.0001V
		±8.0000V	0.0002V
		±16.0000V	0.0004V
		±32.0000V	0.0008V
		±64.0000V	0.0016V

V 1/1 Accuracy (at 23°C ±5°C)	±(0.05%rdg+3 digits)
V 1/100 Accuracy (at 23°C ±5°C)	±(0.05%rdg+2 digits)

Thermocouple temperature measurement (JIS C1602-1995, IEC 60584)

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

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

Note: Accuracy of sensor is not included. Thermocouple B does not use reference junction.

Pt-RTD temperature measurement (JIS C1604-1997, IEC 60751 Pt100)

Applicable Pt-RTD	Pt100
Measuring method	3-wire (Pt3W)
Linearization	Digital processing
Temperature coefficient of accuracy	±0.0020%rdg / °C
Secular change of accuracy	±0.05%rdg / year
Measuring range	-200 ~ +850°C
Resolution	0.1°C
Accuracy (at 23°C ±5°C)	±(0.05%rdg + 0.3°C)

Built-in 1-gauge 4-wire unit Factory installed option (under development)

Number of measuring point	Expandable up to 30 points by every 10 points
Switcher	Semiconductor relay
Modular connector	6-pin modular jack
Applicable gauge resistance	120/240/350 Ω
Sensor cable extension range	Total cable resistance 200 Ω or less
Stability on zero	Within ±1.0×10⁻⁶ strain / °C
Initial unbalance	Within +500×10⁻⁶ strain
Initial value memory range	±160000×10⁻⁶ strain
Temperature coefficient of accuracy	±0.002%rdg / °C
Secular change of accuracy	±0.02%rdg / year

Measuring range and resolution	Measuring 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)	±(0.25%rdg + 1 digit)

ISW/IHW unit Factory installed option

Specifications on measurement depend on the specificatios of each switching box.

Connection

Applicable type		IHW-50G/ISW-50G/ISW-10D
ELECTRICAL (RS-422)	Number of connection and extension distance	20 switching boxes for 1000 points, 800 m between instruments
	Connection cable	Extension cable for ISW/IHW CR-832M
OPTICAL (Optical fiber)	Number of connection and extension distance	20 switching boxes for 1000 points, 800 m between instruments
	Connection cable	Optical fiber extension cable for ISW/IHW CR-842M

ASW/SSW unit Factory installed option

Specifications on measurement depend on the specificatios of each switching box.

Connection

Applicable type		SSW-50D/SSW-50C/ASW-50C/NDR-100
Applicable network module type		All types, One NDR-100 is required for every 100 points
Number of connection and extension distance	Booster power not supplied	8 switching boxes for 400 points, Extension distance 120 m
	Booster power supplied	20 switching boxes for 1000 points, Extension distance 2 km
Connection cable		Switching box connection cable CR-65 or Switching box extension cable CR-800

Note: Number of connection and extension distance of network modules depend on the specifications of NDR-100.

Standard accessories

Quick Reference	1 copy
Operation manual (CD)	1 piece
AC power cable CR-01	1 piece
Ground wire CR-20	1 piece
Printer paper P-80	2 rolls
Cross slot screwdriver	1 piece
Vinyl cover	1 piece

Factory installed option

Built-in switching box unit
: High speed type with terminal board and connector receptacle Option code -H
: Normal speed type with terminal board and connector receptacle Option code None

Built-in 1-gauge 4-wire unit (Note *)
: 1-gauge 4-wire strain measurement Option code -HF (under development)

One unit for 10 channels is the standard specification.
Two or three units for 20 or 30 channels are available as factory installed option.

Note: The picture may differ from the actual built-in switching box unit.

ASW/SSW switching box control unit: Option code -01

ISW/IHW switching box control unit: Option code -02

If both of these two units are installed (ASW/SSW + ISW/IHW), its option code is -03.

ISW/IHW switching box IHW-50G (optional)

ASW/SSW switching box SSW-50D (optional)

Main functions of generally used switching boxes

Switching box type	Number of measuring points	Connector receptacle included	Strain	Constant current mode	High resolution mode	DC voltage	Thermo-couple	Pt-RTD	Arrestor equipped	1000 point measure-ment	Scanning speed	1-gauge 4-wire *
IHW-50G	50	–	●	●	●	●	●	●	●	1s	0.4s/1000 points	●
IHW-50G-05		●										
ISW-50G	50	–	●	●	●	●	●	●	●	3s	2s/1000 points	●
ISW-50G-05		●										
SSW-50D	50	–	●	●	●	●	●	–	● **	80s	0.08s/point	●
SSW-50D-05		●										
ASW-50C	50	–	●	●	●	●	●	–	–	80s	0.08s/point	–
ASW-50C-05		●										

Note *: 1-gauge 4-wire method Measurement is possible by external switching boxes having the function in addition to the built-in 1-gauge 4-wire unit.

Note **: Factory installed option

* 1-gauge 4-wire strain measurement method (abbreviated as 1G4W)
In our unique 1-gauge 4-wire strain measurement method, a 4-wire lead wire is connected to a strain gauge, and the lead wire is quickly connected to a switching box using a modular plug. Labor and time for lead wire connection is largely reduced in multi-point measurement.
This method has the following advantages which eliminate the need of compensation for conventional quarter bridge method.
▪ Sensitivity drop is not caused by the lead wire resistance
▪ Thermal output is not caused by the change of lead wire temperature
▪ Measured value is not affected by the contact resistance of the lead wire
In addition, this method enables lead-free connection using modular plug.

Option code

TDS-540(**-30HF** **-07**)

Built-in unit options		Other options	
None	10 channels (standard)	None	None
-20	20 channels	-01	ASW/SSW
-30	30 channels	-02	ISW/IHW
-20H	High speed 20 channels	-03	ASW/SSW+ISW/IHW
-30H	High speed 30 channels	-04	Wireless LAN
-10HF	(High speed +1G4W)_10 channels	-05	Wireless +ASW/SSW
-20HF	(High speed +1G4W)_20 channels	-06	Wireless +ISW/IHW
-30HF	(High speed +1G4W)_30 channels	-07	Wireless +ASW/SSW+ISW/IHW

Wireless LAN unit: Option code -04

Remote operation of data logger TDS-540 is possible through internet browser. Operation from every terminal device is available without using dedicated software.
Built-in wireless LAN unit is not approved for use outside Japan. For remote operation of TDS-540 outside Japan, use a commercially available wireless LAN router for remote operation outside Japan.

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

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