OMRON

Intelligent Signal Processor | K3TS

A High-speed Linear Sensor Controller Capable of Inspecting 10,000 Objects a Minute

- A 1.04-ms sampling time and only 5-ms output delay for high-speed, high-precision measurements.
- Three operating parameters including input logic and previous average value comparison.
- Timing signal input to hold sampling, maximum, minimum, and peak-to-peak values complete with discrimination outputs.
- Setting for number of samples averaged for greater precision.
- Eight banks of set values for operational versatility.
- A wide range of standard features: Forced zero, timing delay, output OFF delay, comparison to previous average (to detect only rapid changes), scaling, display refresh period, and more.
- Built-in sensor power supply (12 VDC, 80 mA).
- Models with a forced-zero RAM are available for frequent zero point changes.
- Models with a display shift function are available for display value shift (offset operation).
- Conforms to EMC standards, EN61010-1 (IEC1010-1).

Ordering Information

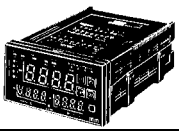
■ DC Voltage/Current Input (for All Models)

(Each model has a multi-range, thus corresponding to the following voltage and current ranges.)

Current measurement range	Voltage measurement range
4.00 to 20.00 mA	1.000 to 5.000 V or –9.999 to 9.999 V

■ Models

Front Panel Classification

Item	K3TS-SD□□B-□□	K3TS-SD1□D-□□
Type	Set value LED display	Thumbwheel switches
Appearance		

Standard Models with Set Value LED Display

Output configuration		Supply voltage	
		100 to 240 VAC	12 to 24 VDC
Relay contact output	5 outputs: HH, H, L, LL (SPST-NO), and PASS (SPDT)	K3TS-SD11B-C2	K3TS-SD12B-C2
	5 outputs: HH, H, L, LL (SPST-NC), and PASS (SPDT)	K3TS-SD11B-C5	K3TS-SD12B-C5
Transistor output	5 outputs (NPN open collector)	K3TS-SD11B-T1	K3TS-SD12B-T1

Standard Models with Thumbwheel Switches

Output configuration		Supply voltage	
		100 to 240 VAC	12 to 24 VDC
Relay contact output	3 outputs: H, PASS, L (SPDT)	K3TS-SD11D-C1	K3TS-SD12D-C1
Transistor output	3 outputs (NPN open collector)	K3TS-SD11D-T1	K3TS-SD12D-T1

Forced Zero RAM Models with Set Value LED Display

Output configuration		Supply voltage	
		100 to 240 VAC	12 to 24 VDC
Relay contact output	5 outputs: HH, H, L, LL (SPST-NO), and PASS (SPDT)	K3TS-SD21B-C2	---
Transistor output	5 outputs (NPN open collector)	K3TS-SD21B-T1	---

Display Shift Function Models with Set Value LED Display

Output configuration		Supply voltage	
		100 to 240 VAC	12 to 24 VDC
Relay contact output	5 outputs: HH, H, L, LL (SPST-NO), and PASS (SPDT)	K3TS-SD31B-C2	---
Transistor output	5 outputs (NPN open collector)	K3TS-SD31B-T1	---

Model Number Legend

Processors with Built-in Outputs

K3TS - □ □ □ □ □ - □ □
1 2 3 4 5 6 7

1, 2. Input Sensor Code
SD: DC voltage/current input

3. Series No.
1: Standard Specifications
2: Forced zero RAM
3: Display shift function

4. Supply Voltage
1: 100 to 240 VAC
2: 12 to 24 VDC

5. Display
B: Set value LED display
D: Thumbwheel switches

Processors with No Outputs

K3TS - □ □ □ □ □
1 2 3 4 5

Output Units

K31 - □ □
6 7

6, 7. Output Type Code
C1: 3 comparative relay contact outputs (H, PASS, L: SPDT) (See Note 1)
C2: 5 comparative relay contact outputs (HH, H, L, LL: SPST-NO; PASS: SPDT) (See Note 2)
C5: 5 comparative relay contact outputs (HH, H, L, LL: SPST-NC; PASS: SPDT) (See Note 2)
T1: 5 comparative transistor outputs (NPN open collector)*
T2: 5 comparative transistor outputs (PNP open collector)*

Note: 1. Available only on Processors with thumbwheel switches.
2. Available only on Processors with set value LED display.

*Only H, PASS and L outputs are available as transistor outputs on Processors with thumbwheel switches.

Optional Output Types
Processors with the following outputs are also available as indicated.

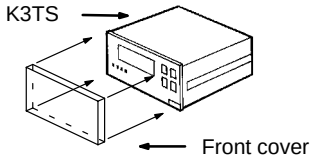
Standard specification		Forced zero RAM	Display shift function	Option output type codes/output configuration
Set value LED display	Thumbwheel switches	Set value LED display	Set value LED display	
OK	OK	OK	OK	B4: BCD output + 5 transistor outputs (NPN open collector)*
OK	---	OK	OK	L4: 4 to 20 mA + 5 transistor outputs (NPN open collector)
OK	---	OK	OK	L5: 1 to 5 V + 5 transistor outputs (NPN open collector)
OK	---	OK	OK	L6: 1 mV/digit + 5 transistor outputs (NPN open collector)
OK	---	OK	OK	S5: RS-485 + 5 transistor outputs (NPN open collector)
OK	---	OK	OK	S6: RS-422 + 5 transistor outputs (NPN open collector)

*Only H, PASS and L outputs are available as transistor outputs on Processors with thumbwheel switches.

■ Accessories (Order Separately)

Transparent Front Cover Model K32-49SC

The K32-49SC Soft Front Cover protects the front panel of the Processor (Basic and the Set Value LED Display Models) from oil and water. All keys on the front panel can be operated with the cover on.



Specifications

■ Ratings

Supply voltage	100 to 240 VAC (50/60 Hz); 12 to 24 VDC
Operating voltage range	85% to 110% of supply voltage
Power consumption	15 VA max. (max. AC load with all indicators lit)); 10 W max. (max. DC load with all indicators lit))
Insulation resistance	10 MΩ min. (at 500 VDC) between external terminal and case
Dielectric withstand voltage	2,000 VAC min. for 1 min between external terminal and case
Noise immunity	±1,500 V on power supply terminals in normal or common mode ±1 μs, 100 ns for square-wave noise with 1 ns rise
Vibration resistance	Malfunction: 10 to 55 Hz, 0.5-mm for 10 min each in X, Y, and Z directions Destruction: 10 to 55 Hz, 0.75-mm for 2 hrs each in X, Y, and Z directions
Shock resistance	Malfunction: 98 m/s^2 (approx. 10G) for 3 times each in X, Y, and Z directions Destruction: 294 m/s^2 (approx. 30G) for 3 times each in X, Y, and Z directions
Ambient temperature	Operating: –10°C to 55°C (with no icing) Storage: –20°C to 65°C (with no icing)
Ambient humidity	Operating: 35% to 85% (with no condensation)
Ambient atmosphere	Must be free of corrosive gas
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference: ENV50140: 10 V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3) 10 V/m (pulse modulated, 900 MHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) (level 3) Immunity Burst: EN61000-4-4: 2 kV power-line (level 3) 2 kV I/O signal-line (level 4)
Approved standards	UL508, CSA22.2; conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1).
Weight	Approx. 450 g

Note: An Intelligent Signal Processor requires a control power supply current of approximately 1 A the moment the Intelligent Signal Processor is turned on. Do not forget to take this into consideration when using several Intelligent Signal Processors.

Input/Output Ratings

Relay Contact Outputs

Item	Resistive load (cosϕ = 1)	Inductive load (cosϕ = 0.4, L/R = 7 ms)
Rated load	5 A at 250 VAC; 5 A at 30 VDC	1.5 A at 250 VAC, 1.5 A at 30 VDC
Rated carry current	5 A max. (at COM terminal)	
Max. contact voltage	380 VAC, 125 VDC	
Max. contact current	5 A max. (at COM terminal)	
Max. switching capacity	1,250 VA, 150 W	375 VA, 80 W
Min. permissible load	10 mA at 5 VDC	

Transistor Outputs

Rated load voltage	12 to 24 VDC $^{+10\%}/_{-15\%}$
Max. load current	50 mA
Leakage current	100 μA max.

BCD Outputs

I/O signal name		Item	Rating
Inputs	REQUEST, HOLD, MAX REQ., MIN REQ., RESET	Input voltage	No-voltage contact input
		Input current	10 mA
		Operating voltage	ON: 1.5 V max. OFF: 3 V min.
Outputs	DATA, POLARITY, OVER, DATA VALID, RUN	Rated load voltage	12 to 24 VDC $^{+10\%}/_{-15\%}$
		Max. load current	10 mA
		Leakage current	100 μA max.

Note: Logic method: negative logic

Linear Outputs

Item	4 to 20 mA	1 to 5 V	1 mV/digit
Resolution	4,096		
Permissible load resistance	600 Ω max.	500 Ω min.	1 KΩ min.
Output error	±0.5% FS		---

Note: For the 1 mV per digit output, the output voltage changes for every 4 to 5 increment in the display value.

■ Communications

Item		RS-422	RS-485
Transmission method		4-wire, half-duplex	2-wire, half-duplex
Synchronization method		Start-stop synchronization	
Baud rate		300/600/1,200/2,400/4,800/9,600/19,200/38,400	
Transmission code		ASCII (7-bit)	
Communications	**Write to K3TS**	Set values, reset control (maximum/minimum values)	
	Read from K3TS	Set values, process value, maximum/minimum values, model data, error code, etc.	

For details, refer to the K3TS Communications Manual.

■ Characteristics

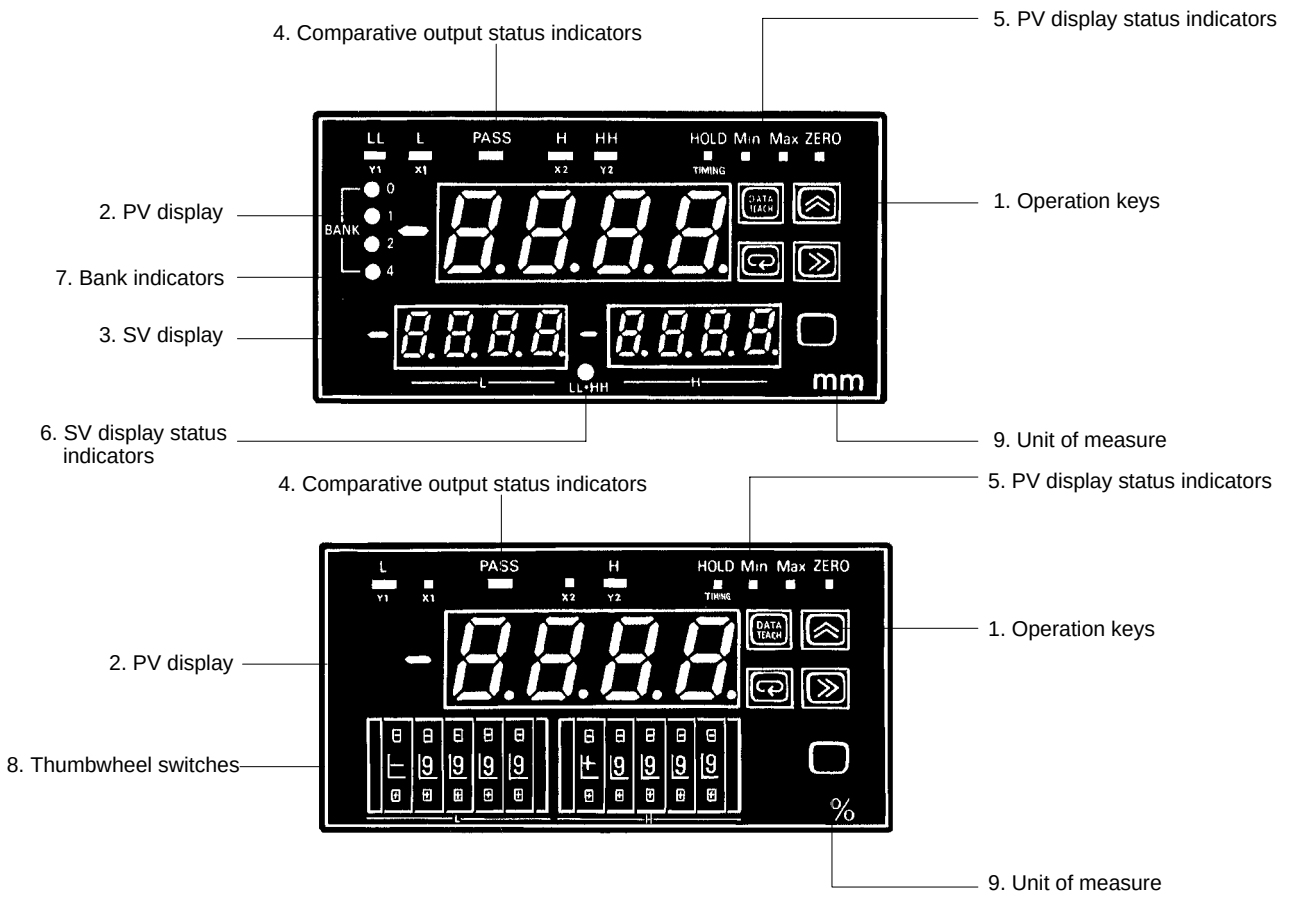
Input signal	DC voltage/current (4 to 20 mA, 1 to 5 V, ±9.999 V) 2 channels
A/D conversion method	Sequential conversion system
Sampling time	1.04 ms (See Note 1)
Display refresh period	0.1/1.0/2.0/3.0/4.0 s (switch selectable)
Max. displayed digits	4 digits (±9,999)
Display	7-segment LED
Polarity display	"–" is displayed automatically with a negative input signal.
Zero display	Leading zeros are not displayed.
Scaling function	Programmable with front-panel key inputs (range of display: ±9999 with a decimal position of 10^{-1} to 10^{-3}
2-input operation function	A, A + B, A – B, K – (A + B), (1 – B/A) x 100, B/A x 100
HOLD function	Sampling hold (The data at the rising edge of the TIMING input is held.) Maximum hold (The maximum data while TIMING input is ON is held.) Minimum hold (The minimum data while TIMING input is ON is held.) Peak-to-peak hold (The difference between the maximum value and the minimum value of the data while TIMING input is ON is held.)
External controls	TIMING: (TIMING input) HOLD: (Process value held) RESET: (Maximum/minimum data reset, measurement reset) ZERO: (Forced zero) BANK: (Selection of one bank out of 8 banks of set values)
Comparative output hysteresis setting	Programmable with front-panel key inputs (001 to 999 digits).
Timing delay	1.99 s max.
Output OFF delay	1.99 s max.
Other functions	Set values protect, previous average comparison mode, setting of number of process values to average (1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192)
Output configuration	Relay contact outputs (5 or 3 outputs), Transistor outputs (NPN open collector) (BCD, linear, and communications models are available by special order)
Delay in comparative outputs (see Note)	Normal parameter for operating parameter 3: 6.24 ms Sampling HOLD parameter for operating parameter 3: 5.20 ms
Enclosure rating	Front panel: Refer to IEC standard IP50 Rear case: Refer to IEC standard IP20 Terminals: Refer to IEC standard IP00
Memory protection	Non-volatile memory (EEPROM)

Note: Refer to page 13 for "*Sampling and Delay in Comparative Outputs*".

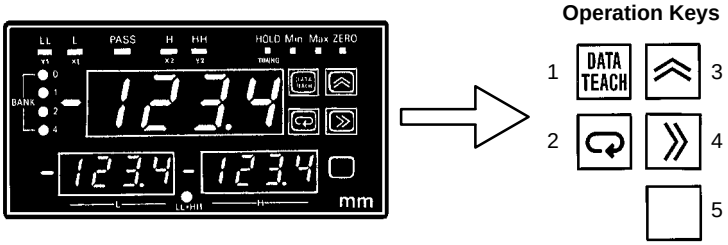
■ Measuring Ranges

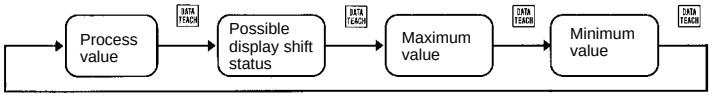
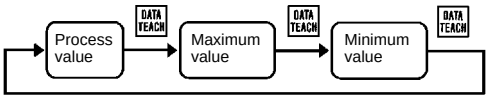
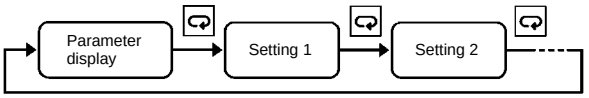
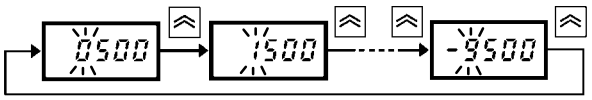
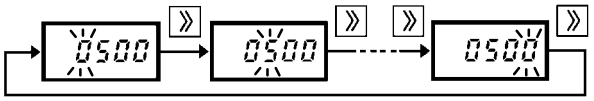
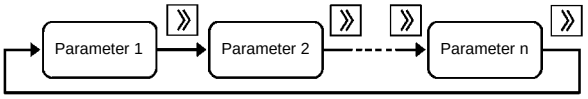
Input range	Measuring range	Input impedance	Reliability (at 25°±5°C)	Instantaneous overload
4 to 20	2.40 to 26.00 mA	10 Ω	1-ch. input: ±0.1%FS ±1 digit max. 2-ch input: ±0.2%FS ±1 digit max.	±200 mA
1 to 5	0.600 to 6.500 V	1 MΩ		±200 V
9.999	±9.999 V	1 MΩ		±200 V

Nomenclature



Name	Functions
1. Operation keys	See next page.
2. PV display	The main display; used for the process value, maximum value, minimum value, operations/parameters when setting, and error messages.
3. SV display	Displays the set value; also displays parameters when setting.
4. Comparative output status indicators	Indicate the status of the comparative output.
5. PV display status indicators	Indicate the ON/OFF status of the hold input, forced zero, and what value is on the PV display: maximum or minimum.
6. SV display status indicators	Indicates which set value is on the SV display.
7. Bank indicators	Indicate which bank of set values is currently selected.
8. Thumbwheel switches	Used to set and display the set values.
9. Unit of measure	Location for attaching the sticker showing the unit of measure (enclosed).



No.	Name	Functions
1	DATA TEACH Key	**Set Value LED Display** Selects the process value, possible display shift status (*1), maximum value (*2), or minimum value (*2). *1: Available only if the model incorporates a shift function. *2: Available only when operating parameter 3 is in the normal setting.  In the setting mode, effects the teaching function. With this function, the comparison value, scaling value, and linear output range are set by means of actual input. **Thumbwheel Switches** The process value, maximum value, or minimum value is selected.  In the setting mode, effects the teaching function. With this function, the set values, prescale values and output range are set by means of actual input.
2	Display Key	The value shown on the SV display changes for models with LED displays. In the setting mode, this key is used to enable setting or to write set values into memory after selecting the parameter with the Shift Key. 
3	Up Key	Used to increment the current digit in the set value by one. 
4	Shift Key	Used to shift the digit being set.  Used to select parameters within each setting level. 
5	Level Key	Used to enter the setting mode. Used within the setting mode to change setting levels.

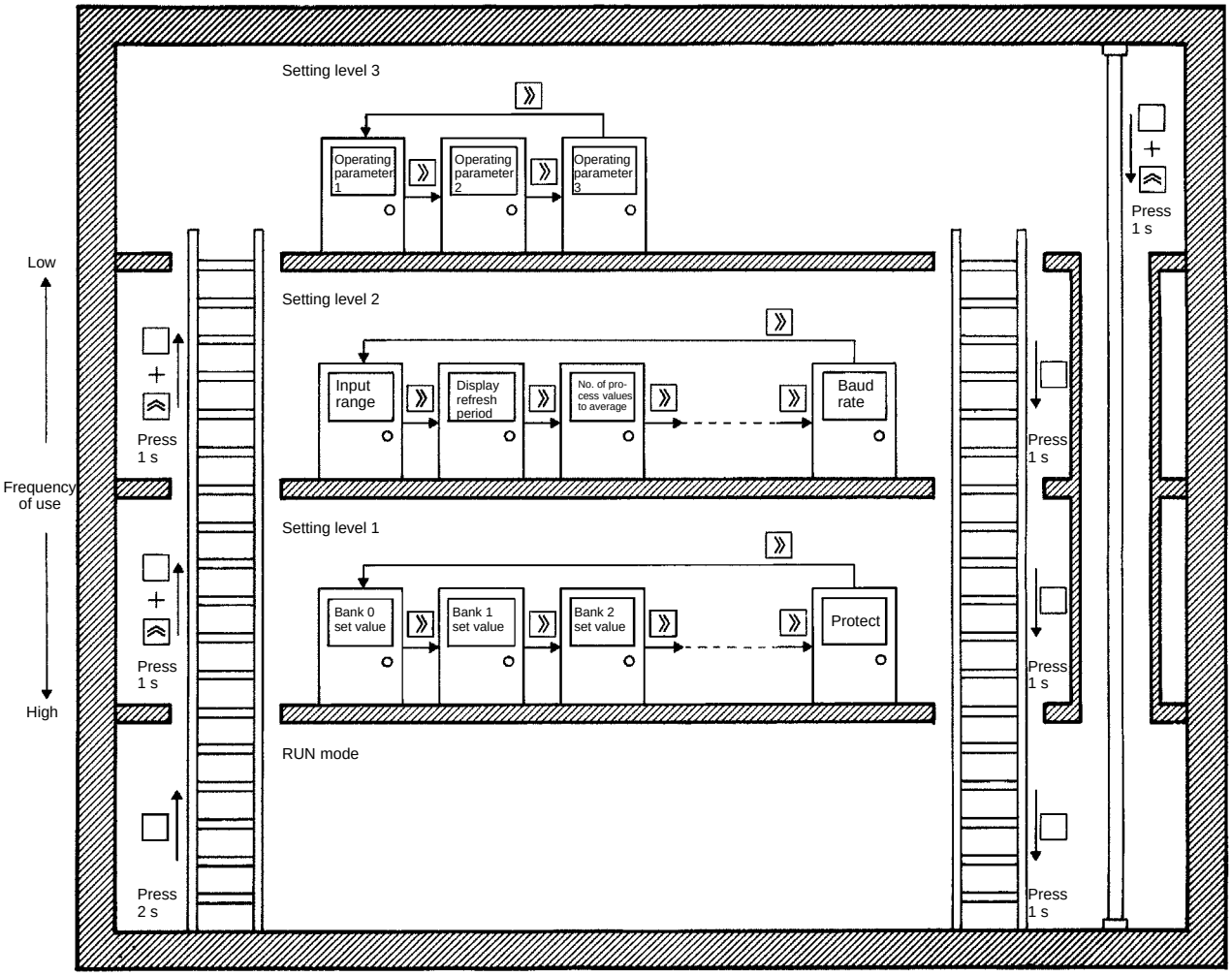
Note: Refer to “K3TS Operation Manual” for details.

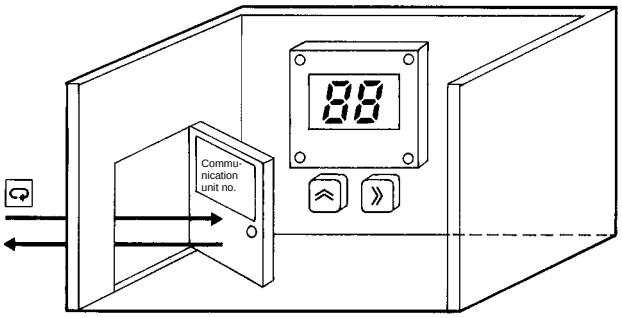
Operation

■ Setting Mode Levels and Parameters

The Processor has two main modes: run mode for normal operations and setting mode for initial parameter input. The setting mode is divided into three levels based on frequency of use. Within both of these levels are various parameters that can be set.
Initial setting of parameters thus entails entering the setting mode, shifting to the levels that contain parameters that must be set, selecting the parameters and writing in the desired set values.

Setting Level Diagram

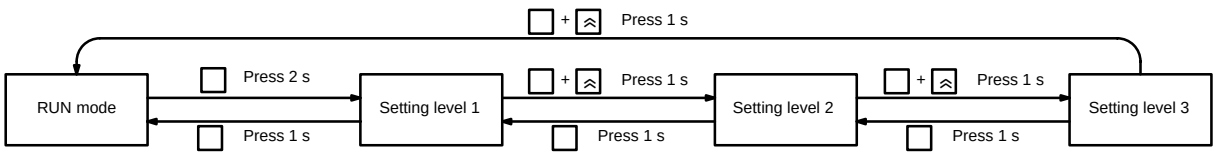




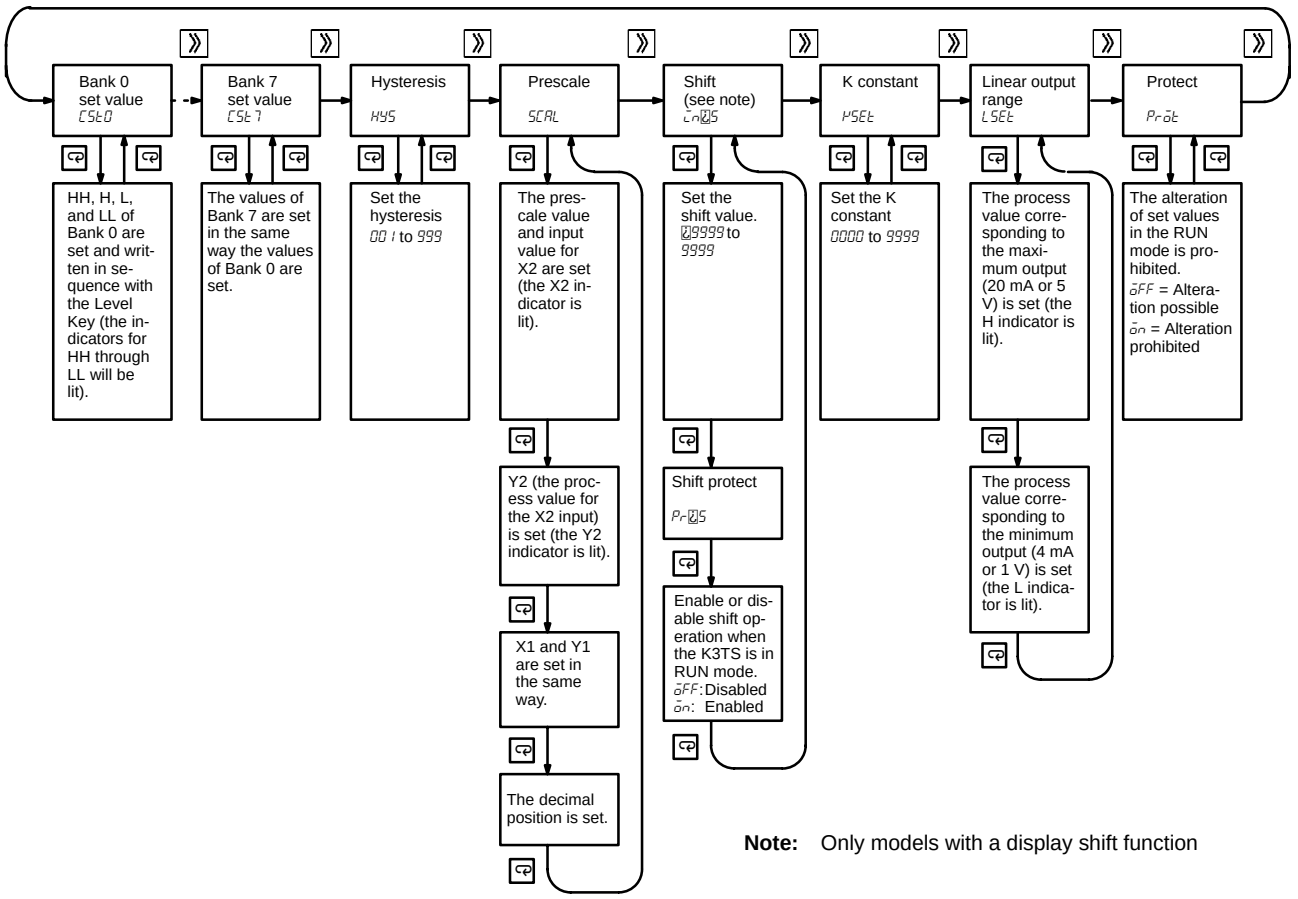
Setting Procedure

1. Press the Level Key or Level and Up Keys to go to the desired level.
2. Use the Shift Key to find the desired parameter.
3. Press the Display Key to access the parameter.
4. Use the Up or Shift Keys to input the desired value.
5. Leave the level you are in with the Display Key.
6. Return to the beginning with the Level Key or the Level and Up Keys.

Shifting Levels

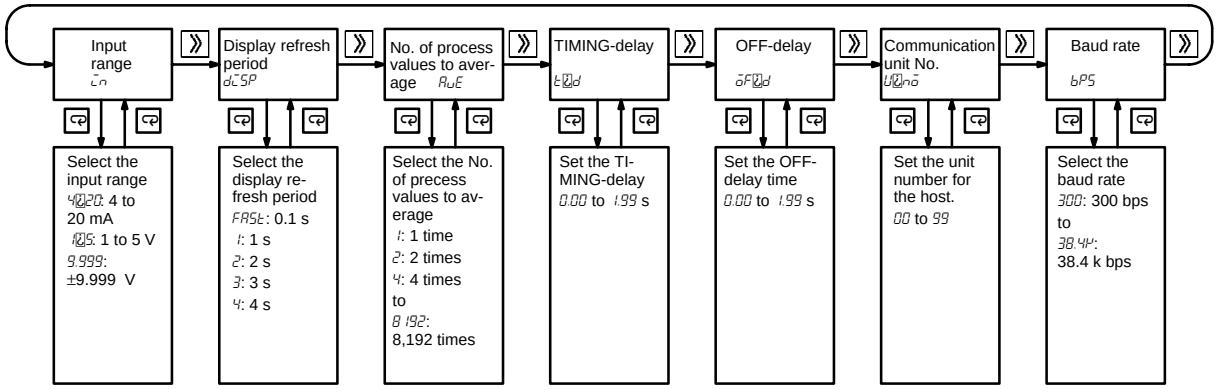


Setting Level 1

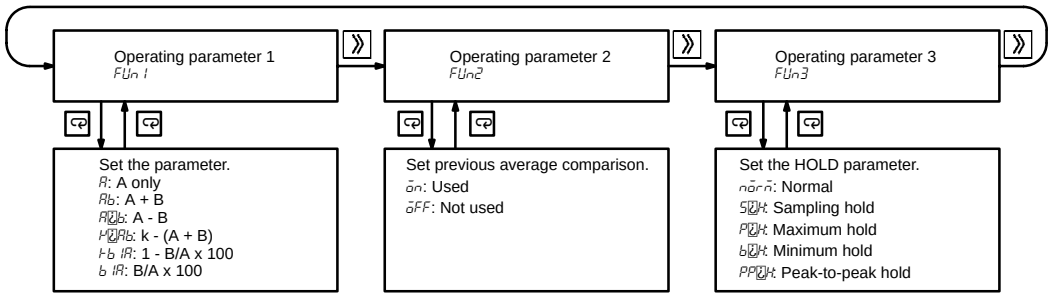


Note: Only models with a display shift function

Setting Level 2



Setting Level 3



■ Parameters

CSt0 to 7 (not provided on Thumbwheel Switches Models)

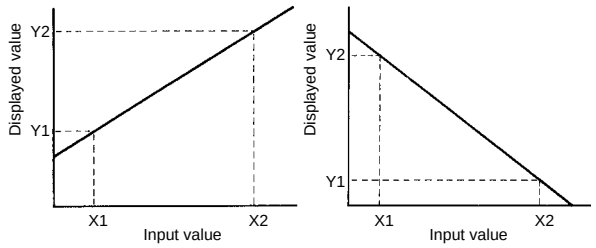
Set values on each bank can be set with Up Key and Shift Key. The HH, H, L, or LL comparative output status turns ON when the measured value exceeds the HH or H set value or falls below the L or LL set value. The available setting range is between ⍁9999 to 9999. The HH and H comparative output status values are set to 9999 and the L and LL comparative output status values are set to ⍁9999 before shipment.

HYS

The hysteresis of comparative outputs can be set with Up Key and Shift Key. The available setting range is between 001 and 999 . The hysteresis is set to 001 before shipment.

SCAL

Prescale values X2, Y2, X1, and Y1 can be set with Up Key and Shift Key.
X2: Any input value
Y2: The displayed value corresponding to X2
X1: Any input value
Y1: The displayed value corresponding to X1
Set so that X2 is larger than X1. Y1 can be either smaller or larger than Y2.
X2 and Y2 are set to 2000 (20.00 mA) and X1 and Y1 are set to 400 (4.00 mA) before shipment.



Sn⍁S (for models with a display shift function)

Set the shift value with the Up Key and Shift Key within a range of ⍁9999 to 9999. The value is set to 0000 before shipment.

Pr⍁S (for models with a display shift function)

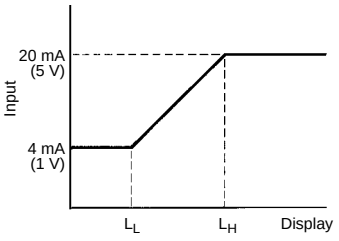
Enable or disable shift operation with the Up Key when the K3TS is in RUN mode.
oFF: Disabled
on: Enabled
The shift protect is set to oFF before shipment.

KSEt

Set K constant in the parameter, K – (A + B), with Up Key and Shift Key. The available setting range is between 0000 and 9999 . K constant is set to 0000 before shipment.

LSEt (Special linear output model only)

A linear output range can be set as required. A value corresponding to the L_H maximum output value (20 mA or 5 V) and that corresponding to the L_L minimum output value (4 mA or 1 V) can be set with the Up Key and Shift Key. The available setting range is between ⍁9999 and 9999 . The L_H value is set to 9999 and the L_L value is set to ⍁9999 before shipment.



Prot (excluding the Thumbwheel Switches Models)

The set value protect can be ON and OFF using the Up Key in the RUN mode. on = Protected, oFF = Not protected. oFF is set before shipment.

In

The input range (4 to 20 (4 to 20 mA), 1 to 5 (1 to 5 V), and 9.999 = ±9.999) can be selected with the Up Key. The 4 to 20 mA range is set before shipment.

dISP

A display refresh period among five levels, FASt (every 0.1 s), 1 (every 1 s), 2 (every 2 s), 3 (every 3 s), and 4 (every 4 s), can be selected with the Up Key. The FASt level is selected before shipment.

AvE

The number of process values to be averaged (1 to 8 192 , on 14 different levels) can be selected with the Up Key. A value of 8 level is set before shipment.

t⍁d

TIMING-delay time (the period required for the K3TS to accept the TIMING signal after it is ON) can be set with the Up Key and Shift Key. The available setting range is between 0.00 and 1.99 . A time of 0.00 is set before shipment.

oF⍁d

Output OFF-delay time can be set with the Up Key and Shift Key. The available setting range is 0.00 to 1.99 . The time is set to 0.00 before shipment.

U⍁no (Communications Output Models)

A unit number, an identification number by which the host computer identifies each K3TS Intelligent Signal Processor, can be selected with Up Key and Shift Key. The available setting range is 00 to 99 . A value of 00 is set before shipment.

bPS (Communications Output Models)

A baud rate up to 38,400 bps can be selected with the Up Key. The available setting range is 300 to 38.4 . A value of 9600 is set before shipment.

Fun 1

Operating parameter 1 can be set to one of the following: A (input A only), Ab (A + B), A⍁b (A – B), K⍁Ab (K – (A + B)), 1⍁A b ((1 – B/A) x 100), or b A (B/A x 100). A is set before shipment.

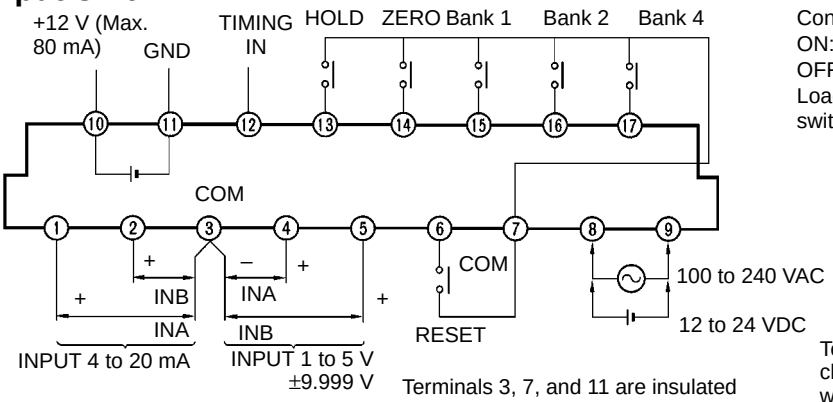
Fun2

Previous average value comparison (operating parameter 2) can be turned ON and OFF with the Up Key (on = Possible, oFF = Not possible). oFF is set before shipment.

Fun3

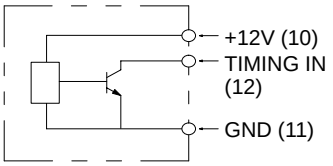
The holding data parameter can be set to one of the following: norn (Normal), S⍁H (Sampling hold), P⍁H (Peak hold), b⍁H (Bottom hold), or PP⍁H (Peak-to-peak hold) with the Up Key. norn is set before shipment.

■ Input Unit



Terminals 3, 7, and 11 are insulated from one another.

Connecting timing sensor:
ON: Residual voltage must be 3 V max.
OFF: Leakage current must be 1.5 mA max.
Load current: The input device must have a switching capacity of 20 mA min.

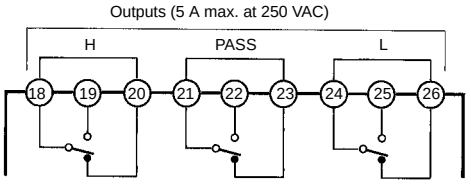


Terminals 11 and 12 should be opened and closed so that a load current of 5 mA or less will be easily switched for a non-voltage contact input.

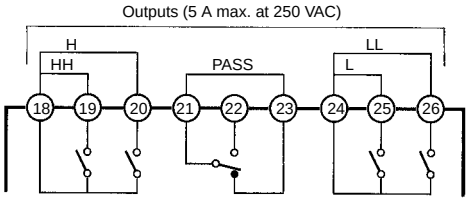
Input range	Connection terminals	
	1 input (INA)	2 inputs
4 to 20 mA	①–③	①–③ (INA)
		②–③ (INB)
1 to 5 V	④–③	④–③ (INA)
		⑤–③ (INB)
±9.999 V	④–③	④–③ (INA)
		⑤–③ (INB)

■ Output Units

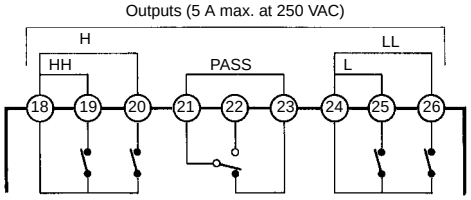
K31-C1: Relay (3 Outputs)



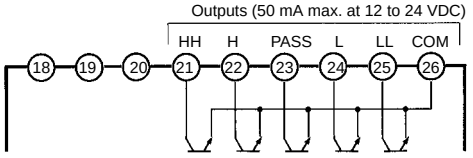
K31-C2: Relay (5 Outputs)



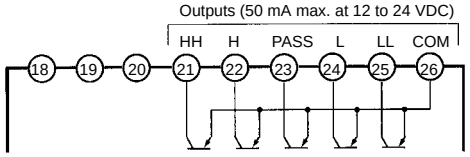
K31-C5: Relay (5 Outputs)



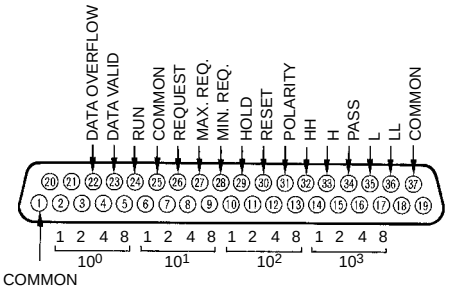
K31-T1: Transistor (NPN Open Collector)



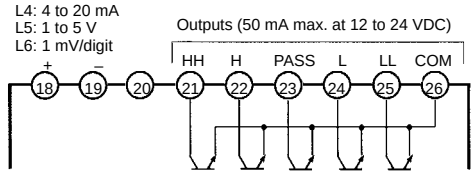
K31-T2: Transistor (PNP Open Collector)



K31-B4: BCD + Transistor (NPN Open Collector)*

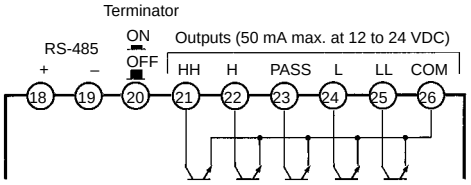


K31-L4, L5, L6: Linear + NPN Open Collector Transistor*



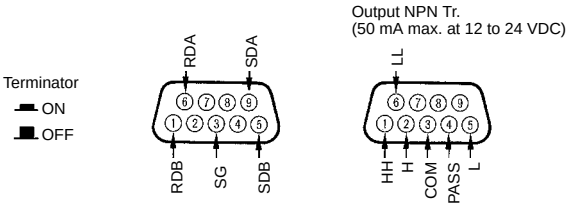
*The circuit configurations marked with asterisks conform to special specifications.

K31-S5: RS-485 + NPN Open Collector Transistor*



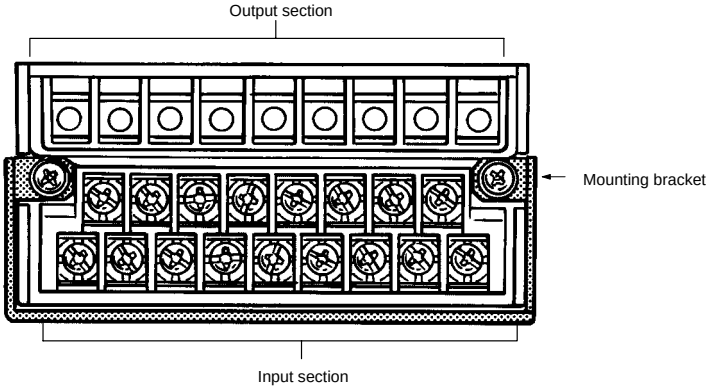
- D-sub 37P Connectors for BCD output (enclosed)
  Plug: XM2A-3701
  Hood: XM2S-3711
- D-sub 9P connectors for RS-422 output (order separately)
  Plug: XM2A-0901 or XM4A-0921
  Hood: XM2S-0911

K31-S6: RS-422 + NPN Open Collector Transistor*



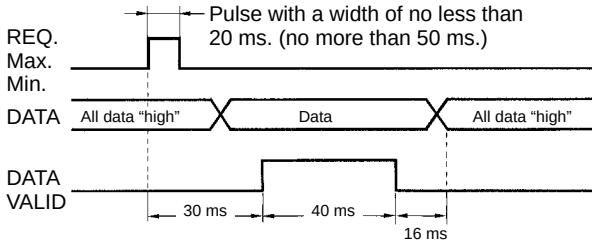
*The circuit configurations marked with asterisks conform to special specifications.

■ Terminal Arrangement



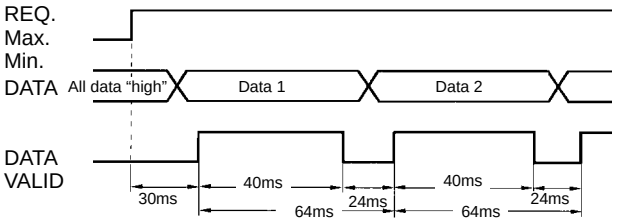
■ BCD Output Timing Chart

Single Sampling Data Output



Approximately 30 ms after the REQ signal rises, a sample is taken and the DATA VALID signal is output. Read the data when the DATA VALID signal is ON.
The DATA VALID signal will turn OFF in 40 ms, and then in 16 ms, the data will go OFF.

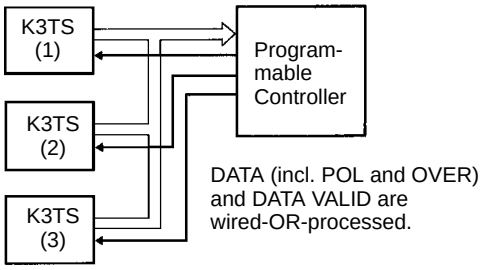
Continuous Data Output

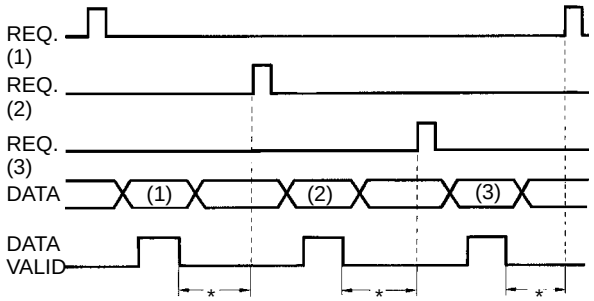


The K3TS outputs each measurement on an interval of 64 ms when the REQ signal is ON continuously.
If the HOLD signal is ON at the moment the DATA output is switched from data 1 to data 2 or vice versa, the output BCD data will be either data 1 or data 2 according to the timing of the HOLD signal. However, output data will be low.

Models with a BCD output have an open collector output configuration so that wired-OR connection is possible.

Models with a BCD output have an open collector output configuration so that wired-OR connection is possible.

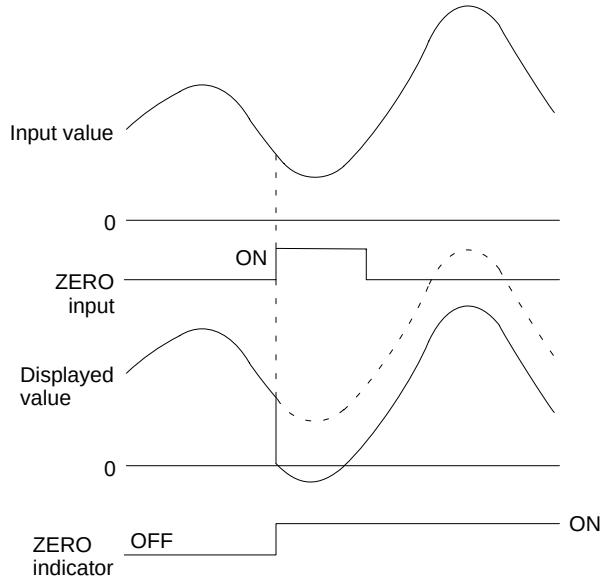




*The period between the DATA VALID signal and the REQ signal should be no less than 20 ms.

Forced Zero (Zero-shift)

With the ZERO input ON (by short-circuiting the ZERO input), the process value can be shifted to zero. This condition is held until the next ZERO input signal is turned ON.



Each time forced zero is turned ON on the standard K3TS, the shifted value will be written to the internal non-volatile memory (EEPROM). The data will not be lost even if the K3TS has a power failure. The EEPROM can be overwritten approximately 100,000 times. For applications in which the forced zero function is used more frequently, please use the K3TS-SD21B-□ with forced zero RAM.

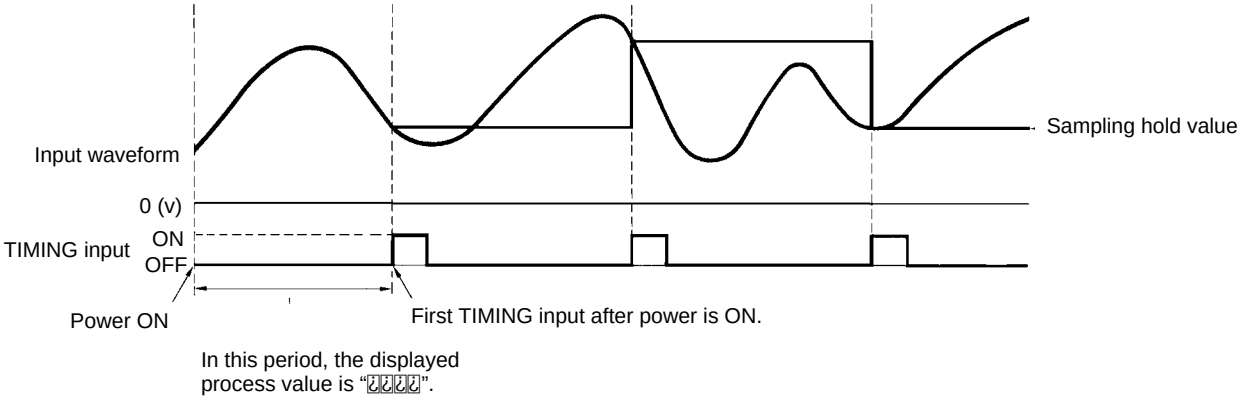
■ Holding Data (TIMING Input)

Normal

The K3TS is in continuous data sampling operation.

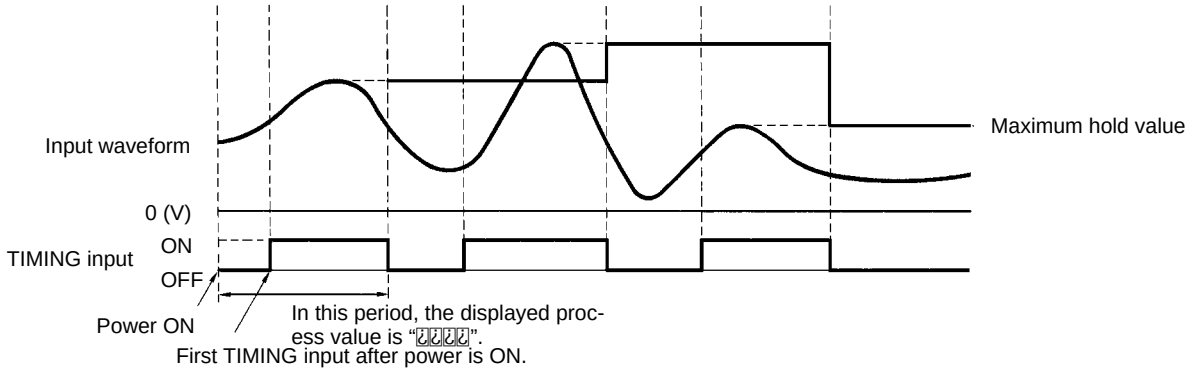
Sampling Hold

The K3TS retrieves and holds the data on the rising edge of the TIMING input signal.



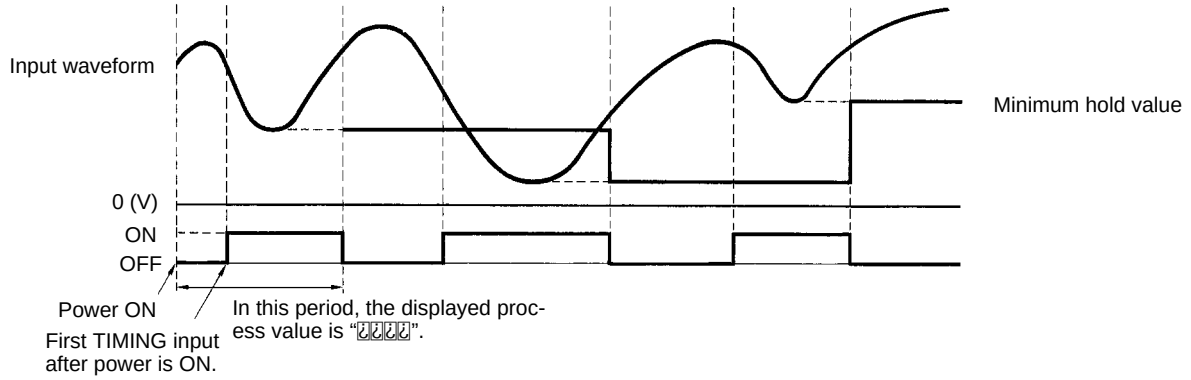
Maximum Hold

The K3TS displays the maximum value of the data and holds the value while the TIMING input is ON.



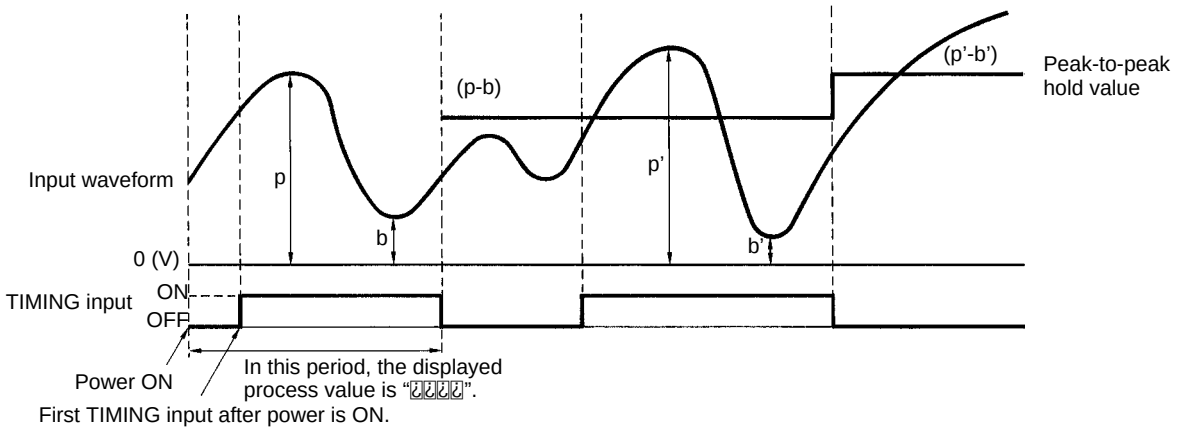
Minimum Hold

The K3TS displays the minimum value of the data and holds the value while the TIMING input is ON.

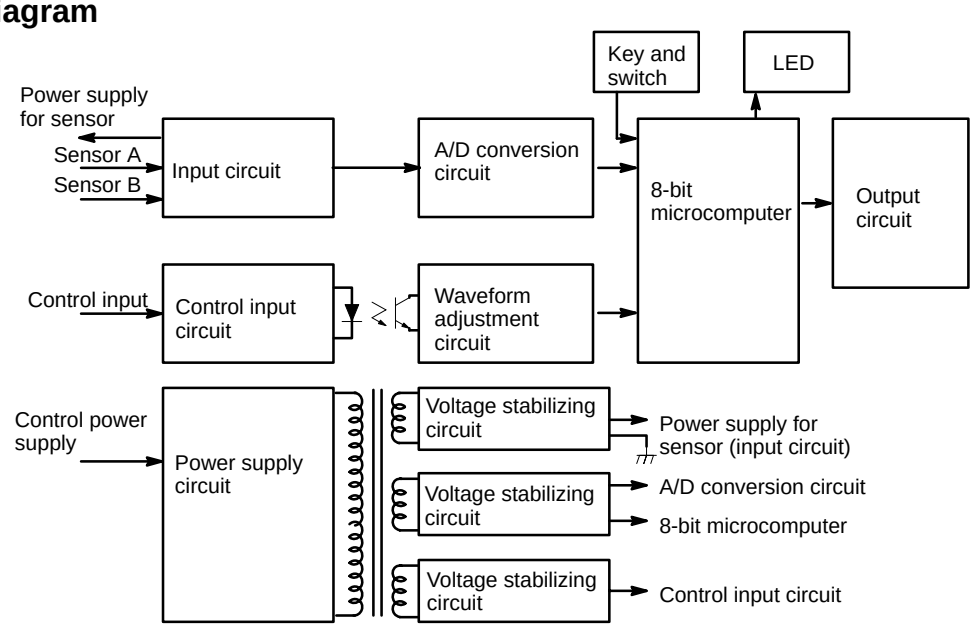


Peak-to-Peak Hold

The K3TS displays the maximum/minimum value of the data and holds the value while the TIMING input is ON.



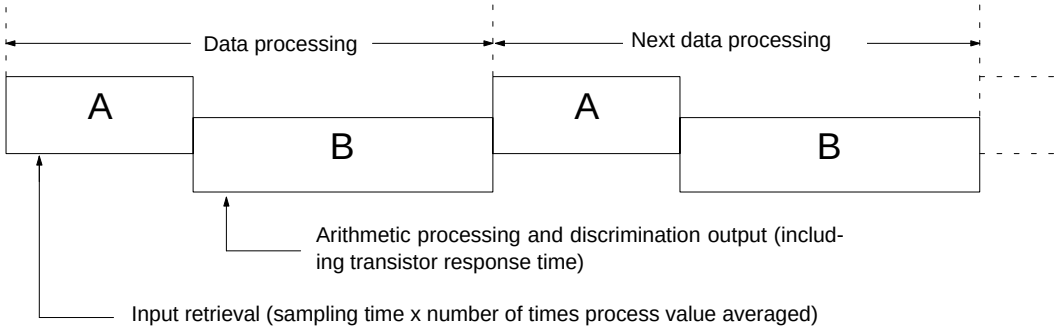
■ Block Diagram



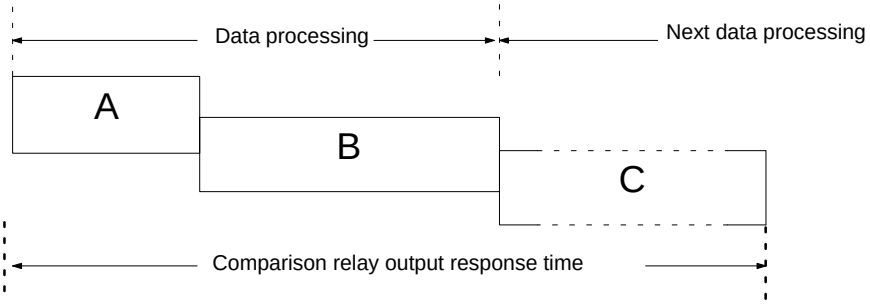
■ Sampling and Delay in Comparative Outputs

The sampling time or comparative output response time varies as follows with the setting of the number of process values to be averaged or the operating parameters (2-input or holding data).

The K3TS repeats operation A (input retrieval operation) and B (arithmetic processing and discrimination output operation) as shown in the figure. While operation B is executed, the comparative output transistor operates.



If the comparative output is a relay output, the response time (C in the figure) of the relay is added to the comparative output response time.



The data processing time and comparative output response time vary with the setting condition in each operating parameter as follows, they do not vary in operating parameter 2 (average value comparison).

Differences in Data Processing Time in Operating Parameter 1 (2-input)

*n: number of process values to be averaged.

Operating parameter 1 (2-input)	A (input retrieval)	B (arithmetic processing and determination)	C (relay response time)
A only	1.04 x n * (ms)	2.08 ms	10 ms
A + B, A – B, K – (A + B)	2.08 x n* (ms)	4.16 ms	10 ms
B/A x 100, (1 – B/A x 100)	2.08 x n* (ms)	5.20 ms	10 ms

Differences in Delay in Comparative Outputs in Operating Parameter 3 (Holding Data)

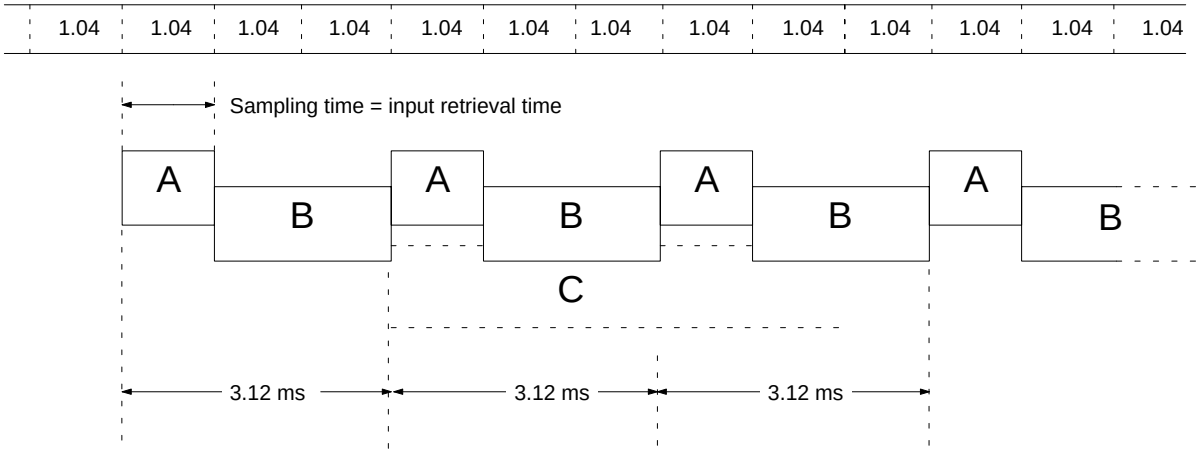
Operating parameter 3 (holding data)	Definition of delay	Delay in comparative outputs
Normal	The time required between output transistor operation and input value change.	Min.: A + B (ms) Max.: (A + B) x 2 (ms)
Sampling hold	The time required between output transistor operation and timing signal rise.	Min.: 1.04 + A + B (ms) Max.: 2.08 + A + B (ms)
Maximum hold, minimum hold, peak-to-peak hold	The time required between output transistor operation and timing signal fall.	Min.: B (ms) Max.: A + B (ms)

Timing Charts (Examples)

Example 1

The following timing chart shows the operating timing with the setting specified in the table.

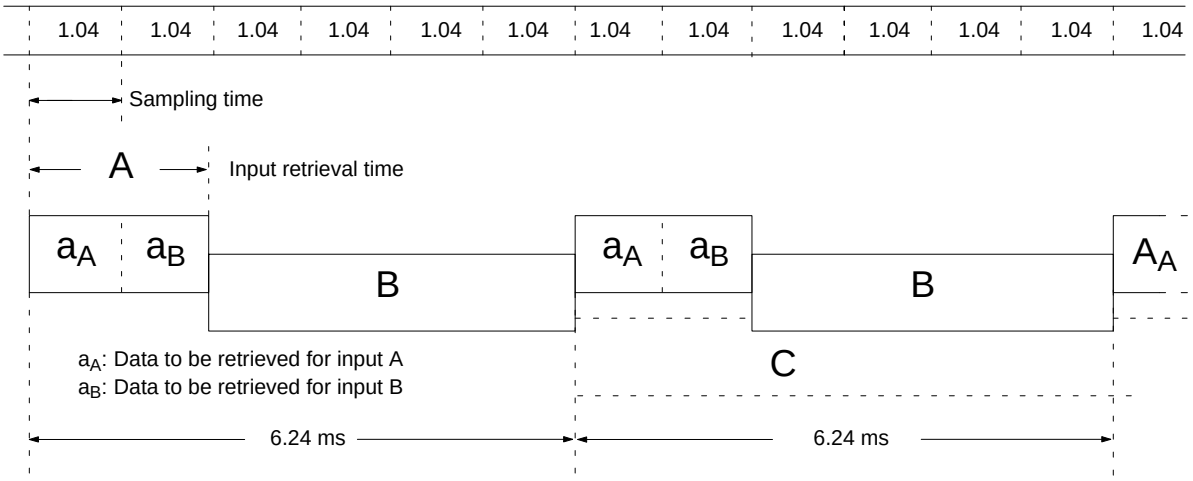
Operating parameter 1 (2-input)	A only
Operating parameter 3 (holding data)	Normal
Number of process values to be averaged	1
Delay in comparative outputs	3.12 to 6.24 ms



Example 2

The following timing chart shows the operating timing with the setting specified in the table.

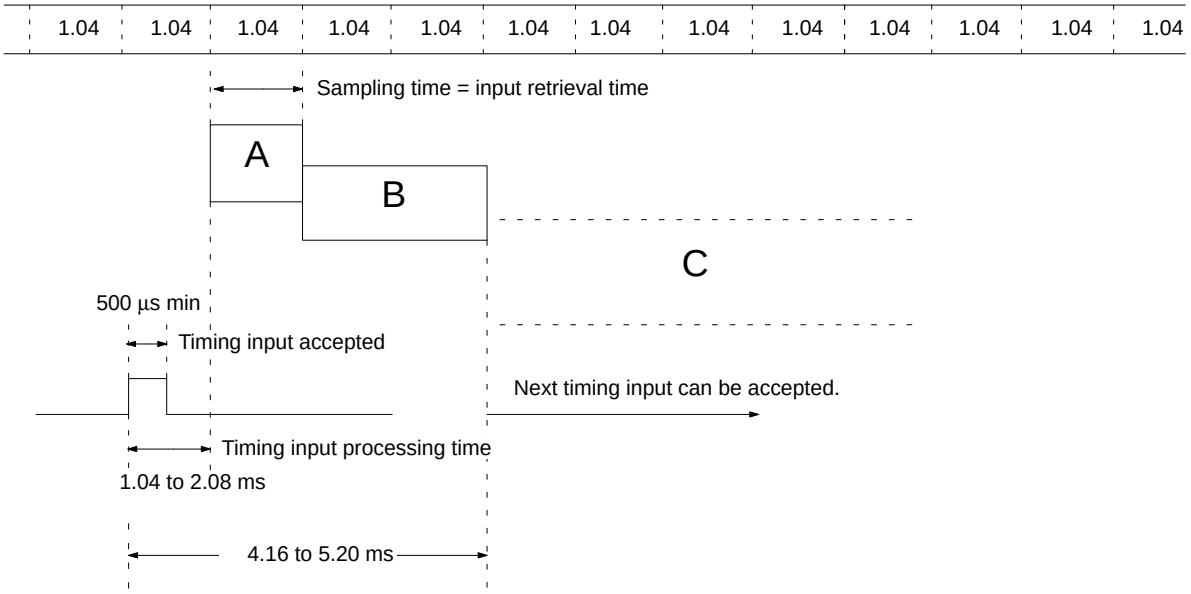
Operating parameter 1 (2-input)	A + B
Operating parameter 3 (holding data)	Normal
Number of process value averaging operations	1
Delay in comparative outputs	6.24 to 12.48 ms



Example 3

The following timing chart shows the operating timing with the setting specified in the table.

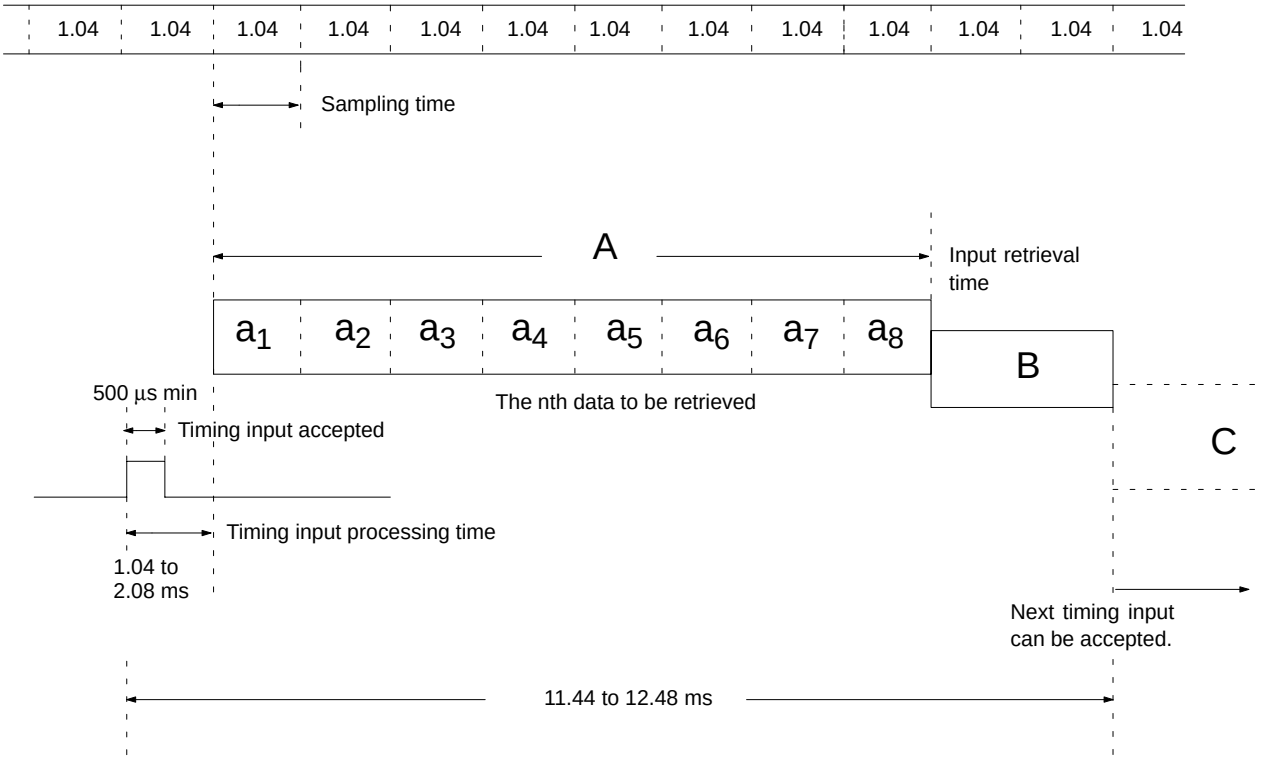
Operating parameter 1 (2-input)	A only
Operating parameter 3 (holding data)	Sampling hold
Number of process value averaging operations	1
Delay in comparative outputs	4.16 to 5.20 ms



Example 4

The following timing chart shows the operating timing with the setting specified in the table.

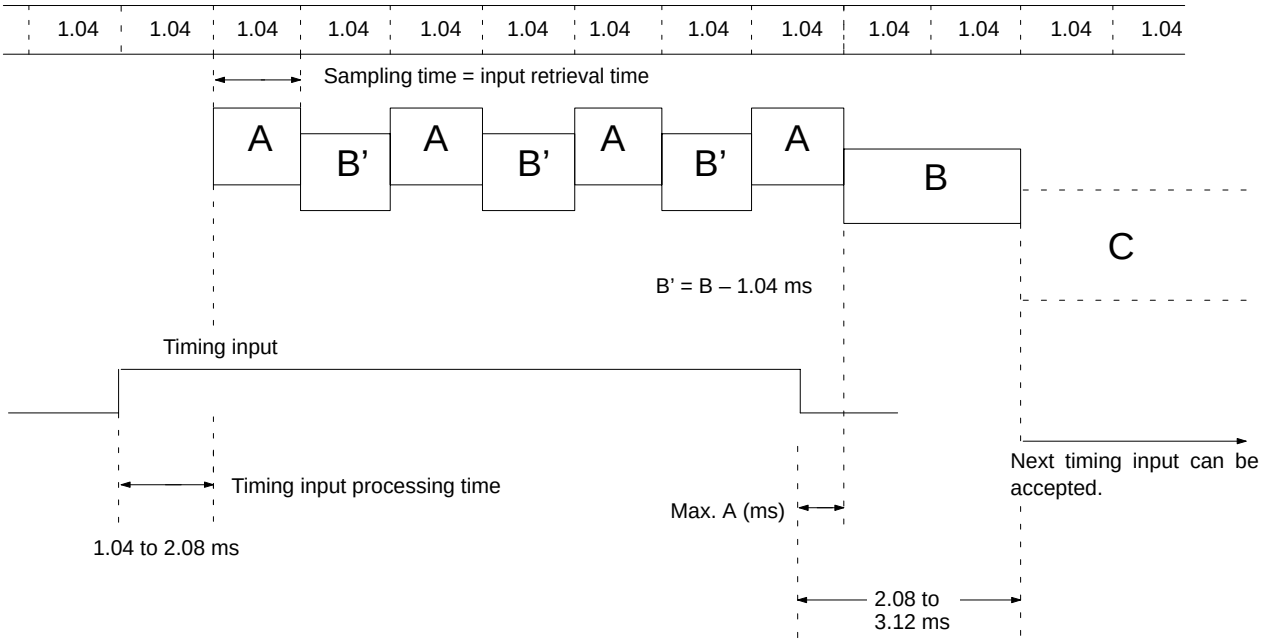
Operating parameter 1 (2-input)	A only
Operating parameter 3 (holding data)	Sampling hold
Number of process value averaging operations	8
Delay in comparative outputs	11.44 to 12.48 ms



Example 5

The following timing chart shows the operating timing with the setting specified in the table.

Operating parameter 1 (2-input)	A only
Operating parameter 3 (holding data)	Maximum hold
Number of process value averaging operations	1
Delay in comparative outputs	2.08 to 3.12 ms



■ Application Examples

Height Measurement/Discrimination of Objects

The following operations are possible with K3TS:

- With a synchronous sensor, the sampling hold parameter makes it possible to display the height of an object and hold its value.
- The eight switchable banks make it possible for the K3TS to measure different kinds of objects smoothly.
- With the forced zero function, zero calibration can be done with ease.

K3TS Settings
Level 3

FUn1 A (A only)
FUn2 oFF (No previous average comparison)
FUn3 S&H (Sampling hold)

Level 2

in 4&20 (4 to 20 mA)
dISP ——
AvE 8
t&d 0.00
oF&d ——

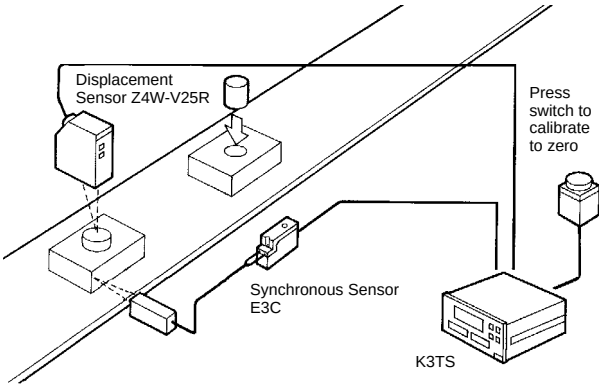
Level 1

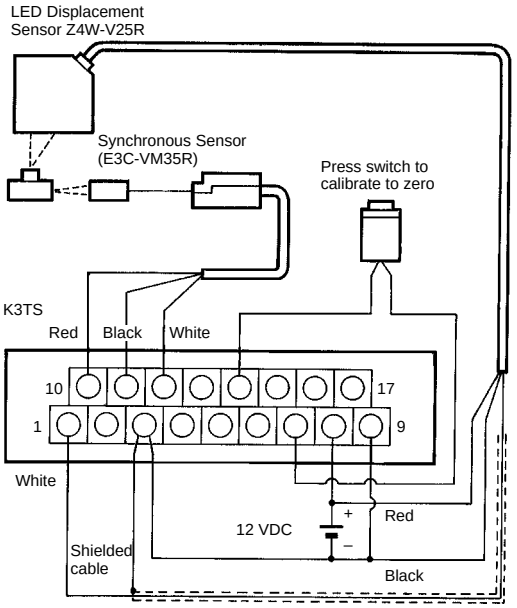
CST0 to CST7
(Example: Checks if deviations in the objects are within a range of ±0.1 mm.)
HH = 1.50
H = 0.10
L = &0.10
LL = &1.50
(Adjust according to the object)
HYS = ——
SCAL If X_2 = 20.00, Y_2 = –4.00
If X_1 = 4.00, Y_1 = 4.00
Prot (set to on if necessary, after all setting operations have been completed.)

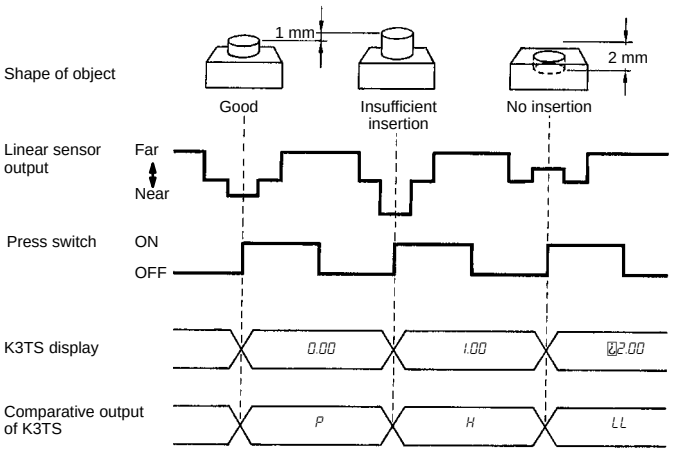
"——" indicates parameters that are not displayed.

This method can be used to check the dimensions of molding components and the height of each component after processing.

Dimensional Check after Mounting Objects



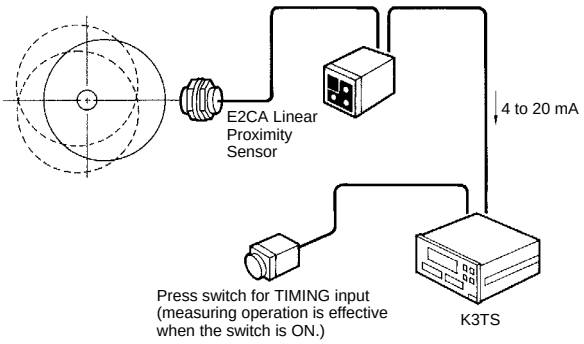




Measurement of Discs

The following operations are possible with K3TS:

- The output signal of the linear sensor varies continuously. The peak-to-peak hold function makes it possible to measure the difference between the maximum value and minimum value of the signal in order to measure the decentering of disc-shaped objects.
- The measuring operation is carried on while the TIMING input (a push switch in this example) is ON. When the TIMING input is OFF, the K3TS will HOLD the final result.



K3TS Settings
Level 3

FUn1 A (A only)
FUn2 oFF (No previous average comparison)
FUn3 PPoH (Peak-to-peak hold)

Level 2

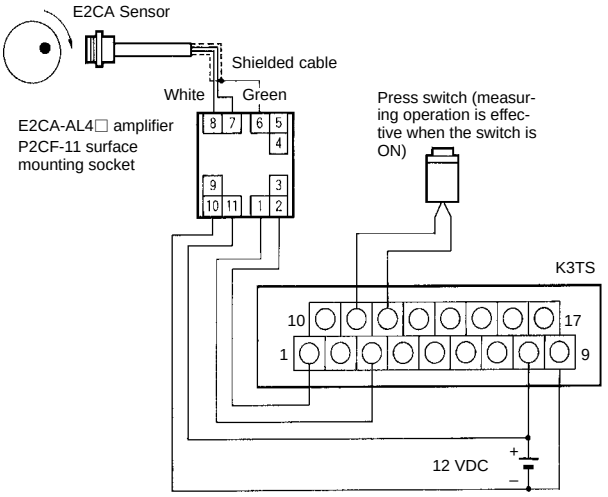
in 4o20 (4 to 20 mA)
dSP ——
AuE 0
tod 0.00
oFFd ——

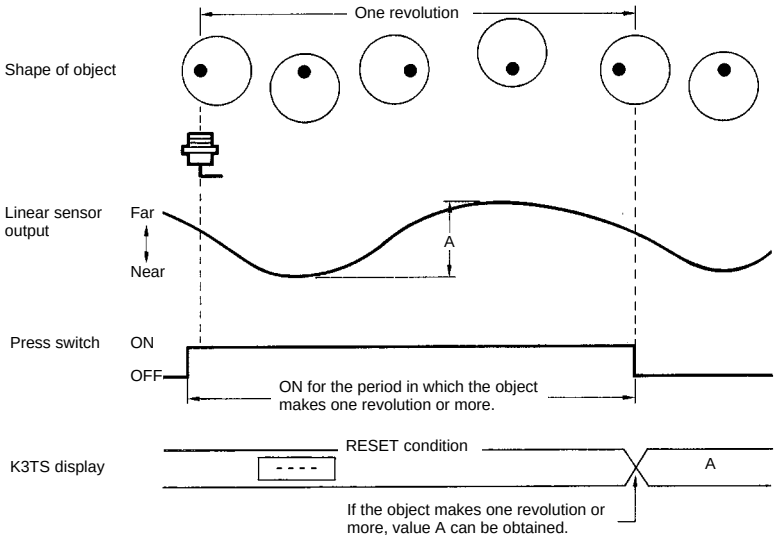
Level 1

C5t0 to C5t7 (When the comparative output is used, set HH, H, L, and LL.)
HYS = ——
SCAL If X_2 = 20.00, Y_2 = 20.00
If X_1 = 4.00, Y_1 = 4.00
Prot (set to on if necessary, after all setting operations have been completed.)

"——" indicates parameters that are not displayed.

The decentering of the shafts of objects can be measured. If they are not metal objects, use an optical displacement sensor or a supersonic displacement sensor.





Measurement of Plate Thickness

The following operations are possible with the K3TS:

- Using two displacement sensors, the plate thickness can be measured by setting operating parameter 1 to K – (A + B) and by converting the outputs of the displacement sensors into actual figures (the thickness of the plates).
- With the forced zero function, object thickness can be compared with that of a standard object and the deviation can be measured with ease.

K3TS Settings
Level 3

FUn1 HoAb (K–(A+B))
FUn2 oFF (No previous average comparison)
FUn3 norn (Normal)

Level 2

in	4-20 (4 to 20 mA)
dISP	FASt
AuE	8
t-d	———
oF-d	0.00

Level 1

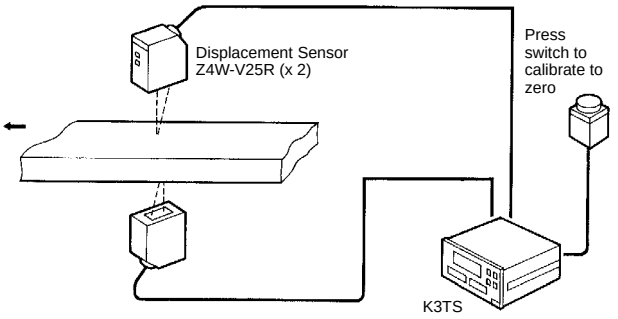
CSt0 to CSt7
(Example: Checks if the objects are within a thickness of 20 (standard thickness) ±0.5 mm.)
HH = 22.00
H = 20.50
L = 19.50
LL = 18.00
(Adjust according to the object)
HYS = 001

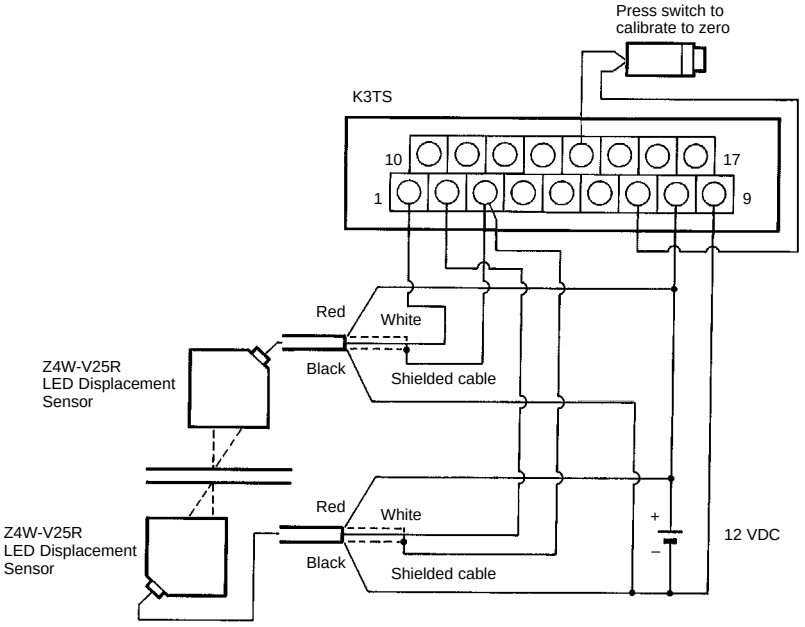
SCAL If X_2 = 8.00, Y_2 = 42.00
If X_1 = 40.00, Y_1 = 58.00
(Input the results of operation for X and Y.)

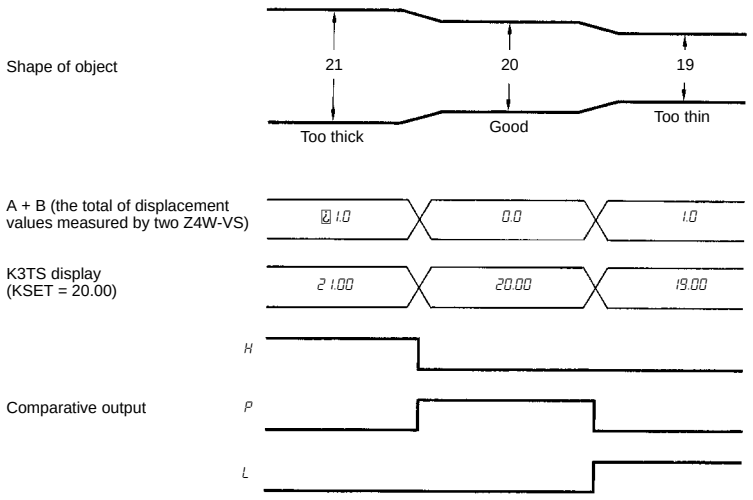
PSEt (Set the sensor distance in mm.)

Prot (set to on if necessary, after all setting operations have been completed.)

"———" indicates parameters that are not displayed.







Checking Height Differences

The following operations are possible with the K3TS:

- Using two displacement sensors, the difference in the level of an object surface can be measured by setting operating parameter 1 to A – B.
- With the forced zero function, the difference in the level of an object surface can be compared with that of a standard object.

K3TS Setting
Level 3

FUn1 A-b (A–B)
FUn2 oFF (No previous average comparison)
FUn3 SmH (Sampling hold)

Level 2

in 4-20 (4 to 20 mA)
dSP ——
AvE 8
tmd 0.00
oFSd ——

Level 1

CSt0 to CSt7
(Example: Checks if the objects are within a thickness of 3 (standard thickness) ±0.1 mm.)
HH = 4.00
H = 3.10
L = 2.90
LL = 2.00
(Adjust according to the object)
HYS = ——

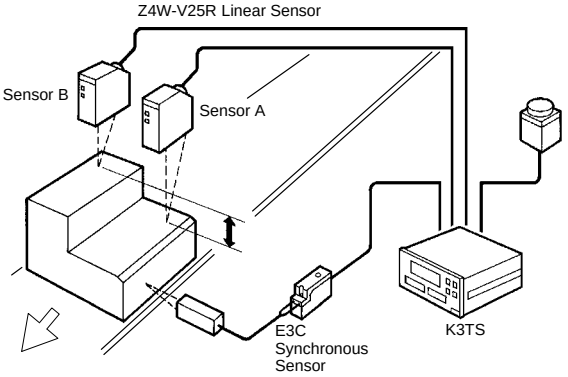
SCAL If $X_2 = 0.00$, $Y_2 = 0.00$
If $X_1 = 16.00$, $Y_1 = 8.00$
(Input the results of operation for X and Y.)

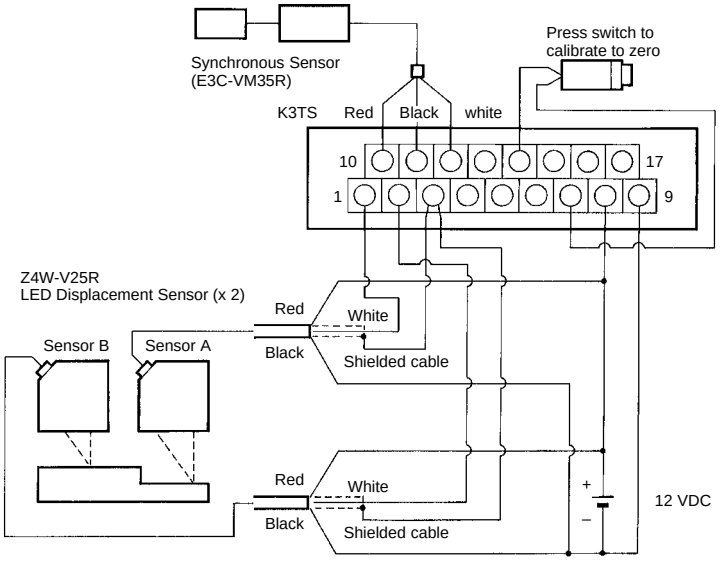
Prot (set to on if necessary, after all setting operations have been completed.)

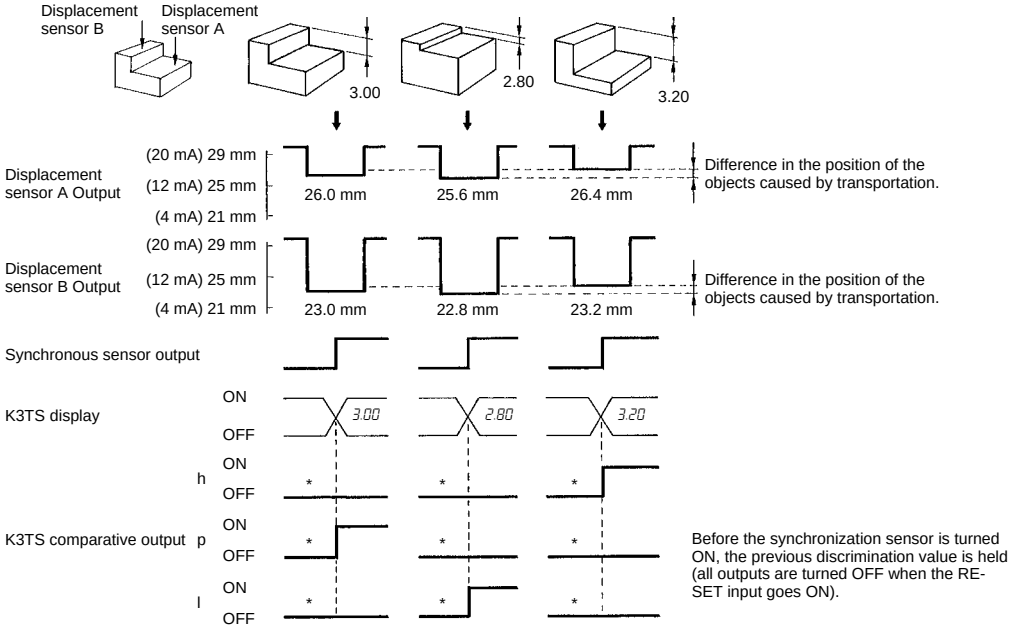
"——" indicates parameters that are not displayed.

This method can be applied to an ordinary dimensional checking operation. By measuring the distance between the upper surface of the object and the belt conveyor, the dimension of the object will be measured accurately even if the belt is not evenly flat.

Dimensional Check of Molding Parts







Detection of the Protruding Portion of Cylindrical Objects

The deflection of cylindrical objects does not influence the detecting operation. Therefore the objects can be rolled.
For example, the burr or a protruding part of a rubber roller or a molded object can be detected.

The following operation is possible with the K3TS:

- With the previous average comparative value function, only a rapid change in value will be checked, and a slow change in value (such as a change due to the deflection of the cylindrical sensing object) will be dismissed.

Example of Operations Set on K3TS
Level 3

FUn1 A (A only)
FUn2 on (Previous average comparison)
FUn3 norn (Normal)

Level 2

in 9.999 (±9.999V)
diSP FASt
AuE 1
tMd ——
oFMd 0.10 (0.1 s) (Set appropriate time)

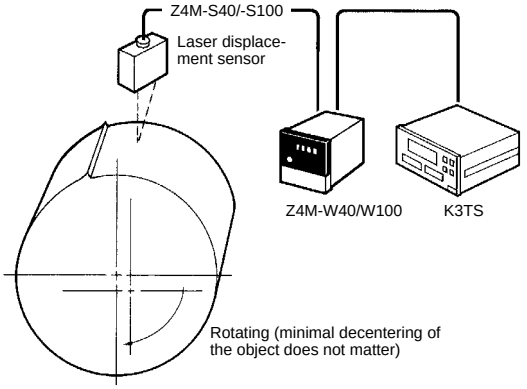
Level 1

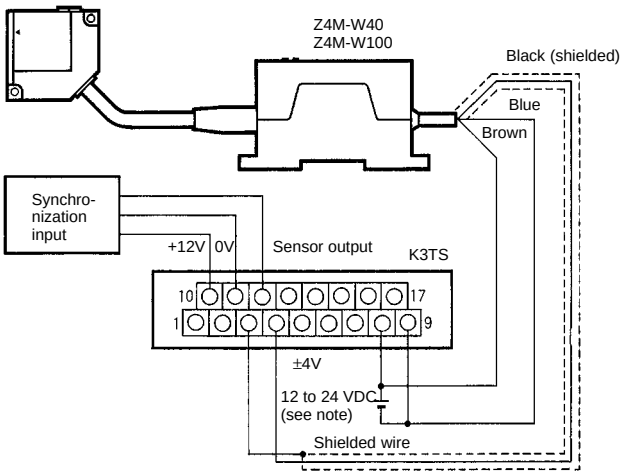
CSt0 to CSt7
H = 5.00
L = 000
(Take the rolling speed and the burr of the objects into consideration before setting.)
HYS = ——

SCAL If X_2 = 9.999, Y_2 = 9.999
If X_1 = –9.999, Y_1 = –9.999

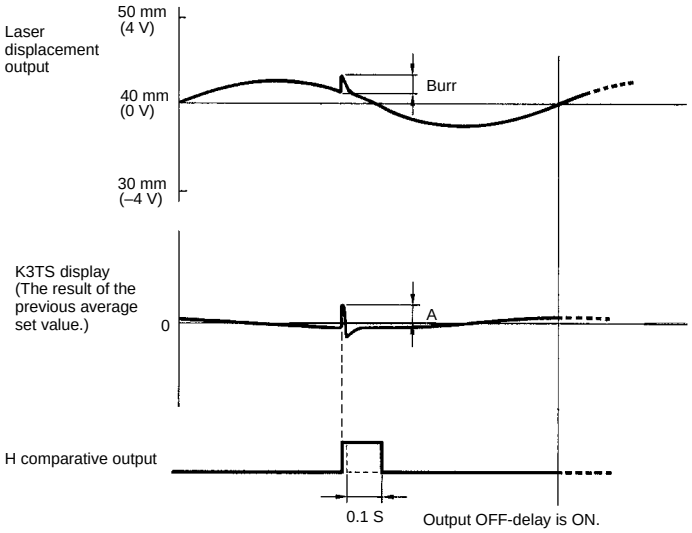
Prot (set to on if necessary, after all setting operations have been completed.)

"——" indicates parameters that are not displayed.





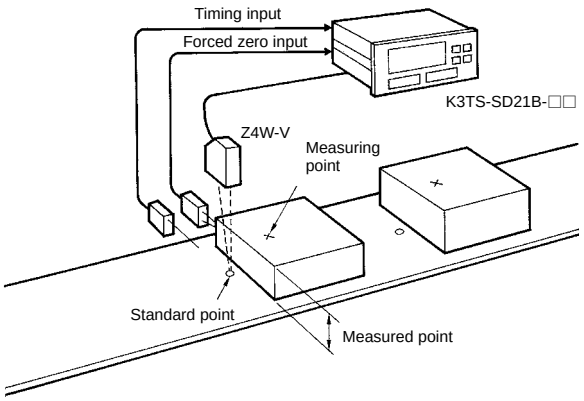
Note: This wiring is for the K3TS models for DC power supply. When using the K3TS models for AC power supply, separate the AC power supply for the K3TS from the DC power supply for the Z4M.



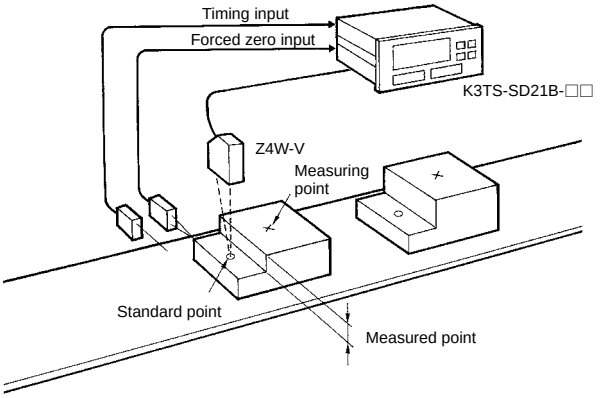
Forced Zero RAM Models

In the following applications, the zero value is changed repeatedly for measurement purposes.

Standard Height Change



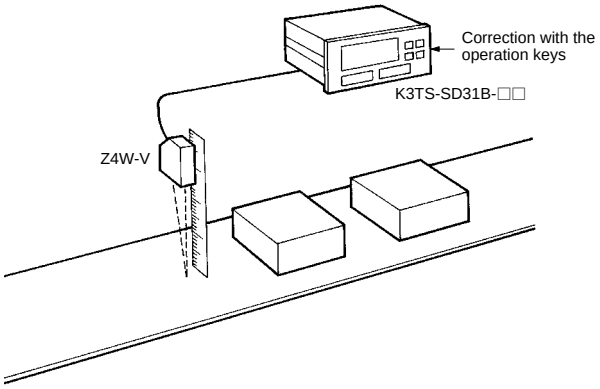
Height Difference Measurement of Each Object



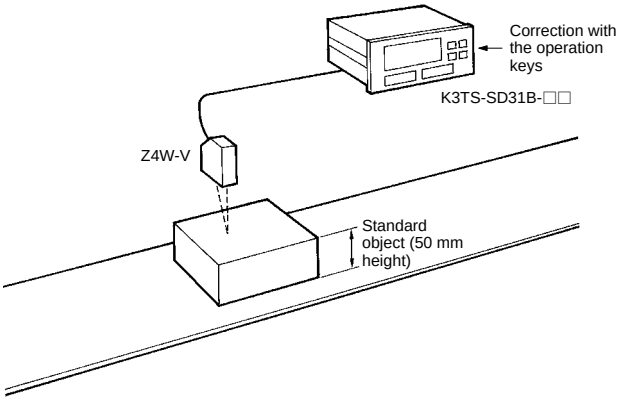
Display Shift Function Models

In the following applications, errors are corrected.

Correction of the Sensor Mounting Position



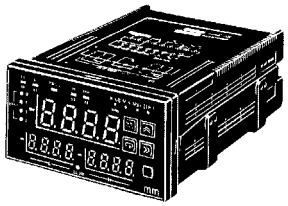
Correction of Height Measurement Values

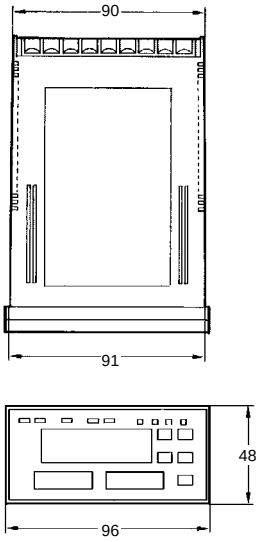


Correction of sensor errors caused by object colors, materials, and angles.

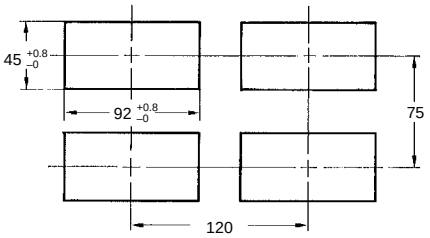
Dimensions

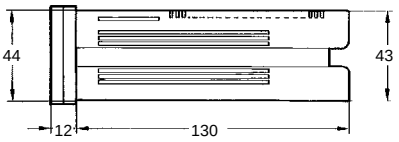
Note: All units are in millimeters unless otherwise indicated.





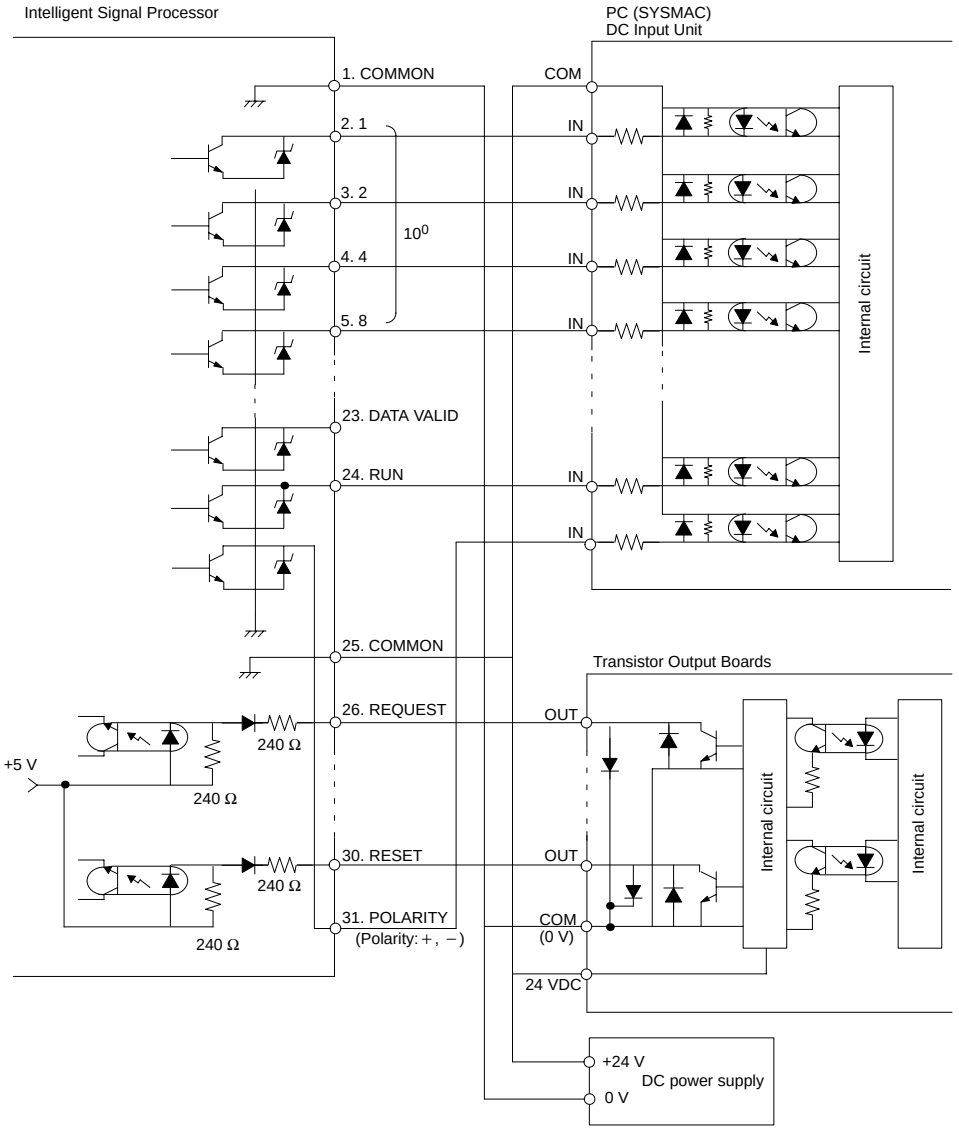
Panel Cutouts





Installation

■ Example of Connection to Programmable Controller



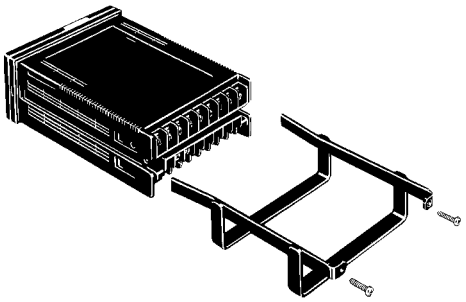
Precautions

Mounting

Recommended panel thickness is 1 to 3.2 mm.

Mount the Processor by attaching the mounting bracket supplied as an accessory from the rear of the Processor. Turn each mounting screw clockwise and tighten it to a torque of about 5 kgf • cm (0.49 N • m).

Always attach the Mounting Bracket before wiring the terminals. Also, always remove the wiring from the terminals before removing the Mounting Bracket.



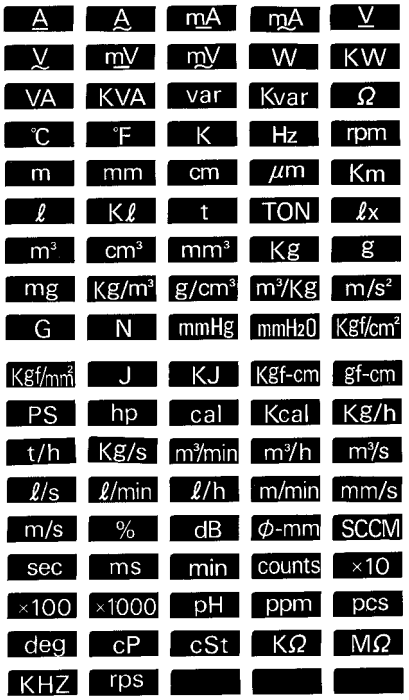
Mount the Processor as horizontally as possible.

Never use the Processor in locations where corrosive gas (particularly sulfureted or ammonia gas) is generated.

As much as possible avoid use of the Processor in a location subject to severe shock or vibration, excessive dust, or excessive moisture.

Select a mounting location where the Processor can be used at an ambient operating temperature of –10°C to 55°C.

No product is shipped with the unit attached. Select a unit label from the sheet provided, and attach it to the product.



Operating Environment

The Processor does not have a water-resistive structure preventing the internal circuitry from drops of water that may penetrate through the space between the keys and operating panel. If operated by wet or oily hand, put a soft cover (sold separately) onto the operating panel. Although the soft cover corresponds to IP51, avoid places where the Processor is directly exposed to water or oil.

Each time forced zero is turned ON on the standard K3TS, the shifted value will be written to the internal non-volatile memory (EEPROM). The data will not be lost even if the K3TS has a power failure. The EEPROM can be overwritten approximately 100,000 times. For applications in which the forced zero function is used more frequently, please use the K3TS-SD21B-□ with forced zero RAM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. N073-E1-2A **In the interest of product improvement, specifications are subject to change without notice.**

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