OMRON

Process Meter

K3NX

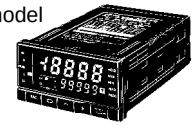
Advanced Intelligent Signal Processor Accepts Voltage/Current Input

- Programmable through the front panel or via RS-232C, RS-485, or RS-422
- Programming with easy setup and calibration
- Multi-range function allows single Process Meter to cover a wide range of inputs
- Easy-to-use scaling function with the key programming method
- Auxiliary power supply (80 mA at 12 VDC)
- NEMA4/IP66 front panel
- UL, CSA, and CE approved

Ordering Information

To order output and communication boards, refer to the separate K31 data sheet called *Output and Communication Boards*. See page 155.

■ BASE UNITS

Model	Supply voltage	Applicable output boards	Part number			
			Input type			
			DC voltage	DC current	AC voltage	AC current
Basic model  Present value LED and front-panel control keys. Can connect to any output board or, without an output board, can be used for display only.	100 to 240 VAC	K31-C1/C2/C5 K31-T1/T2 K31-B2/B4 K31-L1/L2/L3/L4/L5/L6/L7/L8/L9/L10 K31-FLK1/FLK2/FLK3/FLK4/FLK5/FLK6	**K3NX-VD1A**	**K3NX-AD1A**	**K3NX-VA1A**	**K3NX-AA1A**
	12 to 24 VDC		**K3NX-VD2A**	**K3NX-AD2A**	**K3NX-VA2A**	**K3NX-AA2A**
Set value LED model  Present value LED, set value LED, and front-panel control keys. Can connect to relay contact, transistor, or combination output boards.	100 to 240 VAC	K31-C1/C2/C5 K31-T1/T2 K31-B4 K31-L4/L5/L6/L9/L10 K31-FLK4/FLK5/FLK6	**K3NX-VD1C**	**K3NX-AD1C**	**K3NX-VA1C**	**K3NX-AA1C**
	12 to 24 VDC		**K3NX-VD2C**	**K3NX-AD2C**	**K3NX-VA2C**	**K3NX-AA2C**

Note: "Set Value LED" models must be used with an output board in order for them to operate.

■ MODEL NUMBER LEGEND

Base Units

K3NX - □ □ □ □
1 2 3 4

1, 2. Input Sensors Codes
VD: DC voltage input
AD: DC current input
VA: AC voltage input
AA: AC current input

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

4. Display
A: Basic Model
C: Set Value LED Display

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 (See Note.)		15 VA max. (max. AC load with all indicators lit) 10 W max. (max. DC load with all indicators lit)
Sensor power supply		80 mA at 12 VDC±10% (Use a power supply of less than 50 VAC or 70 VDC for input signals.)
Insulation resistance		20 MΩ min. (at 500 VDC) between external terminal and case. Insulation provided between inputs, outputs, and power supply.
Dielectric withstand voltage		2,000 VAC for 1 min between external terminal and case. Insulation provided between inputs, outputs, and power supply.
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
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 (10G) for 3 times each in X, Y, and Z directions Destruction: 294 m/s^2 (30G) for 3 times each in X, Y, and Z directions
Ambient temperature	Operating	−10 to 55°C (14 to 131°F) with no icing
	Storage	−20 to 65°C (−4 to 149°F) with no icing
Ambient humidity	Operating	23% 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, CE; conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1); conforms to VDE106/part 100 (Finger Protection) when the terminal cover is mounted.
Weight		Approx. 400 g

Note: An Intelligent Signal Processor with DC supply voltage requires approximately 1 A DC as control power supply current the moment the Intelligent Signal Processor is turned on. Do not forget to take this into consideration when using several Intelligent Signal Processors. When the Intelligent Signal Processor is not in measuring operation (e.g., the Intelligent Signal Processor has been just turned on or is operating for startup compensation time), the display will read "*00000*" and all outputs will be OFF.

■ CHARACTERISTICS

Input signal		DC voltage/current, AC voltage/current
A/D conversion method		Double integral method
Sampling period		50 Hz: 12.5 times/s; 60 Hz: 15 times/s (selectable)
Display refresh period		Sampling period (sampling times multiplied by number of averaging times if simple average processing is selected.)
Max. displayed digits		5 digits (−19999 to 99999)
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: −19999 to 99999). The decimal point position can be set freely.
HOLD function		Maximum hold (maximum data) Minimum hold (minimum data)
External controls		HOLD: Process value held RESET: Maximum/Minimum data reset ZERO: Forced zero
Comparative output hysteresis setting		Programmable with front-panel key inputs (1 to 9999).
Other functions		Variable linear output range (for models with linear outputs only) Remote/Local processing (available for communications output models only) Maximum/Minimum value data reset with front panel keys Forced-zero set with front panel keys Averaging processing function (simple or moving average) Startup compensation time (0.0 to 99.9 s) Comparative output pattern selection Security Field calibration
Output configuration		Relay contact output (5 outputs) Transistor output (NPN and PNP open collector), BCD (NPN open collector) Parallel BCD (NPN open collector) + transistor output (NPN open collector) Linear output (4 to 20 mA, 1 to 5 V) + transistor output (NPN open collector) Communication functions (RS-232C, RS-485, RS-422) Communication functions (RS-232C, RS-485, RS-422) + transistor output (NPN open collector)
Delay in comparative outputs (transistor output)		DC input: 200 ms max. AC input: 400 ms max.
Enclosure ratings	Front panel	NEMA4 for indoor use (equivalent to IP66)
	Rear case	IEC standard IP20
	Terminals	IEC standard IP00
Memory protection		Non-volatile memory (EEPROM) possible to rewrite 100,000 times

■ MEASURING RANGES

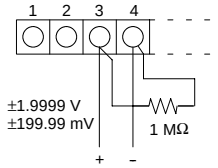
Input range		Measuring range	Input impedance	Reliability (See Note 2.)	Instantaneous overload (30 seconds)
DC voltage	A	±199.99 V	10 MΩ	±0.1%rdg ±1 digit max.	±400 V
	b	±19.999 V	1 MΩ		±200 V
	C	±1.9999 V	10 MΩ min.		
	d	±199.99 mV	10 MΩ min.		
	E	1.0000 to 5.0000 V	1 MΩ		
DC current	A	±199.99 mA	1 Ω	±0.1%rdg ±1 digit max.	±400 mA
	b	±199.99 mA	10 Ω		±200 mA
	C	±1.9999 mA	100 Ω		
	d	4.000 to 20.000 mA	10 Ω		
AC voltage	A	0.0 to 400.0 V	1 MΩ	±0.3%rdg ±5 digit max.	700 V
	b	0.00 to 199.99 V	1 MΩ		
	C	0.000 to 19.999 V	1 MΩ	±0.5%rdg ±10 digit max.	400 V
	d	0.0000 to 1.9999 V	10 MΩ min.		
AC current	A	0.000 to 10.000 A	(0.5 VA CT) (See Note 4.)	±0.5%rdg ±20 digit max.	20 A
	b	0.0000 to 1.9999 A	(0.5 VA CT) (See Note 4.)		
	C	0.00 to 199.99 mA	1 Ω	±0.5%rdg ±10 digit max.	2 A
	d	0.000 to 19.999 mA	10 Ω		

Note: 1. The “rdg” stands for “reading value.”

2. The accuracy is guaranteed for the input frequency range of 40 Hz to 1 kHz (except for A and b ranges of AC current input) and the ambient temperature of 23±5°C.
If the actual input in each of the following measuring ranges is 10% of the maximum value or less, the following accuracy values will apply.

Input range		Reliability
DC voltage	A, b, C, d, E	±0.15% FS
DC current	A, b, C, d	±0.1% FS
AC voltage	A	±0.25% FS
	b	±0.5% FS
	C, d	±0.15% FS
AC current	A	±0.15% FS
	b	±0.1% FS
	C, d	±1.0% FS

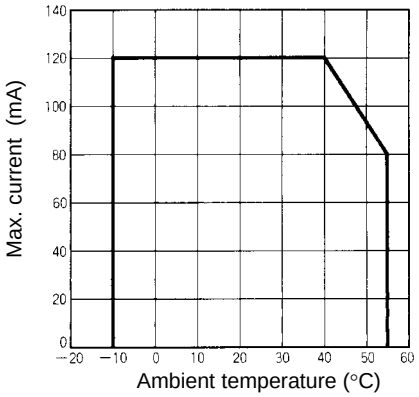
3. When using a DC voltage input model in the C and d range, do not open the input terminals. The input terminals can be opened, however, if a resistor of approximately 1 MΩ is connected to the input terminals.



4. “0.5 VA CT” indicates consumption VA of the internal CT.

Engineering Data

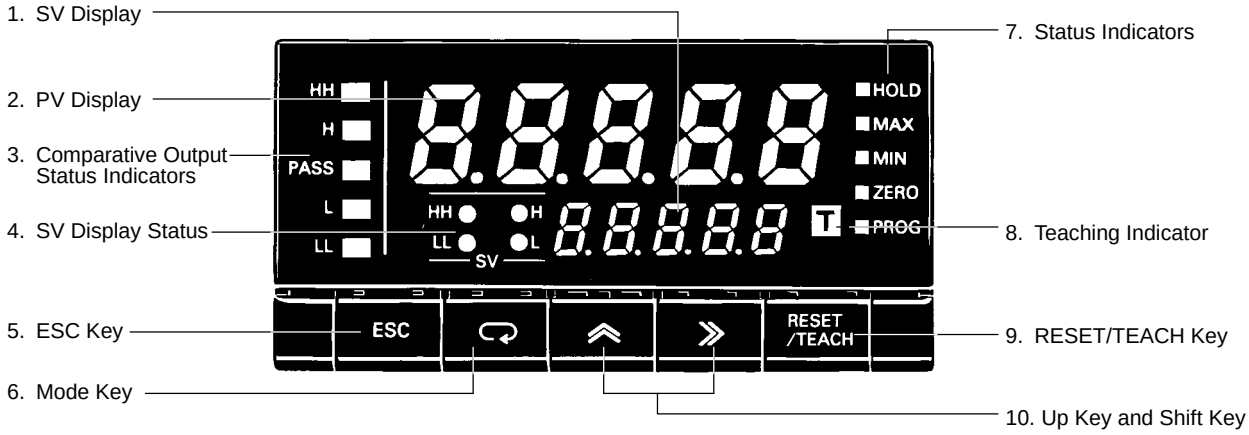
■ DERATING CURVE FOR SENSOR POWER SUPPLY



Note: The derating curve shown is for standard installation.
The derating curve depends on the mounting direction.

Nomenclature

■ K3NX



Name	Functions
1. SV display	Displays the set value or parameter. Available for Set Value LED Models only.
2. PV display	Displays the process value in addition to the max./min. value or parameter.
3. Comparative output status indicators	Displays the status of comparative output.
4. SV display status	Indicates which comparative set value is currently on the SV display.
5. ESC Key	Used to return to the RUN mode from the Setting, Protect, or Maintenance mode. The process value, maximum value, or minimum value to be displayed can be selected.
6. Mode Key	Used to enter the Setting mode. Used to allow the PV display to indicate set values sequentially. Available for Basic Models only. Used to indicate set values sequentially on the SV display. Available for Set Value LED Models only.
7. Status indicators	HOLD: Lit when HOLD input is ON. MAX: Lit when the maximum value is indicated on the PV display. MIN: Lit when the minimum value is indicated on the PV display. ZERO: Lit when the forced zero function is activated. PROG: Lit or flashes while parameters are being set.
8. Teaching indicator	Lit when the teaching function is enabled and flashes when the Intelligent Signal Processor is in teaching operation.
9. RESET/TEACH Key	The forced zero, maximum value, and minimum value are reset by pressing this key. Teaching is available when the teaching function is enabled.
10. Up Key and Shift Key	The digit being set is scrolled by pressing the Shift Key. The set value increases by one whenever the Up Key is pressed.

Operation

■ SETTING PROCEDURES

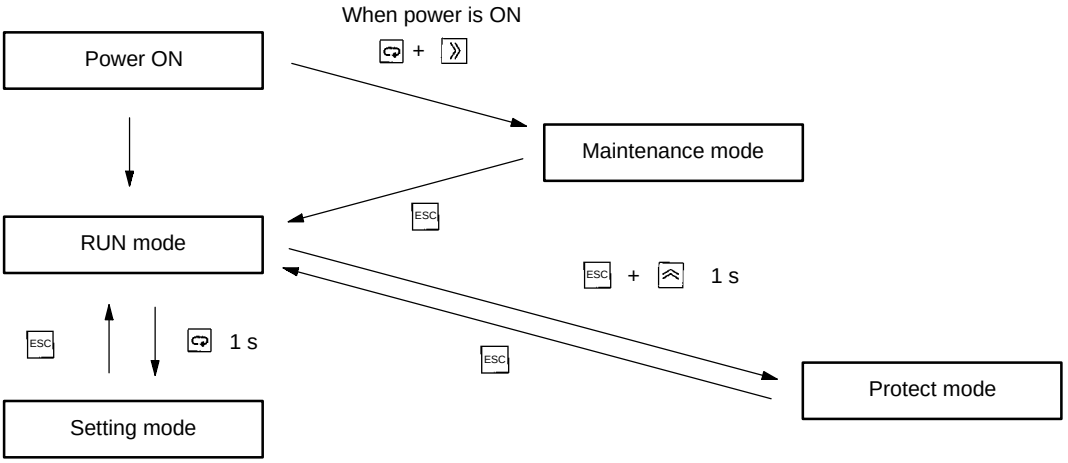
The K3NX has four modes: RUN mode for normal operations, Setting mode for initial parameter input, Protect mode for lock-out configuration, and Maintenance mode for initializing set values and user calibration. The parameters that are accessible on any individual K3NX will vary depending on the Output Board installed. Refer to the *K3NX Operation Manual* for details.

RUN Mode: Remains in this mode under normal operation.
The process value or the max./min. value can be monitored.
Using the front panel keys, the comparative set value can be changed and forced-zero reset or max./min. values reset can be performed.

Setting Mode: Used for making initial settings.
Includes four menus (Set value (SuSEt), scaling (SCALE), setup (SEtUP), option (oPt)) and the output test.

Protect Mode: Used for locking the front key operation or parameter changes.

Maintenance Mode: Used for initializing set values and user calibration of the inputs.
The user calibration is valid for selected input ranges.



SuSEt - Program set values
- Su.HH Enter set value HH
- Su. H Enter set value H
- Su. L Enter set value L
- Su.LL Enter set value LL

SCALE - Display scaling
- inP.2 Enter signal level for scaling point #2
- dSP.2 Enter display reading for scaling point #2
- inP. 1 Enter signal level for scaling point #1
- dSP. 1 Enter display reading for scaling point #1
- dEC-P Select decimal point

SEtUP - Program input range/Serial communications
- in-t Specifying input range
- FrE Select the supply frequency to eliminate inductive noise
- U-no Enter the unit no. for the host
- bPS Select the baud rate
- LEn Select the word bit length
- Sbit Select the stop bits
- PrtY Select the parity bits

oPt - Supplementary settings related to display or control
- AVG Set for averaging process value
- StiME Set startup compensation time
- HYS Enter hysteresis value
- C-oUt Select the output pattern
- LSEt.H Enter the upper limit (H) of linear output range
- LSEt.L Enter the lower limit (L) of linear output range
- r-L Select the remote/local programming

tESt - Generating simulated input for testing the output function

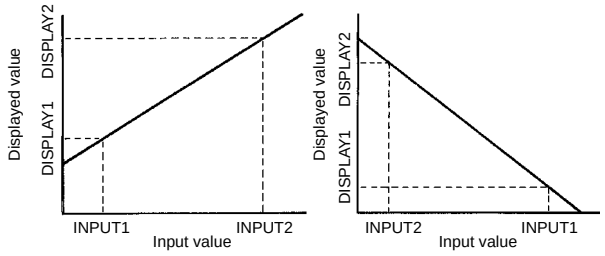
Prot - Program lock-out configuration
- ALL Enable all key protection
- SuSEt Enable set value change prohibition
- ZEro Enable prohibition of forced-zero reset using the front panel keys
- mm.rSt Enable prohibition of max./min. value reset using the front panel keys
- SEC r Specify the menus to be protected against setting in the setting mode.

■ PARAMETERS

Scaling SCAL

The Intelligent Signal Processor converts input signals into desired physical values.

INPUT2:	Any input value
DISPLAY2:	Displayed value corresponding to INPUT2
INPUT1:	Any input value
DISPLAY1:	Displayed value corresponding to INPUT1



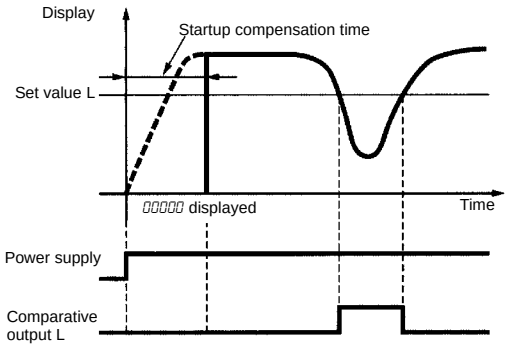
Average Processing AVG

The average processing function stabilizes displayed values by averaging the corresponding analog input signals that fluctuate dynamically or reducing the noise in the input signals.

Startup Compensation Time STCMP

The startup compensation time parameter keeps the measurement operation from sending an unnecessary output corresponding to instantaneous, fluctuating input from the moment the K3NX is turned ON until the end of the preset period.

The compensation time can be set in a range from 0 to 99.9 seconds as the waiting time until the devices subject to measurement become stable after the startup of the power supply.



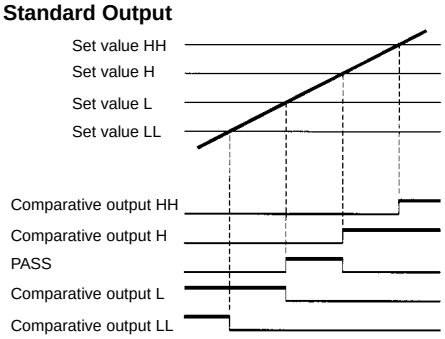
Hysteresis HYS

The hysteresis of comparative outputs can be set to prevent the chattering of comparative outputs. For more details, refer to *Output Operation Timing in Run Mode* (found later in this section).

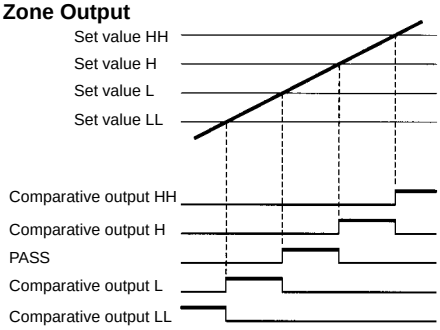
Output Pattern Selection C-OUT

The patterns of comparative output are selectable according to the level change. Select the pattern according to the application.

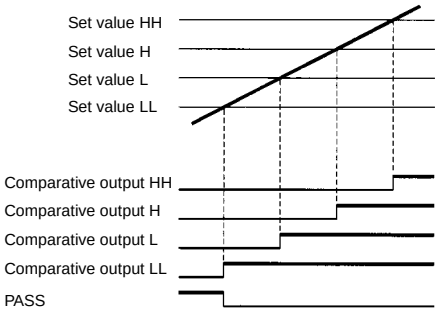
Standard Output



Zone Output



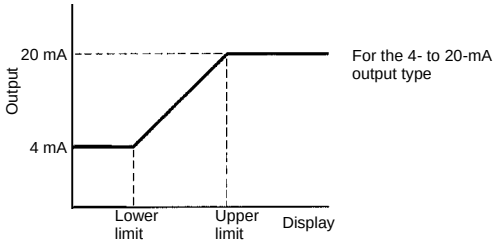
Level Output



Note: The following setting conditions must be satisfied, otherwise, no zone output will turn ON correctly.
LL < L < H < HH

Linear Output Range L SEt

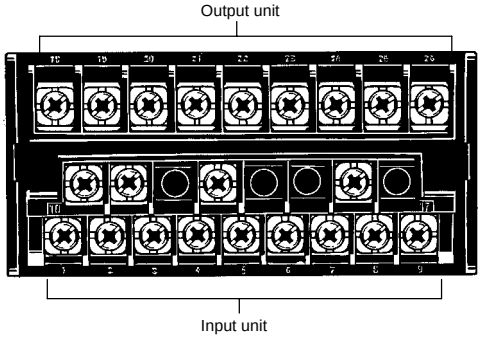
A linear output range can be set as required. A value corresponding to the maximum output value and that corresponding to the minimum output value can be set.



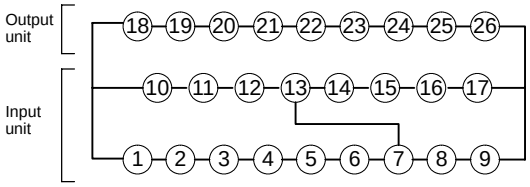
Remote/Local Selection r-L

Select remote programming when performing all settings through the host devices and select local programming when performing settings through key operation.

■ TERMINAL ARRANGEMENT

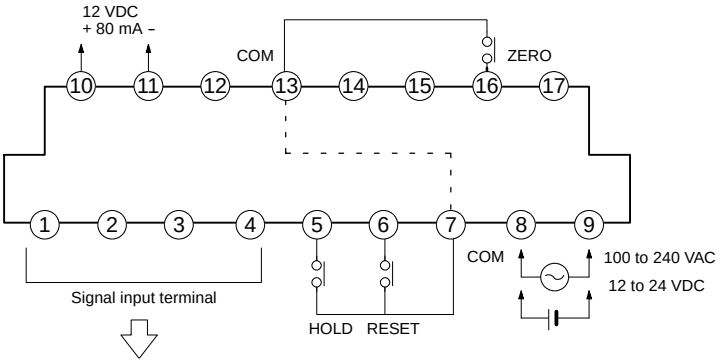


Terminal Numbers



Note: Terminals 7 to 13 are connected internally.

■ INPUT UNIT



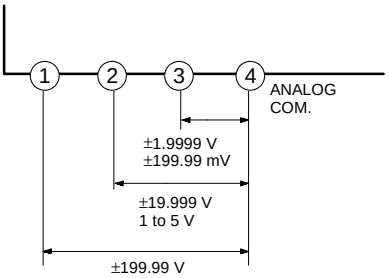
When inputting the external control signals through the open collector:

Transistor Inputs:

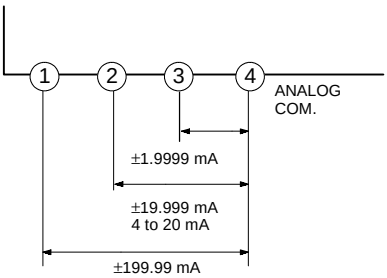
ON: Residual voltage must be 3 V max.
OFF: Leakage current must be 1.5 mA max.
The switching capacity must be 20 mA or greater.

When the external signal input is short-circuited, a voltage of approximately 5 V will be applied to between the terminals 5 to 7 and the COM terminal, and a current of approximately 18 mA (nominal value) will flow.

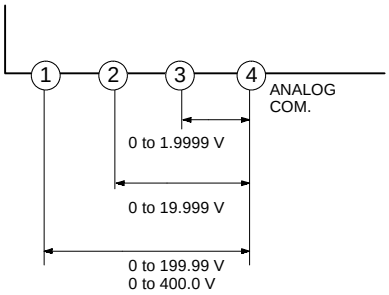
VD: DC Voltage Input



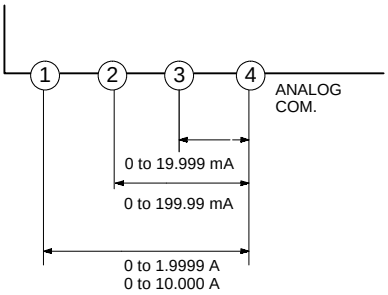
AD: DC Current Input



VA: AC Voltage Input

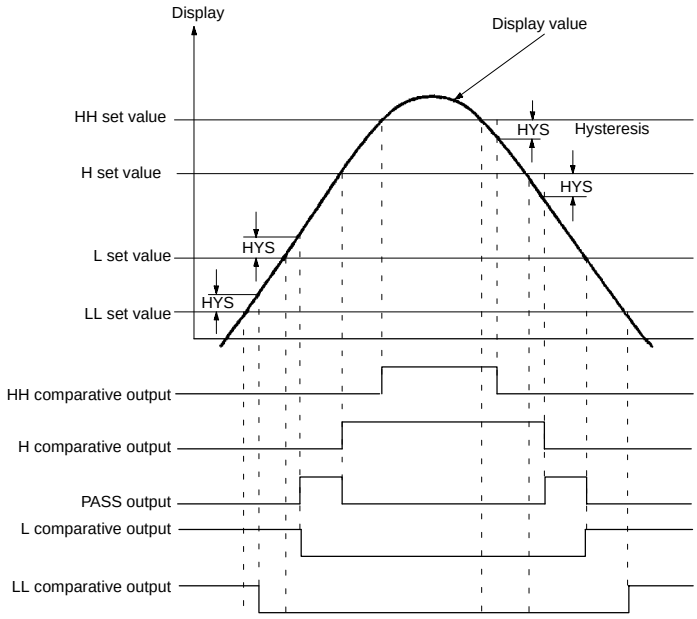


AA: AC Current Input



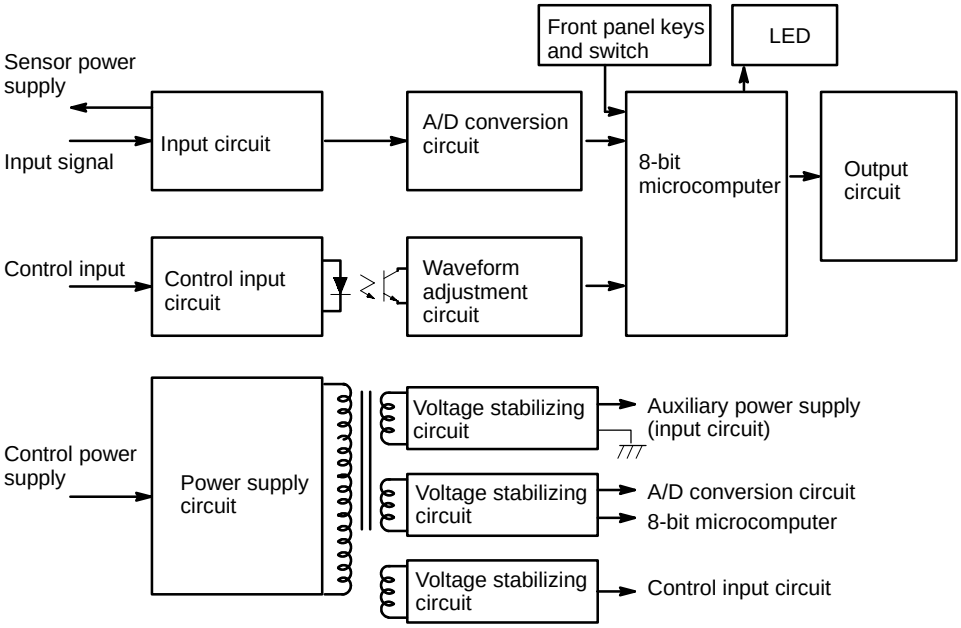
■ OUTPUT OPERATION TIMING IN RUN MODE (RELAY OR TRANSISTOR OUTPUTS)

The following timing chart is for a 5-comparative output board when the standard output pattern is selected.



Note: The hysteresis value set in setting mode will be applied to all set values.

■ BLOCK DIAGRAM

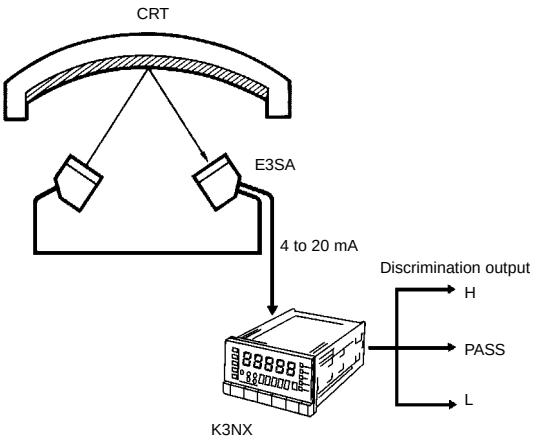


Application Examples

■ DETECTION OF ALUMINUM DEPOSITION

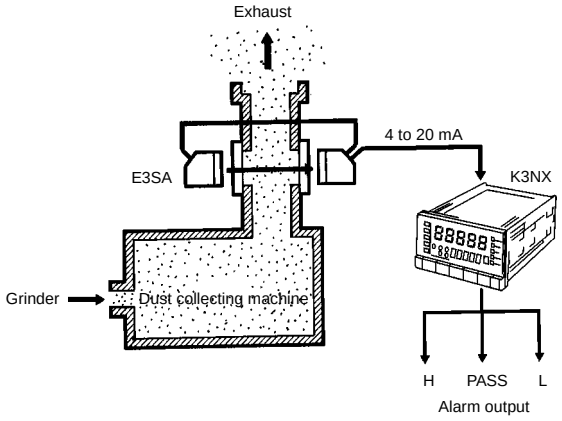
Detects via the E3SA the change in reflected light according to the amount of aluminum deposition on the CRT.

The input is processed and displayed in percentage by the scaling function.



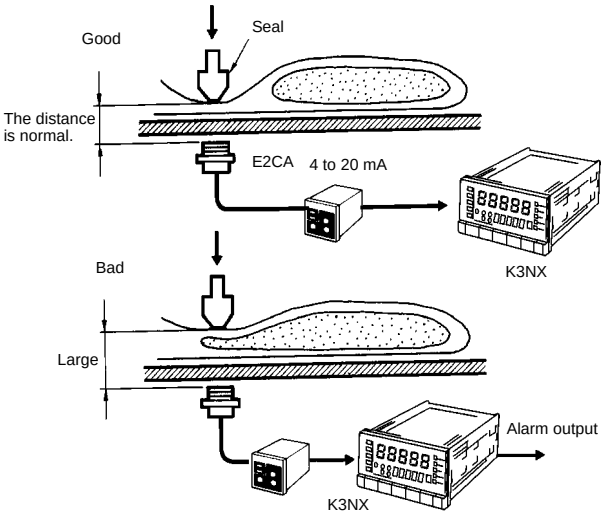
■ DETECTION OF DUST EXHAUST

The change in the density of the dust is detected via the E3SA and discriminated by the K3NX.



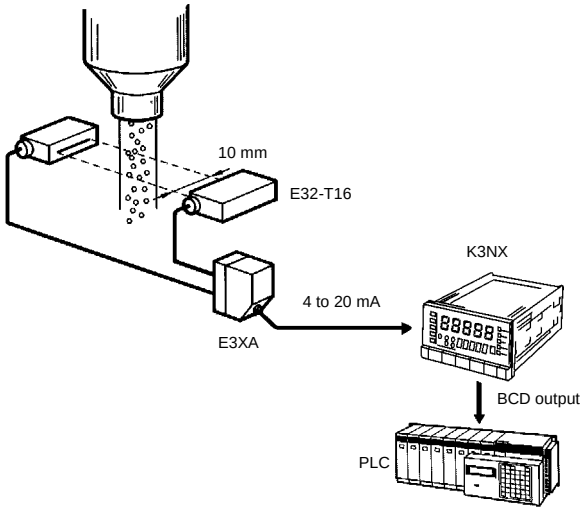
■ DETECTION OF IMPROPER PACKING

Detects the difference between a good and bad seal.



■ DETECTION OF DISCHARGED POWDER

The output of the analog photoelectric sensor is processed and displayed after scaling. Monitoring the powder level is possible with the BCD data sent to the PLC

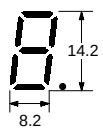


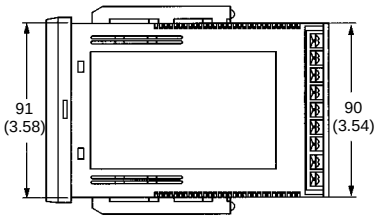
Dimensions

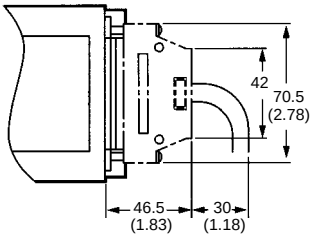
Unit: mm (inch)

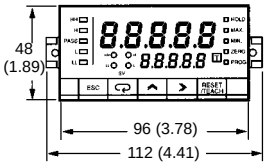
■ K3NX

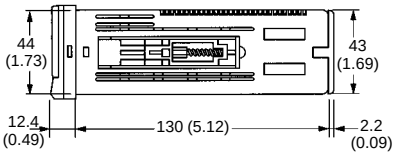
PV Display



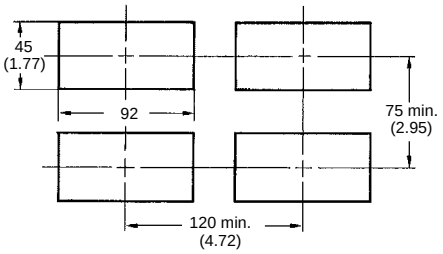






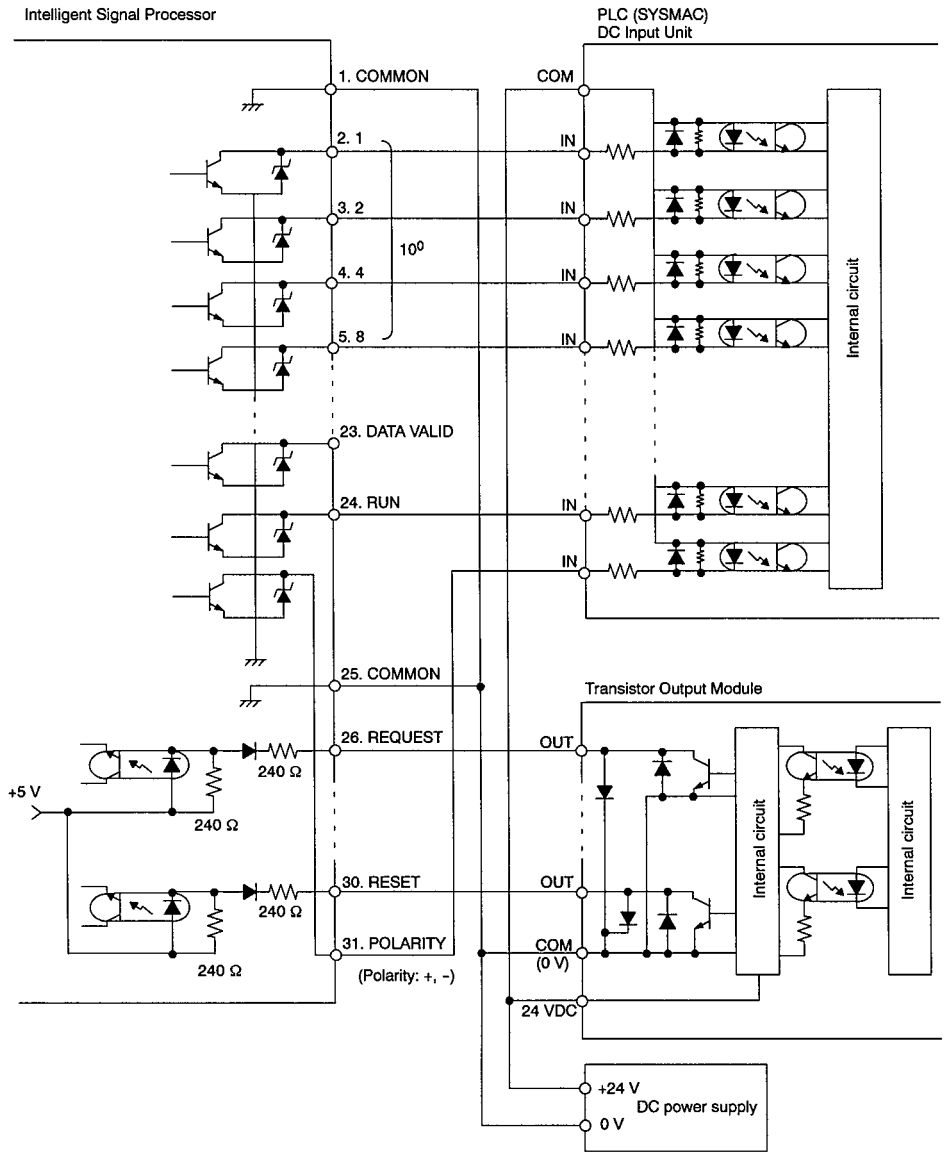


Panel Cutouts



Installation

■ EXAMPLE OF CONNECTION TO PROGRAMMABLE CONTROLLER FOR K3N□ SERIES



NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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