

## Description

CS1-F economic Frequency Indicator is equipped with high accuracy measurement, display and communication of frequency.

It features user-defined range of frequency input, 0.01Hz~ 100KHz ( optional purchase for ~140KHz), and the display resolution will change based on the maximum input frequency.

It allows to purchase one optional set of relay output, analogue output, or RS-485(Modbus RTU Mode) communication port, and such diversal interface provides many functions to control, alarm, remote communication, and relevant application.



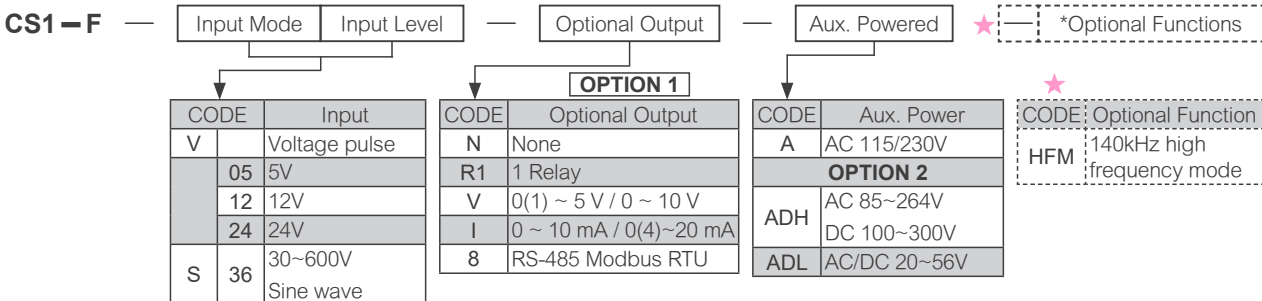
## Features

- Measuring frequency range: 0.01~100KHz; ~140KHz (optional purchase); voltage pulse or sine wave (specified spec).
- Accuracy:  $\pm 0.005\%$ ; display range: 0~99999; automatically move the decimal point according to the setting range.
- Optional to purchase only one of them: 1 relay output, 1 analogue output, or RS-485 communication port
- 1 relay can be programmed individually to be a Hi / Lo / Hi Hold / Lo Hold / Start Delay / Hysteresis / Energized & De-energized Delay functions.
- CE Approved & RoHS

## Applications

- MCC panel, switch gear... for frequency measurement; work with PC/PLC for remote I/O control and alarm
- Testing Equipments for Frequency Measuring, Alarm or Communication with PC/PLC

## Ordering Information



## Measurement and Wiring

Input Frequency	Input Mode	Input Level
0.01Hz ~ 50 Hz	Voltage Pulse	High Level: over 2/3 of input level
0.01Hz ~ 100KHz		Low Level: under 1/3 of input level
0.01Hz ~ 140KHz (option)	Sine Wave	

## Technical Specification

### Input

Input range: regular range: 0.01Hz ~ 100KHz (optional purchase: ~140KHz)

Accuracy:  $\leq \pm 0.005\%$  of FS  $\pm 1C$ ;

Sampling time: 15 cycles/sec( $\geq 15Hz$ ); f cycles/sec( $\leq 15Hz$ )

Response time:  $\leq 100$  mS (when the AvG = "1" )

Time out function: auto, manual; settable range in manul mode 0.0 sec~999.9sec

### Display & Functions

LED: Numeric: 5 digits, 0.8" (20.0mm)H red high-brightness LED

Relay output indication: 1 square red LED

RS-485 communication: 1 square orange LED

E.C.I. function indication: 1 square green LED

Max/Mini Hold indication: 2 square orange LED

Down key function indication (Reset for Max.(Mini.) Hold / PV Hold / Rel. PV ): 1 square green LED

Display range: 0.0000~99999 (automatically move the decimal point)

Resolution of PV: automatically move the decimal point according to the setting range; Auto-Moving for d.p.; auto / semi-auto / fix; 3 modes programmable

Compensation factor: compensating error from 0.001~9.999

Over range indication:  $ouFL$ , when input is over 20% of input range Hi

Max / Mini recording: Maxi & Mini Value of PV storage during power on.

Display functions: PV / Max(Mini) Hold / RS-485 programmable  
 Front key functions: Relative PV / PV Hold / Reset for maxi(mini) hold / Reset for relay energized latch programmable  
 Low cut: Settable range: -19999~29999 counts  
 Digital fine adjustment: P<sub>uP</sub>r<sub>o</sub>: Settable range: 0~+99999  
 P<sub>uS</sub>P<sub>n</sub>: Settable range: 0~+99999

### Reading Stability Function

Average: Settable range: 1~99 times  
 Moving average: Settable range: 1(None)~10 times  
 Digital filter: Settable range: 0(None)/1~99 times

### Control Functions (Optional)

Set-points: One set-point  
 Control relay: 1 Relay, FORM-C, 5A/230Vac, 10A/115V  
 Relay energized mode: Energized levels compare with set-points: Hi / Lo / Hi.HLd / Lo.HLd programmable  
 Energizing functions: Start delay / Energized & De-energized delay / Hysteresis / Energized Latch  
 Start band(Minimum level for Energizing): 0~9999counts  
 Start delay time: 0:00.0~9(M):59.9(S)  
 Energized delay time: 0.00.0~9(M):59.9(S)  
 De-energized delay time: 0.00.0~9(M):59.9(S)  
 Hysteresis: 0~5000 counts

### Analog Output (Optional)

Accuracy:  $\leq \pm 0.1\%$  of F.S.;  
 Ripple:  $\leq \pm 0.1\%$  of F.S.  
 Response time:  $\leq 100$  mS (10~90% of input)  
 Isolation: AC 2.0 KV between input and output  
 Output range: Specify either voltage or current output when ordering  
 Voltage: 0~5V / 0~10V / 1~5V programmable  
 Current: 0~10mA / 0~20mA / 4~20mA programmable  
 Output capability: Voltage: 0~10V:  $\geq 1000\Omega$ ;  
 Current: 4(0)~20mA:  $\leq 500\Omega$  max  
 Functions: R<sub>o</sub>H5 (output range high): Settable range: 0~99999  
 R<sub>o</sub>L5 (output range Low): Settable range: 0~99999

Digital fine adjustment: R<sub>o</sub>P<sub>r</sub>o: Settable range: -38011~27524  
 R<sub>o</sub>S<sub>P</sub>n: Settable range: -38011~27524

### RS-485 Communication (Optional)

Protocol: Modbus RTU mode  
 Address: 1 ~ 255  
 Baud Rate: 1200/2400/4800/9600/19200/38400 bps  
 Data Bits: 8 bits  
 Parity: Even, odd or none  
 Stop bit: 1 or 2  
 Remote display: to show the value from RS-485 command of master  
 Distance: 1200M

### Safety

Dielectric strength: AC 2.0 KV for 1 min, Between Power / Input / Output / Case  
 Insulation resistance:  $\geq 100M\Omega$  @ 500Vdc, Between Power / Input /

Output  
 Isolation: Between Power / Input / Relay, Analog, RS-485  
 EMC: EN 55011:2002; EN 61326:2003  
 Safety(LVD): EN 61010-1:2001

### Environmental Conditions

Operating Temp.: 0~60 °C  
 Operating humidity: 20~95 %RH, Non-condensing  
 Temp. coefficient:  $\leq 100$  PPM/°C  
 Storage Temp.: -10~70 °C  
 Enclosure: Front panel: IEC 529 (IP52); Housing: IP20

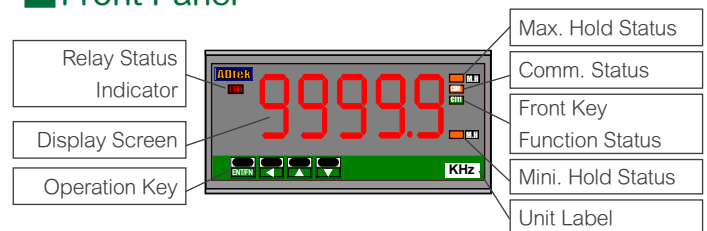
### Mechanical Structure

Dimensions: 96mm(W) x 48mm(H) x 80mm(D)  
 Panel cutout: 92mm(W) x 44mm(H)  
 Case material: ABS fire-resistance (UL 94V-0)  
 Mounting: Panel flush mounting  
 Terminal block: Plastic NYLON 66 (UL 94V-0)  
 10A 300Vac, M2.5, 1.3~2.0mm<sup>2</sup>(16~22AWG)  
 Weight: 350g

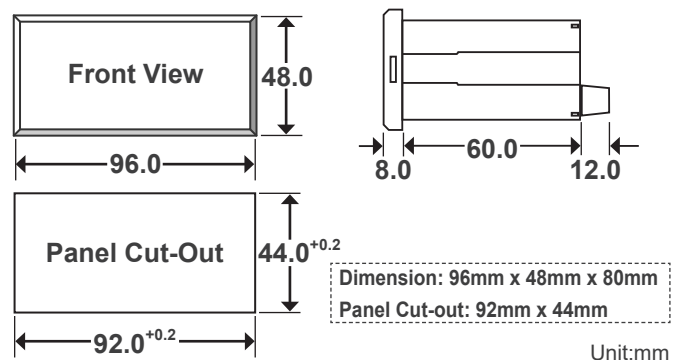
### Power Supply

Power supply: AC115/230V,50/60Hz  
 Optional: AC 85~264V / DC 100~300V or AC/DC 20~56V  
 Power consumption: 3.0VA maximum  
 ADH/ADL: 8VA/4.0W  
 Memory storage: By EEPROM

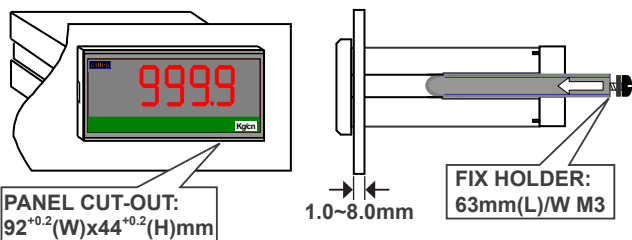
## Front Panel



## Dimensions

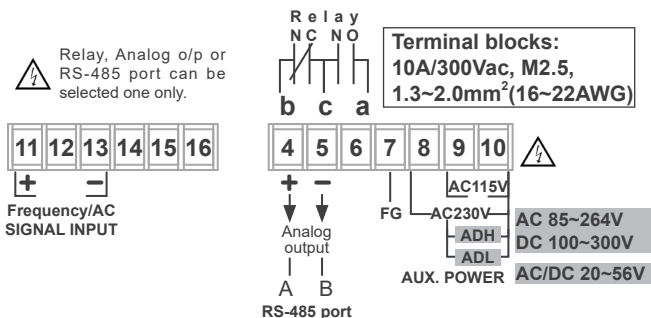


## Installation



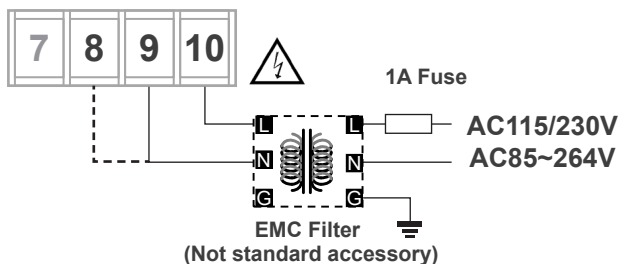
The meter should be installed in a place where it does not exceed the maximum operating temperature and provides good air circulation.

## Terminal Block

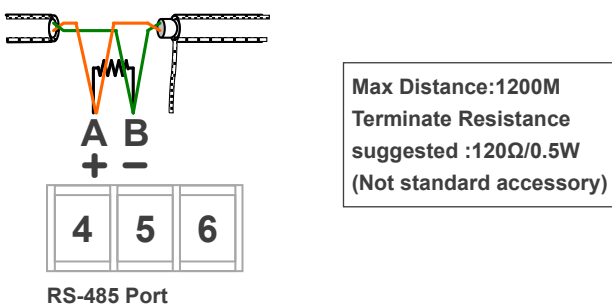


⚠ Please check the voltage of power supplied first, and then connect with the specified terminals. It is recommended that power supplied to the meter be protected by a fuse or circuit breaker.

## Power Connection



## RS-485 Communication Port



## Function Description

### Input Functions

Input range: regular range (user-defined): 0.01Hz ~ 100KHz  
 (optional purchase: ~140KHz)

It can satisfy the application requirement of RPM, linear speed, and frequency, so the users don't need to specify the input range.

Auto range display: programmable between auto range / semi-auto range / manual range; the description is as below,

Auto range **[Auto]**: The decimal point will automatically move up according to the input frequency to keep high-resolution reading.

Semi-Auto range **[SEn]**: The decimal point will automatically move up according to the input frequency to keep high-resolution reading. It shows "overflow" if the input frequency is over the display range.

Manual range **[RRnUL]**: Fixed decimal point

Time out of input:

In the case of low frequency, the meter can not to identify that is low frequency and no input until the next pulse input. Sometimes, it takes a long period.

The meter builds in a time out function to cut out the reading to be "0".

There are two modes **[RRnUL]** / **[Auto]** can be programmed.

Manual **[RRnUL]**: There is a period named **[t.o]** can be set from 0.0 sec~999.9sec. The reading will display "0", when the next pulse doesn't input during the setting time.

Auto range **[Auto]**: The reading will display "0", when the next pulse doesn't input during the time that gave by formula of meter's firmware.

Period of time out: Settable: 0.0 sec~999.9sec  
 If the time out mode **[t.o.n.d]** set to be **[RRnUL]**, it shows **t.o.**

## Display & Functions

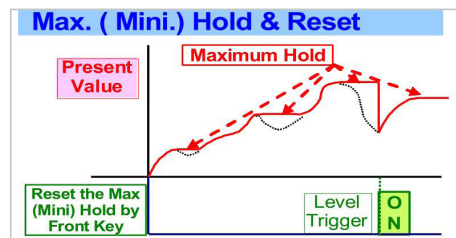
Max / Mini recording: The meter will store the maximum and minimum value in [ User Level] during power on to review drifting of PV.

Display functions: PV / Max(Mini) Hold / RS-485 programmable in (Please refer to step A-07)

Present Value **[PV]**: The display will show the value of the Input signal.

Maximum Hold **[MaxHd]** / Minimum Hold **[MinHd]**: The meter will keep display in maximum (minimum) value during power on until manual reset by front key in [ User Level]. If rear terminal(DI) is closed, then please press front down or up key to reset.

▶ Please find the sticker enclosed in the package, and stick it to the right side of square orange LED.



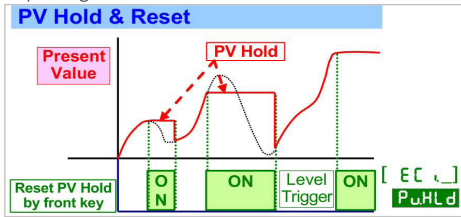
Remote display by RS-485 command **[5485]**  
 The meter will show the value that received from RS-485 sending. In past, The meter normally receive 4~20mA or 0~10V from AO or digital output from BCD module of PLC. We come up with a cost saving solution that PV shows the value through RS-485 command of master.

Front key functions: Relative PV / PV Hold / Reset for maxi(mini) hold / Reset for relay energized latch programmable in [d.n.E.Y] function of [r.n.P.U.E.G.r.o.U.P] Relative PV [F.E.L.P.V] : [d.n.E.Y] function can be set to be [F.E.L.P.V] function. When user press the [E.C.] key, the display will show the differential value( $\Delta$ PV), until press [E.C.] key again.

▶ Please find the [R.P.V] sticker to stick on the right side of square green LED.

PV Hold [P.U.H.L.d] : [d.n.E.Y] function can be set to be [P.U.H.L.d] function. When user press the [E.C.] key, the display will be hold until press the [E.C.] key again.

▶ Please stick [P.V.A] sticker to the right side of square green LED.

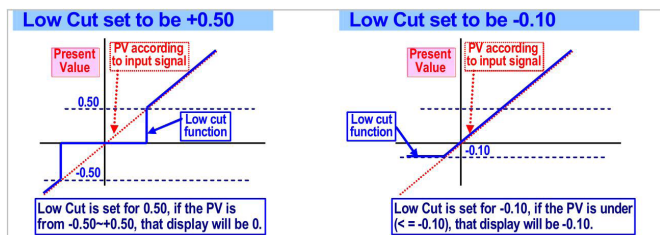


Reset for Max(Mini) Hold: when the [d.S.P.L.Y] in [r.n.P.U.E.G.r.o.U.P] set to be [H.H.L.d] or [L.o.H.L.d], [d.n.E.Y] function can be set to be [r.Y.S.E] to reset.

Reset for relay energized latch: when the [r.Y.i.n.d] in [r.E.L.R.Y.G.r.o.U.P] set to be [H.H.L.d] or [L.o.H.L.d], [d.n.E.Y] function can be set to be [r.Y.S.E] to reset the relay when it is energizing and latching.

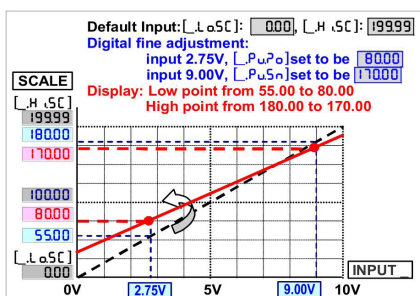
Low cut:

If the setting value is positive, it shows "0",  $|PV| \leq$  setting value; if the setting value is negative, it shows "setting value",  $|PV| \leq$  setting value.



Digital fine adjustment:

In the past, the engineers had to spend lots of time on adjusting high/low values to meet the requirement. With the functions of [P.u.P.o] and [P.u.S.P.n], the users can set the corresponding values with "Just Key in Values" according to actual needs. Also, users can clear the adjusted value with the function of [P.S.C.L.r].

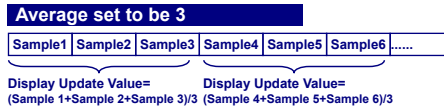


Compensation factor : Settable range: 0.001~9.999

## Reading Stability Function

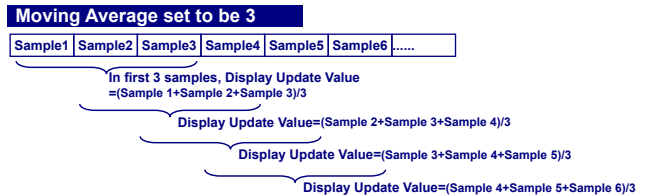
Average:

Basically, the sampling rate of meter is 15cycles/sec. If the function set to be 3 times, It means the meter will update the reading 5 times/sec.



Moving average:

If the function was set to be 3 times, the meter will update delay in first 3 samples, then update 15 times/sec continuously.



Digital filter:

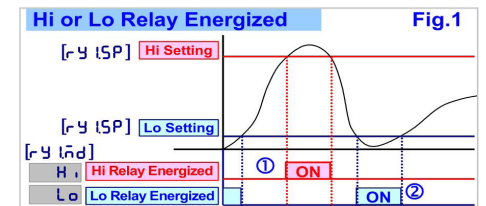
The digital filter can reduce the magnetic noise in field.

## Control Functions (optional)

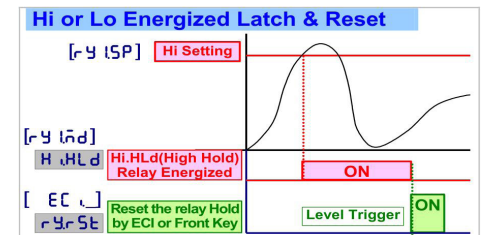
Relay energized mode: Hi / Lo / Hi.HLd / Lo.HLd programmable

H : Relay will energize when PV > Set-Point

L o : Relay will energize when PV < Set-Point

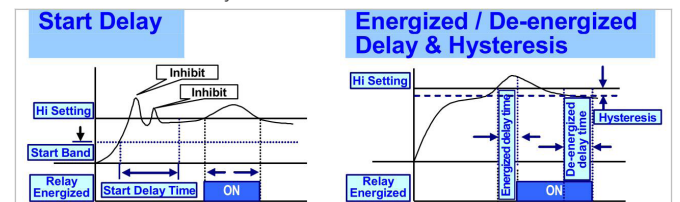


Hi.HLd (Lo.HLd): When the PV is Higher (or lower) than set-point, the relay will be energized and latch until manual reset by from key in [user level] down key to reset (If the [d.n.E.Y] function set to be [r.Y.S.E])



Energized functions: Start delay / Energized & De-energized delay /

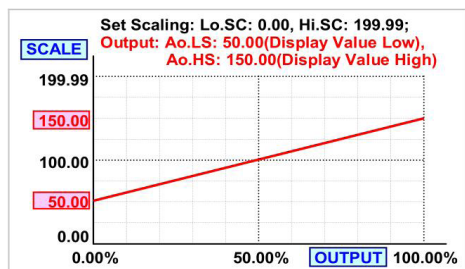
Hysteresis



## Analog Output (optional)

Please specify the output type, 0~10V or 4(0)~20mA when ordering. The programmable output will correspond to low value and high value according to the setting value. The users can also set reverse output value (lower limit of the signal to high value; higher limit of the signal to low value).

- Output range: Voltage: 0~5V / 0~10V / 1~5V programmable  
 Current: 0~10mA / 0~20mA / 4~20mA programmable
- Functions:  $R_{o.H.S}$  (output range high): setting the Display value High to versus output range High (as like as 20mA in 4~20)
- $R_{o.L.S}$  (output range Low): setting the Display value Low to versus output range Low (as like as 4mA in 4~20)



The range between  $R_{o.H.S}$  and  $R_{o.L.S}$  should be over 20% of span at least, otherwise, it will lower the resolution of analog output.

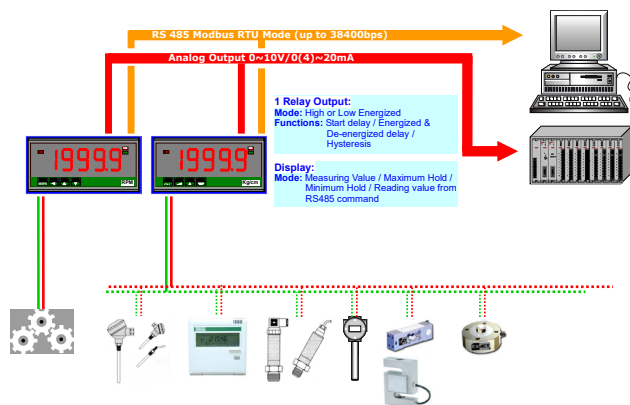
### Fine zero & span adjustment:

Users can do Fine Adjustment for analog output with front keys of the meter. Please connect standard meter with the terminal of analog output. Press the front key (UP or DOWN key) of the meter to adjust and check the output.

- $[R_{o.Z.R.o}]$ : Fine Zero Adjustment for Analog Output;  
 Settable range: -38011~27524;
- $[R_{o.S.P.n}]$ : Fine Span Adjustment for Analog Output;  
 Settable range: -38011~27524;

## RS-485 Communication (optional)

The protocol of RS-485 is Modbus RTU mode, and baud rate is up to 38400 bps. It offers remote monitoring, and display.

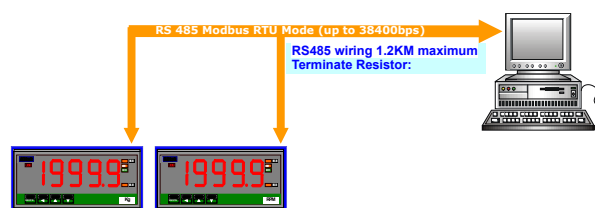


### Remote display:

The meter will show the value that received from RS-485 command. In past, The meter normally receive 4~20mA or 0~10V from AO or digital output from BCD module of PLC. We come up with a cost saving solution that PV value shows on the panel through RS-485 command of master.

When the  $[d5P.L.y]$  is set to be RS-485, it means the screen will show the values through RS-485 command & data. The data is the same as PV that will be compared with the set-point for relay action; analog output corresponding to the outputs.

### CS1 PROCEED REMOTE DISPLAY THROUGH RS-485



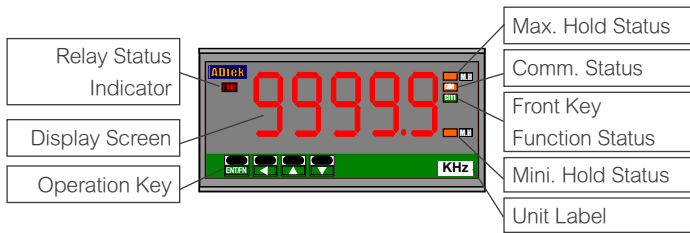
## Error Message

Please check the specification and connection, and turn on the meter to proceed self-inspection.

Self-diagnosis and error code:

Display	Description	Remark
ouFL	Display is positive-overflow (Signal is over display range)	(Please check the input signal)
-ouFL	Display is negative-overflow (Signal is under display range)	(Please check the input signal)
ouFL	ADC is positive-overflow (Signal is higher than input 120%)	(Please check the input signal)
-ouFL	ADC is negative-overflow (Signal is lower than input -120%)	(Please check the input signal)
EEP ↔ FR.L	EEPROM occurs error	(Please send back to manufactory for repaired)
R.i.nC ↔ Pu	Calibrating Input Signal do not process	(Please process Calibrating Input Signal)
R.i.C ↔ FR.L	Calibrating Input Signal error	(Please check Calibrating Input Signal)
R.o.nC ↔ Pu	Calibrating Output Signal do not process	(Please process Calibrating Output Signal)
R.o.C ↔ FR.L	Calibrating Output Signal error	(Please check Calibrating Output Signal)

## Front Panel



### Numeric Screens

0.8" (20.0mm) red high-brightness LED for 5 digital present value.

### I/O Status Indication

- Relay Energized: 1 square red LED  
RLI display when Relay 1 energized;
- RS-485 Communication: 1 square orange LED  
COM will flash when the meter is receive or send data, and COM flash quickly means the data transient quicker.
- Max/Mini Hold indication: 2 square orange LEDs  
M.H displayed: When the display function has been selected in Maximum or Minimum Hold function.

### Stickers:

Each meter has a sticker what are functions and engineer label enclosure.

- Relay energized mode: **HH HI Lo LL DO**
- Down key functions mode:  
**PV.H** PV.H(PV Hold) / **Tare** Tare / **DI** DI(Digital Input)  
**M.RS** M.RS(Maximum or Minimum Reset) /  
**R.RS** R.RS(Reset fo Relay Latch)
- Engineer Label: over 80 types.

Operating Key: 4 keys for **ENTER** Enter(Function) / **ESC** Shift(Escape) / **↑** Up key / **↓** Down key

	Setting Status	Function Index
<b>↑</b> Up key	Increase number	Go back to previous function index
<b>↓</b> Down key	Decrease number	Go to next function index
<b>ESC</b> Shift key	Shift the setting position	Go back to this function index, and abort the setting
<b>ENTER</b> Enter/Fun key	Setting Confirmed and save to EEPROM	From the function index to get into setting status

Password: Settable range:0000~9999;

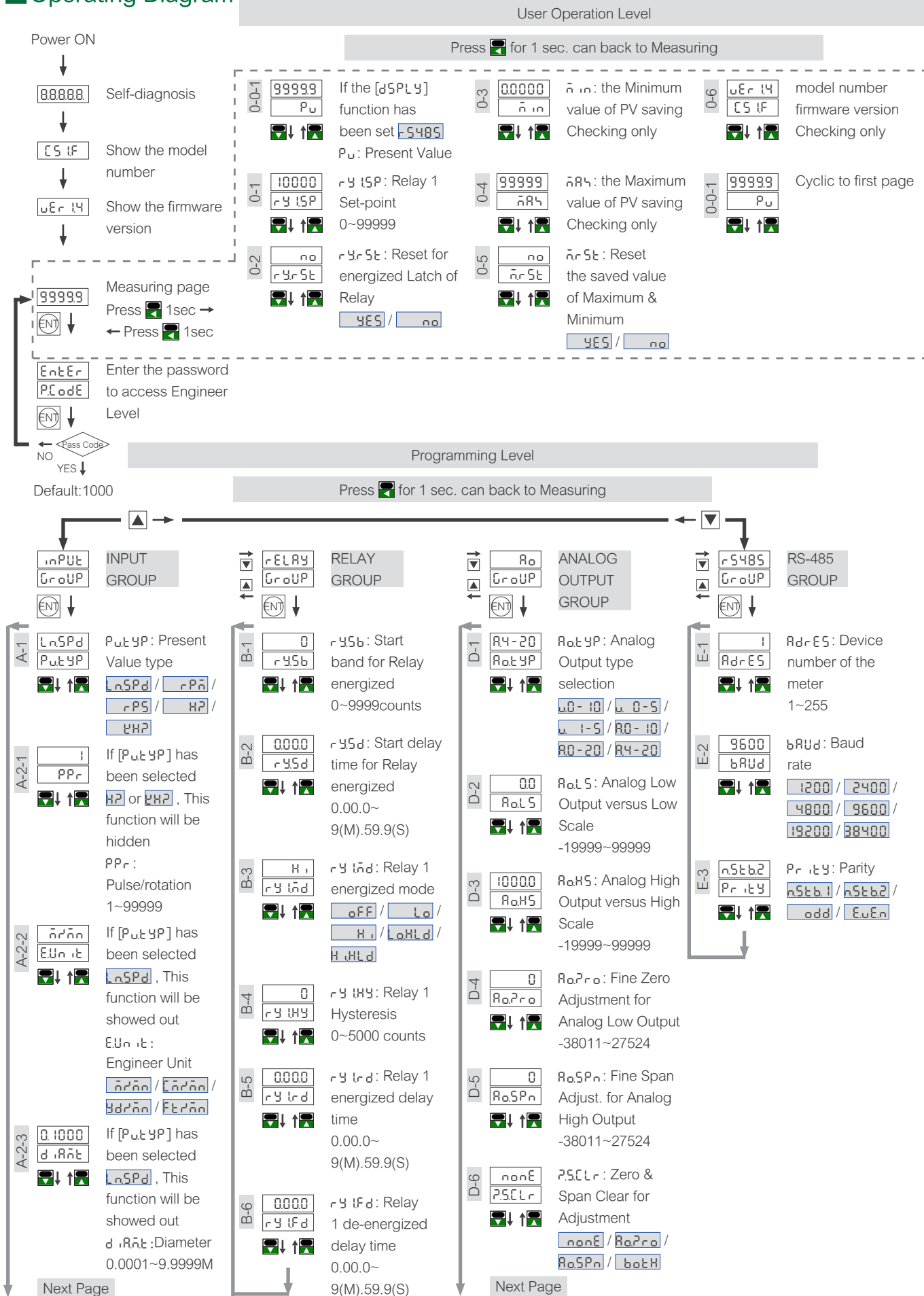
User has to key in the right pass word so that get into [Programming level]. Otherwise, the meter will go back to measuring page. If user forget the password, please contact with the service window.

- Function Lock: There are 4 levels programmable.
- None **nonE**: no lock all.
- User Level **USER**: User Level lock. User can get into User Level for checking but setting.
- Programming Level **ENG**: Programming level lock. User can get into programming level for checking but setting.
- ALL **ALL**: All lock. User can get into all level for checking but setting.

Front Key Function:

- The **ENTER** Key can be set to be **FELPu** / **PuHLd** / **r.rSt** / **r.rSt** programmable.

**Operating Diagram** (please refer to last pages for more details about the operation.)



- A-3  dP: Decimal Point of set-point
- A-4  FRCtr: Compensation Factor
- A-5  PUSPn: Fine High point Adjustment for PV display
- A-6  SCLR: Clear Fine Span Adjustment for PV display
- A-7  dSPLY: Display Function
- A-8  LoCut: Low Cut Function
- A-9  tOnd: Input time out Mode
- A-10  If [ tOnd ] has been selected nRnUL, This function will be showed out
- A-11  rRnGE: Reading Range with decimal point switching.
- A-12  RUC: Average update for PV
- A-13  nRUC: Moving Average update for PV
- A-14  dF, dL: Digital filter
- A-15  dnKEY: Down key function
- A-16  PCode: Pass Code for enter Engineer Level
- A-17  FLoLk: Function Level Lock

D-7  ROLnE: Analog Output High Limit