# TC-32K
## Handheld Data Logger

- Strain Gauges
- Straingauge transducers
- DC Voltage
- Thermocouple
- Pt-RTD
- CSW-5B for multiple measurement

**LCD SCREEN
WITH BACKLIGHT**

**INTERFACE
USB RS-232C**

**POP-UP MENU**

**ALKALINE BATTERY
DRIVE SUPPORTED**

**SWITCHING BOX
CSW-5B**

**CF CARD SAVING**

**1-GAUGE 4-WIRE
STRAIN MEASUREMENT**

TC-32K is a compact and handheld digital data logger. The splash-water-proof construction enables outdoor use. The sensor connection terminal board is a patented onetouch type to facilitate connection with leadwires and banana plug and speedy preparation for measurement. Sensor mode, coefficient and initial values can be set and measurement values recorded for the maximum 20 channels, so you can collect measurement data at several field sites for later data processing.

The use of the exclusive switching box CSW-5B makes 5-channel automatic measurement possible. TC-32K has an interval timer, data memory, CF memory card slot and interfaces for computer control and data transfer. Gauge resistance and insulation resistance measurement functions are also provided to easily check strain gauges and transducers.
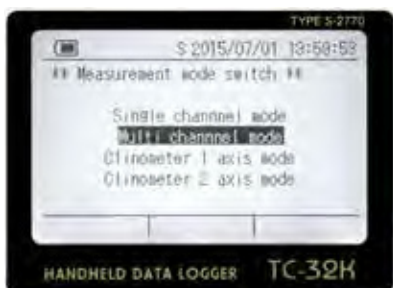
High brightness LCD and display in selectable measurement mode switch

LCD with backlight Resolution 255x160 dots

■ **EASY OPERABILITY AND HIGH RELIABILITY**

**Keeping in touch with multi-measurement of strain, DC voltage, thermocouple, PtRTD, etc.**

Strain gauges

Strain gauge-type transducers

Thermocouples

DV voltage

Load cells, Displacement transducers, etc.

Pt RTD

**Through TEDS compatible sensor, automatically recognizes measurement range, rated output, etc.**

One-touch connection with TEDS compatible load cell.

To use TEDS function, a transducer supporting TEDS is required.

**1-Gauge 4-Wire strain measurement available**

Optional adaptor CR-5810 offers 1-Gauge 4-Wire measurement (patent) with connection by modular plug, enabling ideal measurement without sensitivity drop and temperature effect due to leadwires.

1-Gauge 4-Wire adaptor CR-5810 (option)

1-Gauge 4-Wire method strain gauges with modular plug

**Compact flash memory card**

Measurement data and the contents of setting are recorded on compact flash card. Firmware upgrade through the card is possible.
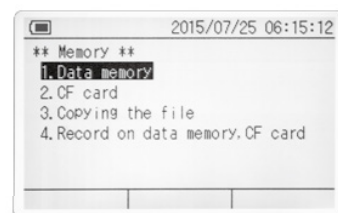
CF card memory capacities Maximum 2GB

## ■ SYSTEM BLOCK DIAGRAM

**Sensor inputs**

- Strain gauges
- Strain gauge-type transducers
- DC voltage
- Thermocouples
- Pt RTD
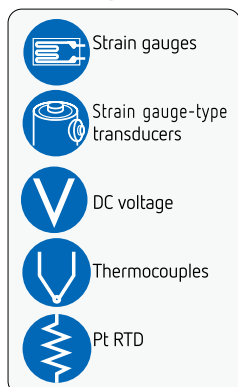
Automatic 5 channels

Automatic 1 channel

**TC-32K**

Exclusive Switching Box
CSW-5B    CSW-5B-05    (with NDIS one-touch connector)

Supplied connection cable CR-655

PC

Control and Data transfer

USB cable to PC CR-6187 (Option)

RS-232C cable to PC CR-5532 (Option )

External printer (Option) DPU-S245-00A-E

Printer cable CR-4511 (Option)

USB port

RS-232C port

RS232C cable CR-5353 (Option )

Remote Power Controller RPC-05A(Option)

AC adaptor CR-1869 (Option)

CF card (2GB at max.)

Data storage

Data transfer to a PC

**OPTIONAL INPUTS**

- 1-Gauge 4-Wire strain measurement through optional Adaptor CR-5810
- TEDS compatible transducers
- 2-axial inclinometer adaptor Combination use with 2-axial insertion type inclinometer
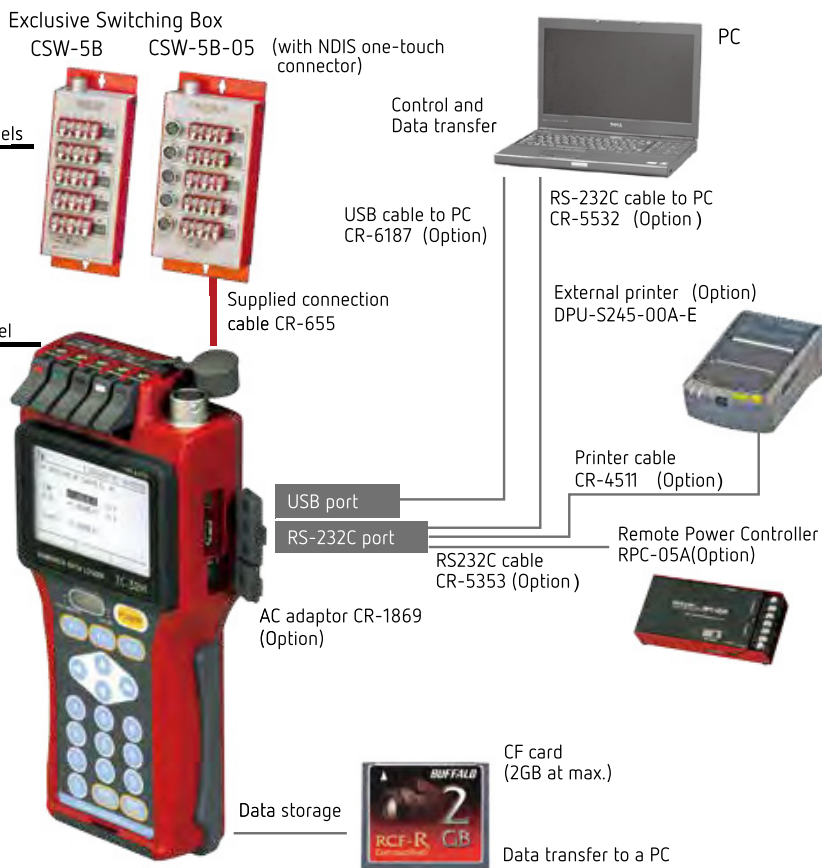
## ■ INTERFACE

Two types of interfaces, USB and RS-232C are equipped.

### USB port

Using the USB cable CR-6187 (option), control of TC-32K from a computer and data read of online measurement are possible. The USB driver is contained in TML measurement software Visual LOG Light (option).

### RS-232C port

By connecting the RS-232C cable CR-5532 (option), control of TC-32K from a computer and data read of online measurement can be done.

- Measurement with TML Remote Power Controller RPC-05A
  By setting up RPC-05A between TC-32K and a computer or modems, power on/off, control for solar power charge, etc. in long-terms measurement are possible.
- Printout of data
  The online measurement data is printed on the external printer DPU-S245-00A-E (option).

## ■ DATA MEMORY

The maximum 80000 data in single channel mode can be recorded. The data memory is one area only and the data stored in the area in order of measurement. One data are composed of channel, measurement time, measurement data and physical unit.

- The number of recordable data is 80000.
- When a ring buffer is set to off, if the number of data reaches 80000, 'M' is indicated on the sub-LCD and no more data are recorded.
- Even if a channel is changed, the storage destination of the data is the same.
- The data after storing in a PC should be sorted out by channel.
- If the number of data reaches 80000 at ON of the ring buffer, the oldest data are discarded and the latest data are always recorded.

In the multi-channel mode with the Switching Box CSW-5B, measurements of about 29400 times are possible. One data consists of box number, measurement time, measurement data and physical unit for 5 channels.

- It provides approximately 29400 times of measurement.
- Even if you change the switching box, the data storage destination is the same.
- When the ring buffer setting is 'ON' and the number of data reaches the upper limit, the oldest data are discarded and the latest data are always recorded.
- The data after recorded in a PC should be sorted out by box number and channel.

## ■ OPERATING DURATION ON BATTERY DRIVING

Normal operating duration of the alkaline battery is given below.

→ Continuous operation
  with Auto-Power-OFF not selected
  LCD backlight OFF
  Monitor display ON
  CF card equipped
  Environment 23°C

| Instrument | Duration |
|---|---|
| TC-32K unit only | 10 hours |
| TC-32K+CSW-5B | 6 hours |

→ Sleep-interval functioning
  with Alikaline battery set
  Environment 23°C

| Interval time | TC-32K unit only | TC-32K+CSW-5B |
|---|---|---|
| 1 minute | 60 hrs. (2.5 days) | 43hrs. (1.8 days) |
| 10 minutes | 580 hrs. (24 days) | 428 hrs.(17 days) |
| 1 hour | 2800 hrs. (116 days) | 2400 hrs. (100 days) |
| 3 hours or longer | 7200 hrs. (300 days) | 6000 hrs. (250 days) |

Please note that the above operating duration may vary due to battery type and environments.

## SPECIFICATIONS

### Number of measurement points

| 1-ch | Main unit | Sensor inputs with NDIS connector or via one-touch terminal |
|---|---|---|
| 5-ch | Combined with CSW-5B | CSW-5B, CSW-5B-05 |

### Applicable sensors

| Strain measurement | 1-gauge 4-wire method (1G4W) | 120 Ω 240 Ω 350 Ω | *For 1-gauge 4-wire method on TC-32K, optional exclusive adaptor should be used. |
|---|---|---|---|
| | 3-wire quarter bridge (1G3W) | 120 Ω 240 Ω 350 Ω | |
| | Half bridge(2GAGE)120 ~ 1000Ω Full bridge(4GAGE)120 ~ 1000Ω Full bridge constant 350Ω current (4G C350Ω) | | Bridge excitation voltage DC1V 44ms (50Hz ) |
| | Full bridge 0-2V 120 ~ 1000Ω (4G 0-2V) | | * Bridge excitation voltage DC2V 24ms(50Hz) |
| DC voltage measurement | DC 300mV ± 300mV DC 30V ± 30V DC Auto * ± 30V | | Input impedance V 1/1 500MΩ or more V 1/100 1MΩ or more |
| Thermocouple temperature measurement | T, K, J, B, S, R, E, N | | Linearization: Digital operation JIS C 1602-1995 |
| Pt RTD temperature measurement | Pt100 3W Pt RTD 3-wire | | Linearization: Digital operation JIS C 1604-1997 Pt100 |

* : 1 channel measurement from main unit only

### Measurement range

| Item | Range | Measurement range | Initial memory | Sampling speed |
|---|---|---|---|---|
| Strain measurement | ×1 ×10 | ±30000x10$^{-6}$ strain ±300000x10$^{-6}$ strain | ±160000x10$^{-6}$ strain | |
| 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 | 80ms (50Hz area) 67ms (60Hz area) |
| Thermocouple temperature measurement | – | T: - 250 ~ + 400°C K: - 210 ~ +1370°C J: - 200 ~ +1200°C B: +200 ~ +1760°C S: - 10 ~ +1760°C R: - 10 ~ +1760°C E: - 210 ~ +1000°C N: - 200 ~ +1300°C | – | |
| Pt RTD temperature measurement | – | - 200 ~ +850°C | – | |

Note : Measurement range of Full bridge 0-2V such as our LVDT is ±15000x10$^{-6}$ strain (x1) and ±150000x10$^{-6}$ strain (x10).

### Thermocouple temperature measurement

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

The accuracy of thermocouples is not included. Thermocouple B does not use RJC. RJC: Reference junction compensation

### Measurement accuracy

| Sensor mode | Range | Resolution | Accuracy ( 23°C±5°C ) | Temperature effect ( %rdg/°C) | Aging effect (%rdg/year) |
|---|---|---|---|---|---|
| Strain except 1G4W | ×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 with 1G4W | ×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 |
| DC 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 |
| DC voltage V 1/100 | ×1 ×10 | 0.0001V 0.0010V | ±(0.08%rdg+2digit) ±(0.08%rdg+2digit) | ±0.002 ±0.002 | ±0.02 ±0.02 |
| Pt RTD Pt100 3W | – | 0.1°C | ±(0.08%rdg+0.3°C) | ±0.002 | ±0.05 |

Range: in auto-ranging
For resistance measurement with 2-wire, no leadwire resistance is included.

### Leadwire resistance correction

| Comet B (3-wire quarter bridge ) | Gauge resistance | Leadwire resistance correction range |
|---|---|---|
| | 120Ω | Approx. 100Ω or less |
| | 240Ω | Approx. 200Ω or less |
| | 350Ω | Approx. 300Ω or less |

### Check function

| Insulation | Insulation resistance between sensor and specimen |
|---|---|
| Resistance | Sensor resistance between terminal A and B for input |
| Scattering | Measurement values when scattered |
| Coefficient set | Multiplication results by coefficient set when 100, 1000 or 10000µV or equivalent signal is input. |

| Item | Insulation resistance | Resistance measurement |
|---|---|---|
| Range | 0~500MΩ | 0~30kΩ |
| Accuracy | ±20%rdg on battery working | 0~3kΩ ±(0.5%rdg+0.2Ω ) 3k~30kΩ ±(0.5%rdg+2Ω ) |
| Resolution | 0.1MΩ | 0.1Ω (0~3kΩ) 1Ω (3k~30kΩ) |
| Sampling speed | Approx. 1s | Approx. 0.5s |
| Remarks | Excitation 2.5V | 10µA constant current method |

### Disdplay and Function

| Display | Display unit | LCD display with backlight |
|---|---|---|
| | Resolution | 255×160 dots |
| | Contents | Measurement data, Setting list, Y-T monitor |
| Clock | Setting | Year, Month, Day, Hour, Min. and Sec. |
| | Accuracy | ±1 sec./day (23°C±5°C ) |
| Interface | USB, RS-232C | |
| | Function | Control command from PC and Data transfer |
| Measurement mode | INITIAL, DIRECT, MEASURE for each channel (Direct mode only for temperature measurement) | |
| Changing method of measurement points | Scanning | Automatically changed from channel *0 through *4 to measure (when CSW-5B is connected only. * means box number, any channel can be skipped.) |
| | Monitor | Monitor channel is measured repeatedly. Displayed graphically according to time transition. |
| Start of measurement | Start key switch, Interval timer, USB, RS-232C | |
| Program setting | Capable of setting for each channel | |
| | Coefficient | ±( 0.0001~99999 ) |
| | Unit | 40 kinds such as µε, mV, °C , kN and mm |
| | Decimal point | Any 0 ~ 6 decimal places |
| | Initial value | Wrting for every channel |
| | Sensor mode | Setting for every sensor |
| SIMPLE measure | Coefficient | 1.0000 |
| | Unit | Linked to sensor mode |
| | Decimal point | Linked to sensor mode |
| Self-diagnosis | Upgrade indication, battery, dispersion and burnout check | |
| TEDS | Standard | IEEE1451.4 Class 2 |
| | Function | Readout of TEDS sensor parameters |
| Interval timer | Function | Automatic start according to the set time interval and time |
| | Interval | Hour, Min. and Sec. up to 99H 59M 59S for each step |
| | No. of starts | Programmable 99 times at max. or infinite per step |
| | Real time start | Sets a start time (Day Hour Min. Sec.) for each step |
| | GOTO step | Looping previous step |

| Interval timer | Sleep ON/OFF | | Automatically switches on 5 seconds before measurement time and turns off after measurement |
|---|---|---|---|
| Data memory | Function | | Storing and reading of measurement data |
| | Contents | | Measurement mode, Channel number, Measurement data, Time data and Data number |
| | Capacity | | 80000 data at max. |
| | Storage | | About 20 days with full charge |
| Memory card | Standard | | CF card |
| | Capacity | | Maximum 2GB |
| Auto-power-OFF | | | Automatically turns off when not receiving any key operation and RS-232C commands for any set time.  Switchable On/Off. |

| Vibration resistance | 29.4m/s$^2$ (50Hz 0.6mmp-p) |
|---|---|
| Shock resistance | 49m/s$^2$ |
| Protection rating | IP-54 with connector cap |

| Operational time in continuous use | Alkaline battery : Approx. 10 hours (Strain measurement in 350Ω full bridge) |
|---|---|
| Operational environment | -10~+50°C  85%RH or less without condensation |
| Storing temperature | -20~+60°C |
| Power requirement | LR6 Alkaline cell  4 pieces Exclusive AC adaptor CR-1869 or External battery 9~18V DC |
| Dimensions | 102(W)×49(H)×223(D) mm |
| Weight | 0.8 kg. |

Standard accessory

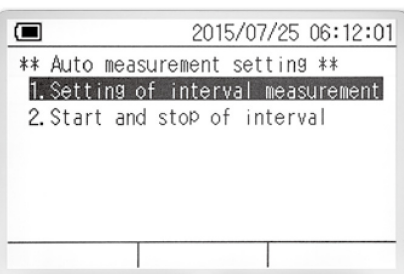| LR6 Alkaline cell | 4 pieces |
|---|---|
| Carrying belt | 1 piece |
| Operation manual | 1 copy |
| Accessory box | 1 piece |

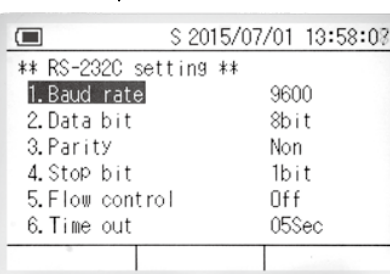## OUTER VIEW AND DIMENSIONAL DIAGRAM



Unit : mm
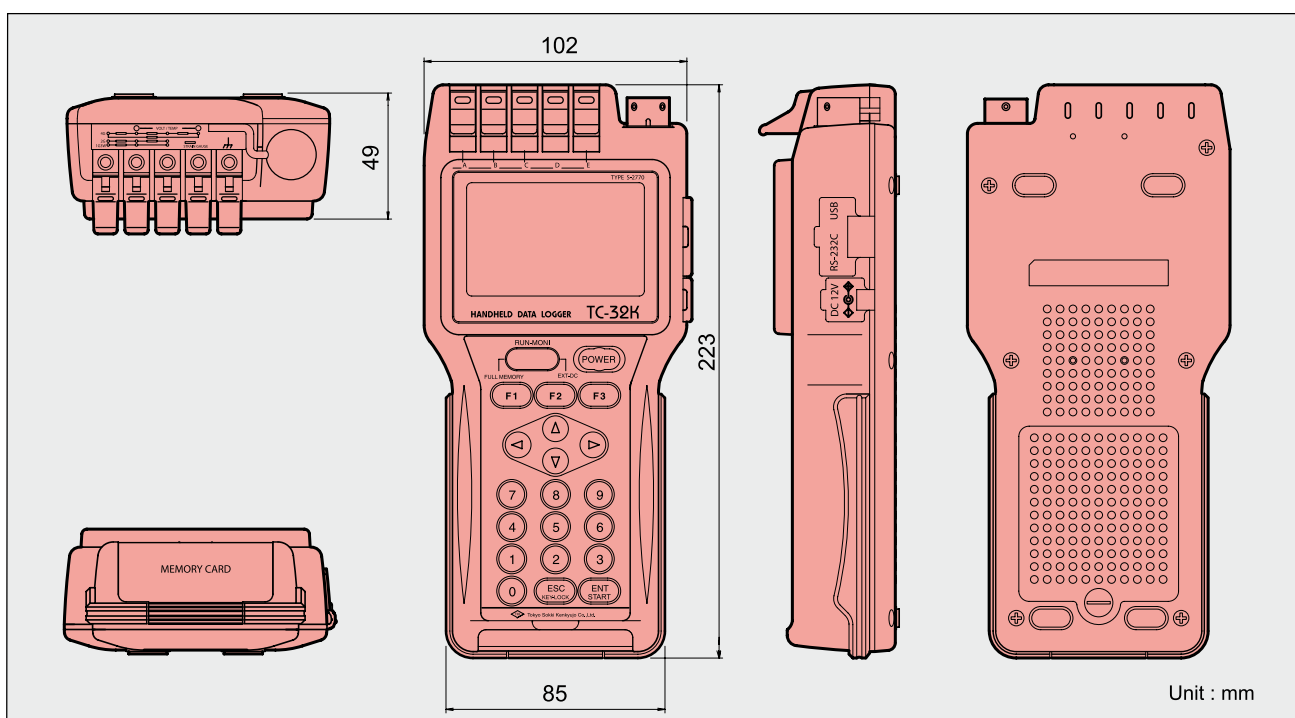
## POP-UP OPERATION GUIDE

( Menu )
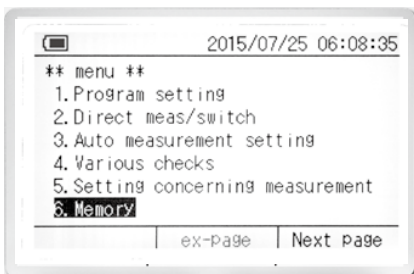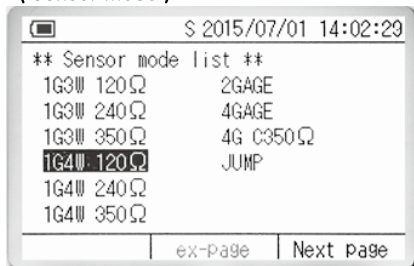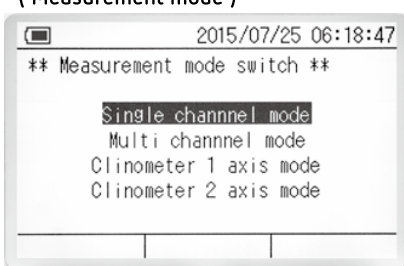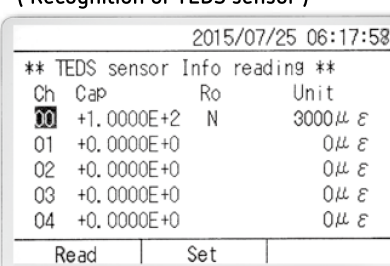


( Automatic measurement )



( RS-232C parameter )



( Sensor mode )



( Measurement mode )



( Recognition of TEDS sensor )

**CSW-5B**

**CSW-5B-05**
with one-touch connector
receptacle for sensor inputs

The CSW-5B switching box is combined with TC-32K when 5-channel extension is needed.  It can accept strain gauges, DC voltage, thermocouples and Pt RTD.  The CSW-5B-05 has a connector receptacle for NDIS 7-pin connector plug for each channel as well as ordinary terminal board.

## Features
- Capable of measuring strain, DC voltage, thermocouple and Pt RTD.
- Sensor mode setting by TC-32K
- Sensor connection by terminal screwing and soldering
- Small and lightweigh

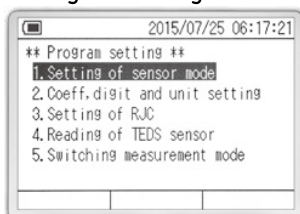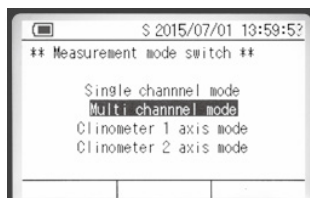## Combination with TC-32K

Connection cable CR-655
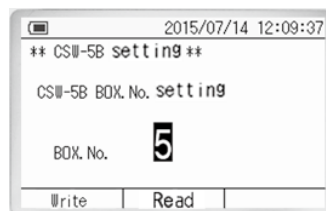supplied with CSW-5B

### Program setting

The setting of sensor mode, coefficient, digits, unit, RJC, etc. is the same as single channel mode, but TEDS sensor is not applicable.

### Multi-channel mode

By selecting the Multi-channel mode, CSW-5B setting, monitoring and automatic measurement become possible.

### SPECIFICATIONS

| Applicable instrument | TC-32K |
|---|---|
| Number of measurement points | 5 |
| Strain measurement | |
| Quarter bridge 3-wire | 120Ω, 240Ω, 350Ω |
| 1-gauge 4-wire method | 120Ω, 240Ω, 350Ω |
| Half bridge | 120 ~ 1000Ω |
| Full bridge | 120 ~ 1000Ω |
| Full bridge constant current | 350Ω (cable total resistance within 200Ω) |
| Full bridge 0-2V | 120 ~ 1000Ω |
| Measuring range | Conforms to TC-32K |
| Sensitivity drop ×1 range ×10 range | ±(0.08%rdg+1digit)-0.33%rdg or less ±(0.08%rdg+2digit)-0.33%rdg or less (Except full bridge constant current) |
| DC voltage measurement | |
| Measuring range | Conforms  to TC-32K |
| Voltage measurement | ±300mV ±30V |
| Allowable input voltage | 300mV range  ±5V 30V range      ±35V |
| Thermocouple temperature measurement | T, K, J, B, S, R, E, N |
| Measuring range | Conforms to TC-32K |
| Pt RTD temperature measurement | |
| Measuring range | Conforms to TC-32K |
| Measuring method | 3-wire system |
| Channel number | Fixed (CH0 ~ CH4) |
| Measuring channel indication | Red LED for each channel |
| Switching relay | Semiconductor relay |
| Environment | -10 ~ +50°C, 85%RH or less without condensation |
| Power supply | Supplied from TC-32K |
| Dimensions CSW-5B CSW-5B-05 | (excluding projected parts) 75 (W) ×35 (H) ×204 (D) mm 95 (W) ×35 (H) ×204 (D) mm |
| Weight CSW-5B CSW-5B-05 | 500g 650g |
| Standard accessories | Operation manual              1 copy Connection cable CR-655    1 piece Accessory box                 1 piece |
| | |

[Option]

| Simple waterproof case |
|---|

### CSW-5B Box No. setting

Applicable switching boxes are set from 0 to 9 figures for 10 units at maximum, saving the setting conditions as well as measurement data.

### Monitoring
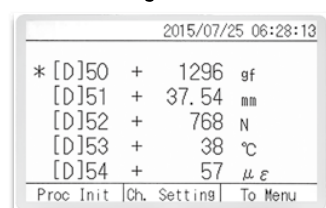
Real time monitoring is available for all 5 channels of the connected box and marked sequentially with blinking.

■ OPTION

## 1-Gauge 4-Wire Adaptor CR-5810

1-Gauge 4-Wire method
strain gauge with modular plug

## Remote Power Controller RPC-05A

In combination with RPC-05A and an external battery, long-term measurement with TC-32K using sleeping function becomes possible.

Exclusive cable CR-5353
for connection with TC-32K

## External Printer DPU-S245-00A-E

The measurement data of TC-32K is printed out.

Printer cable CR-4511
Dsub9P-10P (mini)
thru 0.5m

## RS-232C cable CR-5532
Dsub9P-10P(mini) Cross1.5m
Exclusive cable for connection with PC

## USB cable CR-6187
Mini B-A with ferrite core1.5m
Exclusive cable for connection with PC

## AC adaptor CR-1869

## CF card
Capacity  2GB at maximum

## 2-axial inclinometer adaptor IA-33 / IA-32

The inclionoadaptor is designed to measure biaxial inclination with our Handheld Data Logger TC-32K.  With setting of Inclino mode on the TC-32K, 2 axes inclinations in X and Y directions can be measured simultaneously.

SPECIFICATIONS

| | |
|---|---|
| Applicable instrument | |
| | TC-32K |
| No. of measurement points | 2 |
| Accuracy | Conforms to TC-32K |
| Power requirement | Supplied from TC-32K 5V DC |
| Environment | -10~+50°C   80%RH or less (without condensation) |
| Outer dimension | 95(W)x42(H)x85(D) mm |
| Weight | 300g |

## TEDS compatible sensors

To use TEDS function of the TC-32K, TEDS compatible sensor is required to recognize its own parameters such as measurement range, rated output, etc. registered in the built-in IC chip.

TEDS compatible load cell
TCLZ with the built-in IC chip.

## Monitoring Measurement Software
### *Visual LOG* ® *Light*  TDS-700L

The Visual LOG ® Light is control software for monitoring measurement using our data loggers and a PC.  The software can control a TC-32K (1-channel measurement) or a combination of TC-32K and CSW-5B / CSW-5B-05 (5-channel measurement).  All controls and data readings are made by the PC directly connected to the TC-32K through RS-232C  or USB interface.   Three systems of interval timer program can be set, and on-line measurement is possible manually or by using the interval timer.

## APPLICATIONS

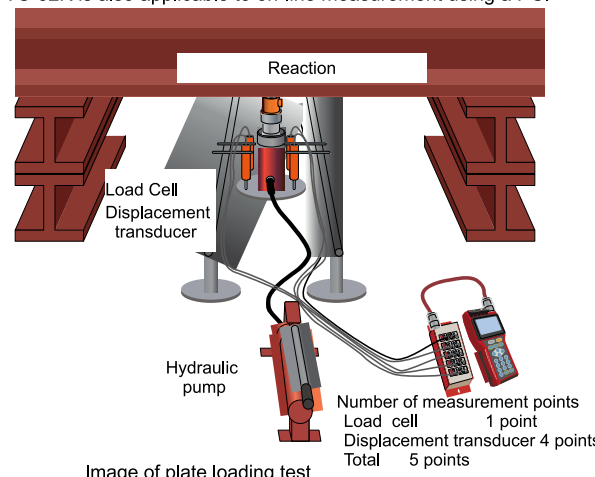### Checking of various sensors

The one-touch type terminal board of the TC-32K enables speedy connection and disconnection of lead wires.  It is very convenient for checking zero balance, resistance and insulation resistance of strain gauges and strain gauge type transducers installed on the site.  Since the TC-32K can measure DC voltage, thermocouple and Pt RTD in addition to strain, it is also capable of checking various sensors.
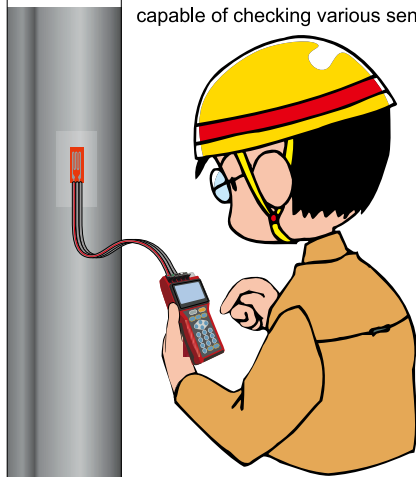
### Manual measurement

Data acquisition is possible by connecting each one sensor to the TC-32K or each five sensors to the switching box CSW-5B.  It is suited to use in small-scale test having one to five measurement points, or observation during and after construction where measurement points are scattered in two or more locations.  The TC-32K is also applicable to on-line measurement using a PC.

Reaction

Load Cell
Displacement
transducer

Hydraulic
pump

Number of measurement points
Load  cell            1 point
Displacement transducer 4 points
Total      5 points

Image of plate loading test

### Long-term unmanned measurement

The TC-32K is equipped with sleep function, which turns off the main power automatically when not measuring during interval timer measurement for the purpose of saving consumption of batteries.  Long-term observation during and after construction becomes possible by periodically collecting the data and replacing the batteries.

Battery-driven time using onboard sleep timer

| Interval time | Ambient temperature: 23°C | | Ambient temperature: 0°C | |
|---|---|---|---|---|
| | Single unit of TC-32K | + CSW-5B | Single unit of TC-32K | + CSW-5B |
| 1 minute | 2.5 days (60 hours) | 1.8 days (43 hours) | 1.75 days (42 hours) | 1.2 days (30 hours) |
| 10 minutes | 24 days | 17 days | 16 days | 12 days |
| 1 hour | 116 days | 100 days | 81 days | 70 days |
| 3 hours or more | 300 days | 250 days | 208 days | 145 days |

※The above operating time is an example with alkaline dry batteries

### Remote observation

The TC-32K is equipped with RS-232C interface.  Measured data can be collected and managed in a remote place by using a modem or a protocol converter for e-mail transmission.

Example of remote measurement system using protocol converter

Specifications are as of March 2016 and are subject to change without notice.

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Design and manufacture of strain gauges, strain measuring equipment and transducers

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