

Autonics

1-channel Digital Temperature Indicators

KN-2000W SERIES

INSTRUCTION MANUAL



Thank you very much for selecting Autonics products.
Please read the following safety considerations before use.

Safety Considerations

- ※Please observe all safety considerations for safe and proper product operation to avoid hazards.
- ※⚠ symbol represents caution due to special circumstances in which hazards may occur.
- ⚠ Warning

Failure to follow these instructions may result in serious injury or death.
- ⚠ Caution

Failure to follow these instructions may result in personal injury or product damage.

Warning

- Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss.** (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
Failure to follow this instruction may result in personal injury, economic loss or fire.
- Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
Failure to follow this instruction may result in explosion or fire.
- Install on a device panel to use.**
Failure to follow this instruction may result in fire or electric shock.
- Do not connect, repair, or inspect the unit while connected to a power source.**
Failure to follow this instruction may result in fire or electric shock.
- Do not disassemble or modify the unit.**
Failure to follow this instruction may result in fire or electric shock.
- Check 'Connections' before wiring.**
Failure to follow this instruction may result in fire.

Caution

- Use the unit within the rated specifications.**
Failure to follow this instruction may result in fire or product damage.
- Use a dry cloth to clean the unit, and do not use water or organic solvent.**
Failure to follow this instruction may result in fire or electric shock.
- Keep the product away from metal chip, dust, and wire residue which flow into the unit.**
Failure to follow this instruction may result in fire or product damage.
- Check the polarity of the measurement input before wiring.**
Failure to follow this instruction may result in explosion or fire.

Ordering Information

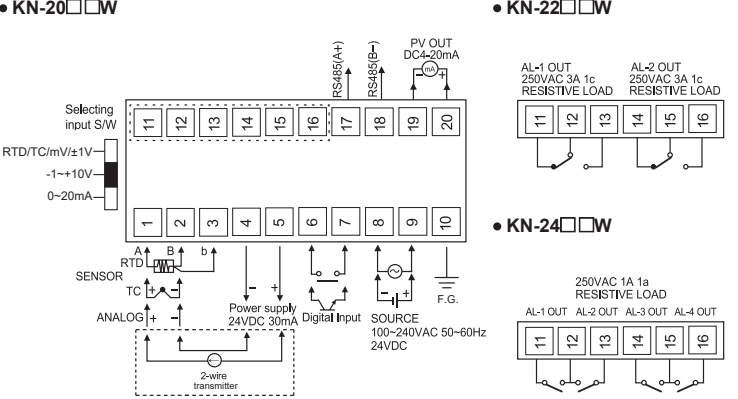
KN-2	0	0	0	W
		Size	W DIN W96×H48mm	
		Power supply	0	100-240VAC 50 to 60Hz
			1	24VDC
		Option output	0	No option
			1	Transmission output (4-20mA) ^{※1}
			4	RS485 communication output
			5	Transmission output (4-20mA) + RS485 communication output
		Alarm output	0	No alarm output
			2	Alarm output: 2
			4	Alarm output: 4
		Item	KN-2	1-channel Digital Temperature Indicators

※1:For transmission output(4-20mA), select one between transmission output+alarm output 2 or transmission output+alarm output 4.

※The above specifications are subject to change and some models may be discontinued without notice.

※Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

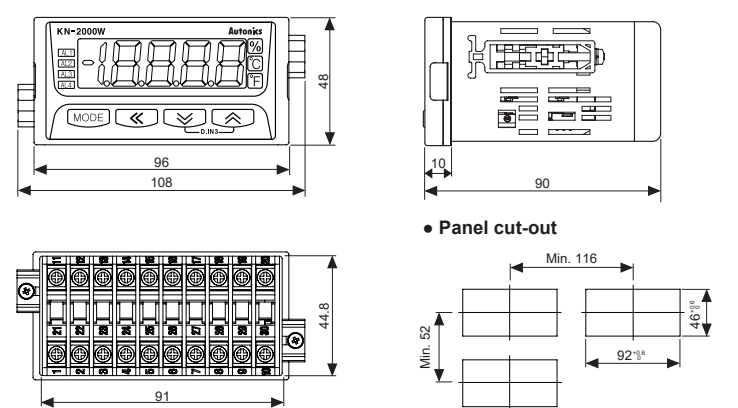
Connections



Unit Description

- Display part(red)**
 - Run mode: Displays current measurement value.
 - Parameter set mode: Displays parameter and SV.
 - Unit indicator:** Displays the set unit.
 - Alarm output indicator**
 - Turns ON when the alarm is ON.
4. **MODE key**
: Used to enter parameter set mode, move to parameters, save SV and return to RUN mode.
5. **⏏, ⏏, ⏏ key:** Used to change parameter SV.
6. **D.IN3**
: Press the ⏏ and ⏏ keys for 3 sec at the same time, it operates the set function (alarm clear, display hold, zero-point adjustment) at [d1 - 1'] at program mode.

Dimensions



Input Type and Range

Input type	Parameter	Input range(°C)	Input range(°F)
Thermo-couple	K(CA)	tC - 1'	-200.0 to 1350.0
	J(IC)	tC - 1	-200.0 to 800.0
	E(CR)	tC - 1	-200.0 to 800.0
	T(CC)	tC - 1	-200.0 to 400.0
	R(PR)	tC - r	0.0 to 1750.0
	B(PR)*	tC - b	400.0 to 1800.0
	S(PR)*	tC - 5	0.0 to 1750.0
	N(NN)*	tC - n	-200.0 to 1300.0
	C(W5)*	tC - L	0 to 2300
	L(IC)*	tC - L	-200.0 to 900.0
RTD	U(CC)*	tC - U	-200.0 to 400.0
	Platinel II*	tC - P	0.0 to 1390.0
	Cu50Q*	tCU50	-200.0 to 200.0
	Cu100Q*	tCU10	-200.0 to 200.0
	DP150Q	dPE1	-200.0 to 600.0
Analog	DP100Q	dPE1	-200.0 to 850.0
	Current	0.00 - 20.00mA	RnR1
		4.00 - 20.00mA	RnR2
		-50.00 - 50.00mV	Rnu1
		-200.0 - 200.0mV	Rnu2
		-1.0000 - 1.0000V	R-u1
		-1.000 - 10.000V	R-u2
	Voltage		

※Above input types which have the * mark are not displayed.
To display the above input types, supply the power with pressing the **MODE** key.

Specifications

Series	KN-2000W
Power supply	AC voltage 100-240VAC~ 50/60Hz DC voltage 24VDC=
Allowable voltage range	90 to 110% of rated voltage
Power consumption	AC voltage Max. 8VA DC voltage Max. 3W
Display method	4½-digit, 7-segment LED (selectable red, green, yellow) method
Character size	W10×H17mm
Input type	RTD JPt100Q, DPt100Q, DPt50Q, Cu50Q, Cu100Q (5 types) Thermocouple K, J, E, T, R, B, S, N, C (W5), L, U, PLII (12 types) Analog •Voltage: ±1.0000V, ±50.00mV, ±200.0mV, -1.000-10.000V (4 types) •Current: 4.00-20.00mA, 0.00-20.00mA (2 types) Digital input •Contact input: max. 2kΩ in ON,Max. 90kΩ in OFF •Non-contact input: residual voltage max. 1.0V in ON, leakage current max. 0.03mA in OFF •Outflow current: approx. 0.2mA Sub output Alarm output •2-point: relay contact capacity 250VAC~ 3A 1c Transmission output •4-point: relay contact capacity 250VAC~ 1A 1a Com. output ISOLATED DC4-20mA (PV transmission) load resistance max. 600Ω Com. output RS485 (Modbus RTU)
Display accuracy	±0.2% F.S. ±1-digit (25±5°C) ±0.3% F.S. ±1-digit (-10 to 20°C, 30 to 50°C) In case of thermocouple and below -100°C input, [±0.4% F.S.]±1-digit ※TC-T, TC-U is min. ±2.0°C
Setting method	Set by front keys or RS485 communication
Alarm output hysteresis	Set ON/OFF interval (1 to 999-digit)
Sampling cycle	Analog input: 100ms, temperature sensor input: 250ms
Dielectric voltage	2000VAC 50/60Hz for 1 min (between input terminal and power terminal)
Vibration	0.75mm amplitude at frequency of 5 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours
Relay life cycle	2-point Mechanical: min. 10,000,000, Electrical: min. 100,000 (250VAC 3A resistance load) 4-point Mechanical: min. 20,000,000, Electrical: min. 500,000 (250VAC 1A resistance load)
Insulation resistance	Over 100 MΩ (at 500VDC megger)
Noise immunity	±2kV the square wave noise (pulse width 1μs) by noise simulator
Memory retention	Approx. 10 years (non-volatile semiconductor memory type)
Environ -ment	Ambient temp. -10 to 50°C, storage: -20 to 60°C Ambient humi. 35 to 85%RH, storage: 35 to 85%RH
Approval	CE
Weight※1	Approx. 332g (approx. 200g)

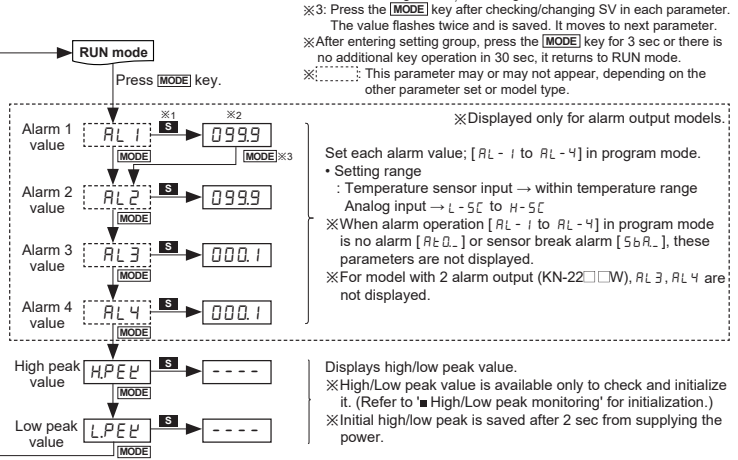
※1: The weight includes packaging. The weight in parenthesis is for unit only.
※Environment resistance is rated at no freezing or condensation.

Communication

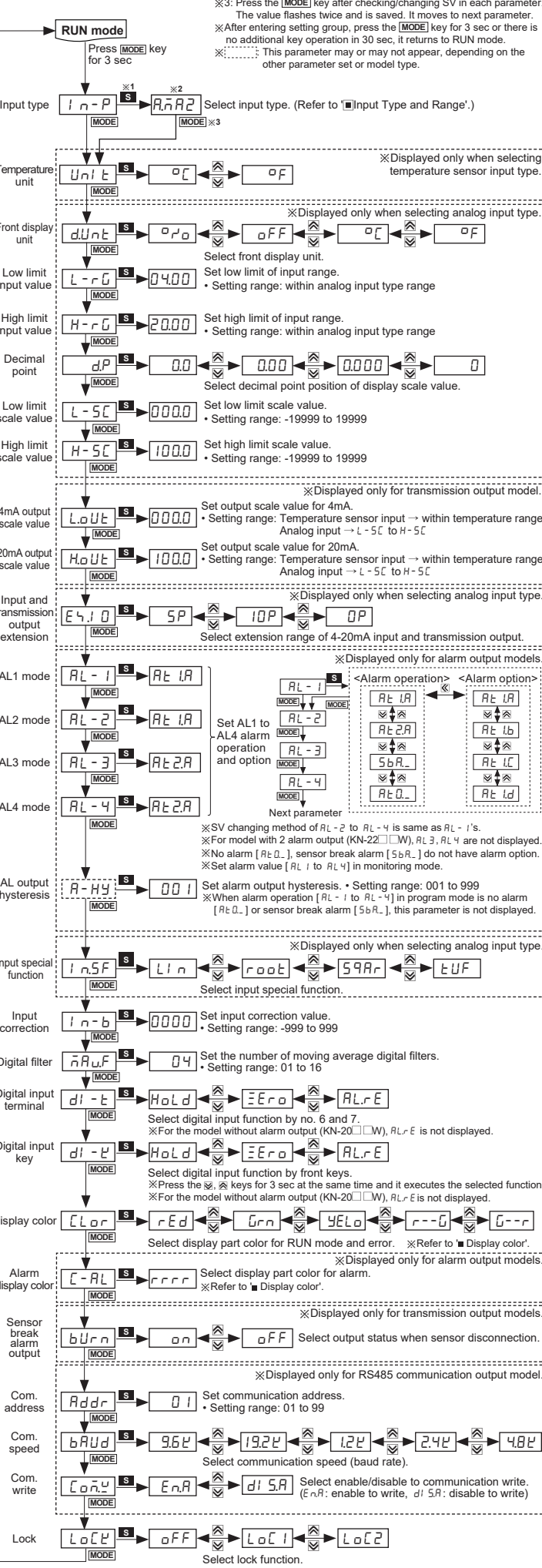
- **Communication set [Program mode: Addr, bAUd]**
You can set communication address [Addr] and communication speed [bAUd] for RS485 communication.
- **Communication write enable/disable [Program mode: CoñW]**
You can set to enable [EnR] or disable [diSA] or writing parameter setting by RS485 communication.
- **Communication manual**
Refer to communication manual for RS485 communication.
Visit our web site (www.autonics.com) to download communication manual and software [Integrated device management program: DAQMaster].
- **Software [Integrated device management program: DAQMaster]**
Integrated device management program, DAQMaster, is able to set and monitor parameters. It is available only for RS485 communication models.
- **Communication specifications**

Item	Minimum requirements	Specifications
System	IBM PC compatible computer with Intel Pentium III or above	Com. method RS485 2-wire half duplex Com. speed(BPS) 19200, 9600, 4800, 2400, 1200 Converter Converter built in RS232
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10	Max. connections 32 units
Memory	256MB or more	Com. distance Max. 1200m (within 700m recommended)
Hard disk	More than 1GB of free hard disk space	Protocol Modbus 1.1 RTU
VGA	1024×768 or higher resolution display	Parity None
Others	RS-232 serial port (9-pin), USB port	Stop Bit 1-bit Data length 8-bit

Monitoring Mode



Program Mode

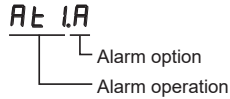


■ Functions

■ Alarm [AL-1, AL-2, AL-3, AL-4]

This product has 2 or 4 alarms to operate individually when the value is too high or low. Alarm function is set by the combination of alarm operation and alarm option.
To clear alarm, use digital input function (setting $d1 \sim d4$ as $AL-1 \sim 4$) or turn the power OFF and ON.

※For the model (KN-20□□W) without alarm output, these parameters are not displayed.



○ Alarm operation

Mode	Name	Alarm operation	Descriptions
$AL-0$	—	—	No alarm operation
$AL-1$	High limit alarm	OFF \downarrow H \uparrow ON High limit alarm value: 800°C PV	PV \geq alarm temperature, alarm is ON
$AL-2$	Low limit alarm	ON \uparrow H \downarrow OFF PV Low limit alarm value: 200°C	PV \leq alarm temperature, alarm is ON
$5bAL$	Sensor break alarm	—	It will be ON when it detects sensor disconnection. Sensor break alarm does not have alarm option.

※ H: Alarm output hysteresis

○ Alarm option

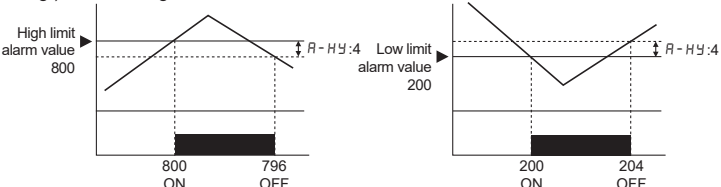
Option	Name	Descriptions
$AL-1A$	Standard alarm	If it is an alarm condition, alarm output is ON. Unless an alarm condition, alarm output is OFF.
$AL-1b$	Alarm latch	If it is an alarm condition, alarm output is ON. Before clearing the alarm, an ON condition is latched. (Holding the alarm output)
$AL-1C$	Standby sequence	First alarm condition is ignored. From the second alarm condition, standard alarm operates. When power is ON and it is an alarm condition, it is ignored. From the second alarm condition, standard alarm operates.
$AL-1d$	Alarm latch and standby sequence	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is ON and it is an alarm condition, it is ignored. From the second alarm condition, alarm latch operates.

■ Alarm output hysteresis [Program mode: A-HY]

Set the interval of ON/OFF alarm output.

The set hysteresis is applied to AL1 to AL4 and it is as below.

※E.g.) A-HY: 4, high limit alarm value: 800, low limit alarm value: 200



■ High/Low peak monitoring [Monitoring mode: H-PEL, L-PEL]

This function is to save high/low peak to check the invisible abnormal condition of system at [H-PEL] or [L-PEL] in monitoring mode.

When the high/low peak is out of the temperature range, it displays HHHH or LLLL.

To initialize high/low peak, press the H and L keys at the same time for 3 sec at [H-PEL] or [L-PEL].

In this case, peak value is the present input value.

■ Error

Display	Descriptions	Troubleshooting
LLLL	Flashes when measured sensor input is lower than the temperature range.	When input is moved within the temperature range, it is cleared.
HHHH	Flashes when measured sensor input is higher than the temperature range.	
$bUr n$	Flashes when the sensor is break or not connected.	Check temperature sensor connection.
$E r r$	Flashes when there is error to SV.	Check set conditions and re-set it.

■ User input range [Program mode: L-rG, H-rG]

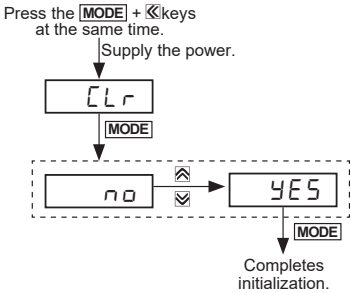
When selecting analog input, you can set the input range for your purpose. Set low limit input value [L-rG] and high limit input value [H-rG] to limit the input range.

•Set conditions:

Low limit input value [L-rG] +20%F.S. < High limit input value [H-rG]

■ Parameter initialization

To initialize all parameter as factory default, supply the power to the product with pressing the MODE and H keys at the same time and it enters initialization parameter.



■ Input and transmission output extension [Program mode: E-HI]

This function is to extend analog input and 4 to 20mA transmission output to 5% or 10% range.

Mode	Operation
OP	Outputs 4 to 20mA within analog input range.
$5P$	Outputs 3.2 to 20.8mA for 5% out of the analog input range.
$10P$	Outputs 2.4 to 21.6mA for 10% out of the analog input range.

※This parameter is displayed only for transmission output (4-20mA) model. But it is not displayed when selecting temperature sensor input.

■ Input correction [Program mode: I-n-b]

This function is to correct the error occurring from a thermocouple, a RTD or analog input out of allowable error range of this unit.

This is also available to correct error when a sensor cannot contact the subject position by calculating the error temperature.

Variable temperature sensors have accuracy level. Because high accuracy type is expensive, standard thermocouples are generally used.

In this case, temperature sensor may occur error. By executing this function, you can get more accurate temperature.

When executing input correction function, you should measure the error from a sensor accurately. If the measured error is not correct, error may be greater.

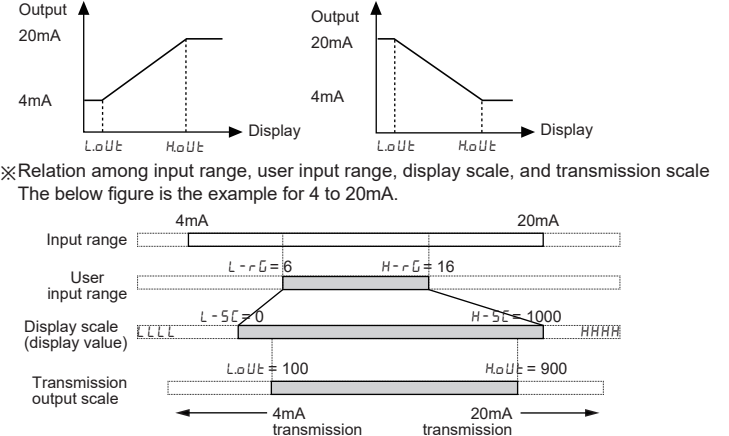
(If $I-n-b = tUF$, $I-n-b$ as atmospheric pressure input value not as input correction function. Refer to '■ Two unit function'.)

E.g.)When measured temperature is 4°C and actual temperature is 0°C. Set $I-n-b$ as -4, and display value is 0°C.

■ Transmission output scale [Program mode: L-oUt, H-oUt]

For 4-20mA current output, this function is to set the display value for 4mA [L-oUt] and the display value for 20mA [H-oUt].

The interval between L-oUt and H-oUt is 10% F.S. If it is below 10%, it is fixed as 10% of SV.



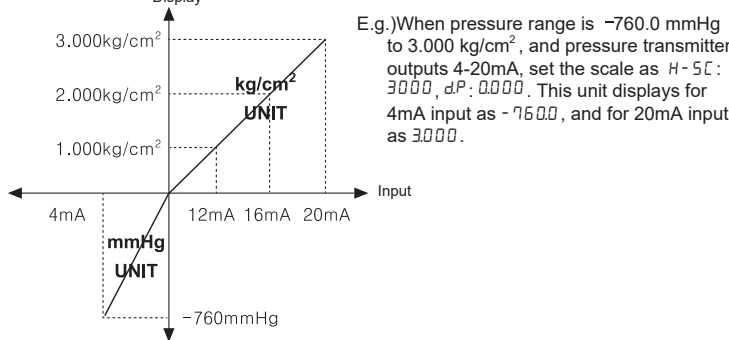
■ Two unit function [Program mode: tUF]

When connecting a pressure sensor, compound pressure which is below atmospheric pressure (0) is for vacuum as mmHg and which is atmospheric pressure or over it is for positive pressure as kg/cm².

Atmospheric pressure is 0 kg/cm². When this unit does not display 0 kg/cm², you can correct zero-point adjustment function.

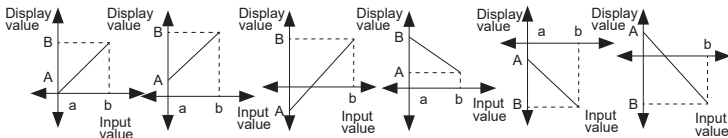
When using two unit function, L-5C is fixed as -760.

L-5C parameter is displayed but you cannot set this. You can set H-5C within 0 to 19999 range.



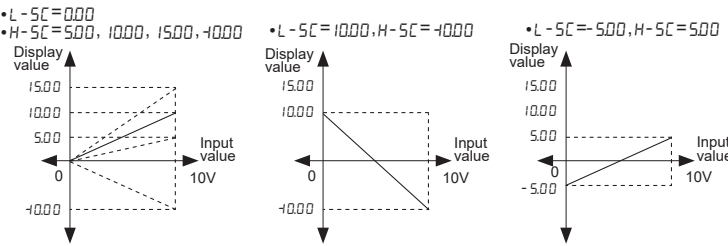
■ Display scale [Program mode: L-5C, H-5C]

For analog input, this function is to set (-19999 to 19999) for particular high/low limit value in order to display high/low limit value of measurement input. If measurement inputs are 'a' and 'b' and particular values are 'A' and 'B', it will display a=A, b=B as below graphs.



Display scale function is able to change display value for max./min. measured input by setting high limit scale [H-5C] and low limit scale [L-5C] in program mode.

※E.g.) Set high/low scale value (input range is 0 to 10V)



※When changing input type, high/low scale is changed as factory default.

■ Input special function [Program mode: I-nSF]

When selecting analog input, this function is to display the calculated actual value by square, root ($\sqrt{}$), or two unit function (TUF) as display value.

Parameter	Functions	Graph	Applications
$I-n$	Outputs as input value		Standard characteristics. Input for linearity.
$r o o t$	Outputs the rooted ($\sqrt{}$) input value		Used for measuring flows by pressure signal.
$59AR$	Outputs the squared input value		Used for outputting differential pressure by flow signal.
tUF	Refer to '■ Two unit function'		

※Display value and mA output value for $59AR$:

$$\text{Display value} = \left(\frac{\text{Input value} - L-rG}{H-rG - L-rG} \right)^2 \times (H-5C - L-5C) + L-5C$$

※Display value and mA output value for $r o o t$:

$$\text{Display value} = \left(\sqrt{\frac{\text{Input value} - L-rG}{H-rG - L-rG}} \right) \times (H-5C - L-5C) + L-5C$$

■ Digital filter [Program mode: nARF]

Moving average digital filter is able to stably display and output the noise from input line and irregular signals as software.

• Filter set range : 01 to 16

(When setting as 01, digital filter function does not run.)

※ Display cycle is same when executing moving average digital filter.

■ Digital input [Program mode: d1-t, d1-t]

By digital input terminal [d1-t] (no. 6, 7 terminals) or digital input key [d1-t] (D.IN3: H and L for 3 sec), one of three functions executes as the below table.

Function	Operaiton
$AL-rE$	Alarm clear When alarm is ON in RUN mode, it clears alarm forcibly. (It applies only for alarm latch, alarm latch and standby sequence options.) Alarm clear operates only when the value is out of the alarm value range. After clearing alarm, alarm operates its option normally. ※For the model without alarm output (KN-20□□W), this parameter is not displayed.
$HoLd$	Display HOLD Temporarily indicated value is stopped in order to check indicated value in unstable input.
$\Xi E r o$	Zero-point adjust-ment Set preset display value as 0. This function is related with input correction [I-n-b]. When executing zero adjustment function in display value as 4, input correction value [I-n-b] is set as -4 automatically.

■ Alarm output for disconnecting input sensor [Program mode: bUr n]

When disconnecting input sensor, you can set the status of transmission output.

Parameter	SV	Transmission output(4-20mA)
$bUr n$	$o n$	20mA+5% output
	$o F F$	4mA-5% output

■ Display color [Program mode: CLor / C-AL]

This function is to change display color for occurring error, operating alarm automatically. User can check the status of this unit directly.

※ Color of monitoring mode, program mode is red.

○ RUN mode and error display color [Program mode: CLor]

Parameter	Display color	Parameter	Display color
SV	RUN	Error	$YELo$
rEd	Red	Red	$r-rG$
$Gr n$	Green	Green	$G-r r$

○ Alarm display color [Program mode: C-AL]

This parameter is displayed only for the alarm output models

(KN-22□□W, KN24□□W).

• The number of set digit is same as the number of alarm output.

[2 alarm outputs (KN-22□□W)] $C-AL$ \xrightarrow{S} rr

[4 alarm outputs (KN-24□□W)] $C-AL$ \xrightarrow{S} $rrrr$

• Set color for each alarm. It changes as $r \rightarrow G \rightarrow Y \rightarrow r$ in turn.

※E.g.) S : Press any one among the H , L , H keys.

$C-AL$ \xrightarrow{S} $Gr n$	RUN mode color is green.
$C-AL$ \xrightarrow{S} $rGrY$	AL-4 color AL-3 color AL-2 color AL-1 color
	① AL-1 is ON, display is green → yellow. ② AL-2 is ON, display is yellow → red. ③ AL-3 is ON, display is red → green. ④ AL-4 is ON, display is green → red.

• When alarm is cleared, or two alarms operate at the same time, the latest alarm's color is applied.

• When error occurs [HHHH, LLLL, bUr n, Err, Err I] during alarm, the set color of CLor is applied.

■ Lock [Program mode: LoEL]

It limits to check parameter set value and to change it.

	$o F F$	$LoEL$	$LoE2$
Program mode	●	●	○
Monitoring mode	●	●	●

●: Enable to check/set, ●: Enable to check, disable to set, ○: Disable to check

※ In $LoE2$, only $LoEL$ parameter displays in program mode.

■ Factory Default

■ Monitoring mode

Parameter	Default	Parameter	Default	Parameter	Default
AL 1	0999	AL 3	000.1	HPEL	----
AL 2	0999	AL 4	000.1	LPEL	----

■ Program mode

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
$I-n-P$	$ARAR$	$LoUt$	0000	$I-n-b$	0000	$Addr$	01
$UnLt$	$^{\circ}C$	$HoUt$	1000	$I-n-b$	0000	$bRUd$	96%
$dUnE$	$o r o$	$E-HI$	$5P$	$nARF$	04	$CoEL$	EnR
$L-rG$	0400	$AL-1$	$AL-1A$	$d1-t$	$HoLd$	$LoEL$	$o F F$
$H-rG$	2000	$AL-2$	$AL-1A$	$d1-t$	$HoLd$		
dP	00	$AL-3$	$AL-2A$	$CLor$	rEd		
$L-5C$	0000	$AL-4$	$AL-2A$	$C-AL$	$rrrr$		
$H-5C$	1000	$A-HY$	001	$bUr n$	$o n$		

■ Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- For connecting the power, use the crimp terminal (M3.5, max. 7.2 mm)
- 24 VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Keep away from high voltage lines or power lines to prevent inductive noise.
Do not use near the equipment which generates strong magnetic force or high frequency noise.
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
- This unit may be used in the following environments.
 - Indoors (in the environment condition rated in 'Specifications')
 - Altitude max. 2,000 m
 - Pollution degree 2
 - Installation category II