F90 Series (Rate Indicators / Controllers)
INSTRUCTION MANUAL

FEATURES

DIN 48 ´ 96mm

DIN 48 ´ 96mm Standard
Panel Size

1 / TAU

High precision, from low speed to high speed by 1/TAU.
Measuring range is 0.11Hz ~ 20kHz.

Prescale

Multiplier and divider combinable, correspond to any revolution ratio and circumference ratio.

Monitor & Preset Type

1. Monitor type with the large display
2. Preset Type can make the upper/lower limit output.

Input

Correspond to each input mode of Contact, Open Collector, Voltage and Magnetic Sensor

Discontinued Analog Output

Analog output available as an option

Decimal Point Positioning

By selecting the decimal point position, it can display the measured data below the decimal point.

Up-Date Time

Up-date time can be set regardless of sampling time.

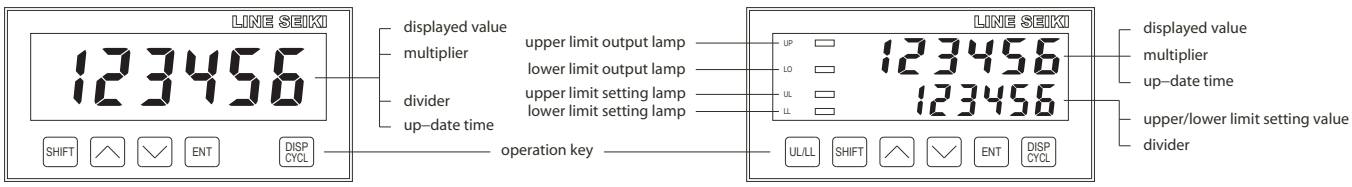
Key Lock and Output Inhibition

By easy wirings, key lock (front key operation lock) and output inhibition are available.

MODELS

MODEL	FUNCTION	NUMBER OF DIGITS	SETTING DIGITS	ADDED FUNCTION
F90–101	Monitor Type	6	—	—
Discontinued F90–103		6	—	ANALOG OUTPUT
F90–201	Preset Type	6	6	—
Discontinued F90–203		6	6	ANALOG OUTPUT

FRONT PANEL & DIP–SWITCH



UL/LL : Alternate display of upper limit and lower limit value.

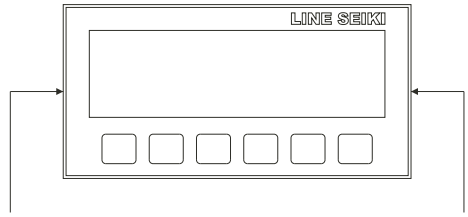
SHIFT : Enter to editing mode and change digit for editing. Display the prescale value. Used for the decimal point positioning.

: 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 : Save the setting. Display the prescale value.

DISP CYCL : Display the up–date time.



For changing of analog output range
Dip–switch (Black)

For changing of input type
Dip–switch (Black)

■ EDITING

< PRESCALE VALUE >

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

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

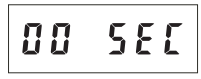
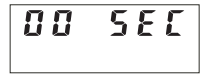
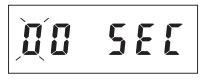
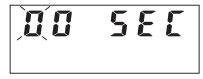
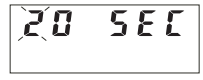
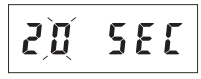
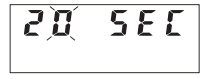
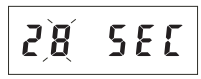
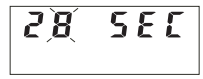
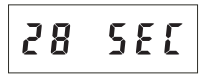
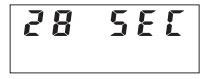
For example, in case of fitting the 200 ppr encoder on the roller whose circumference is 50 cm and making the roller's surface speed display at cm/min, set the multiplier at 50 and divider at 200.

OPERATION	EXPLANATION OF OPERATION	MONITOR TYPE : F90–101 , 103	PRESET TYPE : F90–201 , 203
ENT + SHIFT	Press SHIFT key and with ENT key pressed. Present prescale value will be displayed. The display returns to measuring mode if ENT key is pressed or SHIFT key is not pressed within 3 seconds while present prescale value appears.		
SHIFT	Press SHIFT 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.		
SHIFT	Press SHIFT key once to make the next digit flash.		
∨	Press ∨ key once to set 0 to this flashing digit		
SHIFT	Press SHIFT key 6 times or continue to press to shift the flashing digit for editing.	Press SHIFT 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.		
SHIFT	Press SHIFT key twice to shift flashing digit for editing.		
∨	Press ∨ key once to set 0 to this flashing digit.		
ENT	Press ENT key to stop flashing of digit and save the setting. The display returns to measuring mode after 3 seconds automatically or by pressing ENT 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 >

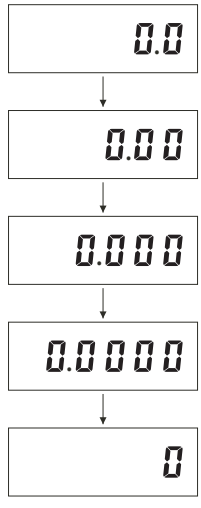
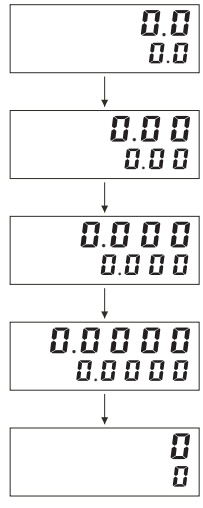
By setting the up-date time, the display can be renewed at reasonable time without renewing the display in every sampling.
For example, if you prefer that display renews every 28 seconds, set 28 for the up-date time.

OPERATION	DESCRIPTION	MONITOR TYPE : F90–101 , 103	PRESET TYPE : F90–201 , 203
DISP CYCL	Press DISP CYCL key to display present up-date time. The display returns to measuring mode if ENT key is pressed or SHIFT key is not pressed within 3 seconds while present up-date time appears.		
SHIFT	Press SHIFT key to enter editing mode and make the left digit flash.		
^	Press ^ key twice to set 2 to this flashing digit.		
SHIFT	Press SHIFT key once to shift flashing digit for editing		
v	Press v key twice to set 8 to this flashing digit		
ENT	Press ENT key to stop flashing of digit and save the setting. The display returns to measuring mode after 3 seconds automatically or by pressing ENT 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 show up to 4 digits after the 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 , 103	PRESET TYPE : F90–201 , 203
^ v + SHIFT	Whenever SHIFT key is pressed while both ^ and v 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 you need output when measured data is above 180000 and below 9200, set upper limit for 180000 and lower limit for 9200.

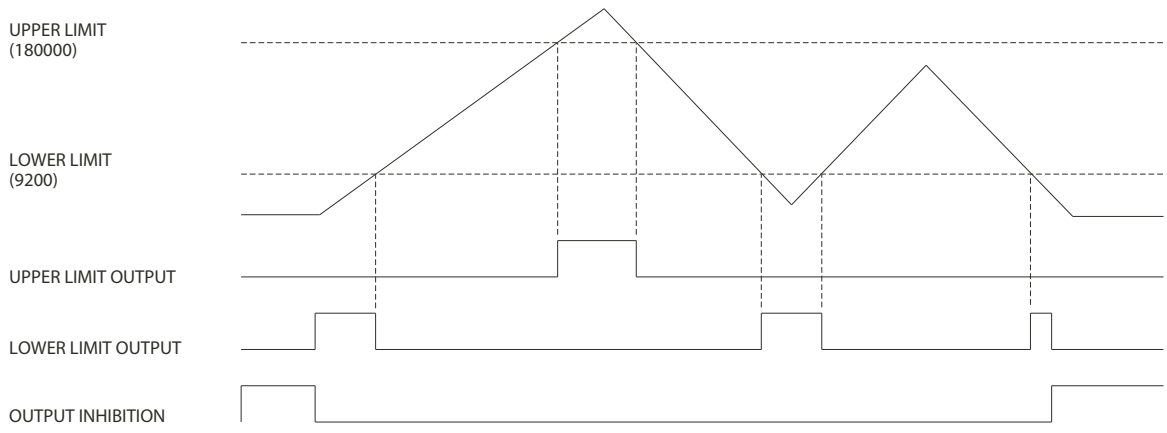
OPERATION	DESCRIPTION	UPPER LIMIT 180000
UL/LL	Press [UL/LL] key to display preset upper limit value and to turn the UL lamp.	0 / UL 0
SHIFT	Press [SHIFT] key once to make the leftmost digit flash.	0 / UL 000000
^	Press [^] key once to set this flashing digit for 1.	0 / UL 100000
SHIFT	Press [SHIFT] key once to shift flashing digit for editing.	0 / UL 100000
v	Press [v] key twice, to set this flashing of digit for 8.	0 / UL 180000
ENT	Press [ENT] key to stop flashing of digit and to memory the selected numbers.	0 / UL 180000

OPERATION	DESCRIPTION	UPPER LIMIT 180000
UL/LL	Press [UL/LL] key to display preset lower limit value and to turn the LL lamp.	0 / LL 0
SHIFT	Press [SHIFT] key three times to make the 4th digit.	0 / LL 000000
v	Press [v] key 9 times to set this flashing digit for 9.	0 / LL 009000
SHIFT	Press [SHIFT] key once to shift flashing digit for editing.	0 / LL 009000
^	Press [^] key twice, to set this flashing digit for 2.	0 / LL 009200
ENT	Press [ENT] key to stop flashing of digit and to memory the selected numbers.	0 / LL 9200

Regardless of up-date time, the measured data is compared with the upper/lower limit value in every sampling time.
The upper/lower limit is compared with the displayed data whose number of digits is determined by decimal point positioning function.
Digits undisplayed are not included in this comparison.

■ MEASURED DATA AND COMPARED OUTPUT

Example : Upper Limit = 180000
Lower Limit = 9200



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

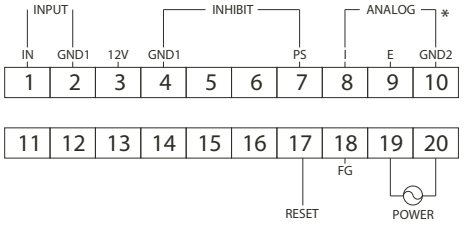
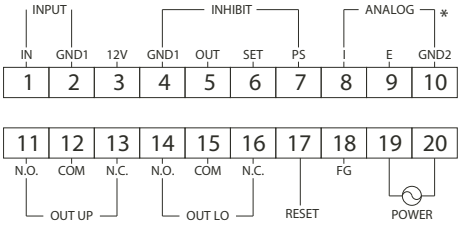
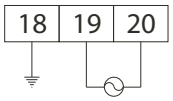
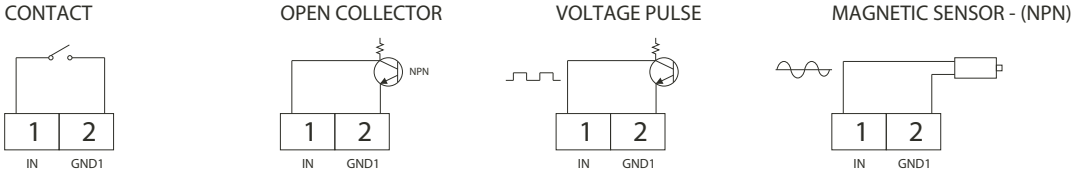
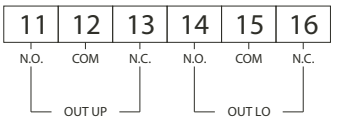
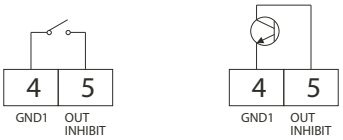
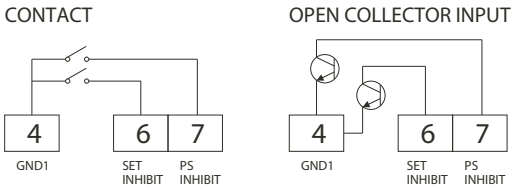
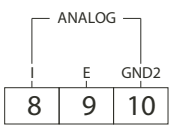
Upper limit > measured data ; make upper limit output OFF and short N. C. and COM of relay (terminal No.⑬ and⑫).

Lower limit ≧ 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 and⑮).

If output inhibition is ON, upper / lower limit output turns OFF at the sampling time.

■ WIRING AND REAR TERMINALS

Type	Monitor Type	Upper / Lower Limit Preset Type
Model	F90–101, 103	F90–201, 203
Rear Terminals	 * F90–103 ONLY	 * F90–203 ONLY
Power Source and Earth	 Supply 100 ~ 240VAC to terminal No. (19) and (20) . Earth terminal No. (18) in case of need.	
Input	 By type of input signal, set dip-switch (Black) on your right side.	
Comparison Output	———	 (11) , (12) , (13) : UPPER LIMIT OUTPUT (14) , (15) , (16) : LOWER LIMIT OUTPUT
Output Inhibition	———	CONTACT INPUT OPEN COLLECTOR INPUT  Short terminal No. (4) and (5) , comparison output mode will be inhibited.
Key Lock	 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 disabled.	
Analog Output	 - Terminal No. (8) ; current output - Terminal No. (9) ; voltage output - Terminal No. (10) ; common of analog output (Select current output or voltage output) • Analog output range is selected by 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 declines prescaler function.	

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

■ SETTING FOR SAMPLING TIME

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

KEY OPERATION | DISPLAY | NOTE

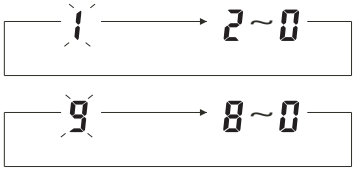
1. [ENT] + [DISP CYCL]

When the display is in the measuring mode, press [ENT] key and [DISP CYCL] key at the same time

(Existing setting value)
* This value is set to 0 on ex-factory.

The cross reference between setting value and sampling time is shown in the table below.

2. [△] / [▽]



Press [△] or [▽] key to blink existing setting value.
By using these keys, select the favorite setting value.

(If the [△] or [▽] is not pressed within 3 secs, the display returns to the measuring mode automatically.)

3. [ENT]

Press [ENT] key to save the setting.

The display returns to the measuring mode by pressing [ENT] key, or 3 sec later automatically.

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 show 0 after input pulse ends. Shortest converging time is equal to the sampling time and longest one is double of sampling time.

■ DIP–SWITCHES

For Input Switch (Black)

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

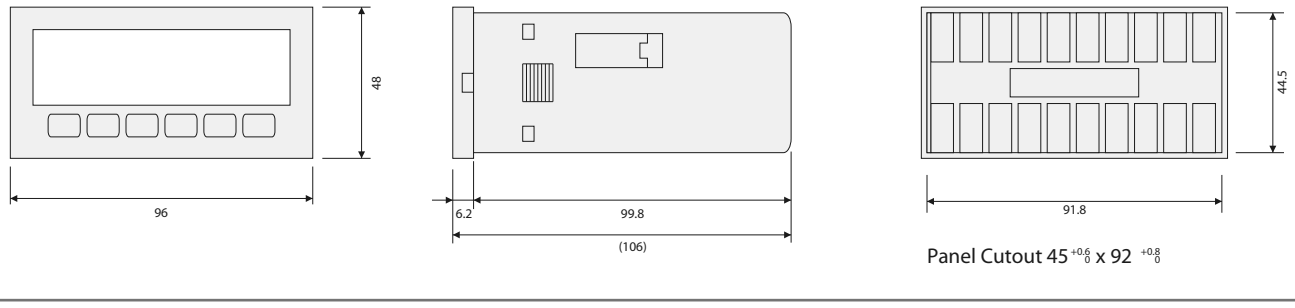
For analog output range (Black) F90–103, 203

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)
20Hz - 2kHz	OFF	ON	OFF	OFF	0.1 - 10V (frequency Hz x 0.005V)	4.16 - 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)

■ 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 x 7.8mm	Measuring Display: Red LED 10.0 x 5.5mm Preset Display : Green LED 8.0 x 4.0mm
Number of Digits	6	
Display Range	0.0001 - 999999	
Digits after Decimal Point	Maximum : 4th decimal places	
Scale Range	0.11Hz - 20KHz (1 pulse / revolution : 6.6667rpm - 120000rpm)	
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 L : 0 - 1.9V Voltage input : input impedance 3KΩ L : 0 - 1.9V H : 3.5 - 30V (P-P3.5Vmin.) Magnetic sensor input : input impedance 3KΩ L : -0.6 - -17 H : 0.6 - 17V	
Input Frequency	Contact input : 0.11Hz - 25Hz minimum pulse width 20µsec Open collector or Voltage input : 0.11Hz - 20KHz minimum pulse width 25µsec Magnetic sensor input : 0.11Hz - 20KHz 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 E²PROM (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 Plague : 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



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*Subject to change without prior notice.