

Digital Strainmeter

TC-31K

TYPE S238C



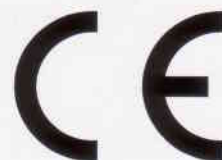
PC card flash memory
available 8~128MB
(PC Card standard Type II)

New



5-ch Switching Boxes
CSW-5A

CSW-5A-05



Tokyo Sokki Kenkyujo Co., Ltd.



DIGITAL STRAINMETER **TC-31K** TYPE S238C

TC-31K TYPE S238C is an upgraded model accepting Flash memory card. It succeeds the originality of former model such as fundamental functions including splash proofing construction (IP-54) and easy mounting connector. In addition to strain, dc voltage, thermocouple and Pt-RTD measurements, it can be used as a digital multi-meter for measurement of resistance and insulation resistance. Interval timer with sleep function is also provided. Measurement data can be stored using PC card (PCMCIA Type II, 8 - 128MByte) on the market. Measured data can easily be processed and analyzed by application software such as MS-Excel. Ten units of five-channel switching box CSW-5A can be connected at maximum (for 50 channels) as same as former model. Control and data transfer are also available by connecting personal computer using exclusive connection cable.

Design

Designed specifically for field measurement

◆ Use of Flash memory card

A flash memory card (PCMCIA Type II) which is acceptable by PC card drive equipped as a standard specification for notebook computer can be used. A card having capacity of 8 to 128MByte should be used.

Note) SRAM card which is accepted by former model of TC-31K cannot be used.



◆ COMPACT AND LIGHTWEIGHT

Weighing only 850g, the unit fits perfectly in your hand.

◆ DURABLE

The moisture tight case protects the instrument with the IP-54 proof class from incidental moisture encountered in the field, and it is shock resistant as well. Connector receptacles are equipped with attached caps to keep moisture out.

◆ SUPERB PORTABILITY

Everything about its design and construction make it ideal to transport in the field. Lightweight, easy to grip and battery powered.

Easy to Use

Convenience at your fingertips

■ QUICK MOUNT TERMINALS

These innovative connectors allow you to quickly and easily connect and disconnect different sensors - an essential feature for measurement and checking in the field.



The input terminals on the upper end feature a finger-touch design (Patent No.3253202) that facilitates connecting leads; no screws or solder needed. Leads with arrow and banana plugs can be inserted into the terminals as well - a real time saver when more than one sensor needs to be connected and read.

■ EASY TO READ DISPLAY

◆ Liquid crystal display with backlight

The display screen shows not only the value measured, but auxiliary information associated with programming of the instrument, like sensor mode and scaling parameter to give you a constant visual reminder of these important setting.

The backlit display means you can take readings in the dark if necessary.



■ FLEXIBLE POWER SUPPLY

◆ LR6 batteries

Alkaline or rechargeable Ni-Cd batteries can power the TC-31K. The unit continues to measure while you charge the battery on an AC adaptor (option). A built-in battery protects data from loss when you replace the batteries. Rechargeable nickel-hydrogen battery on the market can also be used as power source. In this case, exclusive charger should be used to recharge batteries.

◆ Automatic power-off

Power is cut automatically after about 10 minutes of inactivity in order to preserve the battery.

Anytime Flash memory card (PCMCIA Type II) accepted

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Functions

Superb functionality -- In a league of its own

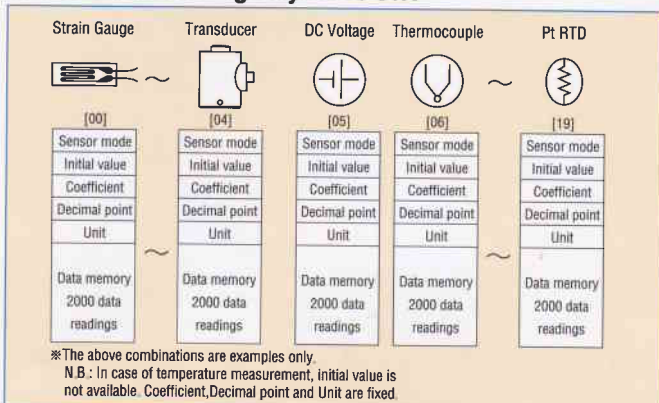
◆ A wide range of measurable quantities

The TC-31K can read strain gauge and strain gauge based transducer inputs, DC voltage, thermocouples and platinum resistance temperature devices. In addition, it can measure resistance, which is handy for trouble shooting strain gauge installation. The unit displayed with readings can be programmed. The output from a device can be multiplied by a programmed constant before display in order to transform it into the desired physical quantity.

◆ Large capacity data memory

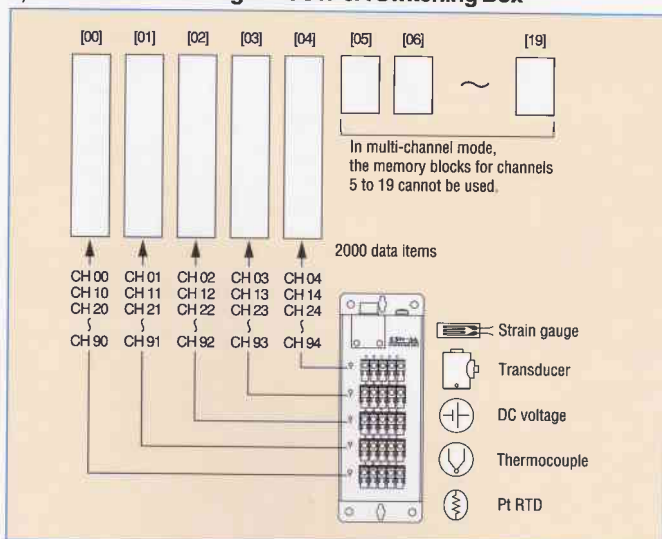
The built-in data memory can be used in a variety of ways (see below) depending on the situation.

1). Measurement Using Only the TC-31K



The data memory is partitioned into 20 blocks, 00 to 19, and each block can have its own input parameters defined independently. This allows you to connect and switch between sensors at up to 20 measuring points and to display and record direct readings of physical quantities. Using the 20 data memory blocks as a continuous block, you can record up to 40,000 data readings. (In this case, you can use only one coefficient, sensor mode and initial value).

2). Measurement Using the CSW-5A Switching Box



The measurements can be saved in the corresponding data memory blocks. Each block is capable of recording 2,000 data items. Two or more CSW-5A switching boxes are manually changeovered to switch for measurement, with a total of 2,000 measurement scans. The sensor mode, coefficient and initial value data for up to ten CSW-5A switching boxes (50 points) can be saved in the TC-31K's memory and direct-reading measurements of physical quantities saved in the data memory. The saved data can then be recorded directly onto a flash memory card.

◆ Data visualization and data transfer

Readings saved in the various memory blocks can be accessed in four different ways.

For small data sets it may be convenient to recall individual readings from memory to the screen display. With a few keystrokes, one can create a screen plot of the

data versus time. A memory card and printer (optional accessories) can be connected to the TC-31K. Finally, data can be transferred via an RS-232C cable (optional accessory) to a PC compatible microcomputer.

◆ Data storage using Flash memory card (PCMCIA Type II)

Data measured and stored by TC-31K can be transferred to a personal computer using Flash memory card (PCMCIA Type II) which is accessible irrespective of personal computer's OS. Flash memory card on the market (8 - 128Mbyte) can be used.

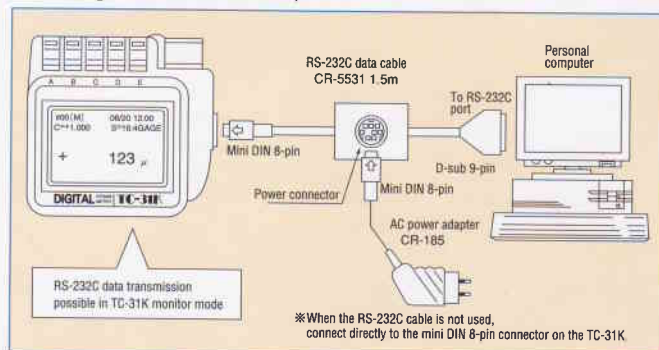
Note) SRAM card which is accepted by former model of TC-31K cannot be used.

◆ Interval timer

You don't have to be on site to record data. Using the five step interval timer in conjunction with an auto-start function, the unit will activate, record a series of readings according to the time sequence programmed and then return to an inactive state. An indicator light denotes that the instrument is in this "sleep mode".

◆ Computer interface

The TC-31K can be connected to the serial port of your microcomputer for both control of the unit and for downloading of data from the instrument's memory. (Use the optional CR-5531 cable.)



◆ Automatic switching box CSW-5A

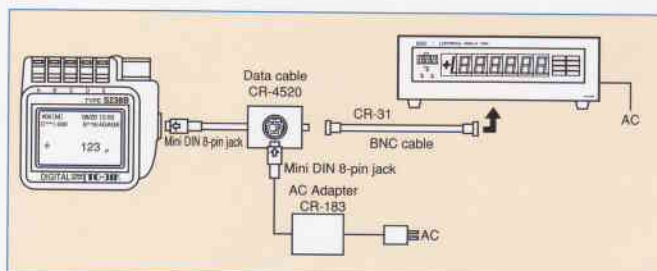
The single channel TC-31K can be upgraded to multi-channel if there is a need to monitor more than one device without manually connecting and disconnecting each to the instrument prior to reading.

The 5 channel switching box allows automatic channel changing for those channels. More than 5 channels can be accommodated by the addition of up to 10 CSW-5A units, although the instrument must be manually connected to each 5 channel unit before taking readings. The CSW-5A-05 is equipped with screw clip connectors for lead wires, and 7 pin connector plug receptacles are also available as an option.

◆ External display unit EDU-11

This is an optional display unit used to monitor the measured value indicated on TC-31K from a distant place. Data cable CR-4520 is required for connecting EDU-11 to TC-31K. Two or more units of EDU-11 can be cascaded to one TC-31K.

Note) Physical unit is not displayed on EDU-11.





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Specifications

[Measurement Mode]

Item	Strain	DC Voltage	Thermocouple	Pt-RTD
Measurement Mode	Initial Direct Measure	Initial Direct Measure	Direct	Direct
Initial Value Storing Range	$\pm 240000 \times 10^{-6}$ strain or less	± 24 V or less	—	—
Sampling Speed	Approx. 0.25 sec	Approx. 0.25 sec	Approx. 0.5 sec	Approx. 0.25 sec
Notes	1G3W (Quarter bridge 3-wire method) : 120, 240 or 350 Ω 2G, 4G(Half or Full bridge method) : 120 Ω to 1000 Ω Constant current full bridge: 350 Ω Coefficient setting : $\pm(0.001 \sim 9.999)$	Input impedance : V240mV 500M Ω or more V24V 1M Ω Coefficient setting : $\pm(0.001 \sim 9.999)$	Built-in RJC (external compensation also available) Digital linearization	Applicable JIS C1604-1997 Pt100 R ₀ =100.00 Ω R ₁₀₀ /R ₀ =1.385 R ₀ : Resistance at 0°C R ₁₀₀ : Resistance at 100°C

[Strain / DC Voltage Measurement Accuracy]

Mode	Measurement Range	Resolution	Accuracy $\pm(\%rdg+dig.)$ at 23 $\pm$ 3°C	Temperature Coefficient $\pm(\%rdg) / ^\circ C$	Variation with Age $\pm(\%rdg) / year$
Strain Full bridge (4G)	$\pm 30000 \times 10^{-6}$ strain	1×10^{-6} strain	$\pm 0.08+1$	0.0045	0.04
	$\pm 240000 \times 10^{-6}$ strain	2×10^{-6} strain	$\pm 0.08+2$	0.0045	0.04
DC Voltage V240mV range	± 30 mV	0.001mV	$\pm 0.08+2$	0.0045	0.04
	± 240 mV	0.002mV	$\pm 0.08+2$	0.0045	0.04
DC Voltage V24V range	± 3 V	0.1mV	$\pm 0.08+2$	0.0045	0.04
	± 24 V	0.2mV	$\pm 0.08+2$	0.0045	0.04

Allowable input voltage V240mV range : ± 5 V
V24V range : ± 35 V

[Temperature Measurement Accuracy - Thermocouple and Pt-RTD]

Thermocouple	Measurement Range	Accuracy $\pm(\%rdg+dig.)$ at 23 $\pm$ 3°C		Resolution $^\circ C$	Temperature Coefficient $\pm(\%rdg) / ^\circ C$	Variation with Age $\pm(\%rdg) / year$
		External RJC	Internal RJC			
K (CA)	-200 $\sim$ -100 $^\circ C$	0.152 $\pm$ 0.2	0.152 $\pm$ 1.5	0.1	0.0086	0.076
	-100 $\sim$ +1370 $^\circ C$	0.094 $\pm$ 0.1	0.094 $\pm$ 0.8	0.3	0.0053	0.047
T (CC)	-200 $\sim$ -100 $^\circ C$	0.14 $\pm$ 0.2	0.14 $\pm$ 1.5	0.1	0.0079	0.070
	-100 $\sim$ +400 $^\circ C$	0.095 $\pm$ 0.1	0.095 $\pm$ 0.9	0.1	0.0053	0.047
J (IC)	-200 $\sim$ -100 $^\circ C$	0.143 $\pm$ 0.1	0.143 $\pm$ 1.3	0.1	0.0081	0.072
	-100 $\sim$ +1200 $^\circ C$	0.09 $\pm$ 0.1	0.09 $\pm$ 0.7	0.1	0.0051	0.045
E (CRC)	-200 $\sim$ -100 $^\circ C$	0.138 $\pm$ 0.1	0.138 $\pm$ 1.4	0.1	0.0078	0.069
	-100 $\sim$ +1000 $^\circ C$	0.092 $\pm$ 0.1	0.092 $\pm$ 0.8	0.1	0.0052	0.046
S	-10 $\sim$ +1760 $^\circ C$	0.086 $\pm$ 0.4	0.086 $\pm$ 1.1	0.2	0.0049	0.043
B	+200 $\sim$ +400 $^\circ C$	0.04 $\pm$ 1.0	0.04 $\pm$ 1.0	0.5	0.0023	0.020
	+400 $\sim$ +1760 $^\circ C$	0.053 $\pm$ 0.5	0.053 $\pm$ 0.5	0.3	0.0030	0.026
R	-10 $\sim$ +1760 $^\circ C$	0.084 $\pm$ 0.4	0.084 $\pm$ 0.1	0.2	0.0047	0.042
N	-200 $\sim$ -100 $^\circ C$	0.161 $\pm$ 0.3	0.161 $\pm$ 1.7	0.2	0.0091	0.081
	-100 $\sim$ +1300 $^\circ C$	0.092 $\pm$ 0.1	0.092 $\pm$ 0.8	0.4	0.0052	0.046
Pt-RTD	-200 $\sim$ +650 $^\circ C$	$\pm(0.2\% rdg+0.4 digit)$		0.1		

[Check Mode]

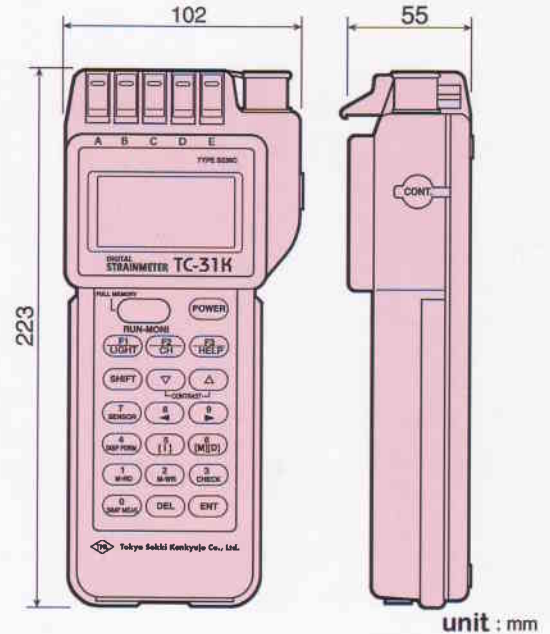
	Insulation Resistance	Resistance
Measuring Range	0 $\sim$ 500M Ω	0 $\sim$ 24k Ω
Accuracy	$\pm 2\%rdg$ (0 $\sim$ 10M Ω) $\pm 5\%rdg$ (10 $\sim$ 100M Ω) $\pm 20\%rdg$ (100 $\sim$ 500M Ω)	$\pm(0.5\%rdg+2dig.)$
Resolution	0.1M Ω	0.1 Ω (0 $\sim$ 2.4k Ω) 1 Ω (2.4 $\sim$ 24k Ω)
Sampling Speed	Approx. 1 sec	Approx. 0.25 sec
Notes	Excitation voltage Approx. 2.9V	Excitation current 10 μA



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[Common specifications]

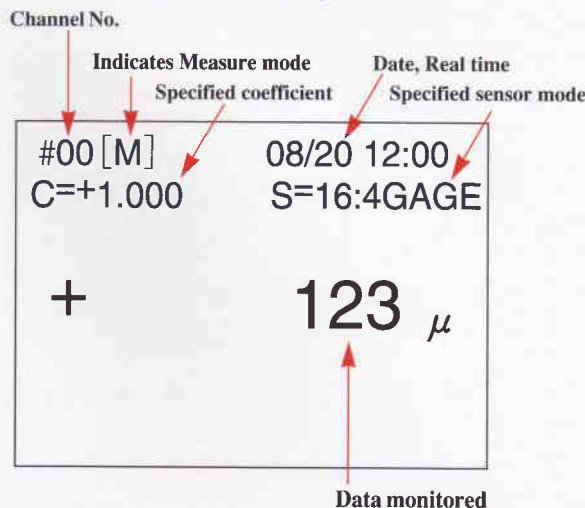
Number of channels	1 (TC-31K itself) 5 (combined use with CSW-5A switching box)
Display	128×64 dots with backlight LCD
Time	
Settings	Year, Month, Day, Hour, Minute, Second
Tolerance	±2 secs in a day (23±3°C)
Interval timer	
Settings	Measurement interval (upto 99 hrs. 59 mins. 59 sec. In 1-sec. Increments) and measurement count specifiable
Operation	Automatic measurement based on settings, measurements and times saved in memory Also automatic shutdown (ON-OFF switchable)
Data Memory	
Capacity	Max. 40000 data items
Memory start	ENT key operation(manual) or Interval timer
Auto power-off	When the internal batteries are being used, the power supply is automatically off if no keys are entered and no signals are received through the RS-232 interface for 10 minutes (ON-OFF switchable)
PC card drive	
Functions	Flash memory (PCMCIA TYPE II)
Capacity	Storing and reading of internal memory data 8 ~ 128MByte
File numbers	512
<i>NOTE): SRAM card which is accepted by former model of TC-31K cannot be used.</i>	
Engineering units	35 kinds including $\mu\epsilon$, mm, °C, kN, MPa
RS-232C Interface	
Functions	Optional cable CR-5531 should be required Receiving control signals and transmitting measured data
Baud rate	1200~9600
Vibration tolerance	29.4m/s ² (50Hz, 0.6mm amp.)
Shock survival	40m/s ²
Drip-proof	DIN IP-54 with connector cap tight
Operating temperature	-10~+50°C, 85%RH or below (No condensation)
Storage temperature	-20~+60°C
<i>NOTE):</i> Operation is available in temperature range of -20 to -10°C on the following conditions. ●Display becomes dim even though the contrast is adjusted. ●Battery performance is extremely lowered. AC power adapter should be used.	



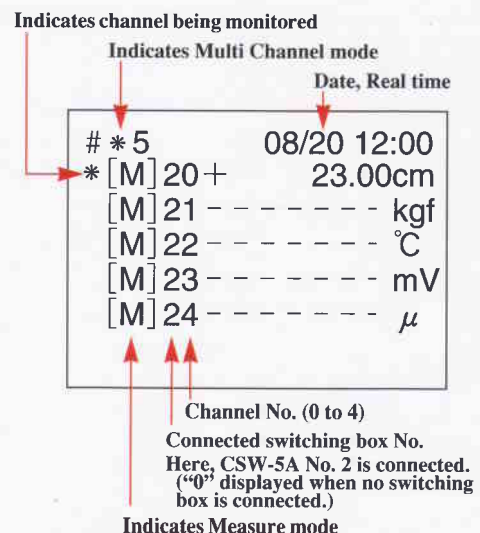
Power supply	4AA-size alkaline batteries(LR6), or 4 AA-size Ni-Cd rechargeable batteries (KR-AA), or special AC adapter (CR-185)
Continuous operation	Approx. 10 hours using alkaline batteries for strain measurement connected to 350Ω bridge Approx. 3 hours using Ni-Cd batteries for strain measurement connected to 350Ω bridge
Dimensions	102W × 55H × 223D mm
Weight	Approx. 850g
Accessories	Operation manual 1 AA-size alkaline battery 4 Shoulder strap 1 Accessory box 1

Sample Monitor Display

[Normal Mode]



[Multi Channel Mode]





SWITCHING BOX

5-channel automatic operation CSW-5A/CSW-5A-05



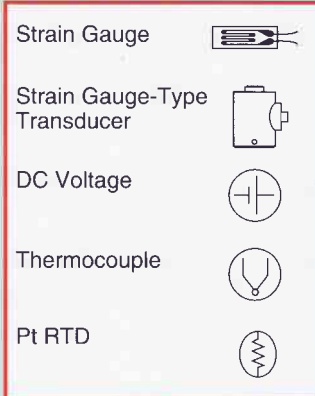
CSW-5A

CSW-5A-05

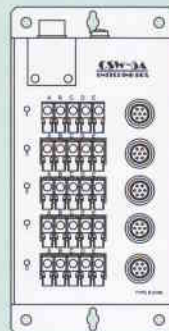
The CSW-5A is a 5 channel automatic switching box which allows multiple channel inputs. Each channel can be programmed with it's own scaling parameter, sensor mode, etc. through the key pad of the TC-31K. Up to 10 of these units can be used, giving a total capability of 50 channels. In addition, automatic measurement is possible using the interval timer function of the TC-31K. The CSW-5A-05 provides connector receptacles in addition to the standard screw clips. These are handy for use with strain gauge based transducers.

- Switching boxes specially designed for the TC-31K
- Can be used for strain gauge, strain gauge-type transducer, DC voltage, thermocouple and platinum resistance-temperature device measurements
- Input connection by screw or soldering
- Compact and light
- CSW-5A-05 provides both terminals and simple, one-push connectors

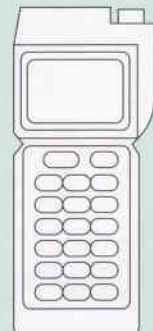
Measurement with 5 or less channels



Switching Box
CSW-5A

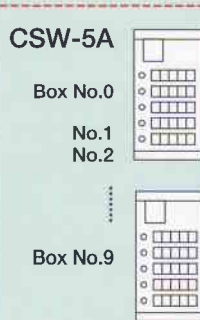
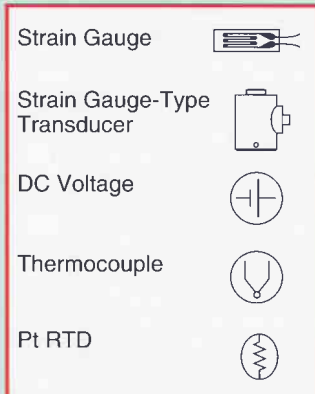


Digital
Strainmeter
TC-31K

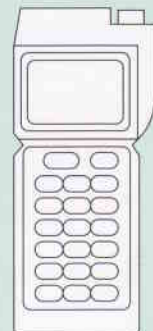


- Up to 5 channels can be automatically measured using the TC-31K interval timer.

Measurement with up to 50 channels



Digital
Strainmeter
TC-31K



- Initial values and coefficients can be programmed for up to 50 channels (10 CSW-5A switching boxes).
- Measurement is made every 5 channels by using CSW-5A.



SWITCHING BOX

Specifications

Applicable strainmeter	TC-31K (Ver. 2.0A or later)
No. of channels	5
Strain Measurement	
Quarter bridge with 3 wires	120Ω, 240Ω or 350Ω
Half bridge	120Ω to 1000Ω
Full bridge	120Ω to 1000Ω
Full bridge with constant current	350Ω
Measurement Range	Conforms to TC-31K
Sensor Cable Extension (full bridge with constant current)	Cable total resistance of 200Ω or less
DC Voltage Measurement	
Measurement Range	Conforms to TC-31K
Input Impedance	1MΩ or more
Thermocouple Temperature Measurement	
Measurement Range	Conforms to TC-31K
Pt RTD Measurement	
Measurement Range	Conforms to TC-31K
Measurement Method	3-wire method
Measuring Point No.	Fixed (CH0 to CH4)
Measurement Point Indicator	Red LED for each point
Switcher	Special sealed relay
Operating Temperature & Humidity	-10°C to +50°C, 85% RH or less (no condensation)
Power Supply	Supplied from TC-31K

Dimensions	75(102)*W × 41.5H × 204Dmm (excluding projected parts) *: Dual-connector model
Weight	Approx. 650g; Dual-connector model 800g
Standard Accessories	CR-655 Switching Box Connection Cable Operation Manual



20 channel operation SW-21B/SW-21E



◆20-channel operation SW-21B/SW-21E

The SW-21B and SW-21E are 20-channel switching boxes which allows multiple channel inputs. The changeover of each channel is made by manual operation, and additional channels are available by cascading several switching boxes. Model SW-21B is equipped with initial balancer, and the wide balancing range makes it possible to measure strain gauges or strain gauge based transducers with a large initial unbalance. The balancing adjustment is done by 10-turn potentiometer.

	SW-21B	SW-21E
Number of channels	20	
Strain measurement	Quarter bridge Quarter bridge 3-wire Half bridge (Common dummy available) Full bridge 120, 240, 350Ω 120~1000Ω is available in half and full bridge when the balancer is off.	Quarter bridge Quarter bridge 3-wire 120, 240, 350Ω Half bridge (Common dummy available) Full bridge 120~1000Ω
DC Voltage measurement	Same as TC-31K (with balancer off)	Same as TC-31K
Balancing method	Balancer 10-turn Potentiometer (Parallel resistance method) Off function of balancer possible	
Balancing range	±1.5% of gauge resistance (approximately $\pm 7500 \times 10^{-6}$)	
Operating temperature	-10~+50°C, 85% RH or less (no condensation)	
Dimensions	285W × 160H × 350D mm (excluding projected parts)	
Weight	6kg	5kg



OPTION ACCESSORIES

OPTION

◆ CR-185 AC Power Adapter for the TC-31K

Input: 220V AC

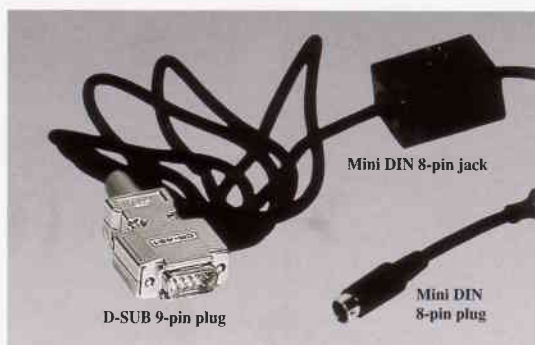
Output: 7.5V DC, 480mA



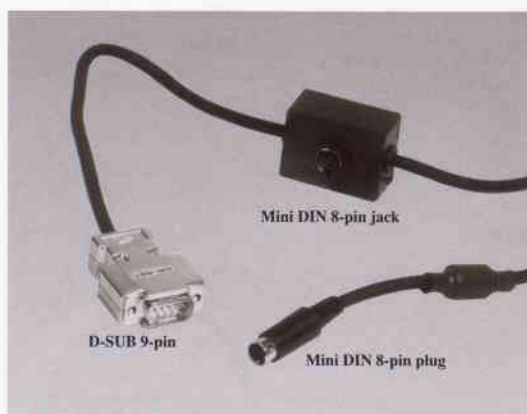
◆ DPU-H245 Printer



◆ CR-5531 RS-232C Data Cable



◆ CR-451 Printer Connection Cable



◆ Flash Memory card and Card adapter



◆ External Display Unit EDU-11



CE

ISO 9001



Approval Certificate No.:0957261
Design and manufacture of strain
measuring equipment and transducers
No.2 and No.3 Production Divisions



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Specifications subject to change without prior notice.