omron

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: ±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.

Ordering Information

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

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

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 withstand voltage	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)
Ambient atmosphere	Must be free of corrosive gas
EMC	Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4-kV contact discharge (level 2) 8-kV air discharge (level 3) Immunity-RF-interference: ENV50140: 10 V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3) 10 V/m (pulse modulated, 900 MHz) Immunity Conducted Disturbance: ENV50141: 10 V (0.15 to 80 MHz) (level 3) Immunity Burst: EN61000-4-4: 2-kV power-line (level 3) 2-kV I/O signal-line (level 4)
Approved standards	UL508, CSA22.2; conforms to EN50081-2, EN50082-2, EN61010-1 (IEC61010-1); conforms to VDE106/part 100 (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.

Input/Output Ratings

Relay Contact Output

(Incorporating G6K Relays)

Item	Resistive load (cosϕ = 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

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.

■ 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	±0.1% FS ±1 digit max. (at 23±3°C)	1 MΩ min.	–19999 to 99999 (with scaling function)
	–5.000 to 5.000 V	±0.1% FS ±1 digit max. (at 23±5°C)		
	–10.00 to 10.00 V			
DC current	4.00 to 20.00 mA/ 0.00 to 20.00 mA	±0.1% FS ±1 digit max. (at 23±3°C)	60 Ω	

No-voltage Contact/Open Collector Inputs

Input	Measuring range	Measuring accuracy (at 23±5°C)	Displayable range
No-voltage contact (30 Hz max.) with ON/OFF pulse width of 16 ms min.	0.05 to 30.00 HZ	±0.1% FS ±1 digit max.	–19999 to 99999 (with scaling function)
Open collector (5 kHz max.) with ON/OFF pulse width of 90μs min.	0.1 to 5000.0 HZ		

Digital Data Display (By RS-485 Communication)

Displayable range	–19999 to 99999

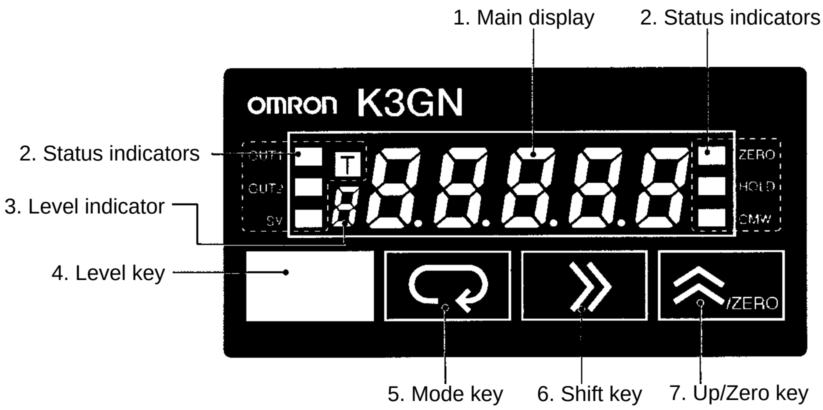
■ Characteristics

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)	---	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)	Forced-zero set with front panel keys Control inputs (HOLD/ZERO) selection via front panel keys
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.		
Enclosure ratings	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.

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
P	Protect
Not lit	Operation
A	Adjustment
S	Initial setting
C	Communications setting
F	Advanced function setting
U	User calibration

Operation

■ Main Functions

Input Types and Ranges

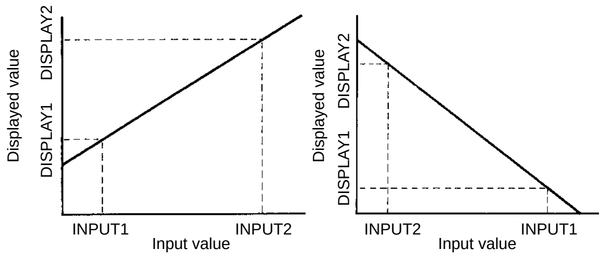
Input type (setting parameter)	Function	Input range (setting parameters)	Setting range
Analog input (AnALG)	Selects DC voltage/current signal input.	4 to 20 mA/0 to 20 mA (4-20)	Displayable from –19999 to 99999 with scaling function. The position of the decimal point can be set as desired.
		1 to 5 V/0 to 5 V (1-5)	
		±5 V (5)	
		±10 V (10)	
Pulse input (PULSE)	Selects pulse input signal.	0.05 to 30 Hz (30)	
		0.1 to 5 kHz (5k)	
Remote (rmt)	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



- **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, Y, is expressed in the form Y = f × *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:

$Y = f \times 1/N \times 60$ (i.e., $a = 1/N \times 60$)

where N is the number of pulses per revolution.
If the display unit is m/min, Y is given by the following:

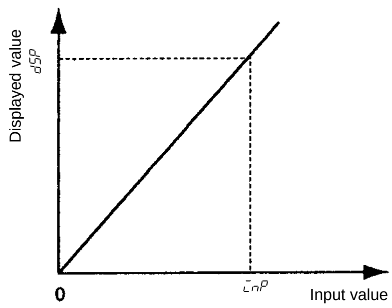
$Y = f \times \pi d \times 1/N \times 60$ (i.e., $a = \pi d \times 1/N \times 60$)

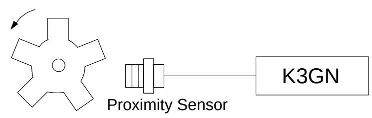
where πd = the wavelength (m) per revolution.

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

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

so if f = 1, then Y = 12. Therefore, input 1 for inP and 12 for dSP.





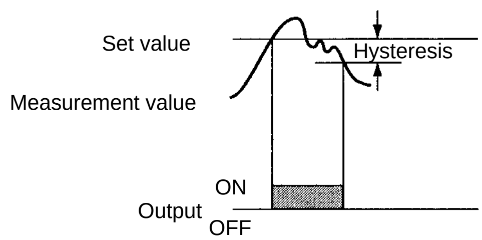
Average Processing

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

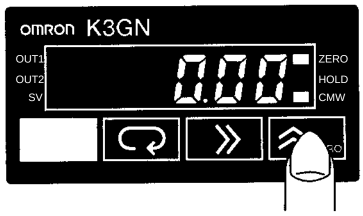
The display can be programmed to change color when an output turns ON. In an example, the K3GN can be programmed to display Green for normal, and Red for errors. The color can be set to change from either green to red or red to green when output turns ON. K3GN can also be programmed to display only one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

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.



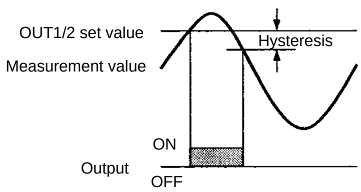
Configurable Output Operating Action

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

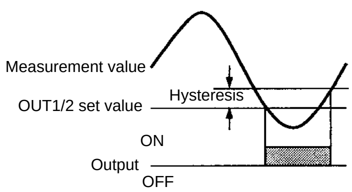
- Upper limit (High Acting):
  The output is turned ON when the measured value is greater than its set value.
- Lower limit (Low Acting):
  The output is turned ON when the measured value is less than its set value.
- Upper and lower limits (Outside band Acting):
  An upper limit (H set value) and lower 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.

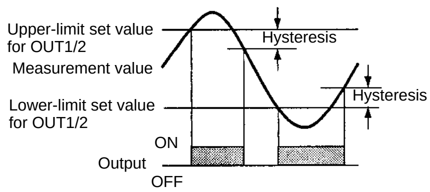
Upper Limit (High Acting)



Lower Limit (Low Acting)

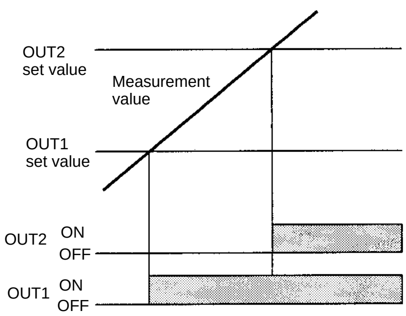


Upper and Lower Limits (Outside Band Acting)

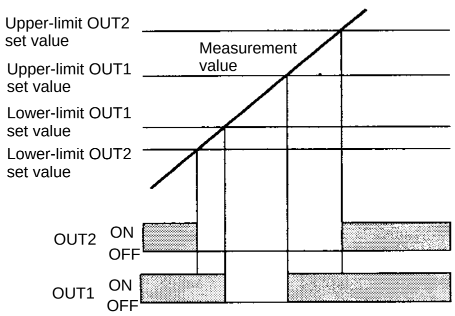


The three types of output operations shown above can be combined as desired. The following are examples of possible combinations.

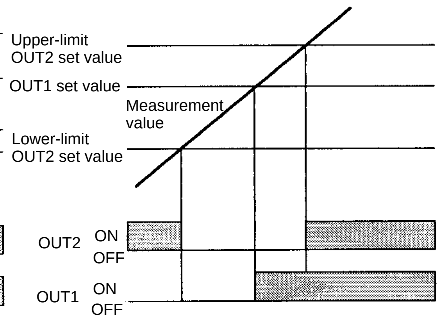
Upper Limit 2-stage Output



Threshold Output

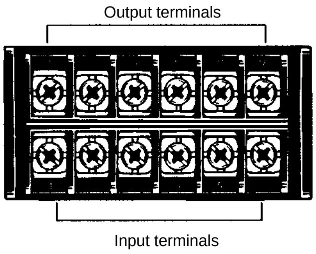


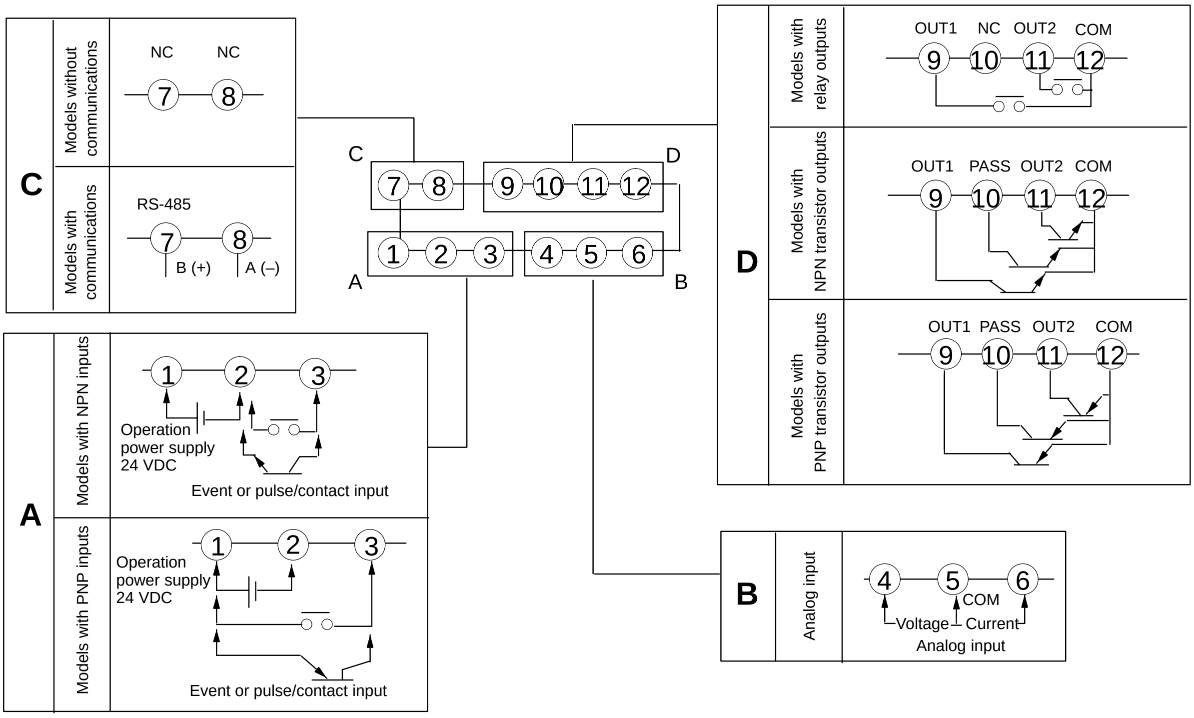
Combination of Upper Limit and Upper/Lower Limits



■ External Connections

Terminal Arrangement

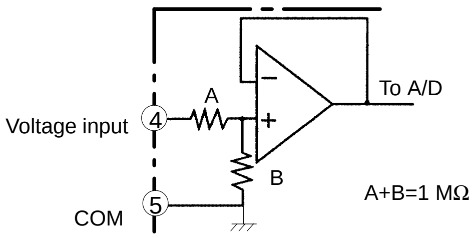


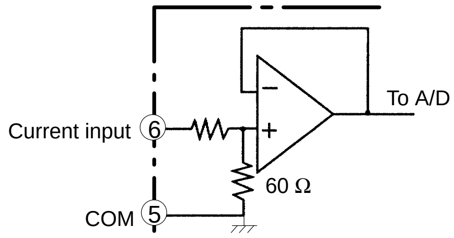


Terminal No.	Name	Description
①-②	Operation power	Connect the operation power supply.
③-②	Event input or pulse/contact input	Operates as follows depending on parameter setting: • Holds process value. • Calibrate the process value to zero and clear the forced-zero function. • Pulse or contact input.
③-①		
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		

■ Input Circuits

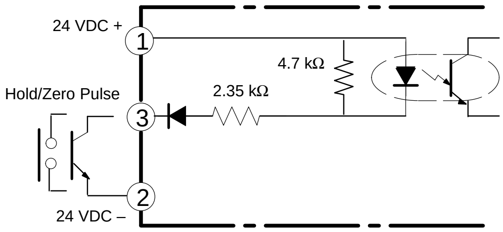
Analog Input (DC Voltage/Current)



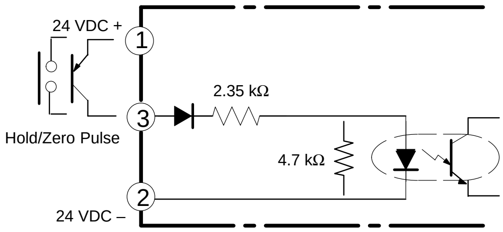


Pulse Input/Control Event Input (HOLD/ZERO)

NPN Input

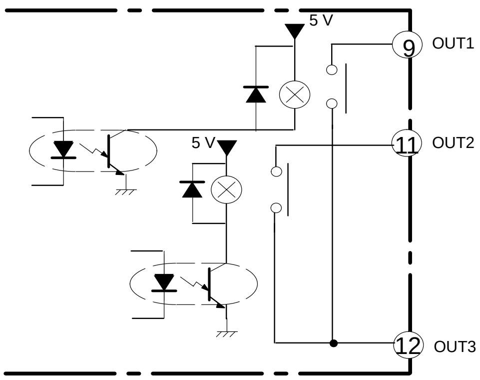


PNP Input

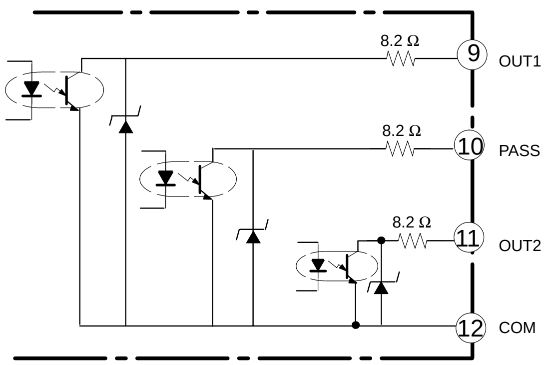


■ Output Circuits

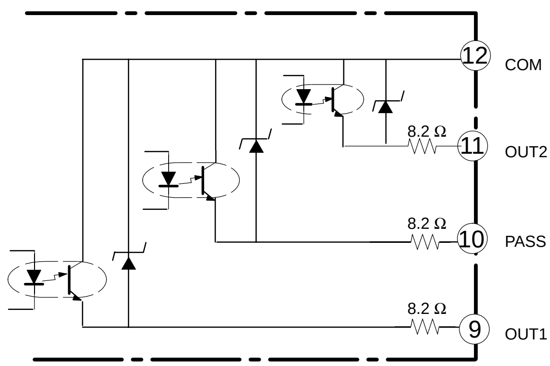
Contact Output



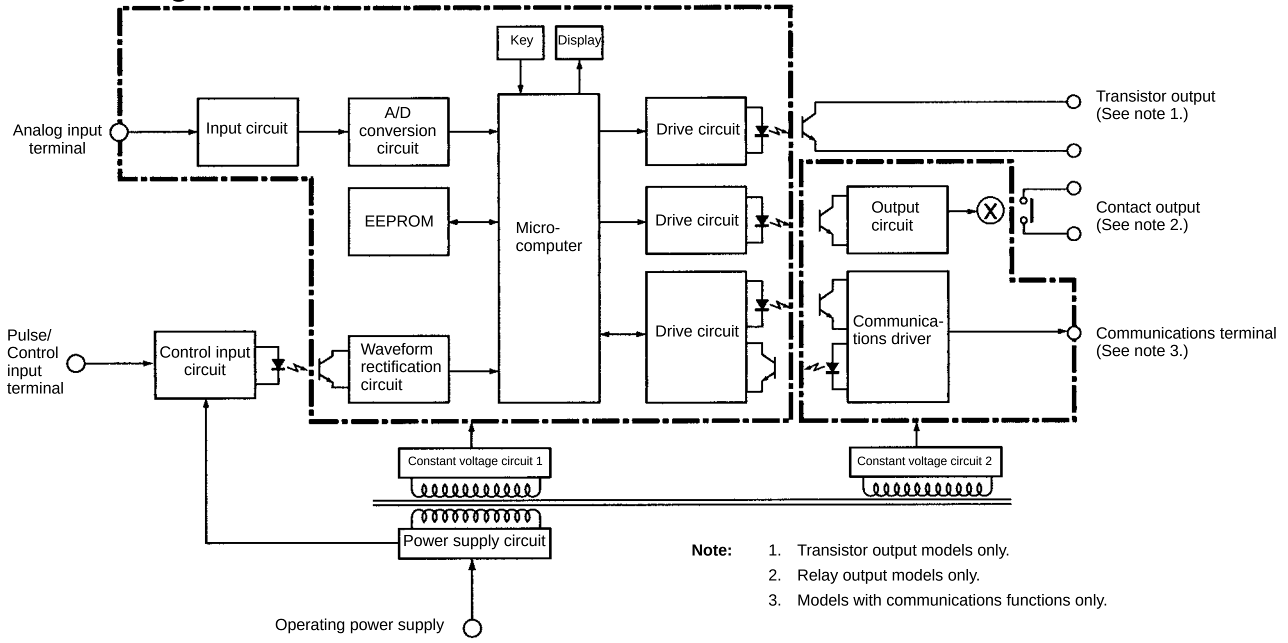
Transistor Output (NPN output)



(PNP output)



■ Block Diagram

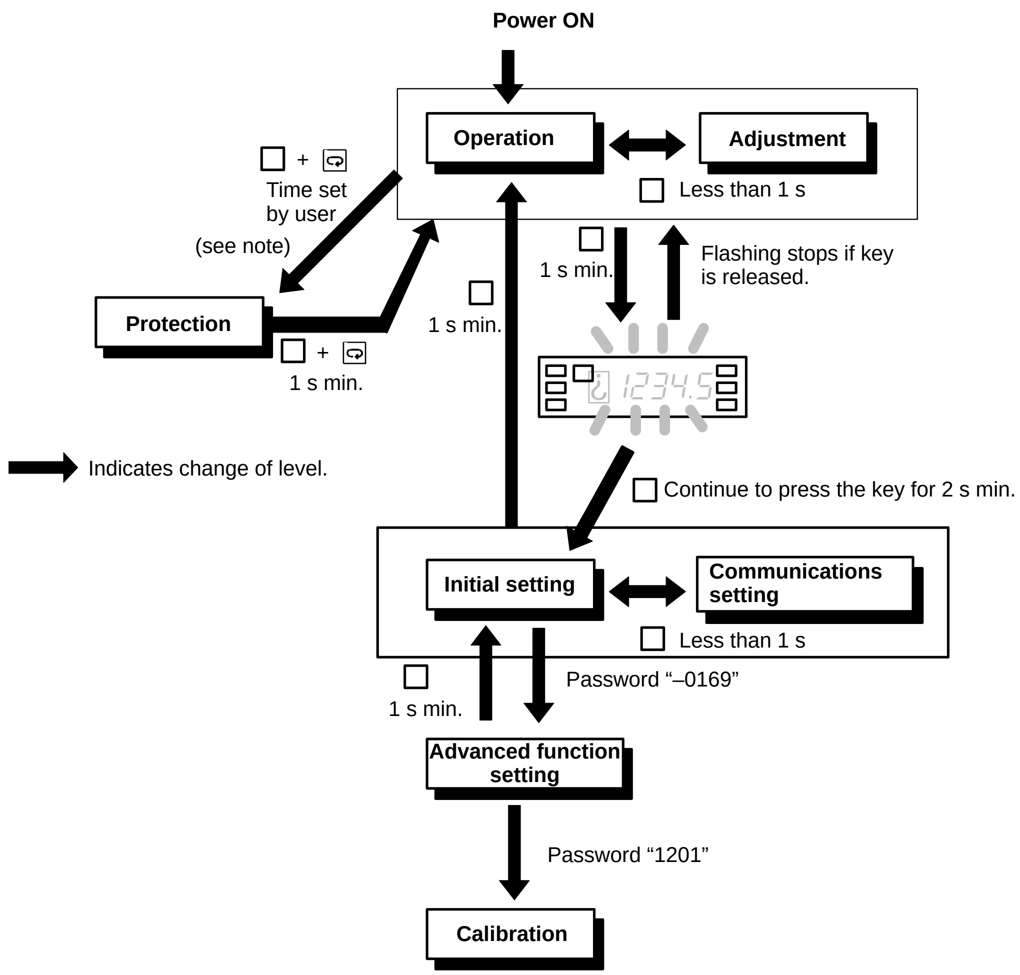


Note:
1. Transistor output models only.
2. Relay output models only.
3. Models with communications functions only.

■ Levels

"Level" refers to a grouping of parameters. The following table lists the operations that are possible in each of the levels, and how to move between levels. There are some parameters that are not displayed for certain models.

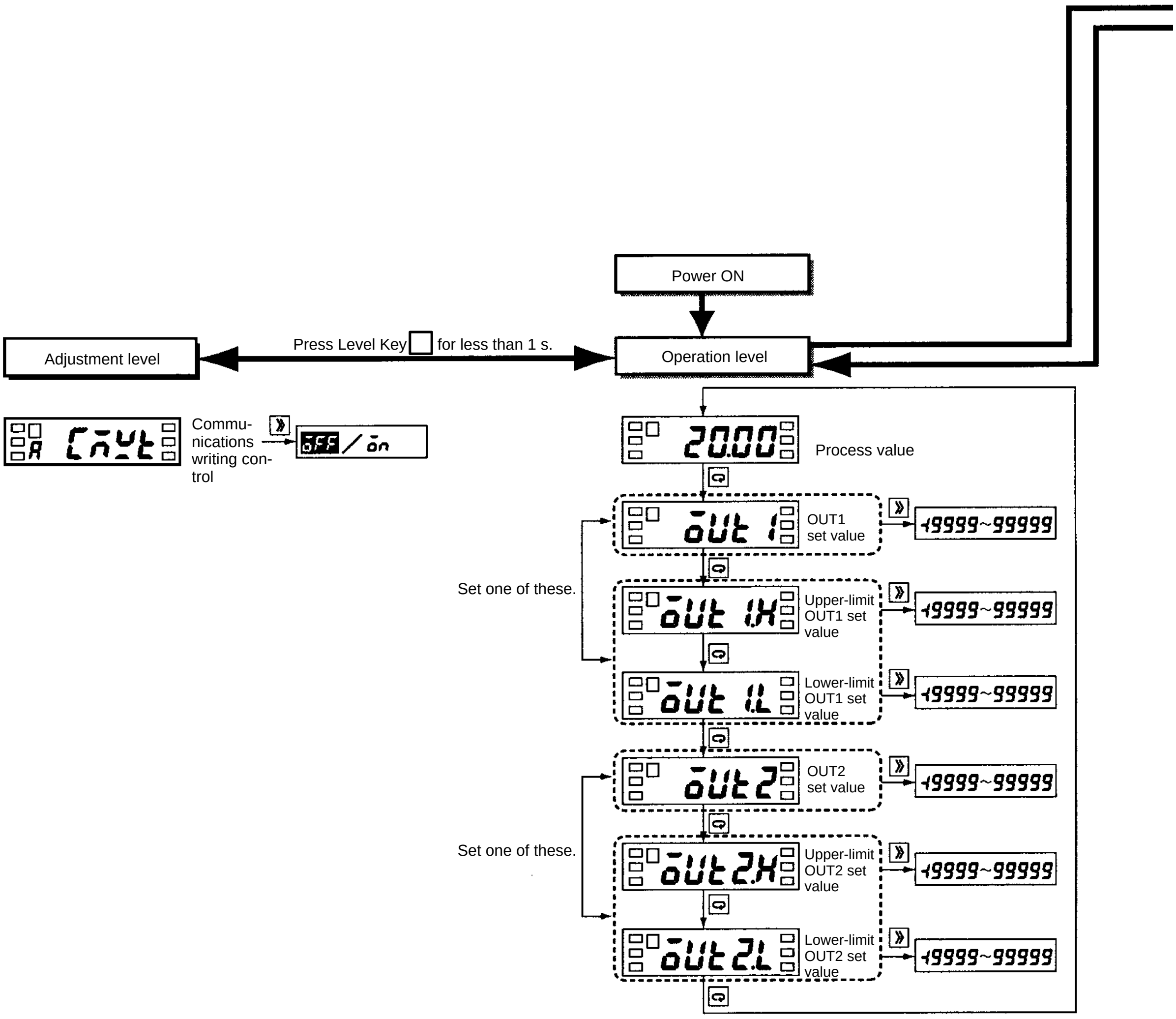
Level name	Function	Measurement
Protect	Setting lockouts.	Continue
Operation	Displaying process values, setting/clearing forced-zero function, and setting OUT 1/2 set values.	Continue
Adjustment	Setting communications writing control.	Continue
Initial setting	Making initial settings of input type, scaling, output operating action, and other parameters.	Stopped
Communications setting	Setting baud rate, word length, and other communications data.	Stopped
Advanced function setting	Setting average processing, display color settings, and other advanced function parameters.	Stopped
Calibration	Setting user calibration of the inputs.	Stopped

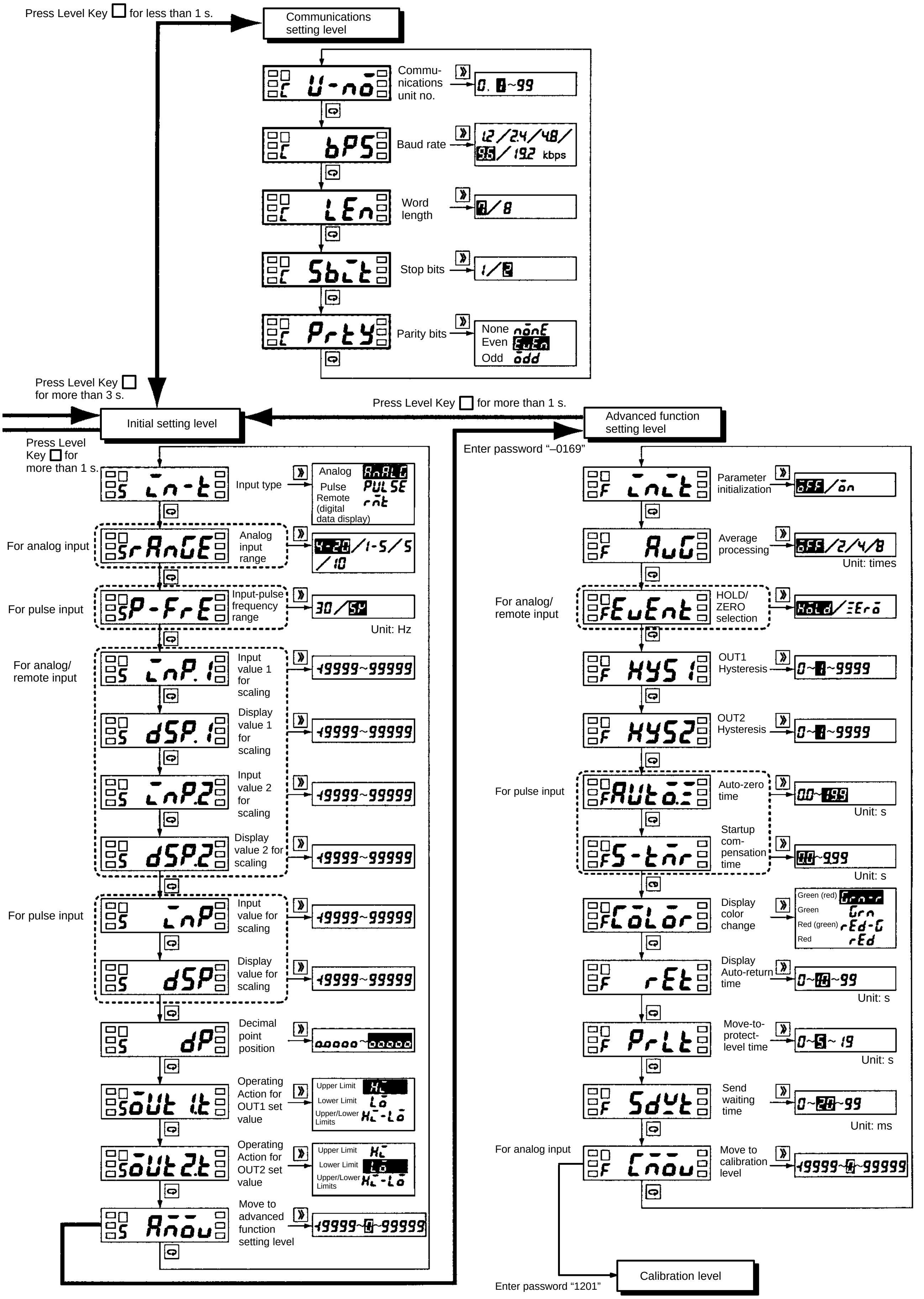


Note: The move to protection level time can be set in the advanced function setting level.

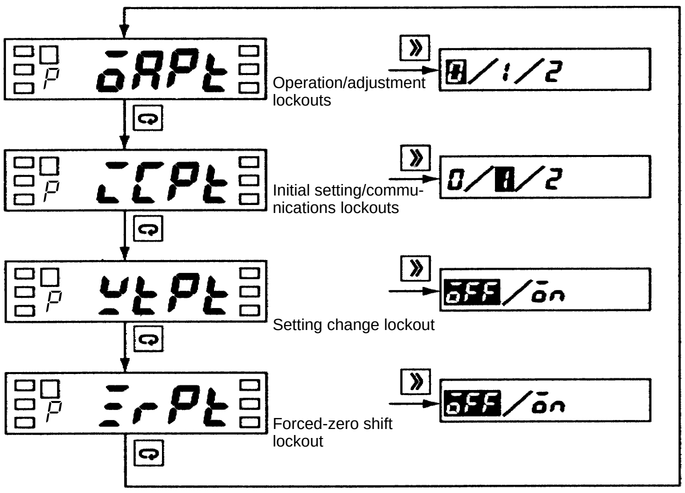
■ Parameters

Note:
1. There are some parameters that are not displayed for certain models.
2. The K3GN will stop measurement if the level is changed to the initial setting level, the advanced function setting level, the communications setting level, or the calibration level.
3. If the input range is changed, some parameters are set to default values. Therefore, set the input range first.
4. Settings displayed in reverse black/white are initial settings.




Press Level Key for less than 1 s.
Communications setting level
Commu-nications unit no.
Baud rate
kbps
Word length
Stop bits
Parity bits
None
Even
Odd
Press Level Key for more than 3 s.
Initial setting level
Press Level Key for more than 1 s.
Advanced function setting level
Press Level Key for more than 1 s.
Enter password "–0169"
Input type
Analog
Pulse
Remote (digital data display)
For analog input
Analog input range
For pulse input
Input-pulse frequency range
Unit: Hz
For analog/ remote input
Input value 1 for scaling
Display value 1 for scaling
Input value 2 for scaling
Display value 2 for scaling
For pulse input
Input value for scaling
Display value for scaling
Decimal point position
Operating Action for OUT1 set value
Upper Limit
Lower Limit
Upper/Lower Limits
Operating Action for OUT2 set value
Upper Limit
Lower Limit
Upper/Lower Limits
Move to advanced function setting level
Parameter initialization
Average processing
Unit: times
For analog/ remote input
HOLD/ ZERO selection
OUT1 Hysteresis
OUT2 Hysteresis
For pulse input
Auto-zero time
Unit: s
Startup com-pensation time
Unit: s
Display color change
Green (red)
Green
Red (green)
Red
Display Auto-return time
Unit: s
Move-to-protect-level time
Unit: s
Send waiting time
Unit: ms
For analog input
Move to calibration level
Calibration level
Enter password "1201"

Protect level



- Prohibits menu display, writing, etc., for operation level and adjustment level.
- Prohibits access to menu display, initial setting level, communications setting level, and advanced function setting level.
- Prohibits setting changes using front panel keys.
- Prohibits use of the forced-zero function using front panel keys.

Operation/Adjustment Lockouts

Prohibits key operations for operation level and adjustment level.

Setting	Operation level		Moving to adjustment level
	Process value display	Set value display	
0	Allowed	Allowed	Allowed
1	Allowed	Allowed	Prohibited
2	Allowed	Prohibited	Prohibited

- Initial setting is 0.
- When the set value is 0 (the initial setting), protection is not set.

Setting Change Lockout

Prohibits setting changes.

Setting	Meaning
OFF	Setting changes using front panel keys allowed (i.e., it is possible to move to the state where changes to settings can be made).
ON	Setting changes using front panel keys prohibited (i.e., it is not possible to move to the state where changes to settings can be made).

- The initial setting is OFF.

Note: Changes to protection level parameters, moving to advanced function setting level, and moving to calibration level are all allowed.

Initial Setting/Communications Lockouts

Prohibits moving to the initial setting level, the communications setting level, and the advanced function setting level.

Setting	Moving to initial setting level	Moving to communications setting level
0	Allowed (message for moving to advanced function setting level displayed)	Allowed
1	Allowed (message for moving to advanced function setting level not displayed)	Allowed
2	Prohibited	Prohibited

- The initial setting is 1.

Forced-zero shift Lockout

Prohibits the setting or clearing of a forced-zero using the front panel key.

Setting	Meaning
OFF	Executing and clearing of forced-zero allowed.
ON	Executing and clearing of forced-zero prohibited.

- The initial setting is OFF.

■ Initial Settings

Power ON

↓

Press the Level Key □ for 3 s min. to move to the initial setting level.

↓

Select the input type and specify the analog input range or pulse frequency input range.

Set the scaling values and specify output operating action as required.

↓

With communications output models, press the Level Key □ for less than 1 s to move to the communications setting level.

After making communications settings, press the Level Key □ for less than 1 s to move to the initial setting level.

↓

Move to the advanced function setting level and make settings for average processing, HOLD/ZERO selection, hysteresis values, auto-zero time, startup compensation time, display color programming, and other advanced function parameters as required.

↓

Press the Level Key □ for less than 1 s min. to return to the operation level.

↓

Specify set value of OUT 1 and 2.

↓

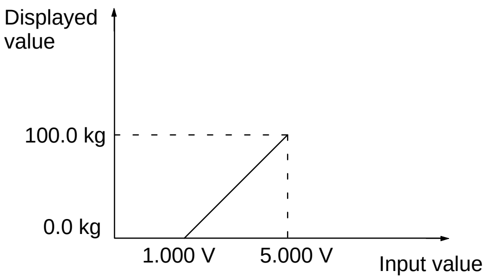
Measurement starts.

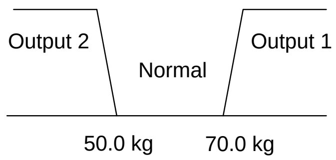
■ Application as a Process Meter

The initial settings required when using the K3GN a process meter are explained below using the following example.

Setting Example

Inputs in the range 1 to 5 V are scaled to the range 0 to 100.0 kg and displayed. If the measurement value goes over 70.0 kg, output 1 turns ON. If the measurement value goes below 50.0 kg, output 2 turns ON.





Initial Setting Procedure

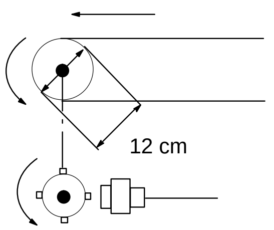
1. **Check the wiring and turn ON the power.**
2. **Set analog input as the input type.**
   If a measurement value is displayed (operation level), move to the initial setting level by holding down the Level Key for 3 s min.
   Set parameter in-t to AnALG.
3. **Set the analog range to 1 to 5 V.**
   Set parameter rAnGE to 1-5.
4. **Set the scaling values.**
   Set parameter inP.1 to 1.000.
   Set parameter dSP.1 to 0.
   Set parameter inP.2 to 5.000.
   Set parameter dSP.2 to 1000.
5. **Set the position of the decimal point.**
   Set parameter dP to oooo.o.
6. **Operating action for OUT1 and OUT2 set values.**
   Set parameter oUt1.t to Hi.
   Set parameter oUt2.t to Lo.
7. **Set OUT1 set value to 70.0 and OUT2 set value to 50.0.**
   If an initial setting level parameter is displayed, press the Level Key for 1 s min. to return to the operation level.
   Set parameter oUt1 to 70.0.
   Set parameter oUt2 to 50.0.
8. **Start actual operation.**

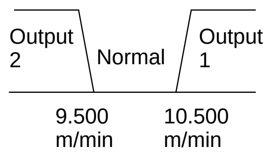
■ Application as a Tachometer

The initial settings required when using the K3GN as a tachometer are explained below using the following example.

Setting Example

The speed of a conveyor belt is displayed in m/min units. For every revolution of the shaft, 4 pulses are output. the diameter of the axis of rotation is 12 cm. If the Rotational speed goes over 10.500 m/min, output 1 turns ON. If the speed goes below 9.500 m/min, output 2 turns ON.





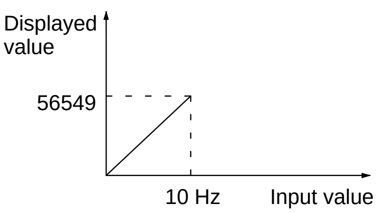
Deciding the Scaling Value

Rotational speed (m/min) = $\pi \times$ Diameter (m) $\times$ Revolutions per minute (rpm)
Revolutions per minute (rpm) = Input frequency (Hz) $\div$ Number of pulses per revolution $\times$ 60

Applying the appropriate values to these 2 equations gives: Speed (m/min) = 5.654866... $\times$ Input frequency (Hz)

Multiply by 1,000 to display the first 3 digits to the right of the decimal point.

Speed (m/min) = 5654.866... $\times$ Input frequency (Hz)



To limit inaccuracies due to scaling, select a round number (e.g., 10) as the input value and select a display value of as many digits as possible. In this example, scaling is performed so that an input value of 10 gives a displayed value of 56549.

Initial Setting Procedure

1. **Check the wiring and turn ON the power.**
2. **Set pulse input as the input type.**
   If a measurement value is displayed (operation level), move to the initial setting level by holding down the Level Key for 3 s min.
   Set parameter in-t to PULSE.
3. **Set the pulse frequency to 30 Hz.**
   The input pulse frequency for the application is approximately 2 Hz and so can be assumed not to exceed 30 Hz. Set parameter P-FrE to 30.
4. **Set the scaling values.**
   Set parameter inP to 10.
   Set parameter dSP to 56549.
5. **Set the decimal point.**
   Set parameter dP to oo.ooo.
6. **Operating action for OUT1 and OUT2 set values.**
   Set parameter oUt1.t to Hi.
   Set parameter oUt2.t to Lo.
7. **Set OUT1 set value to 10.500 and OUT2 set value to 9.500.**
   If an initial setting level parameter is displayed, press the Level Key for 1 s min. to return to the operation level.
   Set parameter oUt1 to 10.500.
   Set parameter oUt2 to 9.500.
8. **Start actual operation.**