

F90 Series (Rate Indicators / Controllers)

INSTRUCTION MANUAL

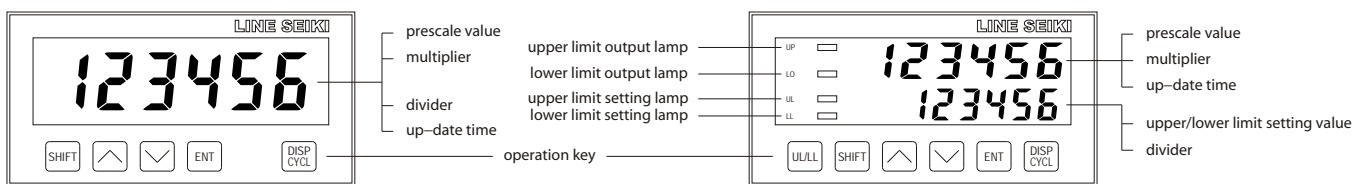
FEATURES

<p>DIN 48 × 96mm</p> <p>DIN 48 × 96mm Standard Panel Size</p>	<p>1 / TAU</p> <p>High precision, from low speed to high speed by 1/TAU. Measuring range is 0.11Hz ~ 20kHz.</p>	<p>Prescale</p> <p>Available to multiplier and divider at once, correspond to any revolution ratio and circumference ratio.</p>
<p>Monitor & Preset Type</p> <p>1. Monitor type with the large display 2. Preset Type can make the upper/lower limit output.</p>	<p>Input</p> <p>Correspond to each input mode of Contact, Open Collector, Voltage and Magnetic Sensor</p>	<p>BCD Output & Analog Output</p> <p>With option, prepared the BCD output & Analog output</p>
<p>Decimal Point Positioning</p> <p>By selecting the decimal point position, it will be available to display the measured data of below the decimal point.</p>	<p>Up-Date Time</p> <p>Regardless of sampling time, it will be available to set the up-date time.</p>	<p>Key Lock and Output Inhibition</p> <p>By easy wirings, key lock (front key operation lock) and output inhibition are available.</p>

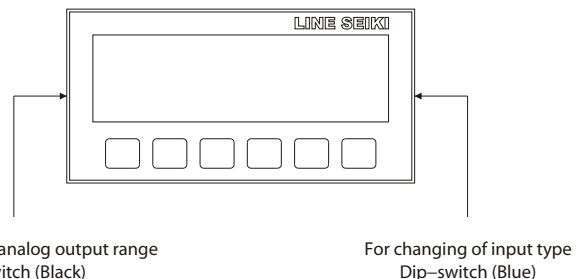
MODELS

MODEL	FUNCTION	NUMBER OF DIGITS	SETTING DIGITS	ADDED FUNCTION
F90-101	Monitor Type	6	—	—
F90-102		6	—	BCD OUTPUT
F90-103		6	—	ANALOG OUTPUT
F90-201	Preset Type	6	6	—
F90-202		6	6	BCD OUTPUT
F90-203		6	6	ANALOG OUTPUT

FRONT PANEL & DIP-SWITCH



- U/LL** : Alternate display of upper limit and lower limit value.
- SHIFT** : Enter to mode and change digit for editing. Call of the prescale value. Used for the decimal point positioning.
- ▲** : Increase the numerical value of the setting digit. Used for the decimal point positioning.
- ▼** : Decrease the numerical value of the setting digit. Used for the decimal point positioning.
- ENT** : Memory of the selected numbers. Call of the prescale value.
- DISP CYCL** : Call of the up-date time.



■ EDITING

< PRESCALE VALUE >

For prescale, both multiplier and divider can be set.
The formula on displayed value and the prescale value is the following

$$\text{Display Value} = \frac{\text{Multiplier}}{\text{Divider}} \times \text{Number of Input Pulse}$$

For example, in case of fitting the 200 ppr encoder on the roller which circumference is 50 cm and making the roller's surface speed display at cm/min, set the multiplier at 50 and divider at 200.

OPERATION	EXPLANATION OF OPERATION	MONITOR TYPE : F90-101 , 102 , 103	PRESET TYPE : F90-201 , 202 , 203
 + 	Press key and with key pressed. Present prescale value will be displayed. The display returns to measuring mode if key is pressed or key is not pressed within 3 seconds while present prescale value appears.		
	Press key to enter multiplier editing mode and make the leftmost digit blink.		
	Press key 5 times or continue to press to set the leftmost digit to be 5.		
	Press key once to make the next digit flash.		
	Press key once to set 0 to this flashing digit		
	Press key 6 times or continue to press to shift the flashing digit for editing.	Press key while the rightmost digit of the multiplier is flashing. Then, the display will enter divider editing mode and the leftmost digit will blink.	
	Press key twice to set 2 to this flashing digit.		
	Press key twice to shift flashing digit for editing.		
	Press key once to set 0 to this flashing digit.		
	Press key to stop flashing of digit and memory the selected numbers. The display returns to measuring mode after 3 seconds automatically or by pressing key again.		

In case of setting the multiplier to be 00.0000, this means the multiplier is 100.
In case of setting the divider to be 0000, this means the divider is 1.

< UP-DATE TIME >

By setting the up-date time, the display can be renewed at reasonable time without renewing the display in every sampling.
For example, if you hope that display renews every 28 seconds, set 28 for the up-date time.

OPERATION	DESCRIPTION	MONITOR TYPE : F90-101 , 102 , 103	PRESET TYPE : F90-201 , 202 , 203
	Press key to display present up-date time. The display returns to measuring mode if key is pressed or key is not pressed within 3 seconds while present up-date time appears.		
	Press key to enter editing mode and make the left digit flash.		
	Press key twice to set 2 to this flashing digit.		
	Press key once to shift flashing digit for editing		
	Press key twice to set 8 to this flashing digit		
	Press key to stop flashing of digit and memory the selected numbers. The display returns to measuring mode after 3 seconds automatically or by pressing key again.		

In case of setting the up-date time to be 00, this means the up-date time is equal to the sampling time.
In case of except for 00, the display shows newest measured data every up-date time passed.
But it shows newest measured data at once if the status of upper or lower output is changed by comparing calculation of every sampling time.

< DECIMAL POINT POSITIONING >

By using the decimal point positioning function, the display can shows up to the 4th digit below decimal point of measured data.
In case of the upper/lower limit type, the decimal point position of preset display shifts automatically corresponding to the decimal point of measuring display.

OPERATION	DESCRIPTION	MONITOR TYPE : F90-101 , 102 , 103	PRESET TYPE : F90-201 , 202 , 203
 + 	Whenever key is pressed while both and key are pressed, decimal point shifts and be determined.	 ↓ ↓ ↓ ↓ 	 ↓ ↓ ↓ ↓

< UPPER / LOWER LIMIT OUTPUT >

F90–201, 202, 203 can set upper lower limit to compare with measured data and to output.
For example, when output for upper limit should be at 180000 and output for lower limit should be at 9200, set upper limit for 180000 and lower limit for 9200.

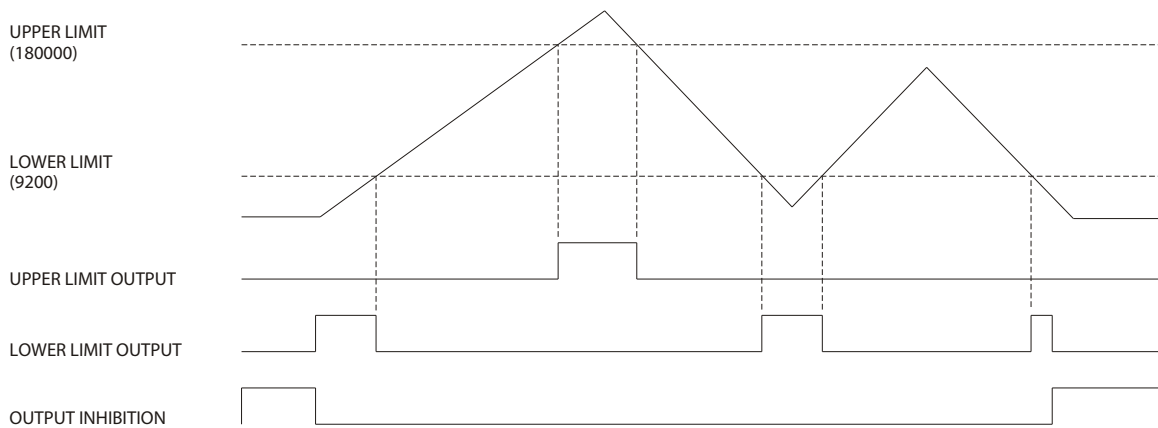
OPERATION	DESCRIPTION	UPPER LIMIT 180000
	Press key to display preset upper limit value and to turn the UL lamp.	
	Press key once to make the leftmost digit flash.	
	Press key once to set this flashing digit for 1.	
	Press key once to shift flashing digit for editing.	
	Press key twice, to set this flashing of digit for 8.	
	Press key to stop flashing of digit and to memory the selected numbers.	

OPERATION	DESCRIPTION	UPPER LIMIT 180000
	Press key to display preset lower limit value and to turn the LL lamp.	
	Press key three times to make the 4th digit.	
	Press key 9 times to set this flashing digit for 9.	
	Press key once to shift flashing digit for editing.	
	Press key twice, to set this flashing digit for 2.	
	Press key to stop flashing of digit and to memory the selected numbers.	

Regardless of up-date time, the measured data is compared with the upper/lower limit value in every sampling time. In this case, displayed data of 6 digits which is decided to be displayed by decimal point positioning function is compared with upper or lower limit data, and not displayed data is no concern with comparison.

■ MEASURED DATA AND COMPARED OUTPUT

Example : Upper Limit = 180000
Lower Limit = 9200



Upper limit \leq measured data ; make upper limit output ON and short N. O. and COM of relay (terminal No.①① and ①②).

Upper limit $>$ measured data ; make upper limit output OFF and short N. C. and COM of relay (terminal No.①③ and ①②).

Lower limit \geq measured data ; make lower limit output ON and short N. O. and COM of relay (terminal No.①④ and ①⑤).

Lower limit $<$ measured data ; make lower limit output OFF and short N. C. and COM of relay (terminal No.①⑥ and ①⑤).

If inhibition output is ON, upper limit output turn to OFF at the lowest sampling time.

■ WIRING AND REAR TERMINALS

Type	Monitor Type	Upper / Lower Limit Preset Type
Model	F90-101, 102, 103	F90-201, 202, 203
Rear Terminals	<p>* F90-103 ONLY</p>	<p>* F90-203 ONLY</p>
Power Source and Earth	<p>Supply 100 ~ 240VAC to terminal No. ⑰ and ⑱ . Earth terminal No. ⑱ in case of need.</p>	
Input	<p>CONTACT</p> <p>OPEN COLLECTOR</p> <p>VOLTAGE PULSE</p> <p>MAGNETIC SENSOR - (NPN)</p> <p>By type of input signal, set dip-switch (blue) on your right side.</p>	
Comparison Output		<p>⑪, ⑫, ⑬ : UPPER LIMIT OUTPUT ⑭, ⑮, ⑯ : LOWER LIMIT OUTPUT</p>
Output Inhibition		<p>CONTACT INPUT</p> <p>OPEN COLLECTOR INPUT</p> <p>Short terminal No. ④ and ⑤ , comparison output mode will be inhibited.</p>
Key Lock	<p>CONTACT</p> <p>OPEN COLLECTOR INPUT</p> <p>Short terminal No. ⑥ & ④ , the change of upper / lower limit and up-date time will be disabled (except monitor type). Short terminal ⑦ & ④ , the change of prescale will be displayed.</p>	
Analog Output	<ul style="list-style-type: none"> - Terminal No. ⑧ ; current output - Terminal No. ⑨ ; voltage output - Terminal No. ⑩ ; common of analog output (Select current output or voltage output) <ul style="list-style-type: none"> • Select the key of output by dip-switch (black) on your left side. • Analog output is adjusted by the volume beside dip-switch. • Analog output is converted directly from frequency of input signal, and no concerned with prescaler function. 	

Do not use the terminal No. 5, 6, 11 ~ 17 of F90-101, 102, 103 and the terminal No. 17 of F90-201, 202, 203
Writing of terminal No. 8, 9, 10 for analog output is available for model F90-103, 203 only.

■ WIRING AND REAR TERMINALS OF BCD OUTPUT

Model	F90 – 102, 202																																																																											
Pin Terminals																																																																												
Display Output	<table border="1"> <tr> <td>Pin No.</td> <td>2</td><td>3</td><td>4</td><td>5</td> <td>20</td><td>21</td><td>22</td><td>23</td> <td>6</td><td>7</td><td>8</td><td>9</td> <td>24</td><td>25</td><td>26</td><td>27</td> <td>10</td><td>11</td><td>12</td><td>13</td> <td>28</td><td>29</td><td>30</td><td>31</td> </tr> <tr> <td>Digit</td> <td colspan="4">10⁰ (digit)</td> <td colspan="4">10¹ (digit)</td> <td colspan="4">10² (digit)</td> <td colspan="4">10³ (digit)</td> <td colspan="4">10⁴ (digit)</td> <td colspan="4">10⁵ (digit)</td> </tr> <tr> <td>Code</td> <td>1</td><td>2</td><td>4</td><td>8</td> <td>1</td><td>2</td><td>4</td><td>8</td> <td>1</td><td>2</td><td>4</td><td>8</td> <td>1</td><td>2</td><td>4</td><td>8</td> <td>1</td><td>2</td><td>4</td><td>8</td> <td>1</td><td>2</td><td>4</td><td>8</td> </tr> </table> <p>Status of code 1 - 2 - 4 - 8 for every digits mean the displayed data. Display time and editing alternation time of prescale and up-date time are not correct. They are not correct when prescale or up-date time are displayed and upper / lower limit is been editing.</p>	Pin No.	2	3	4	5	20	21	22	23	6	7	8	9	24	25	26	27	10	11	12	13	28	29	30	31	Digit	10 ⁰ (digit)				10 ¹ (digit)				10 ² (digit)				10 ³ (digit)				10 ⁴ (digit)				10 ⁵ (digit)				Code	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8
Pin No.	2	3	4	5	20	21	22	23	6	7	8	9	24	25	26	27	10	11	12	13	28	29	30	31																																																				
Digit	10 ⁰ (digit)				10 ¹ (digit)				10 ² (digit)				10 ³ (digit)				10 ⁴ (digit)				10 ⁵ (digit)																																																							
Code	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8	1	2	4	8																																																				
Decimal Point Output	<table border="1"> <tr> <td>Pin No.</td> <td>14</td><td>15</td><td>16</td><td>17</td> </tr> <tr> <td>Digit</td> <td colspan="4">Decimal Point Position</td> </tr> <tr> <td>Code</td> <td>D1</td><td>D2</td><td>D3</td><td>D4</td> </tr> </table> <p>Correspond to decimal point of the display, either D1 ~ D4 will be ON. In case of no decimal point, all of them will be OFF</p>	Pin No.	14	15	16	17	Digit	Decimal Point Position				Code	D1	D2	D3	D4																																																												
Pin No.	14	15	16	17																																																																								
Digit	Decimal Point Position																																																																											
Code	D1	D2	D3	D4																																																																								
Overflow Output	When the measured data is over 6 digits, pin No. 32 will be ON. When pin No. 32 is ON, that means OVERFLOW, BCD output for displaying data are not correct.																																																																											
PC Output	All data will be renewed in every approximately 5 msec ~ 20 msec at the timing, pin No. 33 (PC) will be ON for 2 msec ±30%																																																																											
Protection	<p>Pin No. 34 (PT) is the common terminal of inside diodes to clump reverse voltage when inductance is used. Make wiring like the right figure when inductance is connected with BCD output.</p>																																																																											
Common	Pin No. 1, 18, 19, 36 (COM) are connected with inside of emitter of each open collector.																																																																											

■ DIP-SWITCHES

For Input Switch (blue)



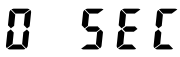




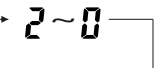











Input	No.	SW1	SW2	SW3
Open Collector Input		OFF	OFF	OFF
Voltage Input		ON	OFF	OFF
Magnetic Sensor Input		ON	ON	OFF
Contact Input		OFF	OFF	ON

For analog output range (black) F90-103, 203

Range	No.	SW1	SW2	SW3	SW4	Voltage Output	Current Output
20Hz ~ 200Hz		OFF	OFF	ON	ON	1 - 10V (frequency Hz X 0.05V)	5.6 - 20mA (frequency Hz X 0.08mA + 4mA)
200Hz ~ 2kHz		OFF	ON	OFF	OFF	1 - 10V (frequency Hz X 0.005V)	5.6 - 20mA (frequency Hz X 0.008mA + 4mA)
200Hz ~ 20kHz		ON	OFF	OFF	OFF	0.1 - 10V (frequency Hz X 0.0005V)	4.16 - 20mA (frequency Hz X 0.0008mA + 4mA)

SETTING FOR SAMPLING TIME

The sampling time can be set in the range of the following diagram.

- | KEY OPERATION | DISPLAY | NOTE |
|---|---|---|
| 1.  +  |  | The cross reference between setting value and sampling time is following diagram. |
| When the display is indicating the measuring display, press  key and  key at the same time | (Existing setting value)
* This value is set to 0 on ex-factory. | |
| 2.   → 
  →  | (If the  or  is not pressed within 3 secs, the display returns to the measuring display automatically.) | |
| Press  or  key to blink existing setting value.
By using these keys, select the favorite setting value. | | |
| 3.   | The display returns to the measuring display by pressing  key, or 3 sec later automatically. | |
| Press  key to make setting value memorize. | | |

CROSS REFERENCE BETWEEN SETTING VALUE AND SAMPLING TIME

Setting Value	Sampling Time (seconds)	Minimum Input Frequency (Hz)	Converging Time (seconds)
0	0.5 ~ 10	0.1000	10 ~ 20
9	0.5 ~ 9	0.1112	9 ~ 18
8	0.5 ~ 8	0.1250	8 ~ 16
7	0.5 ~ 7	0.1429	7 ~ 14
6	0.5 ~ 6	0.1667	6 ~ 12
5	0.5 ~ 5	0.2000	5 ~ 10
4	0.5 ~ 4	0.2500	4 ~ 8
3	0.5 ~ 3	0.3334	3 ~ 6
2	0.5 ~ 2	0.5000	2 ~ 4
1	0.5 ~ 1	1.0000	1 ~ 2

Converging time means the time duration to make the display showing 0 after input pulse ends. Shortest converging time is equal to the sampling time and longest one is double of sampling time. For a sampling time and converging time, refer to the cross reference between setting value and sampling time.

F90 SERIES BCD CABLE LEADWIRE COLOR CODING

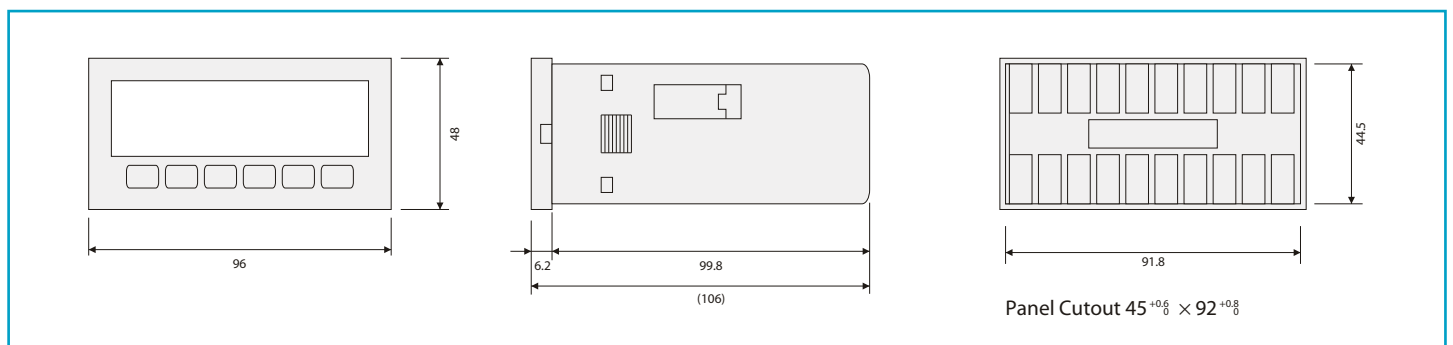
Connector Pin Number	Leadwire Color	BCD Code
1	Orange - Blue 1	GND
2	Orange - Red 1	10 ⁰ - 1
3	Gray - Blue 1	10 ⁰ - 2
4	Gray - Red 1	10 ⁰ - 4
5	White - Blue 1	10 ⁰ - 8
6	White - Red 1	10 ² - 1
7	Yellow - Blue 1	10 ² - 2
8	Yellow - Red 1	10 ² - 4
9	Pink - Blue 1	10 ² - 8
10	Pink - Red 1	10 ⁴ - 1
11	Orange - Blue 2	10 ⁴ - 2
12	Orange - Red 2	10 ⁴ - 4
13	Gray - Blue 2	10 ⁴ - 8
14	Gray - Red 2	DP - D1
15	White - Blue 2	DP - D2
16	White - Red 2	DP - D3
17	Yellow - Blue 2	DP - D4
18	Yellow - Red 2	GND

Connector Pin Number	Leadwire Color	BCD Code
19	Pink - Blue 2	GND
20	Pink - Red 2	10 ¹ - 1
21	Orange - Blue 3	10 ¹ - 2
22	Orange - Red 3	10 ¹ - 4
23	Gray - Blue 3	10 ¹ - 8
24	Gray - Red 3	10 ³ - 1
25	White - Blue 3	10 ³ - 2
26	White - Red 3	10 ³ - 4
27	Yellow - Blue 3	10 ³ - 8
28	Yellow - Red 3	10 ⁵ - 1
29	Pink - Blue 3	10 ⁵ - 2
30	Pink - Red 3	10 ⁵ - 4
31	Orange - Blue 4	10 ⁵ - 8
32	Orange - Red 4	OVF
33	Gray - Blue 4	PC
34	Gray - Red 4	PROTECT
35	White - Blue 4	
36	White - Red 4	GND

SPECIFICATIONS

Type	Monitor Type	Upper / Lower Limit Preset Type
MODEL (Additional Function)	F90-101 F90-102 (BCD output only) F90-103 (ANALOG output only)	F90-201 F90-202 (Upper Limit, Lower Limit and BCD output) F90-203 (Upper Limit, Lower Limit and ANALOG output)
Display	Red LED 14.22 × 7.8mm	Measuring Display: Red LED 10.0 × 5.5mm Preset Display: Green LED 8.0 × 4.0mm
Number of Digits	6	
Display Range	0.0001 ~ 999999	
Decimal Point Position	Maximum : Decimal point 4th	
Scale Range	0.11Hz ~ 20KHz (1 pulse/ revolution : 6.6667rpm ~ 12000rpm)	
Preset Level	_____	Upper / Lower Limit
Measuring Method	1/TAU standard sampling : X'tal 2MHz ± 50ppm	
Measuring Accuracy	±0.008% reading ±1 digit (multiplier = 1.0000, divider = 1)	
Sampling Time	0.5 ~ 9 seconds (sampling time is changed automatically by pulse interval.)	
Up-date Time	Every sampling or 1 ~ 99seconds (maximum)	
Input Signal	Contact input : sink current 2mA Open collector input : sink current 2mA Voltage input : input impedance 3KΩ Magnetic sensor input : input impedance 3KΩ	L : 0~1.9V L : 0~1.9V L : -0.6 ~ -17 H : 3.5 ~ 30V (P-P3.5Vmin.) H : 0.6 ~ 17V
Input Frequency	Contact input : 0.11Hz ~ 25Hz Open collector or Voltage input : 0.11Hz ~ 20KHz Magnetic sensor input : 0.11Hz ~ 20KHz	minimum pulse width 20μsec minimum pulse width 25μsec minimum pulse width 25μsec (L : -0.6Vmax., H : 0.6Vmin)
Prescale	Multiplier : 0.0001 ~ 100 Divider : 1/1 ~ 1/9999 (available to use at the same time)	
Overflow	At every sampling, when the measured data is over 6 digits, "-----" is displayed	
Memory	Prescale value, upper/lower limit value and up date time are reserved for 10years by E ² PROM (rewrite 10000 times)	
Keylock	Prescale value, upper/lower limit value (exclude monitor type) and up date time are inhibited to be changed. Contact input • Open collector input (sink current 7mA L : 2Vmax)	
Output Inhibition	_____	Upper / Lower Limit output inhibition Contact input • Open Collector input (sink current 7mA L : 2Vmax)
Upper / Lower Output	_____	Each 1C relay contact (250VAC 0.5A/30VDC 2A ; load)
BCD Output (For type 102, 202)	Parallel open collector negative logic output Each output 30VDC/20mA/50mW max. Output saturation voltage 0.75V (typ)/20mA Half pitch 36P connector : JAE TX20A-36R-D2LT-A1L Adapt Plug : JAE TX20A-36PH1-D2P1 1m cable accessory	
Analog Output (For type 103, 203)	Frequency voltage converter method Voltage Output : 0.1 ~ 10V (1KΩ min.) ±0.5%FS Current Output : 4.16 ~ 20mA (500Ω max.) ±0.5%FS Output Ripple : 20mVp-p max. 3 types of range, 20Hz ~ 200Hz, or 200Hz ~ 2KHz, 200Hz ~ 20KHz can be selected by dip-switches (Select voltage output or current output).	
Sensor Supply Power Source	12VDC ±10% 100mA max. (Analog output is 50mA maximum)	
Power Supply	100 ~ 240VAC -15% +10% (85 ~ 264VAC) 50/60Hz	
Power Consumption	Approximately 6VA	
Operating Temperature	-5 ~ 50°C (Non freezing)	
Operating Humidity	45 ~ 85% RH (Non condensing)	
Front Panel	IP54 standard	
Weight	Approximately 280g	

DIMENSIONS – MILLIMETERS



LINE SEIKI CO., LTD

37-7, CHUO-CHO, 2-CHOME
MEGURO-KU, TOKYO
JAPAN 152-0001
TEL: +83-3-3716-5151
FAX: +83-3-3710-4552
E-MAIL: webtrade@line.co.jp
URL: <http://www.lineseiki.com>

* Specifications Subject to Change Without Prior Notice
All Rights Reserved, Copyright © 2003
Line Seiki Co., Ltd.
2003.01.30.pokhsiA