

**INSTRUCTION MANUAL  
FOR  
BATTERY OPERATED  
ELECTROMAGNETIC  
FLOW METER  
MODEL NO. :- ELMAG-600**

## SAFETY WARNING & GENERAL INSTRUCTIONS

1. Only qualified and authorized person shall carry out installation, connections, commissioning and service.
2. Read User manual carefully and understand instructions & directions provided in this manual.
3. Only Electronet representative may carry out any repair work and service.
4. To protect instrument from any external hazards, customer should take necessary care while preparing site ready before installation.
5. Lithium batteries are used as power source of the Instrument. They are of Non-Rechargeable type and having higher Amp Hour capacity. They are dangerous if used carelessly.
6. Do not attempt to charge batteries. Do not short circuit batteries. Always connect batteries with 200mA series fuse.
7. Always connect batteries with correct polarities. Do not attempt to crush, puncture or open battery cell.
8. Do not expose batteries to excessive heat and or water. Do not attempt to solder battery body.
9. Batteries should be removed before transporting Instrument. Also batteries should be transported with special packaging.
10. Batteries shall be replaced within two months time, from LOW BAT LED starts blinking.

## FEATURES:

1. **Low Battery Indication:** When approximately 85% of battery power detected consumed. Red LED on Keypad starts blinking.
2. **Over Range Display:** When Flow Rate or Totaliser value is beyond display Limit, "OVER" message is displayed.
3. **Reverse Flow Indication:** Reverse Flow is indicated by 'R' with flow value on display. When Flow is in reverse direction Totaliser value is not updated.
4. **Auto LCD Display Off:** After 10 minutes, from last key board operation.
5. **Data Storage:** Totaliser is saved at 11.30PM everyday in to EEPROM.
6. **Low Flow Setting:** Low Flow value set by user is compared with flow rate and if flow rate found lower than Low Flow value totaliser is not updated.
7. **Unit Conversion:** User can set display units for flow rate & Totaliser as per requirement.
8. **Real Time Clock:** ELMAG-600 has built in RTC, with battery. Date & time display facility available in Run Mode.
9. **Communication:** (Optional) ELMAG-600 comes with one RS232 port.
10. **Magnetic (Reed) Switch:** ENTER key comes with parallel Reed Switch. User can switch LCD display ON or toggle display between flow rate & Totaliser value, by using small magnet without opening instrument enclosure.
11. **Logged Data View Facility :** In program mode logged data (totaliser value) can be viewed by date.

## INTRODUCTION

ELMAG-600 is a battery-powered electromagnetic flow meter, its design and functionality is implemented such that to reduce power consumption and to increase battery life. Instrument measures flow for 4 sec in every 10 seconds cycle. Only for these 4 seconds sensors are powered ON. For every reading 10 samples are gathered, sorted & averaged, and flow rate is calculated (in LPM). Instrument updates LCD display after every 10 seconds. Totaliser value is updated every second. Totaliser value is stored in Liters. Separate unit settings are provided for Flow & Totaliser, so that user can see display value in unit of his choice.

At every 10-second cycle instrument detects MT Pipe signal once, if MT pipe is detected, Sensor supply is deactivated further and no flow sampling & calculations are performed but the flow rate is set to zero. Again when filled pipe is detected, instrument continues with regular operations of sampling & calculation.

After every 10 minutes Instrument checks battery status. When approximately 85% of battery power found consumed, instrument indicates low battery by making LOW BAT LED ON for 1 sec in every 10 sec cycle. Once LOW BAT LED starts blinking user should replace battery within 2 months of time. LCD display is turned OFF after 10 minutes of time from last keyboard operation. LCD can be switched ON anytime by pressing ENTER key.

During Parameter mode operations all the flow measurement operations are continued except flow rate or Totaliser value is not displayed. ELMAG-600 is having in built RTC, with RTC ALARM instrument stores one Totaliser value every day in to EEPROM at 11.30PM. Instrument allows saved Totaliser data downloading through RS232 Port, this can be done with separate Down loader hardware or directly connecting PC & running Down Loader application program. RS232 settings are fixed & instrument uses proprietary protocol for serial communication.

If Instrument detects power failure, power fail early warning is generated and Totaliser value is saved in to EEPROM. At next power on, instrument loads earlier saved Totaliser value. As instrument detects power failure, if power is failed for the fraction of time due to loose contact (break & make contact), Instrument may go in to error condition and LOW BAT LED will lit continuously. To pull Instrument in to normal operating mode, instrument should be powered off by disconnecting battery supply for 3 minutes and again powered on.

Magnetic key Reed Switch is provided . By using small magnet user can operate key without opening enclosure cover.

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## 1. TECHNICAL SPECIFICATIONS

SPECIFICATIONS	DESCRIPTION
Instrument Name	Battery Operated Electromagnetic Flowmeter
Model No.	ELMAG-600
Line Size	16" (400NB)
Process Connection	16" ASA 150 Flange
Serial No.	M-170273
Media	Water
Communication (Optional)	GSM Communication
Display	8 x 1 Alphanumeric LCD - 4 digit for Flow Rate & 8 digit for Totalised Flow
Calibration Range	0 to 2714.34 m <sup>3</sup> /hr
Power Supply	Battery Powered
Battery Type	Non -Rechargeable ER341254 (DD 3.6V)35Ah, 2Nos.
Response Time	< 10Sec
Temp. Drift	0.01% of F.S. Per °C
Accuracy	+/-0.5%of F. S.
Linearity	+/-0.5% of F. S.
Minimum Conductivity	5 μ siemens / cm
Flow Velocity	0.5 to 6 m/s
Battery Life	2 Years
Low Battery Indication	Blinking LED
Battery Replacement	After Low BAT. LED starts Blinking
Auto LCD display OFF	10 minutes after last key operation
Data Storage	Daily Totaliser value storage with Date for 5 Years
Communication Parameter	9600 bps, No Parity, 1 Stop Bit ,8 bit character
Direction of Flow	Direction of Arrow on Meter
Mounting	In Line - Horizontal
Transmitter Enclosure	Aluminum Die cast IP 68

Enclosure Material	Coil Housing : MS
	Electrode : SS 316L
	Flange : MS
	Lining : RUBBER
Termination	Through PIN type Lugs
<b>ENVIRONMENTAL SPECIFICATIONS:-</b>	
Ambient Temperature of Electronics	0 to 55 °C
Working Temperature of Fluid	0 to 85 °C (for Rubber lining) & 0 to 120 °C (for PTFE lining)
Operating Pressure of Mechanical Assembly	0 to 21Kg/cm <sup>2</sup>
Relative Humidity of Electronics	10 - 99 % RH ,non condensing at 25°C



### 3. KEYBOARD DETAILS



**PROGRAM KEY:** - This key is used to toggle between Run mode and Program mode.



**INCREMENT KEY:** - This key is used to

- 1) Increment the numerical value of any digit, from 0 to 9, by one at each time.
- 2) Go to the next parameter in Program mode.
- 3) To view time momentarily in Run mode(for 3 second).
- 4) To start averaging in average mode.



**SHIFT KEY:** -

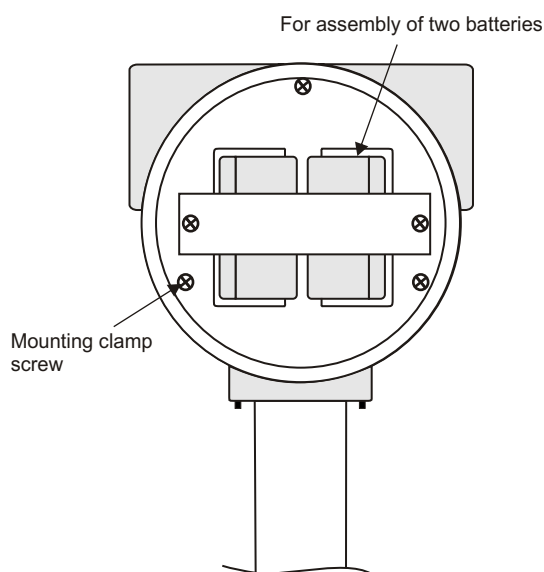
- 1) This key is used to shift the cursor to the next digit.
- 2) To view date momentarily in Run mode(for 3 second).
- 3) To stop averaging in average mode.



**ENTER KEY:** -

- 1) This key is used to validate the function or value of parameter.
- 2) To Toggle between flow rate ,Totaliser mode & average mode in Run mode display.
- 3) To Power on the instrument during sleep mode.

### 4. BATTERY REPLACEMENT



Special care must be taken while handling batteries. Batteries are Non-Rechargeable Lithium batteries with 35 AH capacity. They are dangerous if used carelessly.

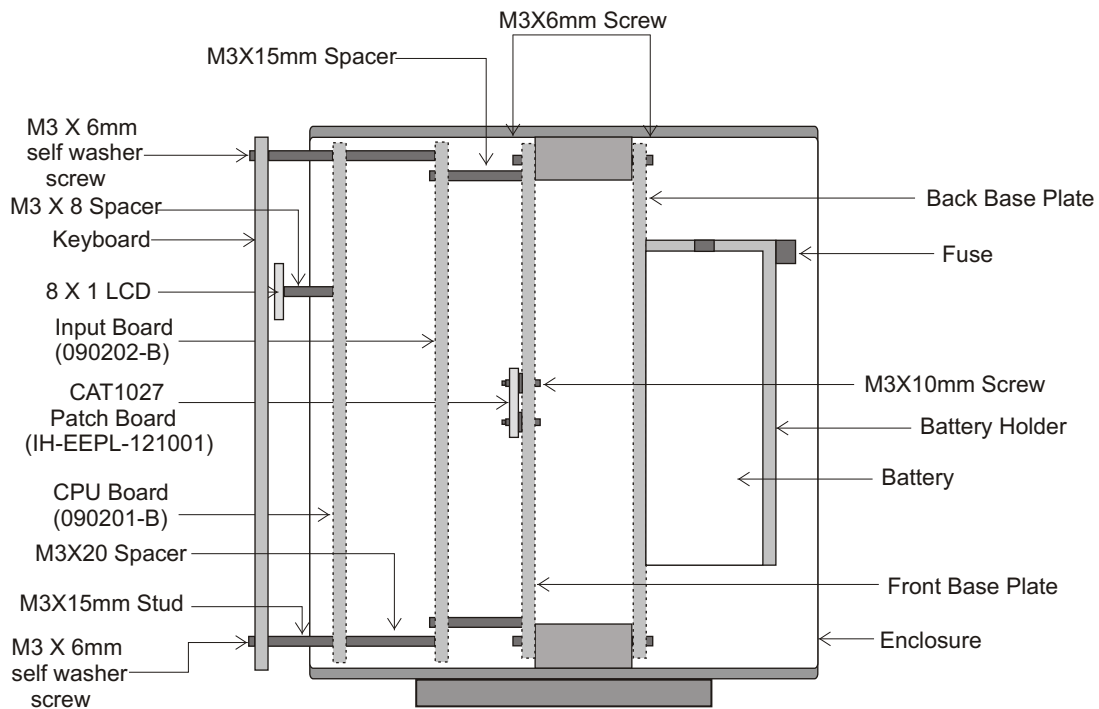
- Remove fuse.
- Remove the battery Holder mounting clamp screw (3 Nos).
- Remove existing batteries.
- Replace with new batteries of same specifications with correct polarities.
- Do not attempt to recharge removed batteries or do not crush, puncture.
- Fit the battery holder clamp.
- Insert fuse.
- Ensure that LOW BAT LED has stopped blinking after installation of new batteries.

**NOTE :** Time & Date (RTC) Will disturb if main battery or fuse is removed, so any user or service person should set time & date at each power on of the system.

**Fig 4 . Rear View**

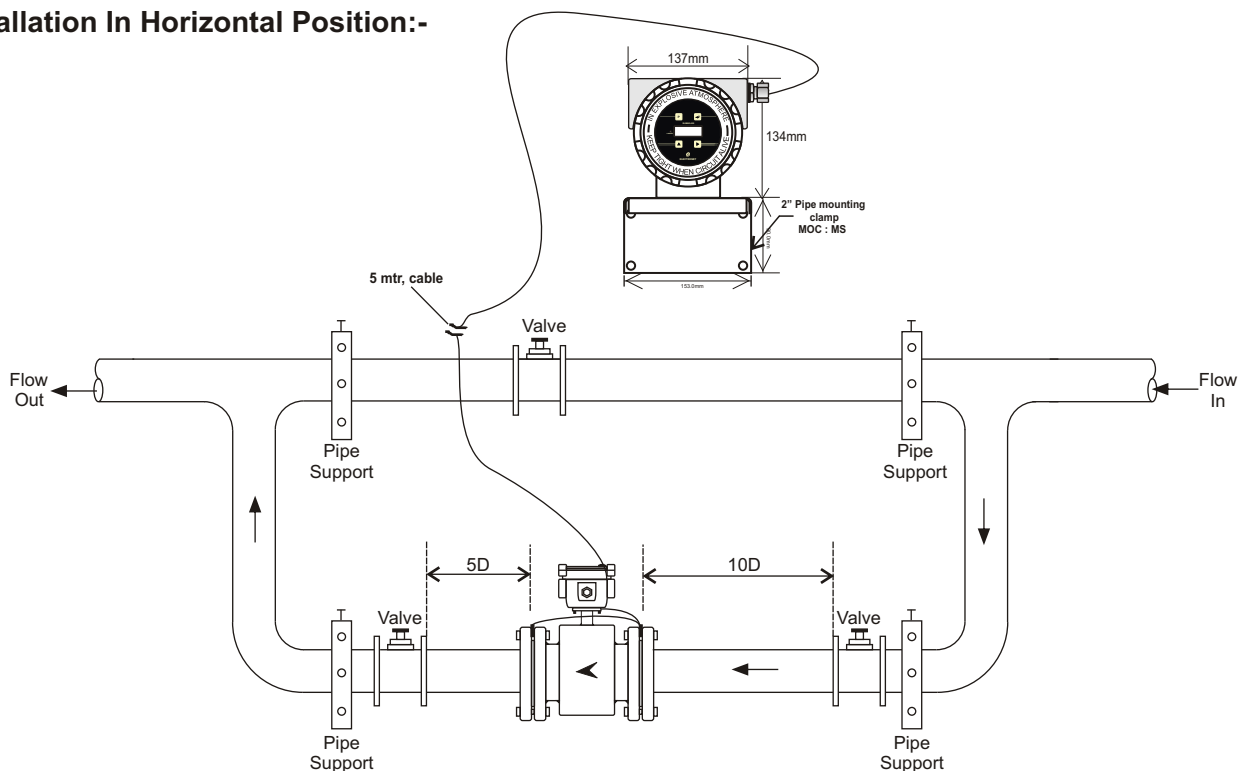


## 5 INTERNAL VIEW



## 6. INSTALLATION DETAILS

### 6.1. Installation In Horizontal Position:-

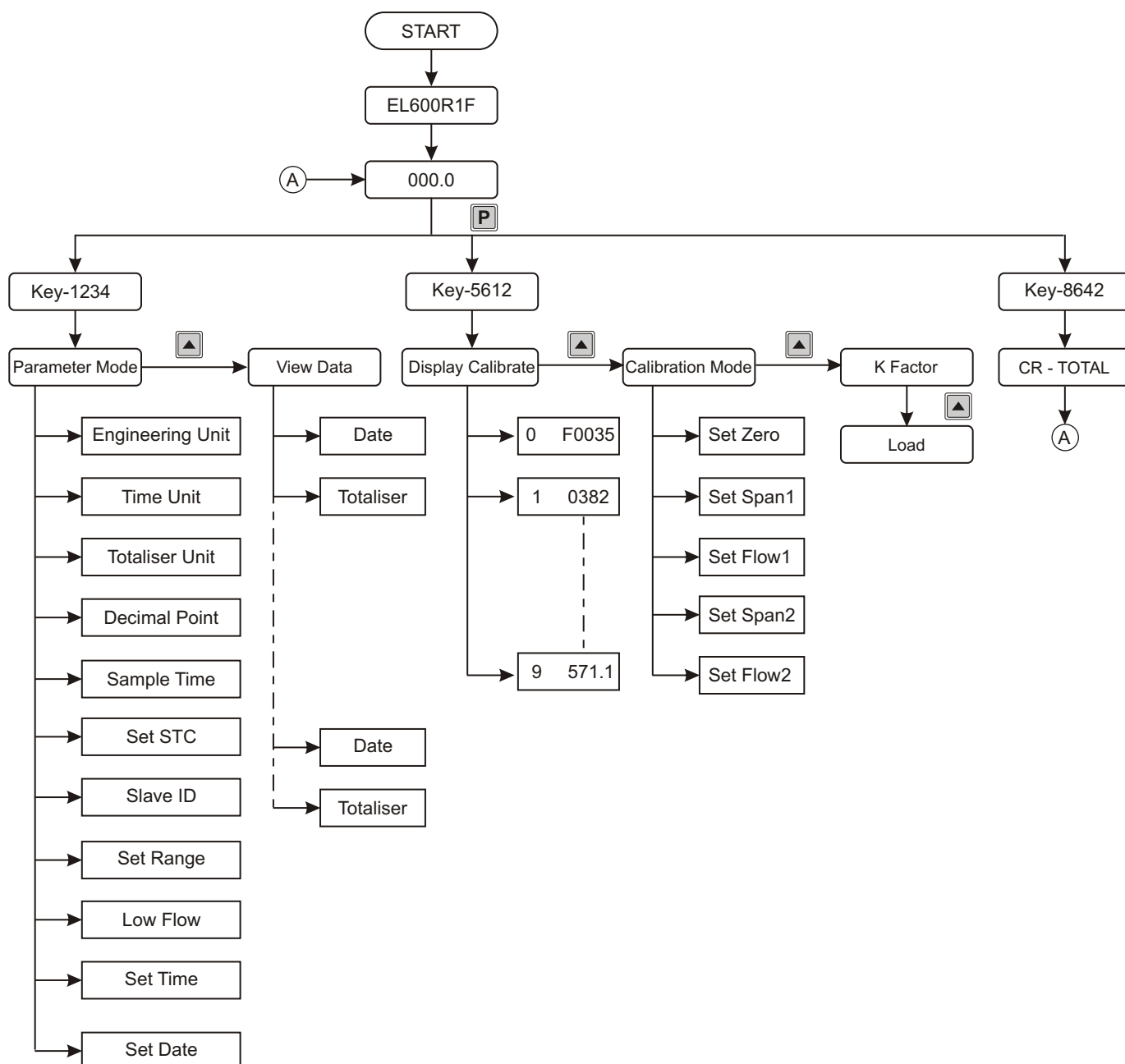


D= Pipe Diameter

**NOTE: Flow meter can be installed in any position either vertical or horizontal. Select a pipe location which will always run full of liquid. Vertical installation with flow from down to top assures full pipe condition.**

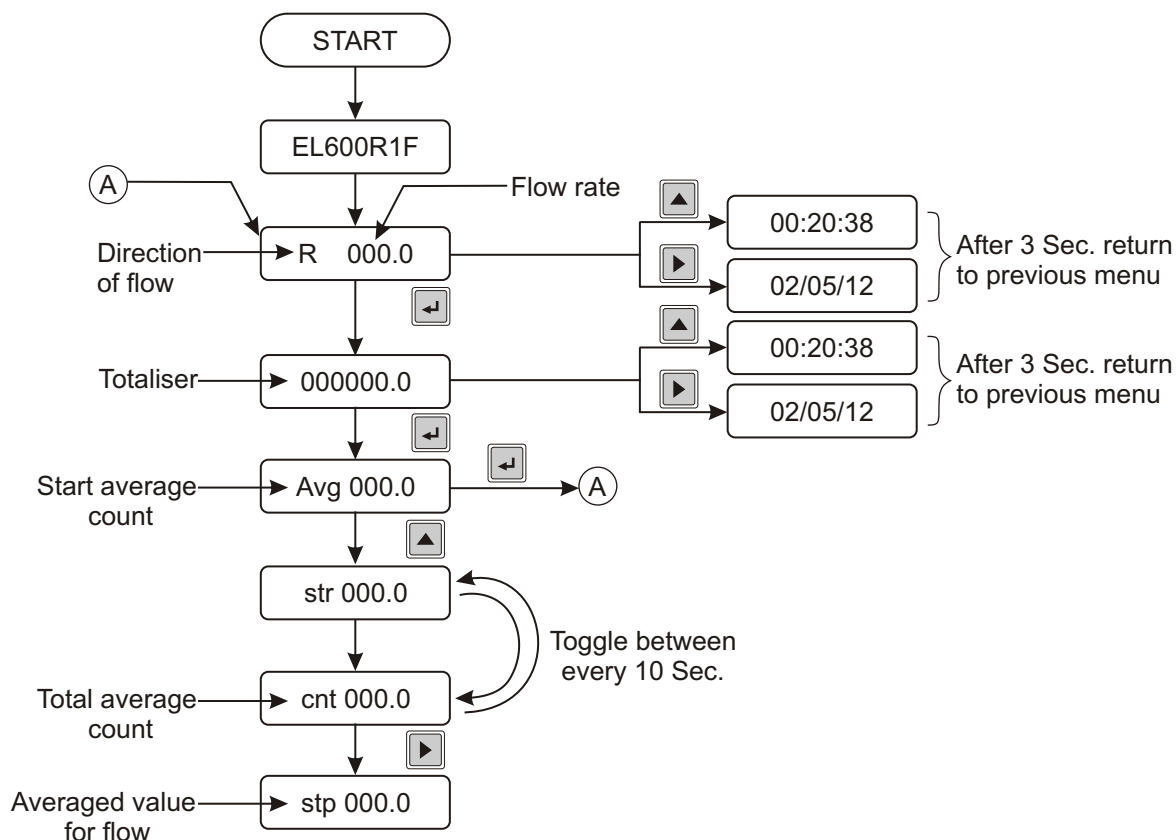
## FLOW CHARTS

### 7.1 General Overview of Operations :





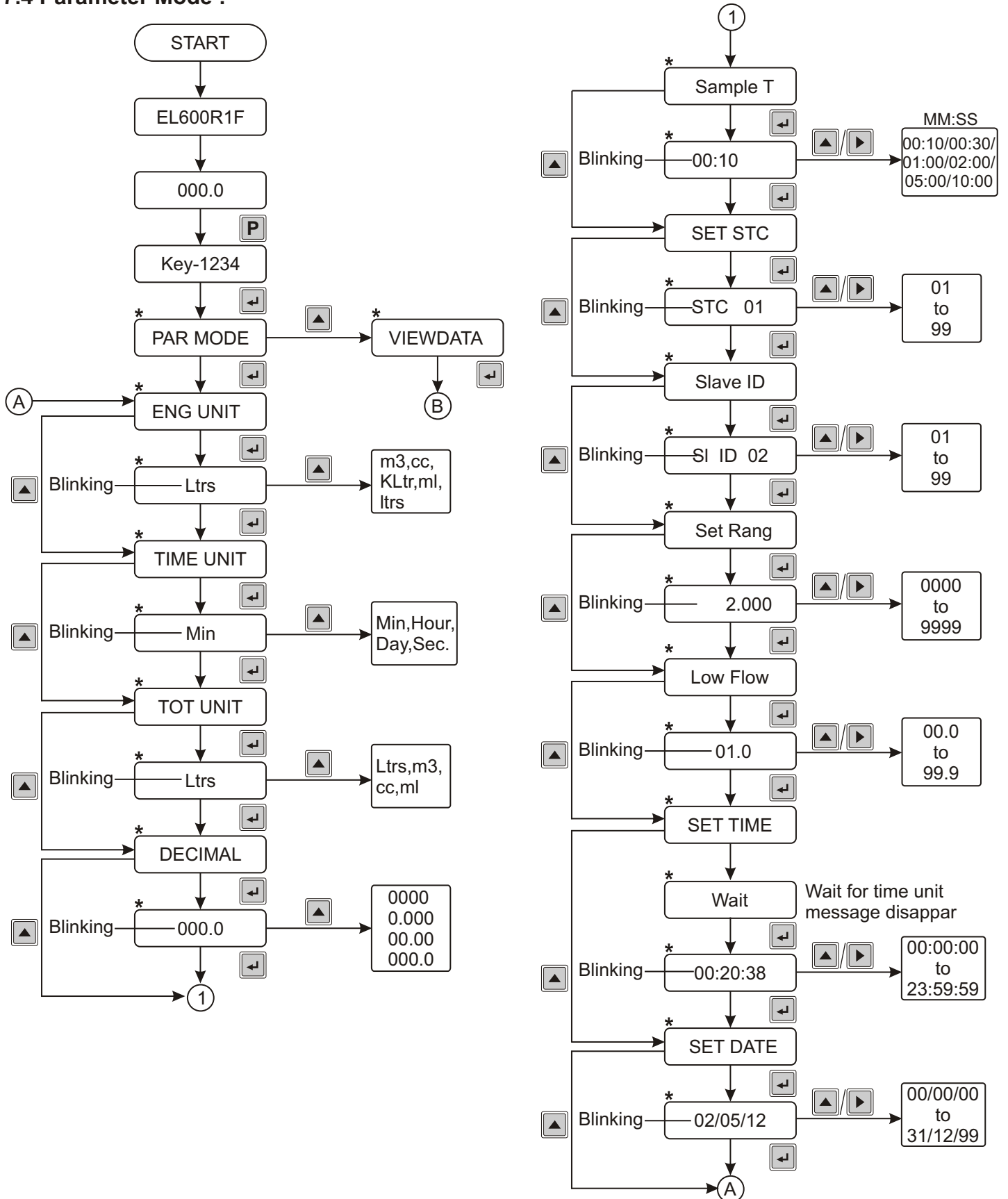
### 7.3 Display In Average Mode :



#### 7.3.1 Averaging Mode Procedure :

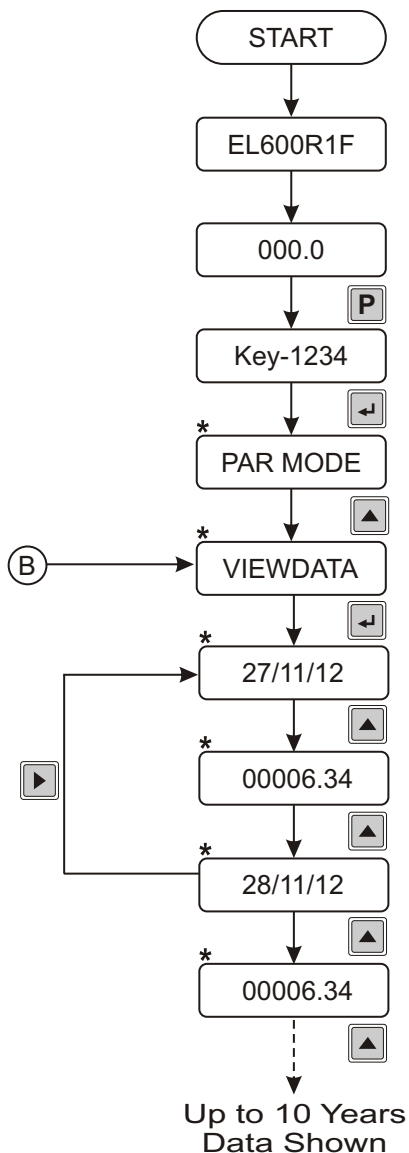
1. Refer Run Mode Flow Chart. By pressing key twice Avg 000.0 message display .
2. By pressing key average mode start & display is toggle in str 000.0 & cnt 000.0 every 10 sec. cycle.
3. By pressing key you can stop a averaging mode and then will get a average flow value stp 000.0
4. This completes averaging mode.

### 7.4 Parameter Mode :



\* Press **P** To Exit to higher level menu

### 7.5 View Data Mode :



\* Press **P** To Exit to higher level menu



## 8. CALIBRATION MODE PROCEDURE

### 8.1 INPUT CALIBRATION :-

1. Refer Calibration Flow Chart. By pressing **P** key and entering correct Calibration mode password (5612), start Calibration Mode. The display will show **CAL MODE**
2. By pressing **↵** key select calibration mode. Display will show **SET ZERO**  
 Press **↵** key, Display will show **XXXX** ——— Approx ADC count.  
 Check that pipe is completely filled with liquid, let the count become stable.
3. Observe counts for 3 to 10 minutes, counts should be stable (acceptable fluctuations in counts are +/-4 counts).  
 Press **↵** key to store ZERO counts. Now display will show **SET SPAN**  
 Now pass approx 20 to 25% of maximum flow wait for some time to stabilize flow and press **↵** key to start SPAN calibration.  
 Wait for 3 to 10 minutes, let counts to stabilize and press **↵** to store SPAN counts.
4. Now display will show **SET FLOW**  
 Press **↵** key. Now measure this flow by weight & measurement or any equivalent method & enter that calculated FLOW value with **▲** & **▶** key, finally press **↵** key to store FLOW value.
5. Observe counts for 3 to 10 minutes, counts should be stable (acceptable fluctuations in counts are +/-4 counts).  
 Press **↵** key to store SPAN counts. Now display will show **SET SPN1**  
 Now pass approx 70 to 75% of maximum flow wait for some time to stabilize flow and press **↵** key to start SPAN 1 calibration.  
 Wait for 3 to 10 minutes, let counts to stabilize and press **↵** to store SPAN 1 counts.
6. Now display will show **SET FL 1**  
 Press **↵** key. Now measure this flow by weight & measurement or any equivalent method & enter that calculated FLOW value with **▲** & **▶** key, finally press **↵** key to store FLOW value.  
 Next Display will be **SET ZERO** again, here one can repeat the hole procedure if required or simply press **P** key to exit Calibration mode.
7. This completes calibration procedure of ELMAG-600. Instrument is ready for use now.



## 9. DOS & DON'TS

### Precautions to be taken on site :-

1. Read the instruction manual carefully before installing the instrument.
2. Do the connections as per the termination details given in the manual.
3. Terminal connections should be tight.
4. Check for proper supply voltage.
5. During calibration, follow the steps mentioned in the manual.
6. Verify that earthing is proper.

## 10. TROUBLE SHOOTING PROCEDURE

SYMPTOMS	CAUSE OF FAILURE	ACTION TO BE TAKEN
No display / Blank LCD With LOW BAT LCD continuously ON	Error condition due to battery supply fluctuation	Make battery connections firm & tight disconnect battery power for 3 minutes & reconnect battery again
No display / Blank LCD	Instrument is in Sleep Mode or No Power supply	Press ENTER key to put Instrument in to RUN mode. Check Battery connection & Battery Voltage. Change batteries if required.
Incorrect Flow Display	Incorrect Parameters selected or incorrect calibration or Loose process connection	Check for correct parameters, if this does not solve the problem , Recalibration is required
Constant 0000 display	Calibration is done at 0 value	Recalibration is required contact Electronet service department.
“ OVER” message on display	Flow or Totaliser value beyond display	Change decimal point change flow or Totaliser unit to higher unit.

### Periodical maintenance :-

The flow meter does not require any special maintenance. Dependent on the media being measured it is recommended that approx. once a year, remove the sensor from the pipe and clean the liner. Method of cleaning consists of removing mechanical dirt and any non-conductive coating (like oil film) from the liner. A very dirty liner could cause inaccuracy of the measurement. Check mechanical state of the liner.

*Authorised Dealer*



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