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

1. **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.
2. **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.
3. **Install on a device panel to use.**
   Failure to follow this instruction may result in fire or electric shock.
4. **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.
5. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in fire or electric shock.
6. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.

⚠ Caution

1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
2. **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.
3. **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.
4. **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

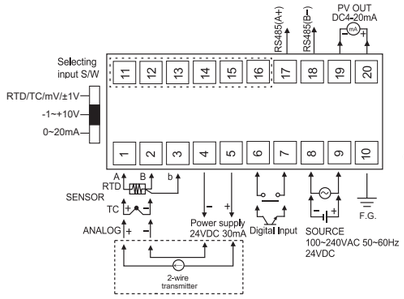
Size	W	DIN W96×H48mm
Power supply	0	100-240VAC 50 to 60Hz
	1	24VDC
Option output	0	No option
	1	Transmission output (4-20mA)※1
	4	RS485 communication output
	5	Transmission output (4-20mA) + RS485 communication output
Alarm output	0	No alarm output
	2	Alarm output: 2
	4	Alarm output: 4
Item	KN-2	1-channel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

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

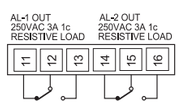
※**The above specifications are subject to change and some models may be discontinued without notice.**
※**Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).**

▣ Connections

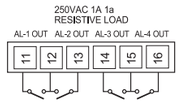
● **KN-20□□W**



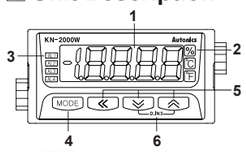
● **KN-22□□W**



● **KN-24□□W**



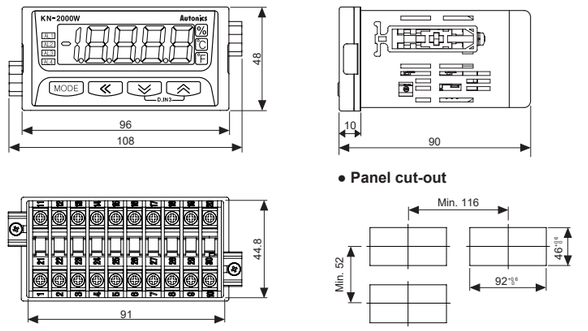
▣ Unit Description



1. **Display part(red)**
   ● Run mode: Displays current measurement value.
   ● Parameter set mode: Displays parameter and SV.
2. **Unit indicator:** Displays the set unit.
3. **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 he and keys for 3 sec at the same time, it operates the set function (alarm clear, display hold, zero-point adjustment) at [ ] at program mode.

▣ Dimensions

(unit: mm)



● **Panel cut-out**

▣ Input Type and Range

Input type			Parameter	Input range(℃)	Input range(℉)
Thermo-couple	K(CA)			-200.0 to 1350.0	-328 to 2462
	J(IC)			-200.0 to 800.0	-328.0 to 1472.0
	E(CR)			-200.0 to 800.0	-328.0 to 1472.0
	T(CC)			-200.0 to 400.0	-328.0 to 752.0
	R(PR)			0.0 to 1750.0	32 to 3182
	B(PR)*			400.0 to 1800.0	752 to 3272
	S(PR)*			0.0 to 1750.0	32 to 3182
	N(NN)*			-200.0 to 1300.0	-328 to 2372
	C(W5)*			0 to 2300	32 to 4172
	L(IC)*			-200.0 to 900.0	-328.0 to 1652.0
	U(CC)*			-200.0 to 400.0	-328.0 to 752.0
	Platinel II*			0.0 to 1390.0	32 to 2534
RTD	Cu50Ω*			-200.0 to 200.0	-328.0 to 392.0
	Cu100Ω*			-200.0 to 200.0	-328.0 to 392.0
	JPt100Ω			-200.0 to 600.0	-328.0 to 1112.0
	DPt50Ω			-200.0 to 600.0	-328.0 to 1112.0
	DPt100Ω			-200.0 to 850.0	-328.0 to 1530.0
Analog	Current	0.00 - 20.00mA		−19999 to 19999 (display range is variable depending on decimal point position)	
		4.00 - 20.00mA			
	Voltage	-50.00 - 50.00mV			
		-200 0 - 200 0mV			
		-1 0000 - 1.0000V			
		-1.000 - 10.000V			

※Above input types which have the * mark are not displayed.
To display the above input types, supply he 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	JPt100Ω, DPt100Ω, DPt50Ω, Cu50Ω, Cu100Ω (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 ●4-point: relay contact capacity 250VAC~ 1A 1a
	Transmission 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℃) ±0 3% F.S. ±1-digit (-10 to 20℃, 30 to 50℃) In case of thermocouple and below -100℃ input, [±0.4% F.S.]±1-digit ※TC-T, TC-U is min. ±2 0℃
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℃, storage: -20 to 60℃
	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: CoMY]**
You can set to enable [EnA] or disable [di SA] or writing parameter setting by RS485 communication.
■ **Communication manual**
Refer to communication manual for RS485 communication.

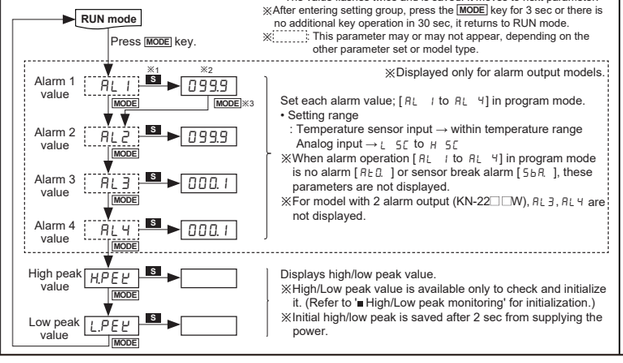
■ **Software [Integrated device management program: DAQMaster]**
Integrated device management program, DAQMaster, is able to set and monitor parameters. It is available only for RS485 communication models.

Item	Minimum requirements
System	BM PC compatible computer with Intel Pentium III or above
Operating system	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB or more
Hard disk	More than 1GB of free hard disk space
VGA	1024×768 or higher resolution display
Others	RS-232 serial port (9-pin), USB port

■ **Communication specifications**

Item	Specifications
Com. method	RS485 2-wire half duplex
Com. speed(BPS)	19200, 9600, 4800, 2400, 1200
Converter	Converter built in RS232
Max. connections	32 units
Com. distance	Max. 1200m (within 700m recommended)
Protocol	Modbus 1.1 RTU
Parity	None
Stop Bit	1-bit
Data length	8-bit

▣ Monitoring Mode



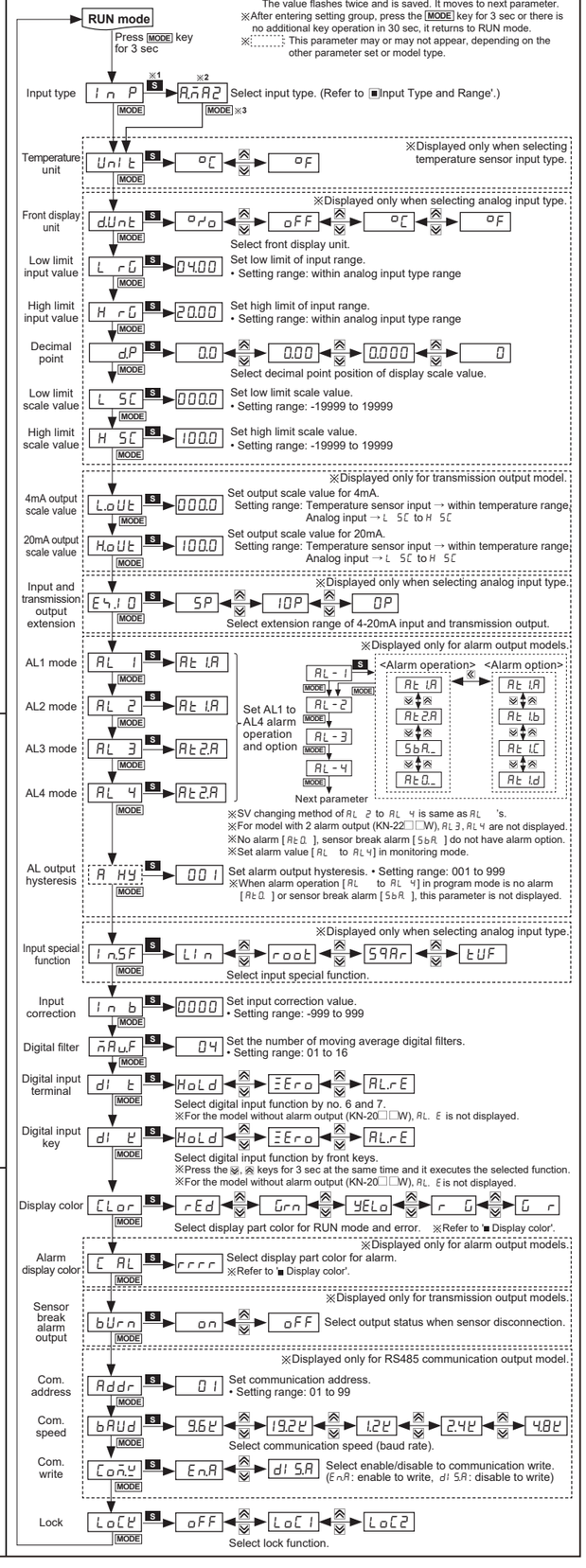
※1: S: Press any key among the ≪, ∧, ∨.
※2: ≪: Moves digits / ∨, ∧: Changes SV.
※3: Press the MODE key after checking/changing SV in each parameter. The value flashes twice and is saved. It moves to next parameter.
※After entering setting group, press the MODE key for 3 sec or there is no additional key operation in 30 sec, it returns to RUN mode.
※: This parameter may or may not appear, depending on the other parameter set or model type.

※Displayed only for alarm output models.
Set each alarm value; [AL 1 to AL 4] in program mode.
• Setting range
: Temperature sensor input → within temperature range
Analog input → L SC to H SC
※When alarm operation [AL 1 to AL 4] in program mode is no alarm [Ato] or sensor break alarm [SbA], these parameters are not displayed.
※For model with 2 alarm output (KN-22□□W), AL3, AL4 are not displayed.

Displays high/low peak value.
※High/Low peak value is available only to check and initialize it. (Refer to '■ High/Low peak monitoring' for initialization.)
※Initial high/low peak is saved after 2 sec from supplying the power.

▣ Program Mode

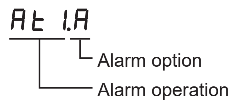
※1: S: Press any key among the ≪, ∧, ∨.
※2: ≪: Moves digits / ∨, ∧: Changes SV.
※3: Press the MODE key after checking/changing SV in each parameter. The value flashes twice and is saved. It moves to next parameter.
※After entering setting group, press the MODE key for 3 sec or there is no additional key operation in 30 sec, it returns to RUN mode.
※: This parameter may or may not appear, depending on the other parameter set or model type.



▣ 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 dI-t, dI-K as ALrE) 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
AtO_	—	—	No alarm operation
At□	High limit alarm	OFF H ON; High limit alarm value: 800℃; PV	PV ≥ alarm temperature, alarm is ON
At2□	Low limit alarm	ON H OFF; Low limit alarm value:200℃; PV	PV ≤ alarm temperature, alarm is ON
SbA_	Sensor break alarm	—	It will be ON when it detects sensor disconnection. Sensor break alarm does not have alarm option.

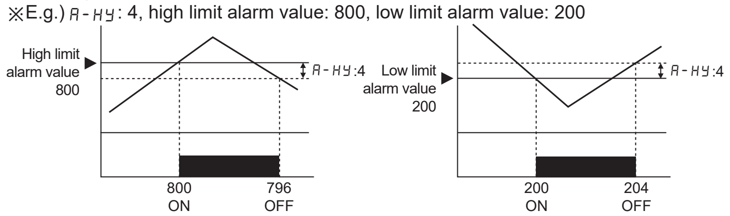
※ H: Alarm output hysteresis

◎ Alarm option

Option	Name	Descriptions
At□A	Standard alarm	If it is an alarm condition, alarm output is ON. Unless an alarm condition, alarm output is OFF.
At□b	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)
At□C	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.
At□d	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.PEK, L.PEK]

This function is to save high/low peak to check the invisible abnormal condition of system at [H.PEK] or [L.PEK] 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 ⩓, ⩔keys at the same time for 3 sec at [H.PEK] or [L.PEK].
In this case, peak value is the present input value.

■ Error

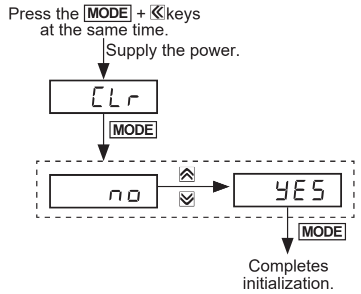
Display	Descriptions	Troubleshooting
LLLL	Flashes when measured sensor input is lower than the temperature range.	When input is moved within the temperature range, it is cleared.
HHHH	Flashes when measured sensor input is higher than the temperature range.	
bUrn	Flashes when the sensor is break or not connected.	Check temperature sensor connection.
Err	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 ⪡ keys at the same time and it enters initialization parameter.



■ Input and transmission output extension [Program mode: E4I o]

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

Mode	Operation
0P	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.

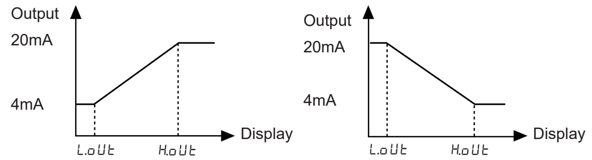
※This parameter is displayed only for transmission output (4-20mA) model. But it is not displayed when selecting temperature sensor input.

■ Input correction [Program mode: In-b]

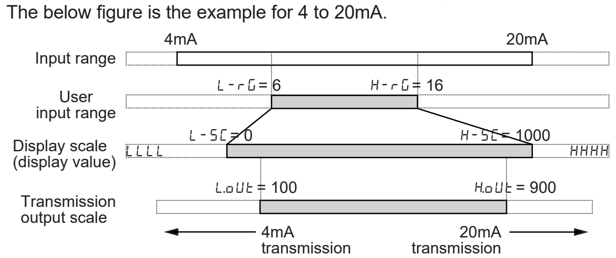
This function is to correct the error occurring from a thermocouple, a RTD or analog input out of allowable error range of this unit.
This is also available to correct error when a sensor cannot contact the subject position by calculating the temperature error.
Variable temperature sensors have accuracy level. Because high accuracy type is expansive, 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 In.SF=tUF, In-b as atmospheric pressure input value not as input correction function. Refer to '■ Two unit function'.)
E.g.)When measured temperature is 4℃ and actual temperature is 0℃. Set In-b as -4, and display value is 0℃.

■ Transmission output scale [Program mode: LoUt, HoUt]

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.

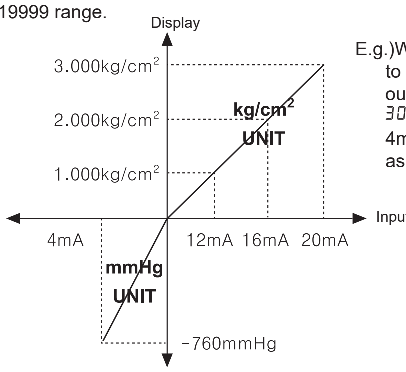


※Relation among input range, user input range, display scale, and transmission scale
The below figure is the example for 4 to 20mA.



■ Two unit function [Program mode: tUF]

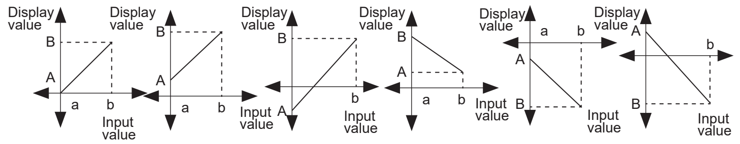
When connecting a pressure sensor, compound pressure which is below atmospheric pressure (0) is for vacuum as mmHg and which is atmospheric pressure or over it is for positive pressure as kg/cm^2.
Atmospheric pressure is 0 kg/cm^2. When this unit does not display 0 kg/cm^2, you can correct zero-point adjustment function.
When using two unit function, L-SC is fixed as -760.
L-SC parameter is displayed but you cannot set this. You can set H-SC within 0 to 19999 range.



E.g.)When pressure range is -760.0 mmHg to 3.000 kg/cm^2, and pressure transmitter outputs 4-20mA, set the scale as H-SC: 3000, dP: 0.000. This unit displays for 4mA input as -760.0, and for 20mA input as 3.000.

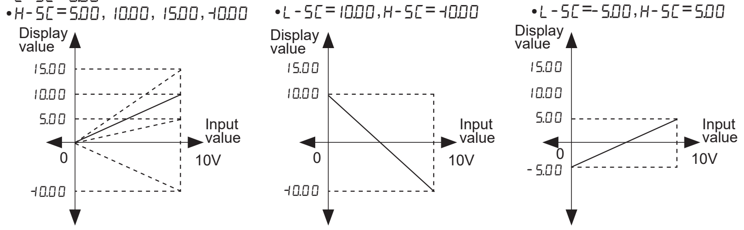
■ Display scale [Program mode: L-SC, H-SC]

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-SC] and low limit scale [L-SC] in program mode.
※E.g.) Set high/low scale value (input range is 0 to 10V)

•L-SC=0.00
•H-SC=5.00, 10.00, 15.00, 40.00
•L-SC=10.00, H-SC=-10.00
•L-SC=-5.00, H-SC=5.00



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

■ Input special function [Program mode: InSF]

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

Parameter	Functions	Graph	Applications
LIn	Outputs as input value	Y = AX + B	Standard characteristics. Input for linearity.
root	Outputs the rooted (√) input value	$Y = A(\sqrt{X}) + B$ (X ≥ 0); Y=0(X < 0)	Used for measuring flows by pressure signal.
SQAr	Outputs the squared input value	$Y = A(X)^2 + B$ (X > 0); $Y = -A(X)^2 + B$ (X < 0)	Used for outputting differential pressure by flow signal.
tUF	Refer to '■ Two unit function'		

※Display value and mA output value for SQAr:

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

※Display value and mA output value for root:

$$\text{Display value (output value)} = \sqrt{\frac{\text{Input value} - L\text{-}rG}{H\text{-}rG - L\text{-}rG}} \times (H\text{-}SC - L\text{-}SC) + L\text{-}SC$$

■ Digital filter [Program mode: ṁAuF]

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: dI-t, dI-K]

By digital input terminal [dI-t] (no. 6, 7 terminals) or digital input key [dI-K] (D.IN3: ⩔+⩓ for 3 sec), one of three functions executes as the below table.

Function		Operaiton
ALrE	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.
ZEro	Zero-point adjust-ment	Set preset display value as 0. This function is related with input correction [In-b]. When executing zero adjustment function in display value as 4, input correction value [In-b] is set as -4 automatically.

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

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

Parameter	SV	Transmission output(4-20mA)
bUrn	on	20mA+5% output
	oFF	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	Yellow	Yellow
rEd	Red	Red	r--G	Red	Green
Grn	Green	Green	G--r	Green	Red

◎ 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 → S → rr
[4 alarm outputs(KN-24□□W)] C-AL → S → rrrr
• Set color for each alarm. It changes as r → G → Y → r in turn.
※E.g.) S:Press any one among the ⪡, ⩓, ⩔ keys.

C-AL → S → Grn	RUN mode color is green.
C-AL → 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, bUrn, Err, Err1] during alarm, the set color of CLor is applied.

■ Lock [Program mode: LoCK]

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

	oFF	LoC1	LoC2
Program mode	●	◐	○
Monitoring mode	●	●	◐

●: Enable to check/set, ◐: Enable to check, disable to set, ○: Disable to check
※ In LoC2, only LoCK parameter displays in program mode.

▣ Factory Default

■ Monitoring mode

Parameter	Default	Parameter	Default	Parameter	Default
AL1	099.9	AL3	000.1	H.PEK	----
AL2	099.9	AL4	000.1	L.PEK	----

■ Program mode

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
In-P	A.ṁA2	L.oUt	000.0	In.SF	LIn	Addr	01
UnIt	°C	H.oUt	100.0	In-b	0000	bAUd	9.6K
d.Unt	°/o	E4.I0	SP	ṁAU.F	04	Coṁ.Y	En.A
L-rG	04.00	AL-1	At1.A	dI-t	HoLd	LoCK	oFF
H-rG	20.00	AL-2	At1.A	dI-K	HoLd		
d.P	0.0	AL-3	At2.A	CLor	rEd		
L-SC	000.0	AL-4	At2.A	C-AL	rrrr		
H-SC	100.0	A-HY	001	bUrn	on		

▣ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. For connecting the power, use the crimp terminal (M3.5, max. 7.2 mm)
3. 24 VDC power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
4. 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.
5. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
6. This unit may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications')
   ②Altitude max. 2,000 m
   ③Pollution degree 2
   ④Installation category II

Autonics