

1/32 DIN Digital Panel Meter K3GN

Compact and Intelligent Digital Panel Meter

- A single Panel Meter covering a wide range of applications.
 - 3 main applicable functions:
 - Process meter (DC voltage/current input).
 - RPM processor/tachometer (frequency input).
 - Digital data display for PC/PLC (RS-485 communications).
- Easy configuration
 - Multi-range analog input: applicable for all standard analog signals.
 - 6 input ranges available: 4 to 20 mA/0 to 20 mA, 1 to 5 VDC/0 to 5 VDC, ± 5 VDC, ± 10 VDC.
 - 5 KHz max. input-pulse frequency range.
 - Scaling in a wide range of engineering units.
 - Programmable output operation action, decimal point position setting, teaching function for input range, leading zero suppression, average processing.
- Advanced and compact design
 - Very compact 1/32 DIN housing: 48 (W) x 24 (H) x 83 (D).
 - 5-digit display with programmable display color in red or green.
 - Good visibility: High contrast backlit LCD display.
 - High protection against water and dust: NEMA4X/IP66 front panel.
- Selectable outputs: 2 relay outputs, 3 transistor outputs, RS-485, and combinations of these.
- High accuracy: $\pm 0.1\%$ full scale.
- Easy to configure through the front panel or via RS-485.
- EN/IEC conformity with CE marking and UL/CSA approval.



Model Number Structure

■ Model Number Legend

K3GN - - 24 VDC
 1 2 3

1. Input Type

ND: DC voltage/current, NPN

PD: DC voltage/current, PNP

2. Output Type

C: 2 relay contact outputs (SPST-NO)

T1: 3 transistor outputs (NPN open collector)

T2: 3 transistor outputs (PNP open collector)

3. Communications Output Type

None: Communications not supported

FLK: RS-485

Ordering Information

List of Models

Input type	Supply voltage	Output	Communications	
			No communications	RS-485
DC voltage/current, NPN	24 VDC	Dual relays (SPST-NO)	K3GN-NDC 24 VDC	K3GN-NDC-FLK 24 VDC
		Three NPN open collector	K3GN-NDT1 24 VDC	K3GN-NDT1-FLK 24 VDC
DC voltage/current, PNP		Dual relays (SPST-NO)	K3GN-PDC 24 VDC	K3GN-PDC-FLK 24 VDC
		Three PNP open collector	K3GN-PDT2 24 VDC	K3GN-PDT2-FLK 24 VDC

Specifications

Ratings

Supply voltage	24 VDC
Operating voltage range	85% to 110% of the rated supply voltage
Power consumption (see note)	2.5 W max. (at max. DC load with all indicators lit)
Insulation resistance	20 MΩ min. (at 500 VDC) between external terminal and case. Insulation provided between inputs, outputs, and power supply.
Dielectric strength	1,000 VAC for 1 min between external terminal and case. Insulation provided between inputs, outputs, and power supply.
Noise immunity	±480 V on power supply terminals in normal mode, ±1,500 V in common mode, ±1 μs, or 100 ns for square-wave noise with 1 ns
Vibration resistance	Malfunction: 10 to 55 Hz, 10 min each in X, Y, and Z directions; acceleration: 9.8 m/s ² Destruction: 10 to 55 Hz, 30 min each in X, Y, and Z directions; acceleration: 19.6 m/s ²
Shock resistance	Malfunction: Models with transistor outputs: 196 m/s ² for 3 times each in X, Y, and Z directions Models with relay contact outputs: 98 m/s ² for 3 times each in X, Y, and Z directions Destruction: 294 m/s ² for 3 times each in X, Y, and Z directions
Ambient temperature	Operating: -10°C to 55°C (with no condensation or icing) Storage: -25°C to 65°C (with no condensation or icing)
Ambient humidity	Operating: 25% to 85% (with no condensation)
EMC	(EMI) EN61326+A1 Industry Emission Enclosure: CISPR 11 Group 1 class A: CISRP16-1/-2 Emission AC Mains: CISPR 11 Group 1 class A: CISRP16-1/-2 (EMS) EN61326+A1 Industry Immunity ESD: EN61000-4-2: 4 kV contact discharge (level 2) 8 kV air discharge (level 3) Immunity RF-interference: EN61000-4-3: 10 V/m (amplitude-modulated, 80 MHz to 1 GHz) (level 3) Immunity Fast Transient Noise: EN61000-4-4: 2 kV (power line) (level 3) Immunity Burst Noise: 1 kV line to line (I/O signal line) Immunity Surge: EN61000-4-5: 1 kV line to line 2 kV line to ground (power line) Immunity Conducted Disturbance EN61000-4-6: 3 V (0.15 to 80 MHz) (level 2) Immunity Voltage Dip/Interrupting EN61000-4-11: 0.5 cycles, 0, 180°, 100% (rated voltage)
Approved standards	UL508, CSA22.2; Conforms to EN61326+A1, EN61010-1 (IEC61010-1) Conforms to VDE0106/P100 (finger protection) when the terminal cover is mounted.
Weight	Approx. 100 g

Note: A control power supply capacity greater than the rated capacity is required when the Digital Panel Meter is turned ON. Do not forget to take this into consideration when using several Digital Panel Meters. When power is supplied, all indicators will light and outputs will be OFF. When using startup compensation time operation, the display will read "00000" and all outputs will be OFF.

■ Characteristics

Input signal	Process voltage (1 to 5 V, 0 to 5 V, ±5V, ±10 V) Process current (4 to 20 mA, 0 to 20 mA)	No-voltage contact (30 Hz max. with ON/OFF pulse width of 16 ms min.) Open collector (5 kHz max. with ON/OFF pulse width of 90 μs min.)	Digital data display (by RS-485 communication)
A/D conversion	Double integral method 14 bit resolution	---	
Sampling period	250 ms	---	
Display refresh period	Sampling period (sampling times multiplied by number of averaging times if average processing is selected.)		
Pulse measurement method	---	Periodic measurement	---
Connectable Sensors	---	ON residual voltage: 2.5 V max. OFF leakage current: 0.1 mA max. Load current: Must have a switching capacity of 15 mA min. Must be able to reliably switch load currents of 5 mA max.	
Max. displayed digits	5 digits (–19999 to 99999)		
Display	7-segment digital display, character height: 7.0 mm		
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 as desired.		
External controls (see note 1)	HOLD: (Measurement value held) ZERO: (Forced-zero)	---	
Hysteresis setting	Programmable with front-panel key inputs (0001 to 9999).		
Other functions	Programmable Color Display Selectable output operating action Teaching set values Average processing (simple average) Lockout configuration Communications writing control (communications output models only)		
	Forced-zero set with front panel keys Control inputs (HOLD/ZERO) selection via front panel keys Field calibration	Startup compensation time (0.00 to 99.9 s) Auto-zero time (0.0 to 19.9 s)	
Output	Relays: 2 SPST-NO Transistors: 3 NPN open collector 3 PNP open collector		
	Combinations: Communications output (RS-485) + relay outputs (2 SPST-NO); Communications output (RS-485) + transistor outputs (3 NPN open collector); Communications output (RS-485) + transistor outputs (3 PNP open collector)		
Communications	Communications function: RS-485		
Delay in comparative outputs (transistor outputs)	750 ms max.		
Degree of protection	Front panel: NEMA4X for indoor use (equivalent to IP66) Rear case: IEC standard IP20 Terminals: IEC standard IP20		
Memory protection	Non-volatile memory (EEPROM) (possible to rewrite 100,000 times)		

Note 1. The minimum input time for control signals is 80 ms.

2. Refer to *N102 Operation Manual* for more details.

■ Measuring Ranges

Process Voltage/Current Inputs

Input	Measuring range	Measuring accuracy	Input impedance	Displayable range
DC voltage	1.000 to 5.000 V/ 0.000 to 5.000 V	$\pm 0.1\%$ FS ± 1 digit max. (at $23\pm 3^{\circ}\text{C}$)	1 M Ω min.	–19999 to 99999 (with scaling function)
	–5.000 to 5.000 V	$\pm 0.1\%$ FS ± 1 digit max. (at $23\pm 5^{\circ}\text{C}$)		
	–10.00 to 10.00 V	$\pm 0.1\%$ FS ± 1 digit max. (at $23\pm 5^{\circ}\text{C}$)		
DC current	4.00 to 20.00 mA/ 0.00 to 20.00 mA	$\pm 0.1\%$ FS ± 1 digit max. (at $23\pm 3^{\circ}\text{C}$)	60 Ω	

No-voltage Contact/Open Collector Inputs

Input	Measuring range	Measuring accuracy (at $23\pm 5^{\circ}\text{C}$)	Displayable range
No-voltage contact (30 Hz max.) with ON/ OFF pulse width of 16 ms min.	0.05 to 30.00 HZ	$\pm 0.1\%$ FS ± 1 digit max.	–19999 to 99999 (with scaling function)
Open collector (5 kHz max.) with ON/OFF pulse width of 90 μs min.	0 to 5000 HZ		

Digital Data Display (By RS-485 Communications)

Displayable range	–19999 to 99999
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■ Input/Output Ratings

Relay Contact Output

(Incorporating G6K Relays)

Item	Resistive load ($\cos\phi = 1$)
Rated load	1 A at 30 VDC
Rated carry current	1 A max. (at COM terminal)
Max. contact voltage	60 VDC
Max. contact current	1 A (at COM terminal)
Max. switching capacity	30 VA
Min. permissible load (P level, reference value)	10 mV, 10 μA
Mechanical life	50,000,000 times min. (at a switching frequency of 36,000 times/hr)
Electrical life (at an ambient temperature of 23°C)	100,000 times min. (at the rated load with a switching frequency of 1,800 times/hr)

Transistor Output

Rated load voltage	24 VDC
Max. load current	50 mA
Leakage current	100 μA max.

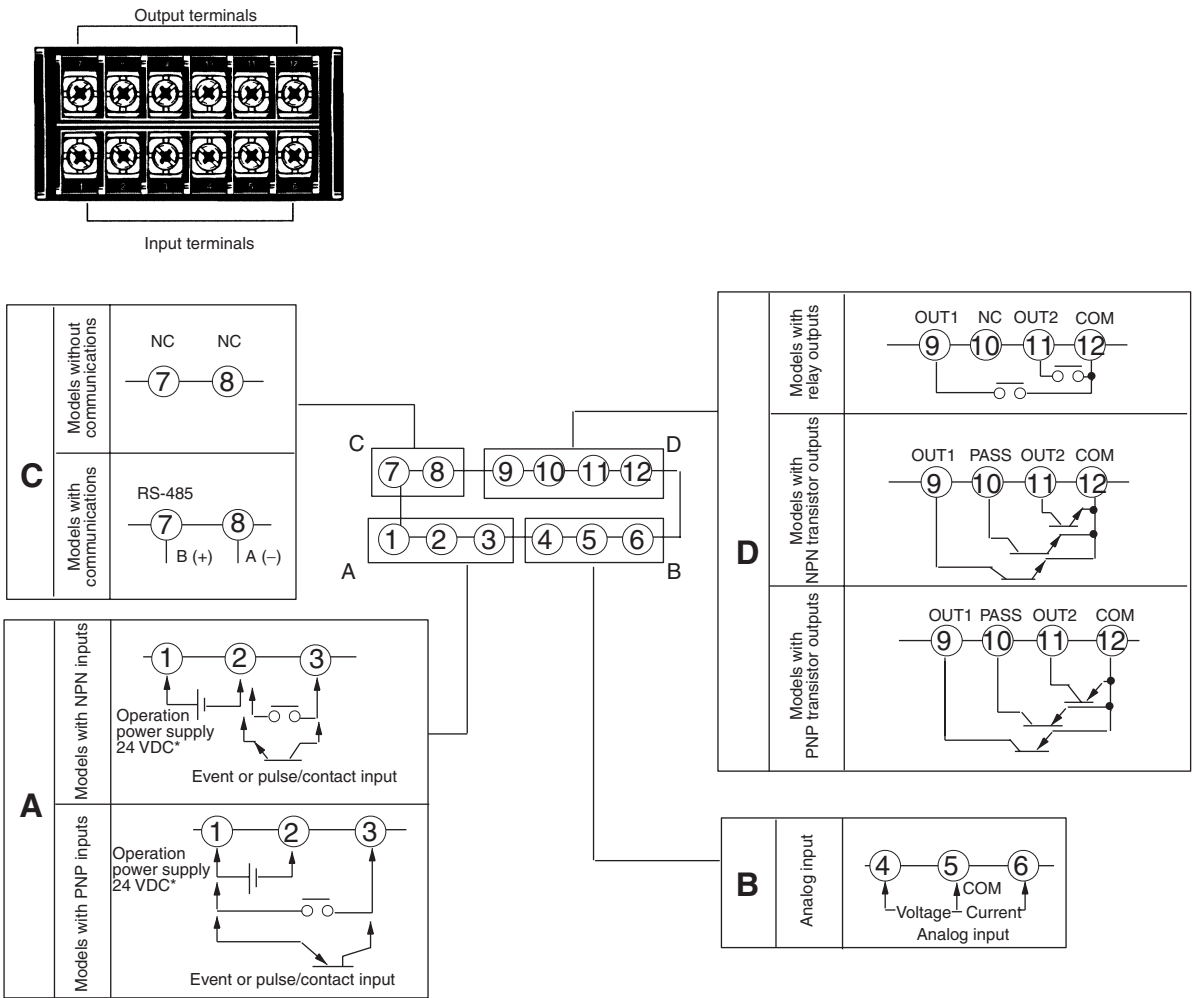
■ Communications Specifications

Item	RS-485
Transmission method	2-wire, half-duplex
Synchronization method	Start-stop synchronization
Baud rate	1,200/2,400/4,800/9,600/19,200 bps
Transmission code	ASCII
Communications	Reading/Writing to the K3GN
	Read/write set values, read/write scaling values, enable/disable the writing of data through communications, forced-zero control, and other data.

Refer to N102 Operation Manual for more details.

Connections

■ Terminal Arrangement

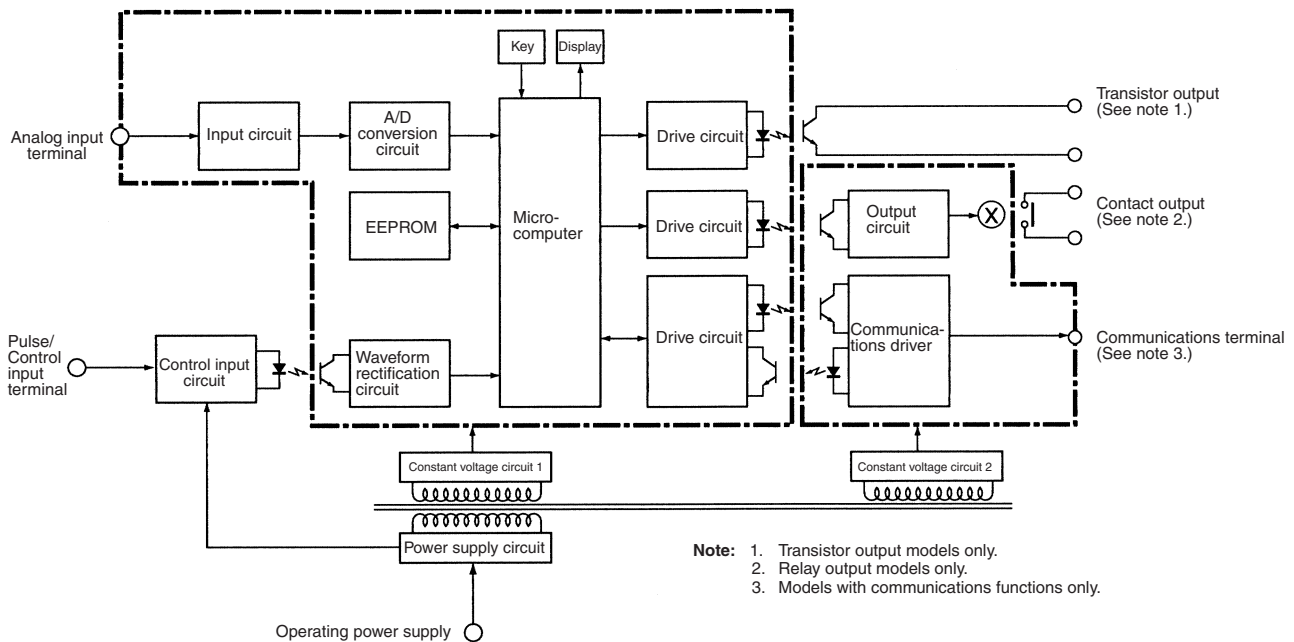


Note: *Operation power supply 24VDC: Recommended DC power supply: eg. OMRON s8VS

Terminal No.	Name	Description
①-②	Operation power	Connect the operation power supply.
③-②	Event input or pulse/contact input	Operates as follows depending on parameter setting: • Holds process value. • Calibrate the process value to zero and clear the forced-zero function. • Pulse or contact input.
③-①		
④,⑥-⑤	Analog input	Connect the voltage or current analog input.
⑦-⑧	Communications	RS-485 communications terminals.
⑨,⑪-⑫	Outputs	Outputs relay or transistor outputs. There is also a PASS output for models with transistor outputs.
⑨,⑩,⑪-⑫		

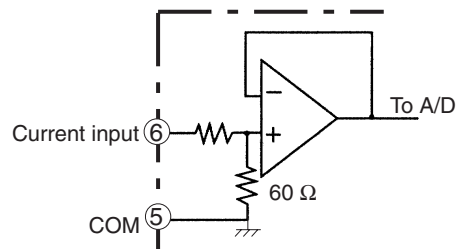
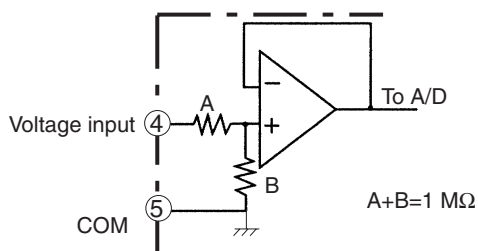
■ Wiring

Block Diagram



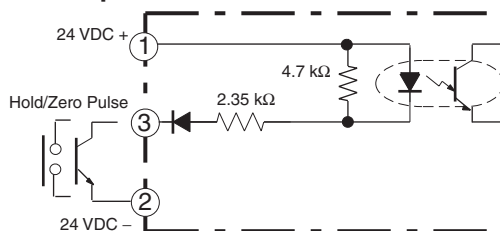
Input Circuits

Analog Input (DC Voltage/Current)

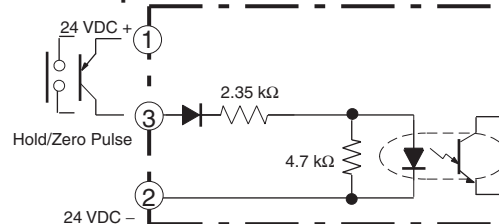


Pulse Input/Control Event Input (HOLD/ZERO)

NPN Input

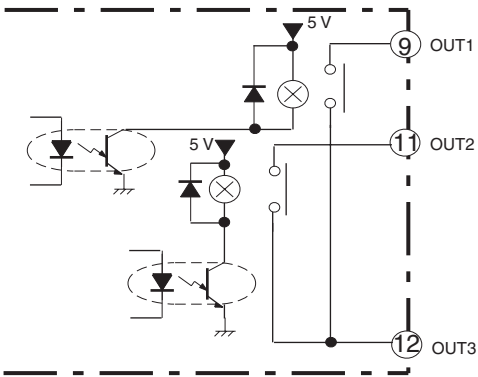


PNP Input



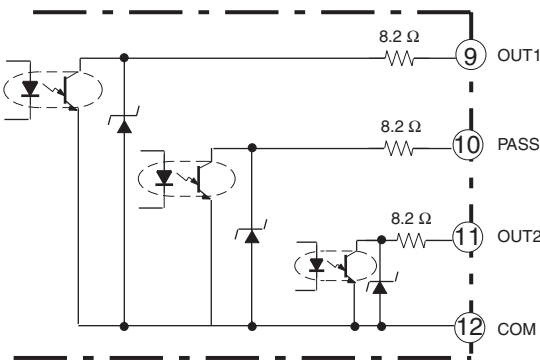
Output Circuits

Contact Output

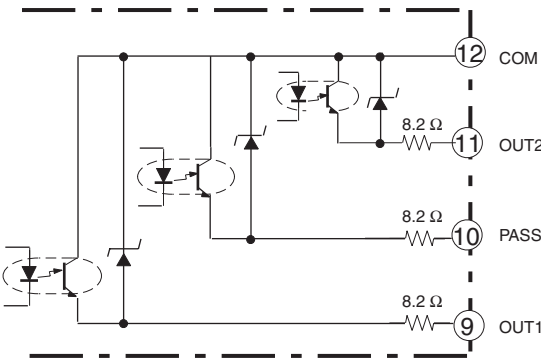


Transistor Output

NPN Output



PNP Output



Operation

■ Main Functions

Input Types and Ranges

Input type (setting parameter)	Function	Input range (setting parameters)	Setting range
Analog input (<i>ANALG</i>)	Selects DC voltage/current signal input.	4 to 20 mA/0 to 20 mA (<i>4-20</i>) 1 to 5 V/0 to 5 V (<i>1-5</i>) ± 5 V (<i>5</i>) ± 10 V (<i>10</i>)	Displayable from -19999 to 99999 with scaling function. The position of the decimal point can be set as desired.
Pulse input (<i>PULSE</i>)	Selects pulse input signal.	0.05 to 30 Hz (<i>30</i>) 0 to 5 kHz (<i>5K</i>)	
Remote (<i>RENT</i>)	Displays digital data from PLC or PC.	---	

Scaling

Analog (Process) Inputs

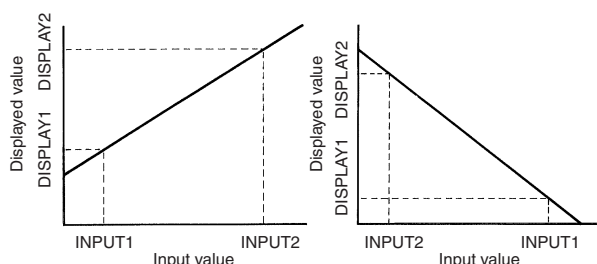
The K3GN converts input signals into desired physical values.

INPUT2: Any input value

DISPLAY2: Displayed value corresponding to INPUT2

INPUT1: Any input value

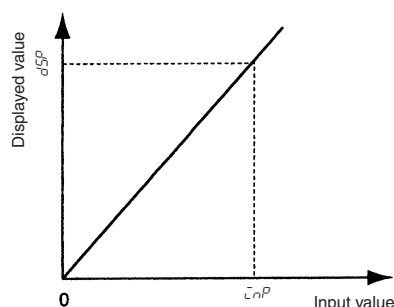
DISPLAY1: Displayed value corresponding to INPUT1



Example: When displaying the rotational speed (rpm) for a machine that generates 5 pulse signals per revolution, D is given by the following:

$$D = f \times 1/5 \times 60,$$

so if $f = 1$, then $D = 12$. Therefore, input 1 for $\bar{C}n^P$ and 12 for $d5^P$.



Pulse Frequency

The K3GN converts pulse signal inputs into desired units such as revolutions or rotational speeds.

The slope of the linear relationship between the input value and display value is calculated automatically when an input value and its corresponding display value are entered.

Input value: Any arbitrary input value

Display value: Desired display value corresponding to input value

If scaling for pulse signals is not performed, the input frequency will be displayed.

The relationship between input, f , and display, D , is expressed in the form $D = f \times a$ (multiplication factor). The value of a will vary according to the display unit. For example, if the display unit is rpm, Y is given by the following:

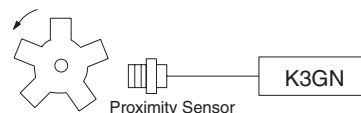
$$D = f \times 1/N \times 60 \text{ (i.e., } a = 1/N \times 60 \text{)}$$

where N is the number of pulses per revolution and f is the input pulse frequency (Hz).

If the display unit is m/min, Y is given by the following:

$$D = f \times \pi d \times 1/N \times 60 \text{ (i.e., } a = \pi d \times 1/N \times 60 \text{)}$$

where πd = the wavelength (m) per revolution.



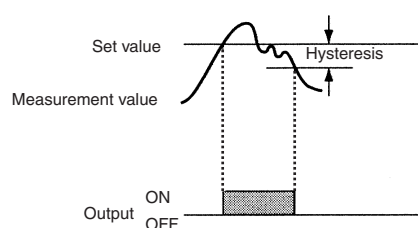
Average Processing

The average processing function stabilizes displayed values by averaging the corresponding input signals that fluctuate dynamically.

Hysteresis

The hysteresis of comparative outputs can be set to prevent the chattering of relay or transistor outputs.

Upper limit (high acting)



Startup Compensation Time (Pulse Input Only)

The startup compensation time parameter keeps the measurement operation from sending an unnecessary output corresponding to instantaneous, fluctuating input from the moment the K3GN is turned ON until the end of the preset period.

The compensation time can be set in a range from 0.0 to 99.9 seconds as the waiting time until the devices subject to measurement become stable after the startup of the power supply.

Changing the Display Color

The display can be programmed to change color when an output turns ON. In an example, the K3GN can be programmed to display Green for normal, and Red for errors. The color can be set to change from either green to red or red to green when output turns ON. K3GN can also be programmed to display only one unchanging color: Red or Green.

Teaching

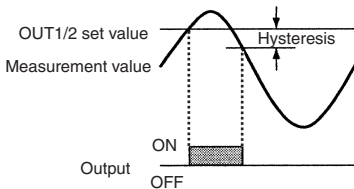
An actual measured value as a set value without any front panel key input can be set with the teaching function. Teaching is useful for making settings while checking the operation status of K3GN.

Configurable Output Operating Action

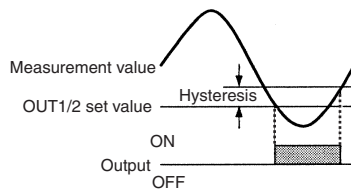
Output 1 and output 2 can be set to operate in one of the 3 following modes:

- Upper limit (High Acting):
The output is turned ON when the measured value is greater than its set value.
 - Lower limit (Low Acting):
The output is turned ON when the measured value is less than its set value.
 - Upper and lower limits (Outside band Acting):
An upper limit (H set value) and lower limit (L set value) can be set independently.
The output is turned ON when the measured value is greater than upper-limit set value or less than the lower-limit set value.
- Only transistor outputs have a PASS output which is output when both OUT1 and OUT2 are OFF.

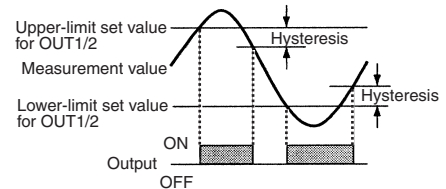
Upper Limit (High Acting)



Lower Limit (Low Acting)

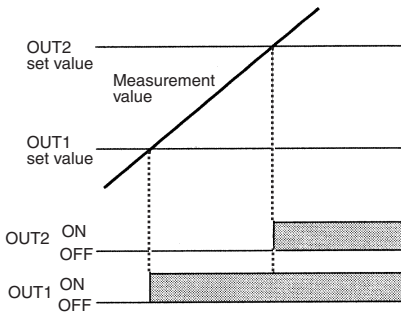


Upper and Lower Limits (Outside Band Acting)

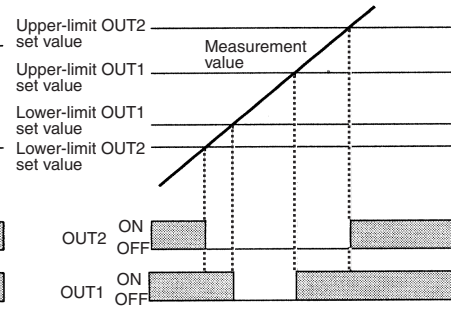


The three types of output operations shown above can be combined as desired. The following are examples of possible combinations.

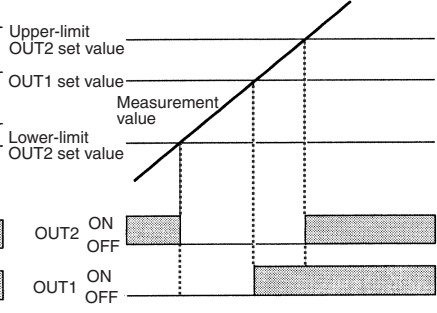
Upper Limit 2-stage Output



Threshold Output

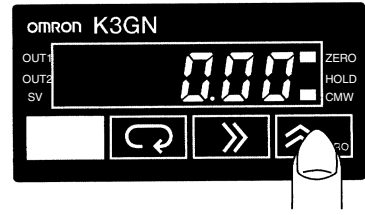


Combination of Upper Limit and Upper/Lower Limits

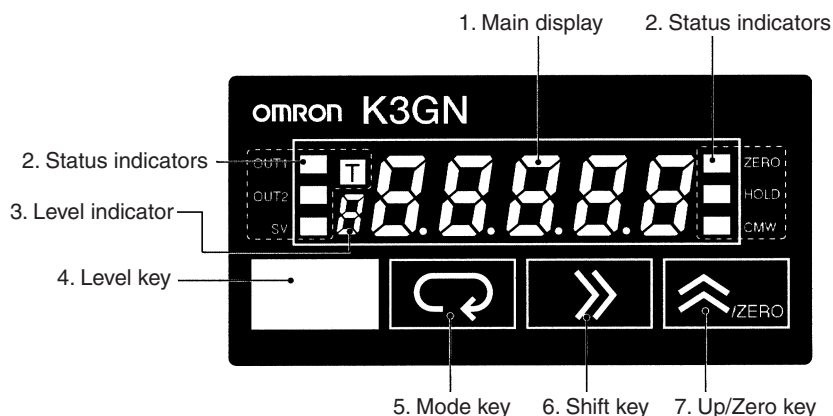


Forced-zero Function

It is possible to shift the zero point to a desired value (such as might be required when adjusting reference values) with one touch of the Up/Zero Key on the front panel.



Nomenclature

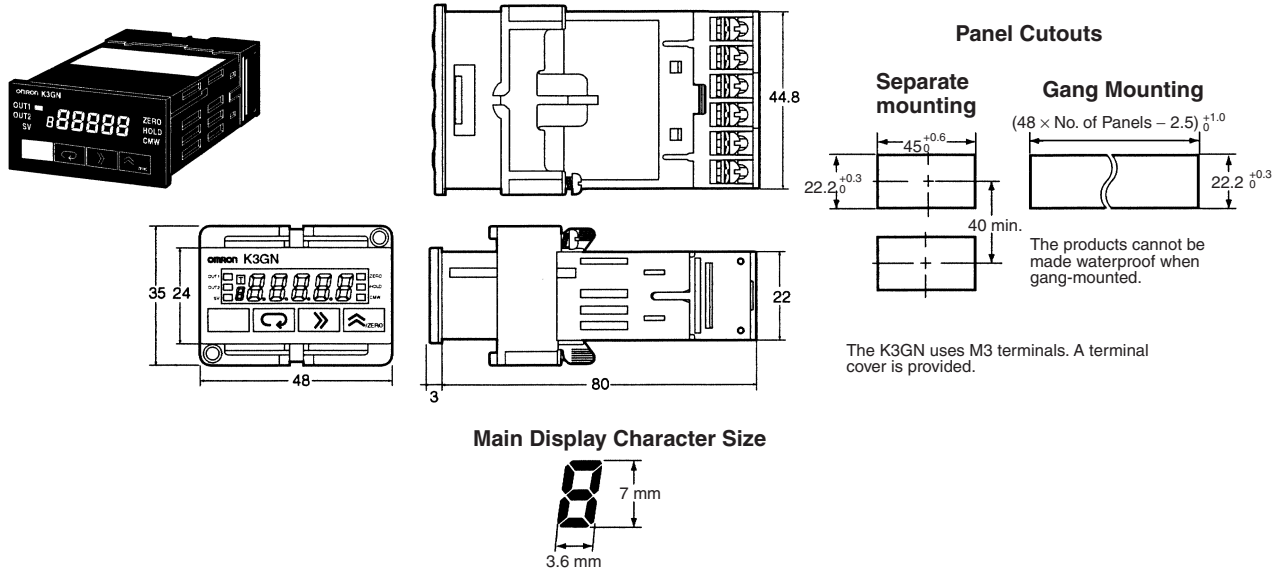


Name		Functions
1. Main display		Displays process values, parameters, and set values.
2. Status indicators	OUT1	Lit when output 1 is ON.
	OUT2	Lit when output 2 is ON.
	SV	Lit when a set value is being displayed or changed.
	T	Lit when the teaching function is enabled. Flashes when the K3GN is in teaching operation. Lit when a calibration value is being displayed during user calibration. Flashes while reading a calibration value.
	ZERO	Lit while the forced-zero function is activated.
	HOLD	Lit when HOLD input is ON.
	CMW	Lit when communications writing is "enabled" and is out when it is "disabled."
3. Level indicator		Displays the current level that the K3GN is in. (See below for details.)
4. Level Key		Used to change the level.
5. Mode Key		Used to allow the Main display to indicate parameters sequentially.
6. Shift Key		Used to enable that set value to be changed. When changing a set value, this key is used to move along the digits.
7. Up/Zero Key		Used to change a set value. Used to set or clear a forced-zero function when a measurement value is being displayed.

Level indicator	Level
<i>P</i>	Protect
Not lit	Operation
<i>A</i>	Adjustment
<i>S</i>	Initial setting
<i>C</i>	Communications setting
<i>F</i>	Advanced function setting
<i>U</i>	User calibration

Dimensions

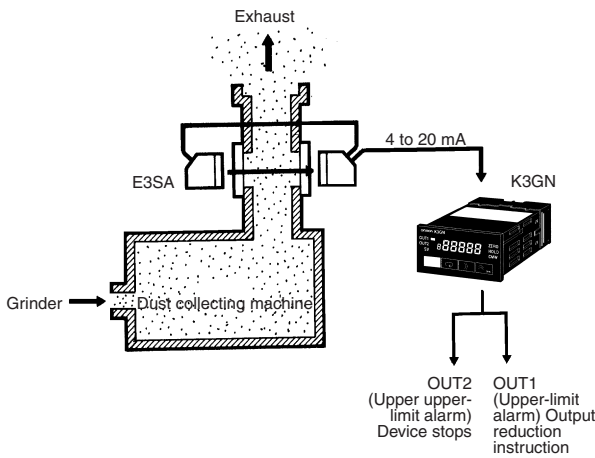
Note: All units are in millimeters unless otherwise indicated.



Application Examples

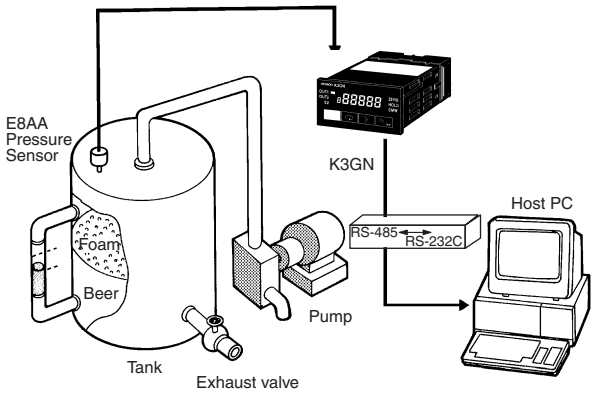
Detection of Dust Exhaust

The change in the density of the dust is detected via the E3SA and discriminated by the K3GN.



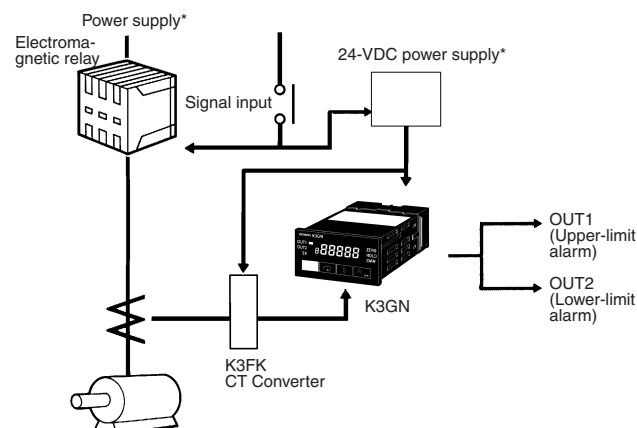
Monitoring of Tank Pressure

The output of the pressure sensor is processed and the pressure is displayed. Remote monitoring of the operation is possible with the communications function.



Monitoring of Motor Load Current

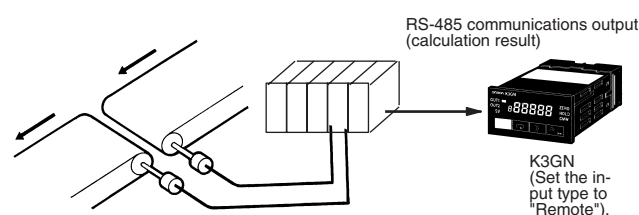
If the startup time compensation of the K3GN is enabled, the K3GN will not be influenced by the inrush current from starting the motor, and no signal will be output from the K3GN.



Note: *Power Supply: Recommended DC power supply: eg. OMRON S8VS.

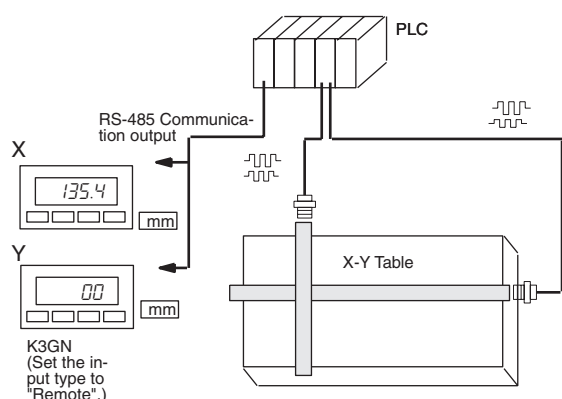
Monitoring Difference between Two Line Speeds

The difference between the two line speeds is calculated by the PLC and the result is written via RS-485 to the K3GN where it is displayed.



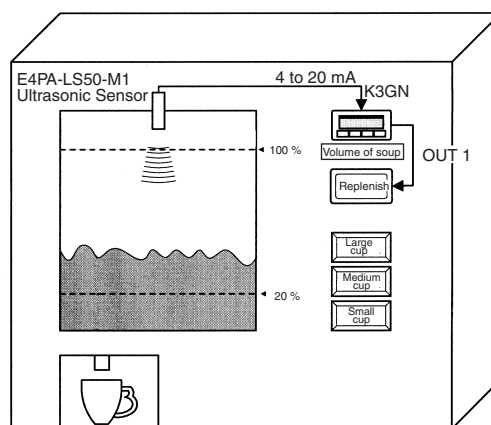
Position Indication on X-Y Table

The position on the X-Y table is calculated by the PLC and the result is written via RS-485 to the K3GN where it is displayed. The scaling function can be used to display the result in millimeter units.

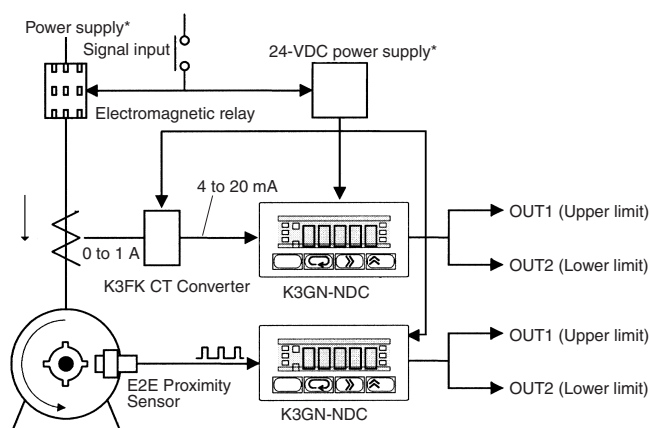


Monitoring the Remaining Quantity of Soup

The distance to the surface of the soup is detected with an ultrasonic sensor and, based on this distance, the K3GN displays the remaining quantity. When the remaining quantity of soup decreases to less than 20%, the K3GN lights the "Replenish" indicator.



Monitoring Number of Motor Revolutions



Note: *Power Supply: Recommended DC power supply: eg. OMRON S8VS.