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

<table>
<thead>
<tr>
<th>Input type</th>
<th>Supply voltage</th>
<th>Output</th>
<th>Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC voltage/current, NPN</td>
<td>24 VDC</td>
<td>Dual relays (SPST-NO)</td>
<td>K3GN-NDC 24 VDC K3GN-NDC-FLK 24 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three NPN open collector</td>
<td>K3GN-NDT1 24 VDC K3GN-NDT1-FLK 24 VDC</td>
</tr>
<tr>
<td>DC voltage/current, PNP</td>
<td></td>
<td>Dual relays (SPST-NO)</td>
<td>K3GN-PDC 24 VDC K3GN-PDC-FLK 24 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three PNP open collector</td>
<td>K3GN-PDT2 24 VDC K3GN-PDT2-FLK 24 VDC</td>
</tr>
</tbody>
</table>
Model Number Legend:
K3GN - □ □ □ - □ - 24 VDC

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

<table>
<thead>
<tr>
<th>Ratings</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>85% to 110% of the rated supply voltage</td>
</tr>
<tr>
<td>Power consumption (see note)</td>
<td>2.5 W max. (at max. DC load with all indicators lit)</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ min. (at 500 VDC) between external terminal and case. Insulation provided between inputs, outputs, and power supply.</td>
</tr>
<tr>
<td>Dielectric withstand voltage</td>
<td>1,000 VAC for 1 min between external terminal and case. Insulation provided between inputs, outputs, and power supply.</td>
</tr>
<tr>
<td>Noise immunity</td>
<td>±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</td>
</tr>
</tbody>
</table>
| Vibration resistance     | Malfunction: 10 to 55 Hz, 10 min each in X, Y, and Z directions; acceleration: 9.8 m/s²  
                           | Destruction: 10 to 55 Hz, 30 min each in X, Y, and Z directions; acceleration: 19.6 m/s² |
| Shock resistance         | Malfunction: Models with transistor outputs: 196 m/s² for 3 times each in X, Y, and Z directions  
                           | Models with relay contact outputs: 98 m/s² for 3 times each in X, Y, and Z directions  
                           | Destruction: 294 m/s² 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 85°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)  
                           | 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)

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

**Transistor Output**

<table>
<thead>
<tr>
<th>Item</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated load voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Max. load current</td>
<td>50 mA</td>
</tr>
<tr>
<td>Leakage current</td>
<td>100 µA max.</td>
</tr>
</tbody>
</table>

### Communications

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

Refer to N102 Operation Manual for more details.

### Measuring Ranges

#### Process Voltage/Current Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Measuring range</th>
<th>Measuring accuracy</th>
<th>Input impedance</th>
<th>Displayable range</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC voltage</td>
<td>1.000 to 5.000 V/0.000 to 5.000 V</td>
<td>±0.1% FS ±1 digit max. (at 23±3°C)</td>
<td>1 Ω min.</td>
<td>-19999 to 99999 (with scaling function)</td>
</tr>
<tr>
<td></td>
<td>-5.000 to 5.000 V</td>
<td>±0.1% FS ±1 digit max. (at 23±3°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-10.00 to 10.00 V</td>
<td>±0.1% FS ±1 digit max. (at 23±3°C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC current</td>
<td>4.00 to 20.00 mA/0.00 to 20.00 mA</td>
<td>±0.1% FS ±1 digit max. (at 23±3°C)</td>
<td>60 Ω</td>
<td></td>
</tr>
</tbody>
</table>

#### No-voltage Contact/Open Collector Inputs

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

Digital Data Display (By RS-485 Communication)

| Displayable range | -19999 to 99999 |
### Characteristics

<table>
<thead>
<tr>
<th>Input signal</th>
<th>Process voltage (1 to 5 V, 0 to 5 V, ±5V, ±10 V)</th>
<th>No-voltage contact (30 Hz max. with ON/OFF pulse width of 16 ms min.)</th>
<th>Digital data display (by RS-485 communication)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process current (4 to 20 mA, 0 to 20 mA)</td>
<td>Open collector (5 kHz max. with ON/OFF pulse width of 90 µs min.)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>A/D conversion</td>
<td>Double integral method</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Sampling period</td>
<td>250 ms</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Display refresh period</td>
<td>---</td>
<td>Periodic measurement</td>
<td>---</td>
</tr>
<tr>
<td>Connectable Sensors</td>
<td>ON residual voltage: 2.5 V max.</td>
<td>OFF leakage current: 0.1 mA max.</td>
<td>Must have a switching capacity of 15 mA min. Must be able to reliably switch load currents of 5 mA max.</td>
</tr>
<tr>
<td>Max. displayed digits</td>
<td>5 digits (–19999 to 99999)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Display</td>
<td>7-segment digital display, character height: 7.0 mm</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Polarity display</td>
<td>“–” is displayed automatically with a negative input signal.</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Zero display</td>
<td>Leading zeros are not displayed.</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Scaling function</td>
<td>Programmable with front-panel key inputs (range of display: –19999 to 99999). The decimal point position can be set as desired.</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>External controls (see note 1)</td>
<td>HOLD: (Measurement value held)</td>
<td>HOLD: (Measurement value held)</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>ZERO: (Forced-zero)</td>
<td>ZERO: (Forced-zero)</td>
<td>---</td>
</tr>
<tr>
<td>Hysteresis setting</td>
<td>Programmable with front-panel key inputs (0001 to 9999).</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Other functions</td>
<td>Programmable Color Display</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Selectable output operating action</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Teaching set values</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Average processing (simple average)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Lockout configuration</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Communications writing control (communications output models only)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Forced-zero set with front panel keys</td>
<td>Startup compensation time (0.00 to 99.9 s)</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Control inputs (HOLD/ZERO) selection via front panel keys</td>
<td>Auto-zero time (0.0 to 19.9 s)</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Field calibration</td>
<td>Forced-zero set with front panel keys</td>
<td>---</td>
</tr>
<tr>
<td>Output</td>
<td>Relays: 2 SPST-NO</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Transistors: 3 NPN open collector</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>3 PNP open collector</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Combinations: Communications output (RS-485) + relay outputs (2 SPST-NO);</td>
<td>Communications output (RS-485) + transistor outputs (3 NPN open collector);</td>
<td>Communications output (RS-485) + transistor outputs (3 PNP open collector)</td>
<td>---</td>
</tr>
<tr>
<td>Delay in comparative outputs (transistor outputs)</td>
<td>750 ms max.</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Enclosure ratings</td>
<td>Front panel: NEMA4X for indoor use (equivalent to IP66)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Rear case: IEC standard IP20</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Terminals: IEC standard IP20</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Memory protection</td>
<td>Non-volatile memory (EEPROM) (possible to rewrite 100,000 times)</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**Note:**
1. The minimum input time for control signals is 80 ms.
2. Refer to *N102 Operation Manual* for more details.
### Nomenclature

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

#### Level indicator

<table>
<thead>
<tr>
<th>Level</th>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protect</td>
</tr>
<tr>
<td>Not lit</td>
<td>Operation</td>
</tr>
<tr>
<td></td>
<td>Adjustment</td>
</tr>
<tr>
<td></td>
<td>Initial setting</td>
</tr>
<tr>
<td></td>
<td>Communications setting</td>
</tr>
<tr>
<td></td>
<td>Advanced function setting</td>
</tr>
<tr>
<td></td>
<td>User calibration</td>
</tr>
</tbody>
</table>
Operation

Main Functions

### Input Types and Ranges

<table>
<thead>
<tr>
<th>Input type (setting parameter)</th>
<th>Function</th>
<th>Input range (setting parameters)</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input (R=RL, I)</td>
<td>Selects DC voltage/current signal input.</td>
<td>4 to 20 mA/0 to 20 mA</td>
<td>Displayable from –19999 to 99999 with scaling function. The position of the decimal point can be set as desired.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 to 5 V/0 to 5 V (I)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>±5 V (I)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>±10 V (I)</td>
<td></td>
</tr>
<tr>
<td>Pulse input (PUL  SE)</td>
<td>Selects pulse input signal.</td>
<td>0.05 to 30 Hz</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.1 to 5 kHz (I)</td>
<td></td>
</tr>
<tr>
<td>Remote (-r-)</td>
<td>Displays digital data from PLC or PC.</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

### 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.
  - 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:
    \[ Y = f \times \frac{1}{5} \times 60 \]
    where N is the number of pulses 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:
\[ Y = f \times \frac{1}{5} \times 60 \]
so if \( f = 1 \), then \( Y = 12 \). Therefore, input 1 for \( \text{CnP} \) and 12 for \( \text{dSP} \).

- **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)**

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**Proximity Sensor**

- K3GN  

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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.
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
# External Connections

## Terminal Arrangement

### Output terminals

### Input terminals

### Models without communications

- **NC NC**
- **7 8**

### Models with communications

- **RS-485**
- **B (+) A (–)**

### Models with NPN inputs

### Models with PNP inputs

### Terminal No. | Name | Description
--- | --- | ---
1-2 | Operation power | Connect the operation power supply.  
3-6 | 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.  
4-5-6 | Analog input | Connect the voltage or current analog input.  
7-9 | Communications | RS-485 communications terminals.  
10-11 | Outputs | Outputs relay or transistor outputs. There is also a PASS output for models with transistor outputs.  
12 | | |
Input Circuits
Analog Input (DC Voltage/Current)

- Voltage input
  - A + B = 1 MΩ

- Current input
  - 60 Ω

Pulse Input/Control Event Input (HOLD/ZERO)

NPN Input

- 24 VDC +
- 24 VDC –
- 2.35 kΩ
- 4.7 kΩ

PNP Input

- 24 VDC +
- 24 VDC –
- 2.35 kΩ
- 4.7 kΩ

Output Circuits
Contact Output

- OUT1
- OUT2
- OUT3

Transistor Output (NPN output)

- OUT1
- PASS
- OUT2

(PNP output)

- OUT1
- PASS
- OUT2
- COM
Block Diagram

- Analog input terminal
- Input circuit
- A/D conversion circuit
- EEPROM
- Waveform rectification circuit
- Control input circuit
- Power supply circuit
- Operating power supply
- Key
- Display
- Micro-computer
- Drive circuit
- Drive circuit
- Drive circuit
- Drive circuit
- Communications driver
- Output circuit
- Contact output (See note 2.)
- Communications terminal (See note 3.)
- Transistor output (See note 1.)
- Transistor output models only.
- Relay output models only.
- Models with communications functions only.

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.

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

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**
  - **Unit no.**
  - **Baud rate** 002/24/48/60/192 bps
  - **Word length** 0/8
  - **Stop bits** 1/0
  - **Parity bits** None

#### Initial setting level

- **Input type**
  - Analog, Pulse, Remote (digital data display)

- **Input range**
  - Analog: 0-20mA, 4-20mA, 0-10V, 0-5V
  - Pulse: 0-10V

- **Input-pulse frequency range**
  - Analog: 0-100kHz

## Press Level Key for more than 3 s.

- **Input value 1 for scaling**
- **Display value 1 for scaling**
- **Input value 2 for scaling**
- **Display value 2 for scaling**

**Unit:** times, s, ms

### For analog input

- **Enter password “–0169”**

### For pulse input

- **Enter password “1201”**

### For analog/remote input

- **Enter password “0169”**

### Advanced function setting level

- **Parameter initialization**
  - **Average processing**
    - **Unit:** times
  - **HOLD/ZERO selection**
  - **OUT1 Hysteresis**
  - **OUT2 Hysteresis**
  - **Auto-zero time**
  - **Startup compensation time**
  - **Display color change**
  - **Display Auto-return time**
  - **Move-to-protect-level time**
  - **Send waiting time**

**Unit: s, ms**

### Calibration level

- **Move to calibration level**
  - **Unit: ms**

- **Enter password “1201”**

### Communications setting level

- **Communications unit no.**
- **Baud rate** 002/24/48/60/192 bps
- **Word length** 0/8
- **Stop bits** 1/0
- **Parity bits** None, Even, Odd, Odd

- **Decimal point position**
- **Operating Action for OUT1 set value**
- **Operating Action for OUT2 set value**
- **Move to advanced function setting level**

**Unit:** Hz
Operation/Adjustment Lockouts
Prohibits key operations for operation level and adjustment level.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Operation level</th>
<th>Moving to adjustment level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Process value display</td>
<td>Set value display</td>
</tr>
<tr>
<td>0</td>
<td>Allowed</td>
<td>Allowed</td>
</tr>
<tr>
<td>1</td>
<td>Allowed</td>
<td>Prohibited</td>
</tr>
<tr>
<td>2</td>
<td>Prohibited</td>
<td>Prohibited</td>
</tr>
</tbody>
</table>

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

Setting Change Lockout
Prohibits setting changes.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Setting changes using front panel keys allowed (i.e., it is possible to move to the state where changes to settings can be made).</td>
</tr>
<tr>
<td>ON</td>
<td>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).</td>
</tr>
</tbody>
</table>

- The initial setting is OFF.

Initial Setting/Communications Lockouts
Prohibits moving to the initial setting level, the communications setting level, and the advanced function setting level.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Moving to initial setting level</th>
<th>Moving to communications setting level</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Allowed (message for moving to advanced function setting level displayed)</td>
<td>Allowed</td>
</tr>
<tr>
<td>1</td>
<td>Allowed (message for moving to advanced function setting level not displayed)</td>
<td>Allowed</td>
</tr>
<tr>
<td>2</td>
<td>Prohibited</td>
<td>Prohibited</td>
</tr>
</tbody>
</table>

- The initial setting is 1.

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

<table>
<thead>
<tr>
<th>Setting</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Executing and clearing of forced-zero allowed.</td>
</tr>
<tr>
<td>ON</td>
<td>Executing and clearing of forced-zero prohibited.</td>
</tr>
</tbody>
</table>

- The initial setting is OFF.
## Initial Settings

1. **Power ON**

2. Press the Level Key \( \square \) for 3 s min. to move to the initial setting level.

3. 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.

4. With communications output models, press the Level Key \( \square \) for less than 1 s to move to the communications setting level.
   After making communications settings, press the Level Key \( \square \) for less than 1 s to move to the initial setting level.

5. 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.

6. Press the Level Key \( \square \) for less than 1 s min. to return to the operation level.

7. Specify set value of OUT 1 and 2.

Application as a Process Meter

The initial settings required when using the K3GN as 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.

Deciding the Scaling Value
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.

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 maximum speed of the 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 Rotational 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) \times 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.

Displayed value

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 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 CR1:RT to R-RLG.
3. Set the analog range to 1 to 5 V.
   Set parameter CR1:RT to R-RLG.
4. Set the scaling values.
   Set parameter A+)
5. Set the position of the decimal point.
   Set parameter A+)
6. 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 CR1:RT to R-RLG.
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 CR1:RT to R-RLG.
8. Start actual operation.
### Application Examples

#### Detection of Dust Exhaust

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

---

#### Exhaust Dust collecting machine

- E3SA
- Grinder
- 4 to 20 mA
- OUT1 (Upper limit alarm) Output reduction instruction
- 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.

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#### Tank Pressure

- E8AA Pressure Sensor
- Beer
- Foam
- Tank
- Pump
- Exhaust valve
- K3GN
- Host PC
- RS-485 RS-232C

---

#### 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.

---

#### Motor Load Current

- Power supply
- Electromagnetic relay
- 24-VDC power supply
- Signal input
- 24-VDC power supply
- K3FK CT Converter
- OUT1 (Upper-limit alarm)
- OUT2 (Lower-limit alarm)
- K3GN

---

#### 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.

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#### Two Line Speeds

- PLC
- RS-485 Communication output
- K3GN

---

#### 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.

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#### X-Y Table

- PLC
- RS-485 Communication output
- K3GN

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(Continued on next page)
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

Power supply
Signal input
24-VDC power supply
Electromagnetic relay
K3FX CT Converter
K3GN-NDC
E2E Proximity Sensor
K3GN-NDC
OUT1 (Upper limit)
OUT2 (Lower limit)
OUT1 (Upper limit)
OUT2 (Lower limit)
Dimensions

Note: All units are in millimeters unless otherwise indicated.

![Image of K3GN dimensions]

Panel Cutouts

Separate mounting

Gang Mounting

(48 × No. of Panels – 2.5) / 1.0

The products cannot be made waterproof when gang-mounted.

Main Display Character Size

![Image of K3GN main display]

Precautions

**WARNING**

Do not touch the terminals while power is being supplied. Electrical shock may result. Also, do not touch the terminals with a screwdriver while power is being supplied. Electrical shock may result via the screwdriver.

Do not allow pieces of metal or wire clippings to enter the product. Electrical shock, fire, or malfunction may result.

**Caution**

Do not attempt to disassemble, repair, or alter the product. Electrical shock, fire, or malfunction may result.

Do not use the product where flammable or combustion gasses are present.

The service life of the output relays depends on the switching capacity and switching conditions. Consider the actual application conditions and use the product within the rated load and electrical service life.

Always maintain the load within ratings. Damage or burning may result if the ratings are exceeded.

Always maintain the power supply voltage within specifications. Damage or risk of fire may result if the specifications are exceeded.

Tighten the terminal screws securely. The recommended tightening torque is 0.5 N•m. Loose screws may result in product failure or malfunction.

Perform correct setting of the product according to the application. Failure to do so may cause unexpected operation, resulting in damage to the unit or injury.

This product is not a safety device. Product failure may prevent operation of comparative outputs. Take safety measures, such as installing a separate monitoring system, to ensure safety and to prevent serious accidents caused by such failure, thus ensuring safety.

Observe the following precautions to ensure safety:

1. Do not connect anything to unused terminals.

2. Be sure to check each terminal for correct number and polarity before connection. Incorrect or reverse connection may damage or burn out internal components of the K3GN.

3. Do not use the product in locations subject to the following:
   - Dust or explosive gasses (e.g., sulfuric gas or ammonia gas).
   - Condensation or icing as a result of high humidity.
   - Outdoors or in direct sunlight.
   - Splashing liquid or oil atmosphere.
   - Direct radiant heat from heating equipment.
   - Extreme changes in temperature.

4. Do not block heat dissipation around the product, i.e., provide sufficient space for heat dissipation. Do not block the ventilation holes on the back of the product.

5. Do not use paint thinner for cleaning. Use commercially available alcohol.

6. Use a power supply meeting the power supply specifications of the K3GN. Be sure that the rated voltage is achieved within 2 s after turning ON the power.

7. Use the K3GN within the specified temperature and humidity ranges. When installing the K3GN in a panel, be sure that the temperature around the K3GN (not the temperature around the panel) does not exceed 55°C. If the K3GN is subject to radiant heat, be sure that the temperature of the surface of the K3GN exposed to the radiant heat does not exceed 55°C by providing a fan or other heat removal method.

8. Store the K3GN within the specified temperature and humidity ranges.

9. Do not lay heavy objects on the product during use or storage. Doing so may deform or deteriorate the K3GN.

10. Conduct aging for 15 minutes min. after power is ON for correct measurement.

Mounting

Recommended panel thickness is 1 to 5 mm.

Insert the K3GN in the square cutout, insert the adapter from the back, and push the K3GN into the cutout as far as possible. Use
screws to secure the K3GN. To make the K3GN waterproof, install watertight packing in the K3GN. Install the watertight packing in the proper direction. Note that the packing is direction-sensitive. When gang-mounting two or more products in a cutout, be sure that the ambient temperature does not exceed the specifications. Mount the K3GN as horizontally as possible. Separate the K3GN from machines generating high-frequency noise, such as high-frequency welding machines and high-frequency sewing machines.

**Operation**

A K3GN model with a relay contact or transistor output may not output any alarm signal normally if the model has an error. It is recommended that an independent alarm device be connected to the model. The parameters are factory-set so that the K3GN will operate normally. The settings of the parameters may be changed according to the application.

**Wiring**

Wire the power supply with the correct polarity. Wiring with incorrect polarity may result in damage or burning. Wire the terminals using crimp terminals. Tighten terminal screws to a torque of approx. 0.5 N·m. Wire signal lines and power lines separately to reduce the influence of noise. Use M3 crimp terminals of the type shown below.

---

**Troubleshooting**

When an error occurs, error details will be displayed on the main display. Confirm the error from the main display and take the appropriate countermeasures.

<table>
<thead>
<tr>
<th>Main display</th>
<th>Level display</th>
<th>Error contents</th>
<th>Countermeasure</th>
</tr>
</thead>
<tbody>
<tr>
<td>E111 (E111)</td>
<td>Not lit</td>
<td>RAM memory error</td>
<td>Turn the power supply OFF and ON again. If the same error is displayed even after the power is turned OFF and ON, it is necessary to replace the memory. If normal operation is restored by turning the power supply OFF and ON, it is possible that there is noise interference. Check that there is nothing in the vicinity that may be the source of noise.</td>
</tr>
<tr>
<td>5 Err- (S.Err) (Flashes at 0.5-s intervals)</td>
<td>Not lit</td>
<td>Input error</td>
<td>Check for incorrect input wiring, for disconnected power lines, for short-circuiting, and the input type.</td>
</tr>
<tr>
<td>99999 (Flashes at 0.5-s intervals)</td>
<td>Not lit</td>
<td>Greater than displayable range</td>
<td>This is not an operational error. These messages are displayed when a value to be displayed lies outside the displayable range, even if the input value is within the input range and the range for which measurement is possible. Bring the input value and display value within range.</td>
</tr>
<tr>
<td>89999 (Flashes at 0.5-s intervals)</td>
<td>Not lit</td>
<td>Less than displayable range</td>
<td></td>
</tr>
</tbody>
</table>

**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.