Instruction Manual

Manufacturing Certificate
CMC Shanghai No.02220105

TYPE LDCK

Smare Electro-magnetic Flow Meter

SHANGHAI NO.9 AUTOMATION INSTRUMENTATION CO., LTD.

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General Description

The high accuracy as well as reliability of LDCK Smart Electro-Magnetic Flow Meter is based on our consistent technical improving and up-grading, the technology of which is reaching up to the advanced level in this country in terms of magnetic excitation, inner lining and intelligence techniques. It is suitable for measuring volumetric flow of conductive medium like acid, alkali or salt solutions, mud or mineral slush, paper pulp and waste water. Since there are no rim-parts within the Meter measuring-pipe, the flow passing through it will not create any additional pressure loss.

The Meter can be divided into two styles structurally, "Integration and Separation", Integration means Sensor is the basic structure with the convertor mounted on it; Separation means two detached structures for Sensor and Convertor, and Convertor can be arranged at any place within 200 m distance from Sensor. In Convertor housing there are 2 chambers, in which the electrical part is isolated from the other components for wiring convenience. When Convertor power on, it provides Sensor with square-wave constant magnetizing current via magnetic excitation cable; if the conductive fluid (medium to be measured) passing through Sensor, after being processed by Convertor, instant and total flow can be displayed on it; meanwhile standard electrical current (4~20mA or 0~10mA), 1~5000Hz frequency signal are also available as output, which can be communicated with up-computer via interfaces.

All Meters prior ex-works have been actually calibrated with water as per the range user ordered. So no further adjusting is needed by the user before operation except ZERO check. If any trouble occurs at your trial operation, please contact us.

This manual is only applicable to the installation, operation and cares of Type LDCK Electro-Magnetic Flow Meter designed and made by this company.

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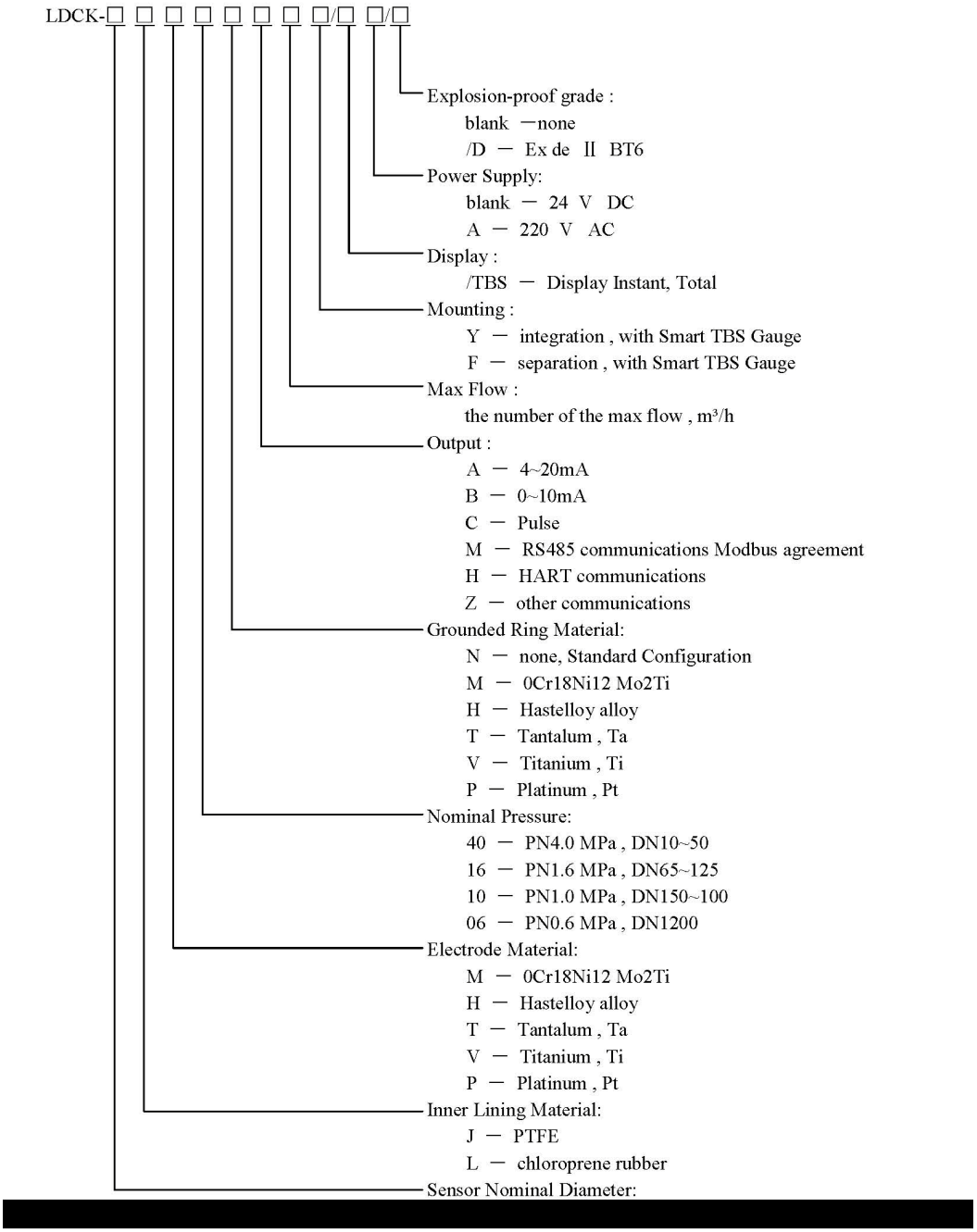
I. Flow Meter

1. Type Code



Example : LDCK-100JM16NA100Y/TBS/D

***Electro-Magnetic Flow meter**:LDCK, **DN**:100mm; **Inner Lining**:PTFE;*
***Electrode**:0Cr18Ni12Mo2Ti;**PN**:1.6MPa; **Grounded Ring**:none; **Output Current**: 4~20mA;*
***Max Flow**:100m³/h; **Mounting Style**: integrated, **Display**:type TBS (instant, total) ,*
***Power Supply**: 24 V DC, **Explosion-proof grade** : Exde ⅡBT6*

2. Standard

As per Standard for *Electro-Magnetic Flow Meter: JB/T9248-1999* for design, manufacturing and inspection

3. Main Specifications

3.1 Nominal diameter for Sensor (mm)

10, 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1200

3.2 Accuracy

Table 3.1 Setting Flow- velocity Range VS Accuracy

Nominal Diameter (mm)	Flow-velocity Range (m/s)	Accuracy
10~20	≤0.3	±0.25%FS
	0.3~1	±1.0%R
	1~15	±0.5%R
25~600	0.1~0.3	±0.25%FS
	0.3~1	±0.5%R
	1~15	±0.3%R
700~1200	≤0.3	±0.25%FS
	0.3~1	±1.0%R
	1~15	±0.5%R
Note: %FS for range; %R for readings		

4. Technical Data (Electrical Parameter)

Electrical Conductivity of the medium to be measured: ⩾ 20μS/cm
Measuring Flow-velocity range: 0.3~10m/s (Normal flow)
Output Signal: 4~20mA
0~10mA
Time Constant: 3.5s (Fixed setting)
Load: ⩽ 500Ω (4~20mA DC)
Power Supply: Standard 220V AC (+10% / －15%) Frequency 48~63Hz
Special: 24V DC (+10% / －15%)
Power Consumption: ⩽ 20W

5. Flow-rate Range

Flow-rate Range Selection

DN (mm)	Min	Available Max flow-rate (m^3/h)									
	Qmin	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Qmax
10	0.1	0.3	0.6	1	1.2	1.5	1.8	2	2.2	2.5	2.8
15	0.2	0.6	1.2	2	2.5	3	4	4.5	5	5.5	6
20	0.4	1.2	2.5	3.5	4.5	6	7	8	9	10	11
25	0.6	1.8	3.5	5	7	9	10	12	14	16	17
32	0.9	3	6	9	12	15	18	20	23	26	28
40	1.5	4.5	9	15	20	25	28	32	35	40	45
50	2.5	7	15	20	30	35	40	50	55	60	70
65	3.6	12	25	35	50	60	70	80	95	110	120
80	5.5	18	36	55	70	90	100	125	145	160	180
100	8.5	28	55	90	110	140	170	200	220	250	280
125	13.5	45	90	135	180	220	260	300	350	400	440
150	20	65	130	200	250	300	380	450	500	570	630
200	35	115	205	350	450	550	680	800	900	1000	1100
250	55	180	350	500	700	880	1000	1200	1400	1600	1760
300	80	250	500	750	1000	1300	1500	1800	2000	2300	2500
350	105	350	700	1000	1400	1700	2000	2400	2800	3100	3460
400	140	450	900	1350	1800	2250	2800	3100	3600	4000	4500
450	180	570	1150	1700	2300	2800	3400	4000	4500	5000	5700
500	220	700	1400	2110	2800	3500	4200	5000	5500	6000	7000
600	310	1000	2000	3000	4000	5000	6100	7000	8000	9000	10000
700	420	1400	2800	4000	5500	7000	8500	10000	11000	12500	13800
800	550	1800	3600	5500	7200	9000	11000	12500	14500	16000	18000
900	700	2300	4600	7000	9100	11500	14000	16000	18000	20000	22800
1000	900	2800	5600	8500	11300	14000	17000	20000	22000	25000	28000
1200	1300	4000	8000	12000	16000	20000	25000	28500	32000	36000	40000

Note:

1). Flow velocity range: 0.3~10(m/s) [extensive range 0.1~15(m/s) for special order]

2). Flow-rate calculating formula: $Q = \upsilon \pi (D/2)^2 = 0.002826D^2 \times \upsilon$

(Flow-rate Q: m^3/h; velocity υ: m/s; nominal dia. D: mm)

3). Q1, Q2, Q3…..Qmax means flow-rate when velocity is 1, 2, 3…..10 (m/s) respectively

4). The minimum flow-rate Qmin is at velocity 0.3(m/s); Qmax means maximum flow

5). The max flow user needs can be one of any flow ranging from Q1~Qmax

Example: if an user is choosing LDCK-100, and the min flow 10m^3/h, the maximum flow can be chosen as one, among 28, 55, 90, 110, 140, 170; …..280 m^3/h, for instance, Q3=90 m^3/h is being chosen; however, any flow figures between "Flow Points" on the above table can also be chosen as maximum flow, here like 60 m^3/h or 80 m^3/h.

6. Installation

Read this Manual carefully before installation; the job-site shall meet the working conditions in environment, protection and maintenance Meter requires;

6.1 Installation Requirements

6.1.1 This Flow Meter can be installed at any place within the operating pipelines; however, taking priority for upright installation; in case of vertical or inclined installation, the axis for the two electrodes should be in vertical position as shown on the Fig.

6.1.2 If the liquid flow direction is in line with the arrow direction on the nameplate, the output signal polarity is as shown on the wiring diagram; opposite flow direction causing opposite polarity;

6.1.3 Liquid fully filled in measuring pipe is necessary; non-full- filling is not permitted;

6.1.4 No iron magnetized material being located nearby the Meter, which needs to be installed at the place far away from the strong magnetic field;

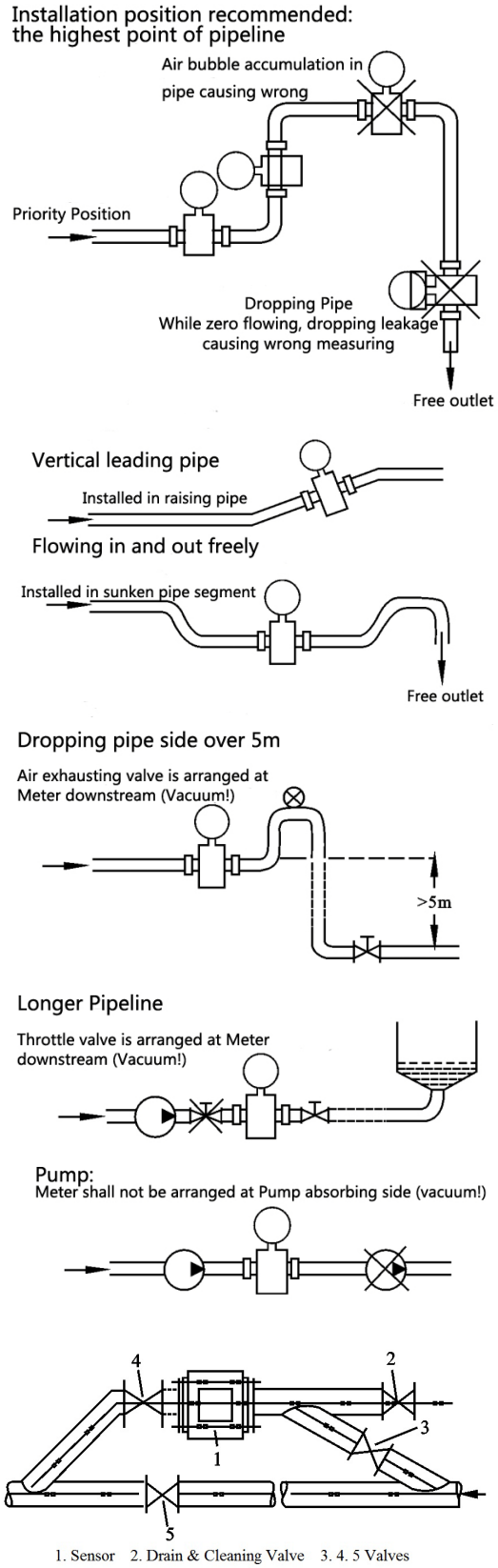
6.1.5 At Meter upstream within the distance of 5DN (DN is Sensor inner diameter), no flow- disturbing-parts may appear; any baffle, valve or sliding vale should be arranged at downstream with a distance, at least, 2DN;

6.16 valves with flanges are not permitted to be arranged directly before and/or after the Sensor; the flow disturbance by valve causing additional measuring deviation; so in any case, such direct installing is not allowed.

6.1.7 Keeping concentricity among Sealing, Grounded Ring and Sensor measuring pipe to avoid vortex

6.1.8 During Meter moving and lifting, never attempt to use tube, bar or string inserting into Sensor measuring pipe for tackling to prevent its inner lining from being damaged; instead, to use string knot on the measuring pipe neck for lifting;

6.1.9 If the medium being severely polluted, Meter can be arranged at by-pass pipeline; so no operating interruption being caused by such arrangement.



1. Sensor 2. Drain & Cleaning Valve 3. 4. 5 Valves

6.2 Grounded

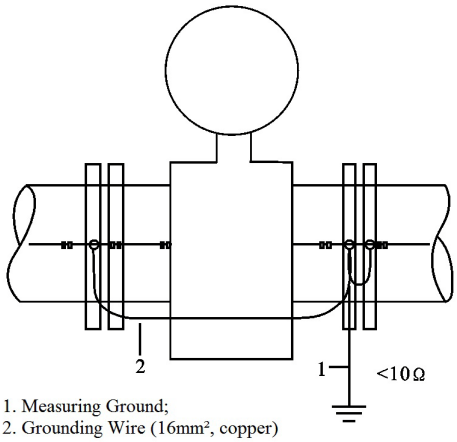
The “grounded” system plays a protecting role in both integrated and separated LDCK Electro-Magnetic Flow Meter, which needs an independent Grounding point; therefore, other electrical equipment are not allowed to use this point for grounding; The grounding resistance should be less than 10 Ω;

6.2.1 The meter should be installed in metallic pipeline with no painting or lining inside;Grounding wire can be connected to two pipe flanges so as to get reliable contacting between pipeline and liquid;

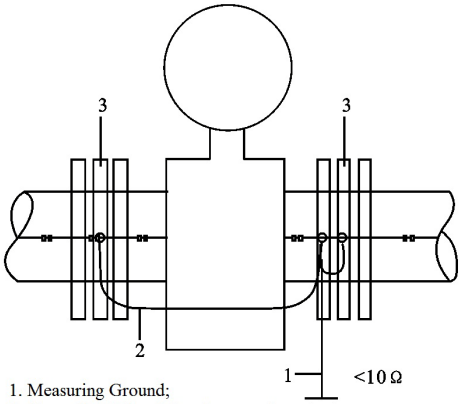
6.2.2 if the pipeline is made of plastic or with inner wall insulated, both inlet and outlet of Sensor need Grounding Rings to ensure “closing-up” between measuring ground and liquid;

6.2.3 In case that the Meter is to be installed in anti-electro-corrosive pipeline with negative polar protection that is normally outside-inside insulated, the liquid is not electrically conductive to the ground; please pay attention to the following key points when grounding:

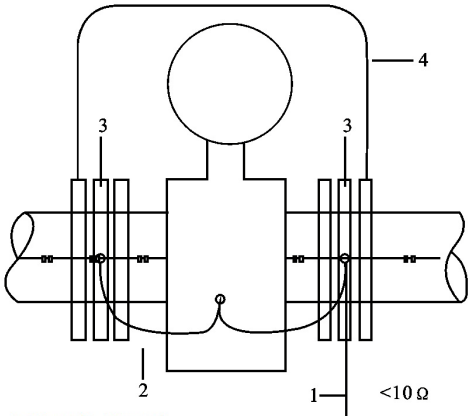
A. Appropriate Grounding Rings should be attached to both end-faces of Sensor, which depend on sealing for insulating to pipeline Sensor flanges;
B. Grounding Ring should be connected to Sensor and measuring ground by a copper wire with section area of 16mm²;
C. Two flanges connected to the Meter should be connected by a copper wire with section area of 16mm²;
D. To adopt sleeves and washes made of insulating materials in making insulation between flange and flange bolts.



1. Measuring Ground;
2. Grounding Wire (16mm², copper)



1. Measuring Ground;
2. Grounding Wire (16mm², copper);
3.Grounding Ring



1. Measuring Ground;
2. Grounding Wire (16mm², copper);
3.Grounding Ring
4. Connecting Wire (16mm², cooper);

7. Dimensions & Weight

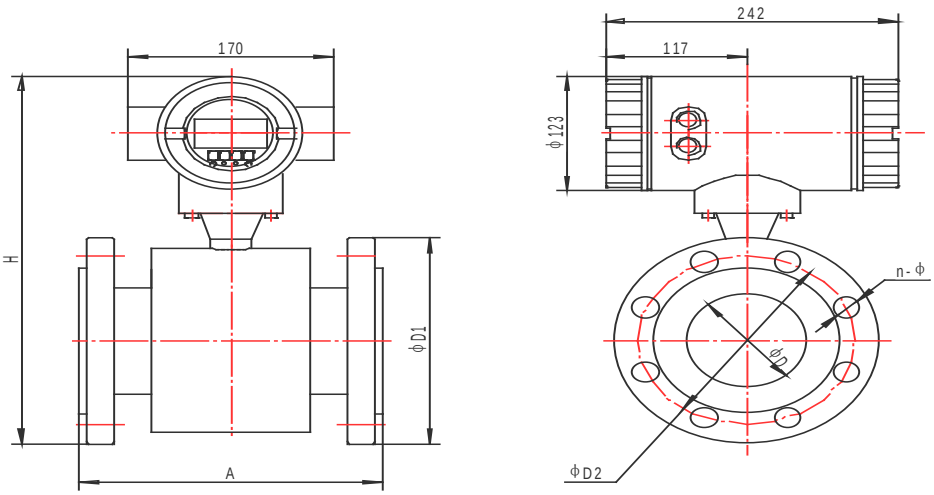


Fig.7 (a) Electro-Magnetic Flow Meter Dimensions

Table 7 (a) Dimensions & Weight

Type	Nominal Diameter ϕD (mm)	Nominal Pressure (MPa)	A (mm)	H (mm)	ϕD1 (mm)	ϕD2 (mm)	n-ϕ (mm)	Weight (kg)
LDCK—10	10	4.0	200	295	90	60	4-ϕ14	6
LDCK—15	15		200	295	95	65	4-ϕ14	7.5
LDCK—20	20		200	295	105	75	4-ϕ14	8
LDCK—25	25		200	295	115	85	4-ϕ14	9
LDCK—32	32		200	315	135	100	4-ϕ18	9.5
LDCK—40	40		200	325	145	110	4-ϕ18	12
LDCK—50	50		200	340	160	125	4-ϕ18	13.5
LDCK—65	65	1.6	200	360	180	145	4-ϕ18	15.5
LDCK—80	80		200	375	195	160	8-ϕ18	17.5
LDCK—100	100		250	385	215	180	8-ϕ18	22
LDCK—125	125		250	425	245	210	8-ϕ18	29
LDCK—150	150	1.0	300	450	280	240	8-ϕ23	35
LDCK—200	200		350	515	335	295	8-ϕ23	47
LDCK—250	250		400	565	390	350	12-ϕ23	68
LDCK—300	300		500	615	440	400	12-ϕ23	85
LDCK—350	350		500	670	500	460	16-ϕ23	127
LDCK—400	400		600	725	565	515	16-ϕ26	184
LDCK—450	450		600	780	615	565	20-ϕ26	195
LDCK—500	500		600	885	670	620	20-ϕ26	210
LDCK—600	600		600	1005	780	725	20-ϕ30	303
LDCK—700	700		700	1160	895	840	24-ϕ30	470
LDCK—800	800		800	1260	1010	950	24-ϕ34	500
LDCK—900	900		900	1360	1110	1050	28-ϕ34	700
LDCK—1000	1000		1000	1460	1220	1160	28-ϕ36	920
LDCK—1200	1200	0.6	1200	1670	1400	1340	32-ϕ34	1100

II. Convertor

1. Functions & Operation

1.1 Basic Functions

- Low-frequency square-wave exciting，exciting frequency:1/16 power frequency, 1/20power frequency,1/25 power frequency
- High-frequency square-wave exciting，exciting frequency:1/2 power frequency（for grouting liquid measure）
- Exciting current can be selected for 125mA,187.5mA,250mA
- No additional electrode empty pipeline measurement, and can measure continuously, alarm by fixed value;
- Measuring velocity range: 0.1~15m/s; velocity resolution: 0.5mm/s
- AC high-frequency on/off power supply: applicable voltage range 85V-250V AC;
- DC 24V on/off power supply: applicable voltage range 16 V -36V DC
- Network communication: MODBUS,HART (optional)
- Chinese-English language display (other languages optional)
- 3 Internal Calculators for positive and negative and differential total flow

1.2 Special Functions

- Power Failure time recording: automatically recording system power interruption interval and missed flow recalculating;
- Hourly total flow recording; recording total flow on hour unit base; suitable for timely measurement

1.3 Normal Working Conditions

Ambient Temperature: −10~+60℃ for separation style
Relative Humidity: 5%~90%
Power Supply: Single phase AC 85~250V, 45~63Hz;
DC 16~30V
Power Consumption: less than 20W, when working with Sensor

1.4 Test Reference Conditions

Ambient Temperature: 20℃±2℃
Relative Humidity: 45%~85%
Power Supply: 220V±2%
Power Frequency: 50Hz±5%
Harmonic Wave Content: less than 5%
Pre-heating duration: 30 min

1.5 Connecting with Sensor

- Round Housing integrated: round housing; housing connecting to flange directly, explosion-proof design
- Square Housing separated: square housing with wall mounting; convertor connecting with sensor by cable

2. Principle Circuit

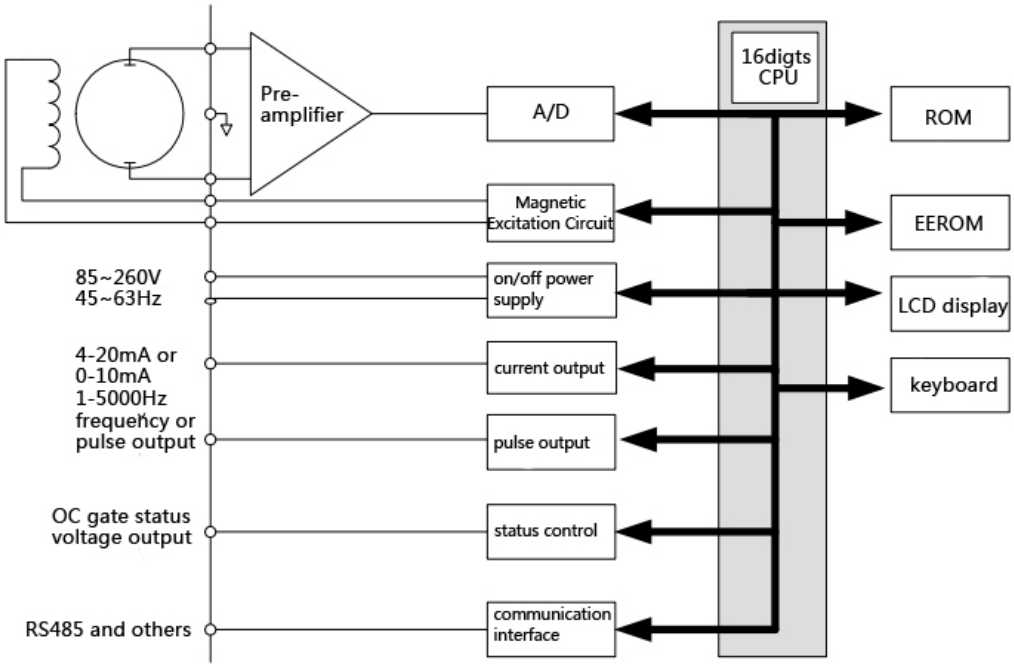


Fig.2.1 Convertor circuit structural diagram

Electro-magnetic flow meter Convertor supplies magnetic-excitation coil of flow meter Sensor with stable magnetic excitation electrical current to maintain B as a constant; meanwhile, amplifies the electrical motive force generated by Sensor, and converting it into standard electrical current or frequency signal for flow display, control and regulating purpose; Fig.2.1 shows the Convertor Circuit Structure;

3. Technical Specifications

3.1 Main Specifications

3.1.1 Sensor nominal diameter for matching: (mm)

10, 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, 1000, 1200

3.1.2 Flow measuring range

The Convertor of LDCK requires the Sensor signal sensitivity at such level that when flow speed is at 1m/s, its output signal shall be, at least, over 150μV; under such circumstance, the Convertor sensitivity is 0.5mm/s, the speed for the flow measuring range up-limit can be chosen within 0.3m/s to 15m/s, and low-limit might be Zero or 1% of up-limit-speed

3.1.3 Deviation Repeatability:

Convertor deviation repeatability: ±0.1% of measuring value

3.1.4 Analog Current Output:

Load Resistance: 0~10mA/ 0~1.5kΩ; 4~20mA/ 0~750Ω

Basic deviation: plus ±10μA on above basic measuring deviation

3.1.5 Digital Frequency Output

Frequency output: up-limit ranging from 1~5000 Hz to be set; the Collector of transistor with optical-electrical isolation in open circuit for two-direction output; external power supply voltage not over 36V, maximum collector current 250mA when fully conductive

3.1.6 Digital Pulse Output

Pulse output up-limit: 5000cp/s

Output pulse Equivalent: 0.001~1.0m^3/cp, 0.001~1.0Litre/cp

Pulse width: automatically setting 50ms or square wave

Output with optical-electrical isolation, the output stage composed by HEXFET Field-Effective- Transistor with open Leaker output; external power supply voltage not over 36V;Maximum collector current 250mA when fully conductive .

3.1.7 Flow direction indication

Fluid flow direction indicated by Convertor with PDIR; high electric level for positive flow; low for negative

3.1.8 Output Alarm

Alarm output by using two-loop collector-open transistors with optical-electrical isolation; ALMH for up-limit alarm, ALML for low-limit; external power supply at alarm terminals not over 36V; maximum collector current 250mA when fully conductive

3.1.9 Digital communication Interface:

Optional RS-232C, RS-485, MODBUS, REMPTE, interface with thunder-struck protection

3.1.10 Electrical isolation

The insulating voltage between analog input and analog output: not less than 500V

The insulating voltage between analog input and alarm power: not less than 500V

The insulating voltage between analog input and AC Power: not less than 500V

The insulating voltage between analog output and AC Power: not less than 500V

The insulating voltage between analog output and Earth: not less than 500V

The insulating voltage between pulse output and AC Power: not less than 500V

The insulating voltage between pulse output and Earth: not less than 500V

The insulating voltage between alarm output and AC Power: not less than 500V

The insulating voltage between alarm output and Earth: not less than 500V

4. Wiring & Operations

4.1 Keyboard and Display

4.1.1 Round Convertor keyboard definition & big LCD display

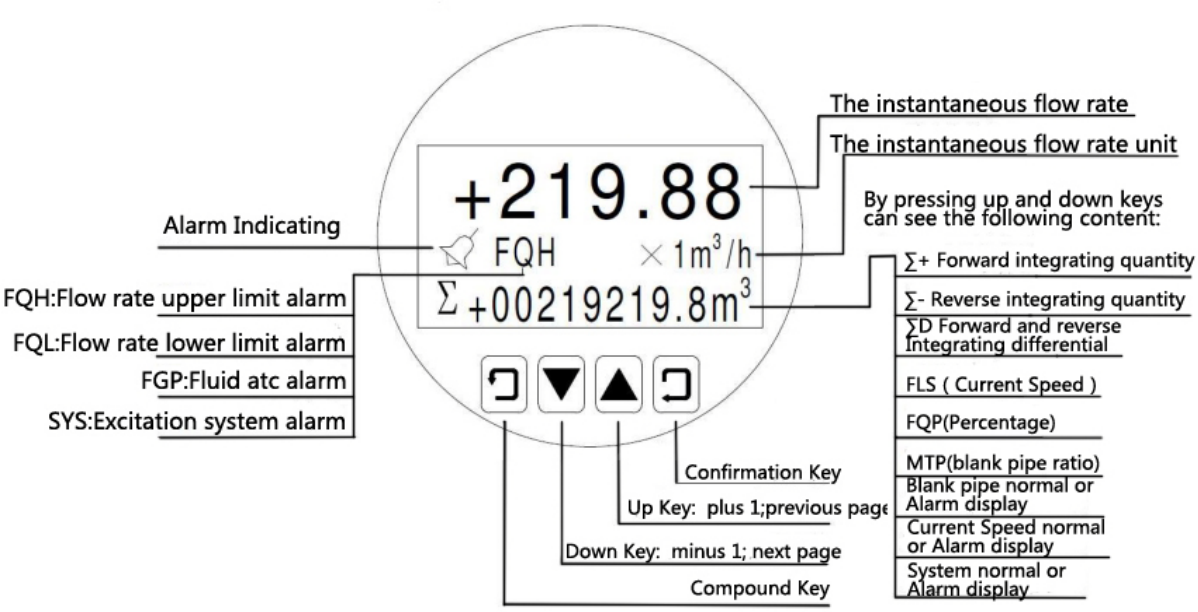


Fig.4.1 (a) Round Convertor keyboard definition & big LCD display

Explanation: in measuring mode, push "compound + Confirmation" key , it appears status changing code (0000), related change to be made as per the code provided by this company referring to security classifications; press "compound + Confirmation" key again to enter parameter setting mode; to restore the operation mode, just hold: Confirmations" key for few seconds

4.1.2 Square Convertor keyboard definition and LCD display

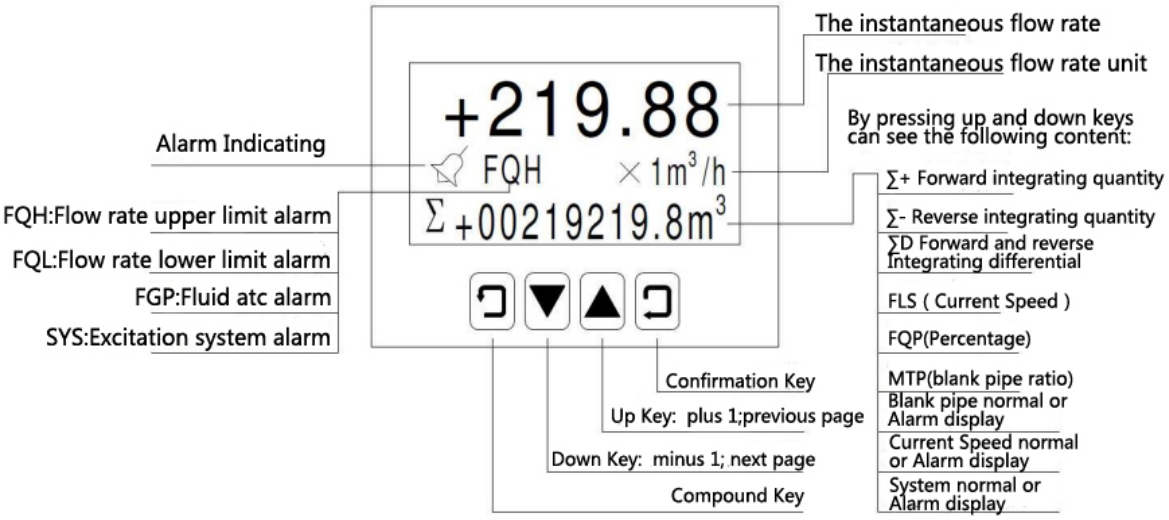
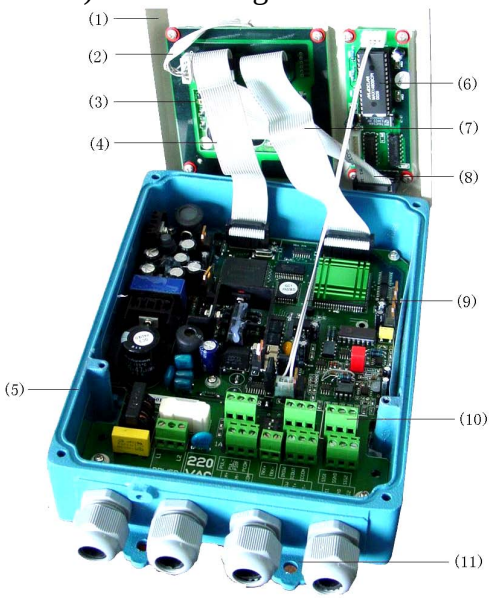


Fig.4.1 (b) Square Convertor keyboard definition & LCD display

4.2 Section Diagram

4.2.1 Square Convertor (isolated) Section Diagram



(1) Up-cover body
(2) key wire
(3) big LCD
(4) Key Cable (plane to LCD/16- wire)
(5) Down-cover body
(6) Communication Board
(7) Display Cable (Plane to LCD/20- wire)
(8) Communication Wire (Plane to Communication Board/16-wire)
(9) Communication Signal Wire (2-wire)
(10) Terminals for wiring
(11) Hook for Separation style

Fig.4.2 (a) Square Convertor (isolated) Section Diagram

4.3 Wiring Diagram

4.3.1 Square Convertor wiring terminals and indicating

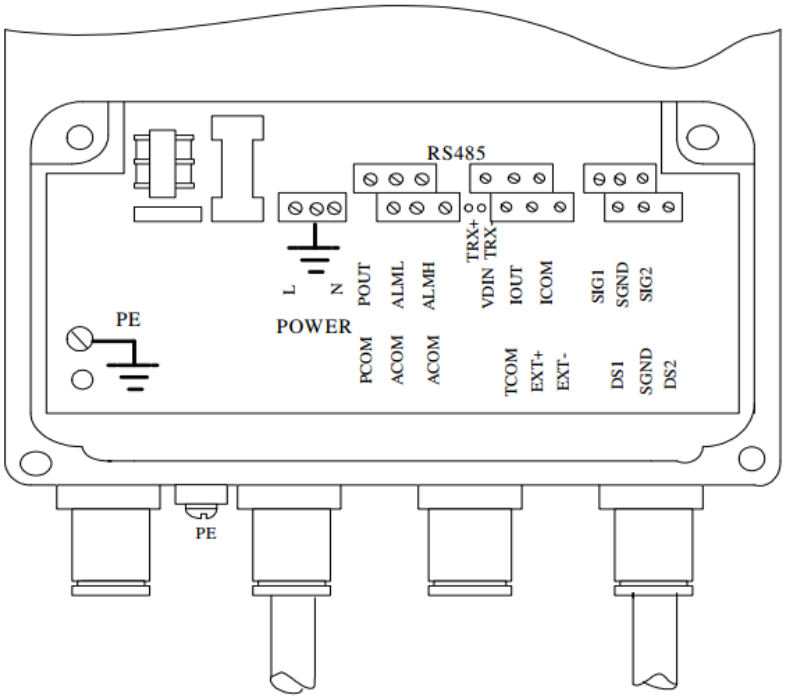


Fig. 4.3(a) Square Convertor wiring terminals

Square Convertor wiring terminals indicating and meaning :

SIG1	Signal 1	Connected to Separated Style Sensor
SGND	Signal Ground	
SIG2	Signal 2	
DS1	Excitation shield 1	
DS2	Excitation shield 2	
EXT+	Magnetic Excitation Current+	
EXT−	Magnetic Excitation Current−	
VDIN	two-wire system 24V Power Supply	Analog Current output
IOUT	Analog Current output	
ICOM	Analog Current output Ground	
POUT	Flow-rate Frequency(Pulse) Signal Output	Frequency(Pulse) Signal Output
PCOM	Frequency(Pulse) Signal Output Ground	
ALMH	Up-limit Alarm output	Two Way Alarm Output
ALML	Low-limit Alarm output	
ACOM	Alarm output Ground	
TRX+	Communication Input	Communication Input
TRX−	Communication Input	
TCOM	232 Communication Ground	
POWER L	Power Supply phase line L	Power Supply
POWER N	Power Supply neutral line N	

4.3.2 Treatment & Indication for Signal wire between Sensor and Convertor

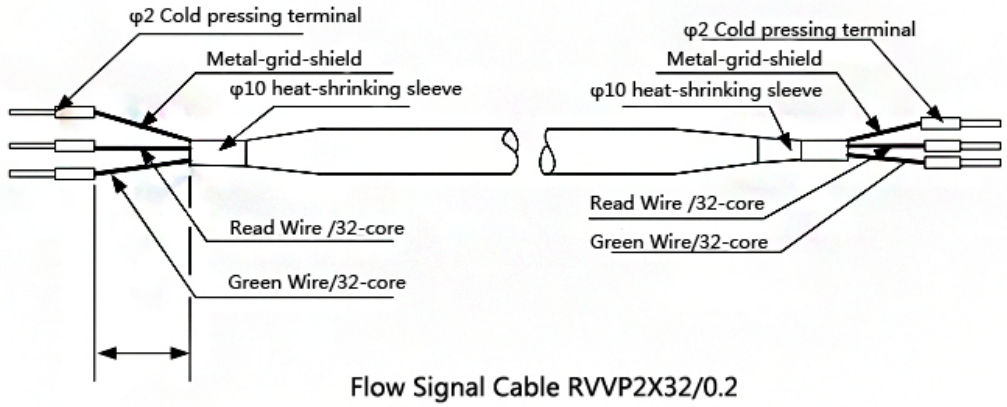


Fig.4.3 (b) Treatment & Indication for Signal wire between Sensor and Convertor

4.3.3 Round Convertor Terminal wiring and indicating

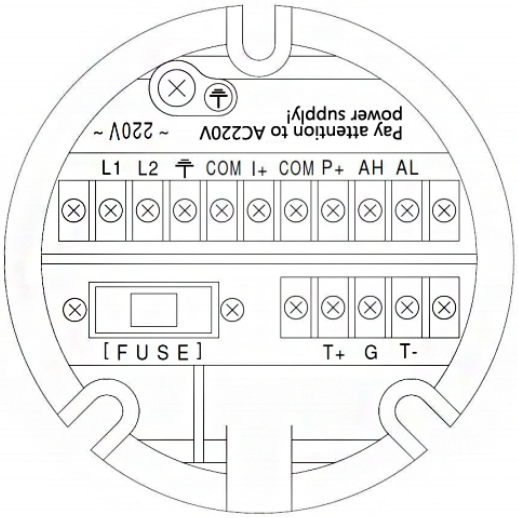


Fig.4.3 (C) Round Convertor Terminal

Round Convertor Terminal indicating & meaning:

I+	Flow current output
COM	Current output Ground
P+	Two-direction Flow Frequency(Pulse) Output
COM	Pulse output Ground
AL	Low-limit Alarm output
AH	Up-limit Alarm output
COM	Alarm output Ground
FUSE	Power Supply fuse
T+	Communication Input
T−	Communication Input
G	RS485 Communication Ground
L1	220V(24V) Power Supply
L2	220V(24V) Power Supply

4.3.4 Round Convertor Signal wire treatment and indication

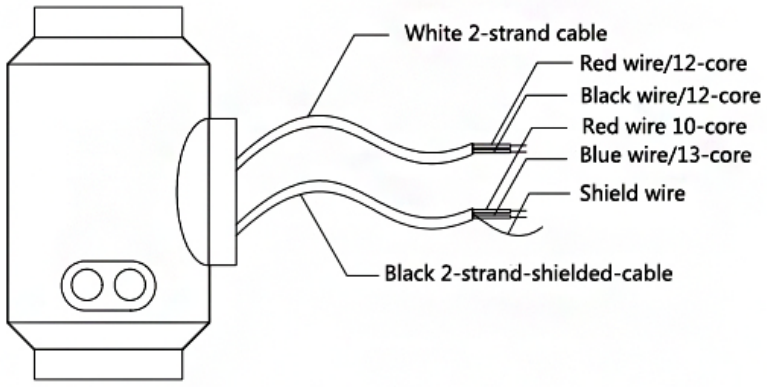


Fig. 4.3 (d) Round Convertor Signal wire treatment and indication

Round Convertor Signal wire indication:

White 2-strand cable	Red wire/12-core	For Excitation current
	Black wire/12-core	
Black 2-strand-shielded-cable	Red wire/10-core	To Signal 1
	Blue wire/13-core	To Signal 2
	Shield wire	To Signal Ground

4.3.5 Wiring

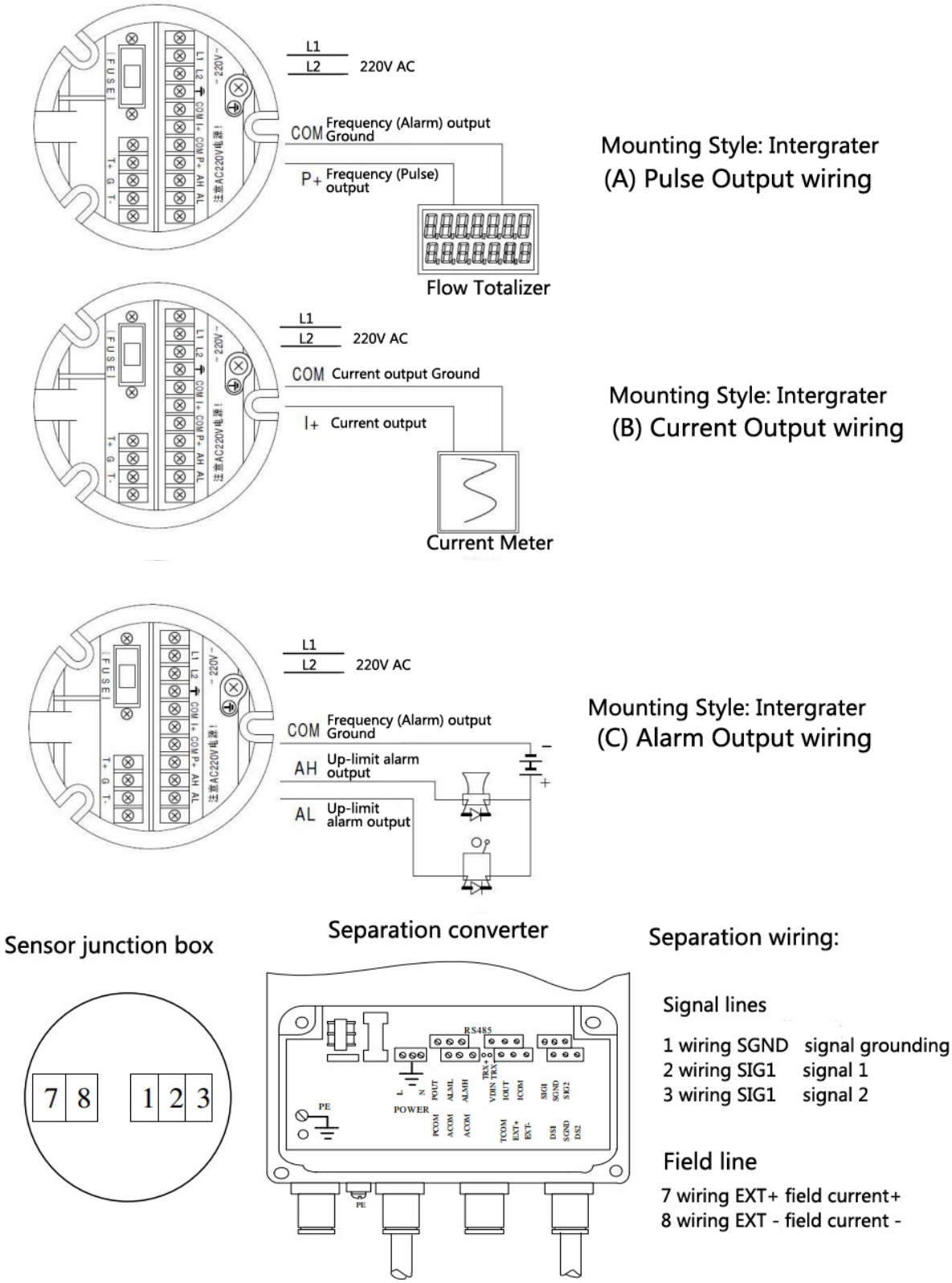


Fig. 4.3(e) Convertor Wiring Terminal

4.4 Cable Specifications and Connections

4.4.1 Flow Signal Wire

Type RVVP2×32/0.2 metal-shielded cable with PVC sleeve can be adopted for flow signal transmission, in case of separated Converter to be connected with Sensor and the fluid to be measured with electrical conductivity more than 50μS/cm; the cable length should be less than 100 m; the signal cable is attached to the ex-works convertor; the wiring for Square and Round Convertor, refer to Fig.4.3 (a) and 4.3(c) respectively;

This Converter is also providing output signal voltage with identical-electric-level-excitation-shielding to minimizing the affection to flow signal caused by the cable transmission distributed-capacitance; if the conductivity is less than 50μS/cm, or for long distance transmission, dual-core/double shield signal cable with identical-electric-level-shielding can be adopted, such as STT3200 special purpose cable or type BTS triple-shielding cable;

4.4.2 Magnetic Excitation Current Wire

Two-core-flexible cable with rubber insulation can be used as magnetic excitation current wire; suggested Type is YHZ-2×1mm²; the magnetic excitation current wire length is as same as signal cable; if STT3200 special cable being used, magnetic excitation current wire and signal cable is consolidated as one cable;

4.4.3 Output and Power Supply Wire

Cable for output or power is user's responsibility as per practical application, be sure, to meet load current requirements;

Note: When DIP switch next to terminal is set to ON places, the converter from its inside can provide +28Vpower supply and up-pull 10kΩ resistance to output Frequencies (PUL) to isolated OC gate, Alarm Output (ALMH.ALML), and Status Control（INSW）.Therefore, when converter has frequency output and works with sensor together, DIP switch can be set as ON getting frequency signals from POUT and PCOM terminals.

Pulse current output, alarm current output and external power supply can be seen in Fig.4.4(a). When inductive load is connected to converter, diode should be used as in Fig.4.4(b).

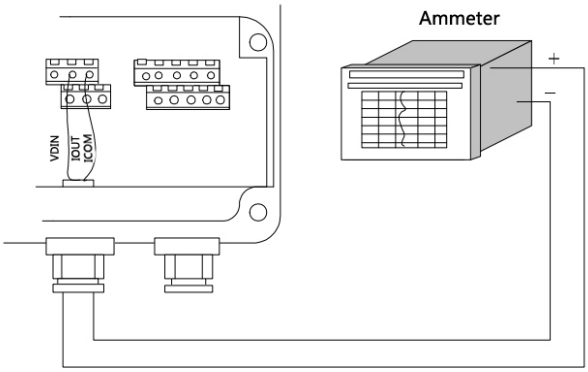


Fig.4.4 (a) Current Output Wiring

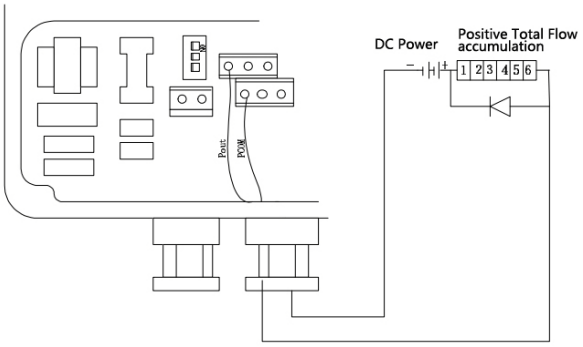


Fig.4.4 (b) Electro-Magnetic Counter Wiring

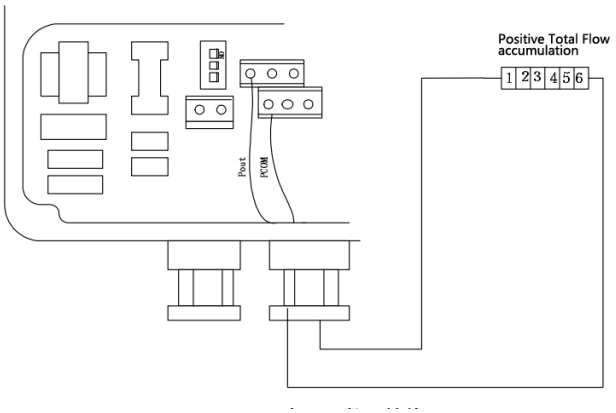


Fig.4.4 (c) Electronic Counter Wiring

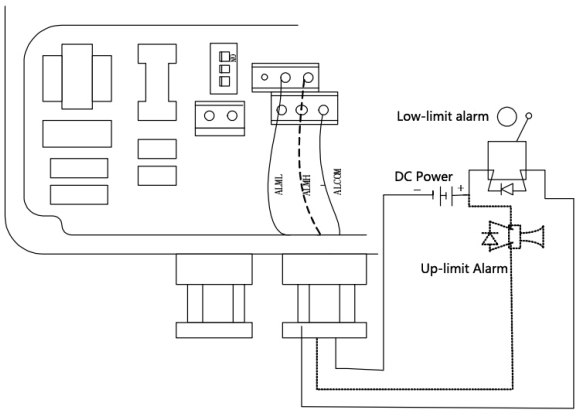


Fig.4.4 (d) Alarm Output Wiring

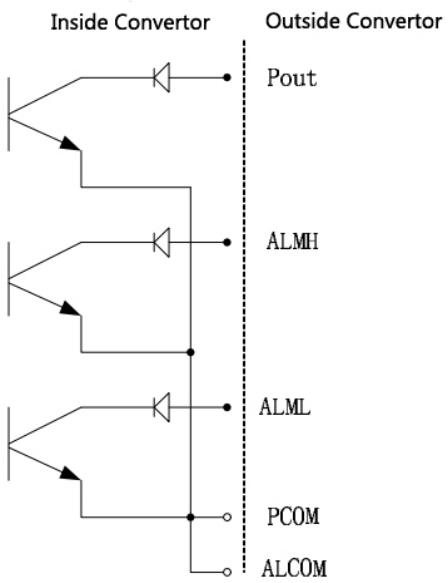


Fig.4.4 (e) OC Gate Connecting inside Convertor

4.4.4 Grounding

The grounding terminal PE on Convertor housing should be connected to the Earth by a copper wire not less than 16mm²; the resistance between housing and the Earth should be less than 10 Ω.

4.5 Digital Output & Calculating

Digital output refers to frequency and pulse output; terminals for both frequency and pulse output are the same one, therefore, frequency and pulse output can not be chosen by user at the same time; only one of them is optional;

4.5.1 Frequency output mode:

Frequency output range is 0～5000HZ, and corresponding the percent of flow-rate.

$$F=\frac{\text{Measure value}}{\text{Full scale value}}\times \text{frequency range}$$

The up limit of frequency output can be adjusted. It can be chosen from 0 ~ 5000Hz, and also can be chosen low frequency: such as 0 ~ 1000Hz or 1 ~ 5000Hz.

Frequency output mode general can be used in control application, because it responses the percent flow-rate. Users can choose pulse output when the equipment is applied to count.

4.5.2 Pulse output mode:

Pulse output mainly applies in count mode. A pulse output delegates a unit flow-rate, such as 1L or $1m^3$ etc. Pulse output unit divide into 0.001L, 0.01L, 0.1L, 1L, $0.001m^3$, $0.01m^3$, $0.1m^3$, 1 m^3 .When users choose the pulse unit, they should notice the match of the flow-rate range of flowmeter and pulse unit. For volume flow-rate, count formula as follows:

$$Q_L=0.0007854\times D^2\times V \text{ (L/s)}$$

or $$Q_M=0.0007854\times D^2\times V\times 10^{-3} \text{ } (m^3/s)$$

or $$Q_M=2.8274\times D^2\times V\times 10^{-3} \text{ } (m^3/s)$$

Where:

D is nominal dia. (mm)
V is velocity of flow (m/s)

The oversize flow-rate and too small pulse unit will be made the pulse output over the up limit. Generally, pulse output should be controlled below 3000P/S. However, the too small flow-rate and too large pulse unit will be made the instrument exports a pulse long time.

Otherwise, pulse output is different from frequency output. When pulse output cumulates a pulse unit, it exports a pulse. Therefore, pulse output is not equality. Generally, measure pulse output should chooseto count instrument, but not frequent instrument.

4.5.3 Digital Output wiring

Digital output has tow connected points: digital output connected point, digital ground point, and symbol as follows:

POUT ----- digital output point;
PCOM ----- digital ground point;

POUT is collector plough output, user may refer to next circuit to connect.

4.5.3.1 Digital Electric-Level output wiring

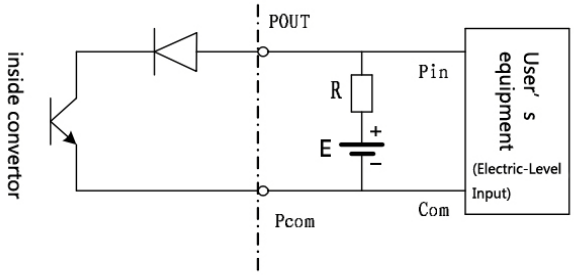


Fig. 4.5(a) Digital Electric-Level output wiring

4.5.3.2 Digital Output connecting to Optical/Electric coupling (like PLC etc.)

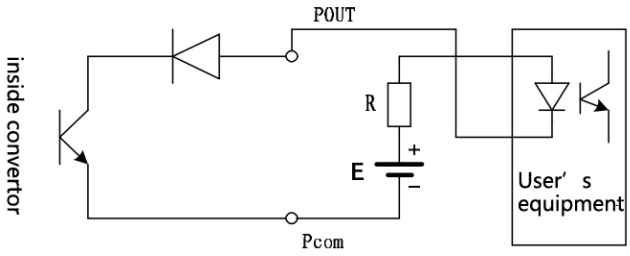


Fig.4.5 (b) Digital Output connecting to Optical/Electric coupling

Generally, user's Optical/Electric coupling needs current about 10mA, therefore, E/R≈10mA, E=5 ~24 V

4.5.3.3 Digital output to Relay

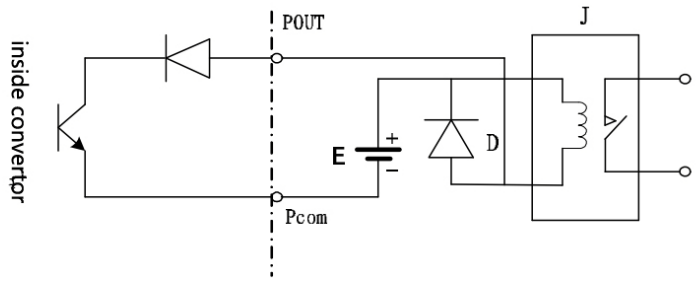


Fig.4.5 (c) Digital output to Relay

Usually, Intermediate Relay needs E=12V or 24V; D means Current Continuation Diode;Now, most Intermediate Relays are with such Diodes built-in; if Relay itself does not contain diode, an external one shall be connected by user.

Digital Output parameters are as shown below:

Table 4.5 (a) POUT Parameters

Parameters	Test Conditions	Minimum	Typical	Maximum	Unit
Operation Voltage	IC=100mA	3	24	36	V
Operation Current	Vol≤1.4V	0	300	350	mA
Operation Frequency	IC=100mA Vcc=24V	0	50000	7500	Hz
High Electric-Level	IC=100mA	Vcc	Vcc	Vcc	V
Low Electric-Level	IC=100mA	0.9	1.0	1.4	V

4.6 Analog Output & Adjusting

4.6.1 Analog Output

There are two optional signal systems for analog output: 0~10mA and 4~20mA; user can choose one of them by setting;

The analog current output is backed by its internal power supply of 24V, for 0 to 20 mA, Load of 750Ω can be driven;

Analog current output being in line with flow percentage,

$$I_0 = \frac{\text{Measure value}}{\text{Full scale value}} \times \text{the scale of current} + \text{the zero point of current}$$

For 0~10mA, the zero point of current is “0”,and,

for 4-20mA, it is 4mA.

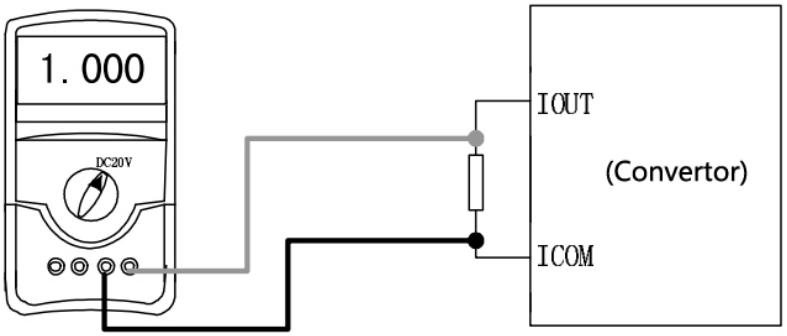
So user shall choose flow meter range properly so as to increase the Resolution for analog current output;

All parameters have been set and adjusted by the manufacturer for Ex-works flow meter;Normally, no user’s adjustment is required; when user needs to adjust the analog output with abnormal condition, refer to the operating instructions below.

4.6.2 Analog Output Adjusting:

(1) Ready for Adjusting:

Starting operation for 15 minutes in reaching heat stability inside the Meter; Class 0.1% Amperemeter, Resistance of 250Ω and Class 0.1% Voltmeter are needed; wiring per the below diagram



(2) Electrical current “0” point adjusting

Set the Convertor to parameter setting mode, select “Electrical current “0” point adjusting” and enter, to adjust Standard Signal Supply to “0” , then adjusting “adjustment coefficient” to make the Amperemeter exactly indicate 4mA (±0.004mA)

(3) Electrical current “full scale” adjusting

Select “Electrical current “Range” adjusting” and enter, to adjust Standard Signal Supply to “full scale” , then adjusting “adjustment coefficient” to make the Amperemeter exactly indicate 20mA (±0.004mA)

Having “0” and “full scale” adjusted, the accuracy for Convertor current output being secured of output linearity within 0.1%;

(4) Output Current Linearity Check

To set the Standard Signal Supply to 75%, 50%, 25% respectively to check the linearity;

4.6.3 electromagnetic flowmeter converter’s connection of current output:

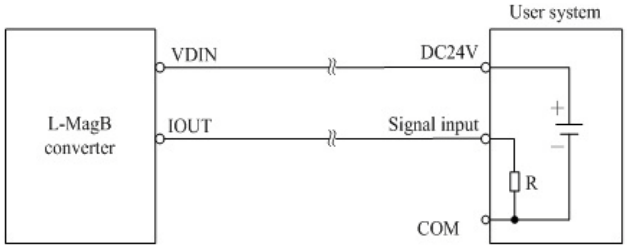


Fig.4.6 (a) two-wire system connection

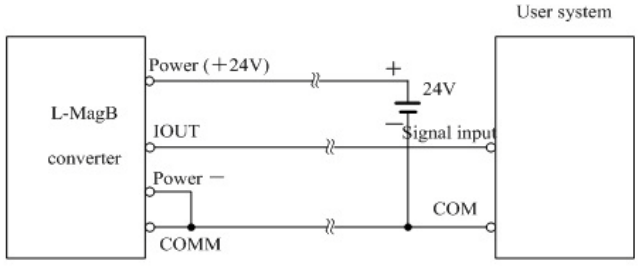


Fig.4.6 (b) three-wire system connection
(power supply and current are not insulated)

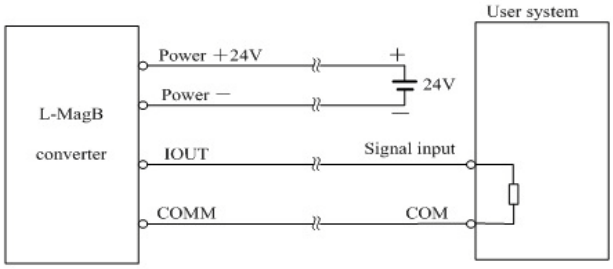


Fig.4.6 (c) four-wire system connection
(power supply and current are insulated)

5. Parameter Settings

After electromagnetic flowmeter converter and sensor connect to the pipe (no matter demarcate or use), may do the next work first:

- Connect the pipe fore-and-aft the sensors tighten.
- Make sure the sensor connects the earth.
- Make sure the liquid stillness when regulating zero of the instrument.
- Make sure the oxidation velum of sensor makes steadily (electrode and liquid contact continuously about 48 hours).

5.1 Key Functions

When electrify, the instrument comes into measure way automatically, and under this way it can do all the functions and display data. Under the parameter setting way, user can set the parameter by the three keys.

5.1.1 Key functions in automatic measuring status

Down-key: select down-row contents on screen circularly
Compound-key + *Confirmation-key*: entering parameter setting status
Confirmation-key: return to automatic measuring status

Under measuring status, LCD display "Contrast" adjustment:

For Round Convertor, hold "*Compound-key* + *Up-key*" or "*Compound-key* + *Down-key*" for several seconds;

For other LCDs, by adjusting the potential meter on its back

5.1.2 Key functions in parameter setting status

Down-key: minus 1 at cursor
Up-key: plus 1 at cursor
Compound-key + *Down-key*: cursor to Left
Compound-key + *Up-key*: cursor to Right
Confirmation-key: enter/exit submenu
Confirmation-key: in any status, hold for 2 seconds, it returns to automatic measuring status.

Note: (1) when "*Compound* " being used, pushing it first, meanwhile holding "*Up*" or "*Down*"

(2) In parameter setting mode, if no operation being made for 3 minuets, it automatically returns to measuring status;

(3) Flow "0" point adjusting for flow direction choosing: by shifting the cursor the left "+" or "–"and then by "*Up*" or "*Down*" key to switching it in the direction that is opposite to the actual flow direction.

5.2 Parameter Setting with Key Operation

To set or correct working parameters, the converter should be running in parameters setting way instead of measuring status. In measuring status, push ""*Compound-key + Confirmation-key* " getting to the select of parameter and transfer password (0000), and then correct the password with one of the new passwords that are provided by manufacturer. Finally, push the "*Compound-key + Confirmation-key* " to work in Parameters Setting mode.

The Convertor is designed with 6 security classification codes; among them, 4 codes can be set by user; the top 2 codes are fixed ones; 6 codes are used by operators with different security qualifications

5.2.1 Function Setting Menu

Push "*Compound-key + Confirmation-key* " to the functions select menu, push "*Up-key* " or "*Down-key*" to select, there are three functions:

Code	Functions	Notes
1	Parameters Set	Select this function; entering the picture of parameter.
2	Clr Total Rec	Select this function，it can be gross reset operation.
3	Fact Modif Rec	Select this function, it can be check the factor 's modif Record

5.1.2.1 Parameters setting

Press "*Compound-key + Confirmation-key* ", it displays "Parameters Set" function,select "Parameters Set", pess "*Confirmation-key* ", input password, press "*Compound-key + Confirmation-key* ",it getting to Parameters Setting status.

5.1.2.2 Clr Total Rec

Press "*Compound-key + Confirmation-key* ", it displays "Parameters Set" function, then push "*Up-key* " to "Clr Total Rec", input the passwords. When the passwords becomes "00000", this function is done, the gross is 0 in the instrument.

5.3 Parameter Setting Menu

LDCK Electro-Magnetic Flow Meter possesses 54 parameters; parameter setting to be made by user as per practical applications.

Parameters being listed below:

List for parameter setting menu

Para-meter No.	Content Reference	Parameter words	Setting mode	Code class	Parameter Range
1	Language	Language	Select	2	English
2	Communication Address	Comm Addres	Set number	2	0～99
3	Communication Speed	Baud Rate	Select	2	300～38400
4	Pipe Diameter	Snsr Size	Select	2	3～3000
5	Flow Unit	Flow Unit	Select	2	L/h、L/m、L/s、m^3/h、m^3/m、m^3/s
6	Measuring Range	Flow Range	Set number	2	0～99999
7	Measuring damping time	Flow Rspns	Select	2	1～50
8	Flow Direction option	Flow Direct	Select	2	Plus/ Reverse
9	Flow zero adjusting	Flow Zero	Set number	2	0～±9999
10	Small signal cut point	Flow Cutoff	Set number	2	0～599.99%
11	Display cut allowed	Cutoff Ena	Select	2	Enable/Disable
12	Flow Calculating unit	Total Unit	Select	2	0.001m^3～1m^3、

					0.001L～1L、
13	Reverse measure allow	SegmaN Ena	Select	2	Enable/Disable
14	Current output system	Analog Type	Select	2	0～10mA /4～20mA
15	Digital output mode	Pulse Type	Select	2	Freque / Pulse
16	Pulse Equivalent unit	Pulse Fact	Select	2	$0.001m^3$～$1m^3$ 、 0.001L～1L、
17	Frequency output range	Freque Max	Select	2	1～ 5999 HZ
18	Empty pipe alarm allow	Mtsnsr Ena	Select	2	Enable/Disable
19	Empty alarm threshold	Mtsnsr Trip	Set number	2	59999 %
20	Up-limit Alarm allow	Alm Hi Ena	Select	2	Enable/Disable
21	Up-limit Alarm value	Alm Hi Val	Set number	2	000.0～ 599.99 %
22	Low-limit Alarm allow	Alm Lo Ena	Select	2	Enable/Disable
23	Low-limit Alarm value	Alm Lo Val	Set number	2	000.0～599.99 %
24	Excitation Alarm allow	Sys Alm Ena	Select	2	Enable/Disable
25	Total Flow accumulated clearing password	Clr Sum Key	Code	3	0～99999
26	Sensor code 1	Snsr Code1	Set by user	4	Finished Y M
27	Sensor code 2	Snsr Code2	Set by user	4	Product number
28	Magnet-Excitation mode	Field Type	Select	4	Type1,2,3
29	Sensor Coefficient	Sensor Fact	Set number	4	0.0000～5.9999
30	Error Correction allow	Line CRC Ena	Select	4	Enable/Disable
31	Correction point 1	Lineary CRC1	User set	4	Set Velocity
32	Correction coefficient 1	Lineary Fact 1	User set	4	0.0000～1.9999
33	Correction point 2	Lineary CRC2	User set	4	Set Velocity
34	Correction coefficient 2	Lineary Fact 2	User set	4	0.0000～1.9999
35	Correction point 3	Lineary CRC3	User set	4	Set Velocity
36	Correction coefficient 3	Lineary Fact 3	User set	4	0.0000～1.9999
37	Correction point 4	Lineary CRC4	User set	4	Set Velocity
38	Correction coefficient 4	Lineary Fact4	User set	4	0.0000～1.9999
39	Positive Total Flow (low level)	FwdTotal Lo	Correctable	5	00000～99999
40	Positive Total Flow (high level)	FwdTotal Hi	Correctable	5	00000～9999
41	Negative Total Flow (low level)	RevTotal Lo	Correctable	5	00000～99999
42	Negative Total Flow (high level)	RevTotal Hi	Correctable	5	00000～9999
43	Spike disturbance inhibition allow	PlsntLmtEna	Select	3	Enable/Disable
44	Spike disturbance inhibition coefficient	PlsntLmtVal	Select	3	0.010～0.800m/s
45	Spike disturbance inhibition time	Plsnt Delay	Select	3	400～2500ms
46	Pass Word 1	Pass Word 1	User correct	5	00000～99999
47	Pass Word 2	Pass Word 2	User correct	5	00000～99999
48	Pass Word 3	Pass Word 3	User correct	5	00000～99999
49	Pass Word 4	Pass Word 4	User correct	5	00000～99999
50	Electrical current “0”	Analog Zero	Set number	5	0.0000～1.9999

	point adjusting				
51	Electrical current “full scale” adjusting	Anlg Range	Set number	5	0.0000～3.9999
52	Meter Fact	Meter Fact	Set number	5	0.0000～5.9999
53	MeterCode 1	MeterCode 1	Factory set	6	Finished Y /M
54	MeterCode 2	MeterCode 2	Factory set	6	Product Serial No

5.4 Parameter Explanation

The Convertor operation status, calculation, output mode are determined by the parameters; correct selecting and setting of parameters make the convertor operate in the optimum status with higher accuracy for both measuring display and output;

The parameter setting for functions is applicable to 6 classified codes; among them classification 1 to 5 are user’s code, class 6 for the manufacturer; user is entitled to reset code 1 to code 4 by code 5 as access;

User is able to read all convertor parameters regardless which classified code he or she is using for access; however change or modification to the parameters needs differently classified code;

Code 1 (00521 for Ex-works): user can read all parameters

Code 2 (03210 for Ex-works): user can change parameters from No.1 to 23

Code 3 (06108 for Ex-works): user can change parameters from No.1 to 24

Code 4 (07206 for Ex-works): user can change parameters from No.1 to 25

Code 5 (fixed): user can change all parameters

It is suggested that higher-rank personnel from user is assigned to know the Code 5 and Code 4 which are mainly used for total flow clearing; Code 1 to 3 for any person whom user prefers;

5.4.1 Language

Two languages for LDCK Electro-Magnetic Flow Meter; Chinese and English at user’s option

5.4.2 Communication Address

For multi-machine communication, different communicating address setting is applicable

5.4.3 Communication Speed

Communication Speed baudrate optional 600, 1200, 2400, 4800, 9600, 14400 B

5.4.4 Measuring Pipe Diameter

Sensors with engineering nominal diameter ranging from 3-3000mm

5.4.5 Flow unit

The flow unit can choose form the parameters (L/s、L/m、L/h、m^3/s、m^3/m、m^3/h),and the user can choose the proper unit according to the technological requirement and using habit.

5.4.6 Measuring Range Setting

The Range refers to up-limit flow for measuring (full scale); and lower limit value is set “0” automatically.Tthe relation of the measuring range and percent display, frequency output and current output with flow:

percent display = (flow measure / measuring range) * 100 %;

frequency output = (flow measure / measuring range) * frequency full;

current output = (flow measure / measuring range) * current full + base point;

pulse output will not be affect by measuring range.

5.4.7 Measuring Damping Time

Longer measuring damping time can increase the stability of Flow display and Signal output; it is more suitable to the operation in which flow control is required; shorter measuring damping

time can decrease the measuring response time, it is more suitable to the measuring of total flow accumulated by pulse flow; damping time is to be set just by selection, one option will do;

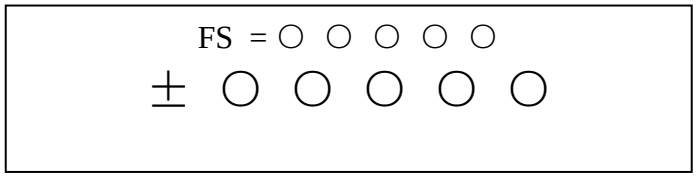
5.4.8 Flow Direction Option

During test if user assumes the fluid flow direction is positive while meter displaying is negative, just set it to negative; it will do when conversely;

5.4.9 Flow ZERO trimming

The flow meter ZERO point is already intelligently processed by the convertor while the conductive fluid being fully filled in the measuring pipe of Electro-Magnetic Flow Sensor and stayed in static status without motion; if related Sensor ZERO is beyond the convertor intelligently-processing-capability, Flow Zero trimming is to be done by user; such flow Zero is expressed by flow speed with unit mm/s

Convertor Zero trimming display as below



In display, up-row FS denoting Zero measuring value, down-row for flow zero trimming value; if FS display is not “0”, adjusting the trimming value to FS=0; if change down- row but FS increasing; change down-row positive/negative sign to meet FS=0;

Further reminding: Flow Zero trimming shall be done in condition that conductive fluid is being fully filled in the measuring pipe of Electro-Magnetic Flow Sensor and stayed in static status without motion;

Flow zero trimming value is a calibrating Constant, which shall be taken in record and on nameplate; recording the Sensor Zero by flow speed in unit of mm/s, and its positive or negative sign is opposite to that of trimming value;

5.4.10 Small signal cutting point

Small signal cutting point is to be set by percentage flow of range; for small signal cutting, it is user’s option to cut off flow, flow speed, and percentage display as well as signal output; or just cut off current output, frequency (pulse) output signals and maintain flow, flow speed and percentage display;

5.4.11 Flow Calculating Unit

Convertor display is a 9-digit counter, maximum counting capacity is 999999999;

Calculating unit: L and m^3 and with multiplying power of 0.001L, 0.01L, 0.1L, 1L and 0.001m^3, 0.01m^3, 0.1m^3, 1m^3 for easy reading of durational total flow accumulated; it also automatically figure out whether any overflow occurs by using applied flow unit and multiplying power;

5.4.12 Function of reverse direction measurement Enable/Disable

When parameter for reverse direction measurement is set as “Enable”, if the fluid flowing in reverse direction, the convertor is working by output pulse, current in accordance with the reverse flow quantity, and taking reverse total flow accumulated into account; when the parameter is set as “Disable”, if fluid flowing in opposite direction, the Convertor pulse output is “0”, current output is “0” (4mA or 0mA)

5.4.13 Current Output system

Two systems: 0~10mA and 4~20mA at user’s option

5.4.14 Digital output mode

Digital output in two modes at option: Frequency output and Pulse output:

- Frequency output: continuous square-form wave;
- Pulse output: a serial of square wave pulse;

Frequency output is mainly applicable to instant flow measuring and total flow accumulation within a short time period;

Pulse output with Pulse Equivalent optional selection, accumulated flow volumetric reading can be obtained, which is mainly used in long- time- period total flow accumulated measuring in direct volumetric unit;

In general, frequency output and pulse output are in the way of OC Gate; therefore external DC power supply and load is to be connected; details refer to section 4.5;

5.4.15 Pulse Unit Equivalent

Pulse Unit Equivalent is: the flow quantity denoted by one pulse; its selection range is optional, see below:

Pulse Equivalent	Flow Quantity	Pulse Equivalent	Flow Quantity
1	0.001L/cp	5	0.001m³/cp
2	0.01L/cp	6	0.01m³/cp
3	0.1L/cp	7	0.1m³/cp
4	1.0L/cp	8	1.0m³/cp

In the same flow quantity condition, the smaller the pulse equivalent, the higher the frequency for output pulse; so the accumulated flow deviation is smaller; the highest output pulse frequency of the Convertor reaches up to 5000cp/s.

5.4.16 Frequency Output Range

The Frequency output range is responding to the flow measuring up-limit, i.e. 100% of percentage flow; frequency output up-limit to be set optionally, ranging from 1 to 5000Hz.

5.4.17 Empty-Pipe Alarm Allowed

The Meter is of empty pipe inspection function; if user opts Empty-Pipe-Alarm allowed, when Empty being detected, Convertor analog and digital output are set as zero signal, also with flow display of zero

5.4.18 Empty-Pipe Alarm Threshold

When the pipe is full of liquid (whether flowing or not), the parameter of “Mtsnsr” could be modified more easily. The parameter displayed upper line is real MTP, and the parameter displayed bellow is the “Mtsnsr trip” that should be set. When setting “Mtsnsr trip”, you could be according to the real MTP, the value that should be set is usually three to five times of real MTP.

5.4.19 Up-limit alarm allowed

Users can choose “Enable” or “Disable”.

5.4.20 Up-limit alarm value

Up-limit alarm value is calculated in range percentage, this parameter is set with figure; user opts a setting within range from 0% to 199.9%; when the instrument meets the condition, it alarms;

5.4.21 Low-limit Alarm allowed

Low-limit Alarm allowed and value are Same as Up-limit Alarm

5.4.22 Excitation Alarm allow

Selecting Enable will have the function, and selecting Disable will cancel the function.

5.4.23 Total Flow accumulated clearing password

This password is used while clearing the total flow accumulated number in the convertor.

During this parameter setting, user sets the password code for “Total Flow accumulated Clearing”, if confirmed, it displays “enter allowed”, Clearing being carried out; at the time, 3 Totalizers being cleared’ for recalculating.

By using Classification 4 Code, “Total Flow accumulated Clearing” Code can be set or modified under the Menu for “Total Flow accumulated Clearing”; please to write down the CODE

5.4.24 Sensor Code

Sensor code can be used to mark the combined Sensors with its ex-works time and number so as to help the Sensor Coefficient setting

5.4.25 Magnetic Excitation Mode

The Convertor offering 3 modes for Magnetic Excitation: 1/16 frequency (type 1), 1/20frequency (type 2), 1/25 frequency (type 3). The small diameter sensors should use 1/16 frequency, and bigger diameter sensors should use 1/20 or 1/25 frequency. When using, please select type 1 first, if the zero of velocity is too high, select the type 2 or type 3.

Note: It must work in the same Magnetic Excitation Mode as it did during calibration

5.4.26 Sensor Coefficient

Refer to the “Sensor coefficient” on the ex-works calibration certificate or nameplate for the combined Sensor; enter the “Coefficient” in its parameter setting;

5.4.27 Positive Total Flow (low level and high level)

Positive total volume high byte and low byte can change forthcoming and reverse total value, and be used to maintenance and instead.

User use Classification 5 code to enter, and can modify the positive accumulating volume (∑+). Usually, it is unsuitable to exceed the maximum the counter set（999999999）.

5.4.28 Negative Total Flow (low level and high level)

User use Classification 5 code to enter, and can modify the negative accumulating volume (∑-). Usually, it is unsuitable to exceed the minimum the counter set（999999999）.

5.4.29 Spike disturbance inhibition allow

For paper pulp, slurry and other serosity, the flow measure will have "spike l disturb", because the solid grain friction or concussion the measure electrode. LDCK converters use variation restrain arithmetic to conquer the disturbing by designing three parameters to select disturb character.

Set it "enable", start variation restrain arithmetic; set it "disable", close variation restrain arithmetic.

5.3.30 Spike disturbance inhibition coefficient

This coefficient can disturb the variation of cuspidal disturb, and calculate as percent of flow velocity, thus ten grades: 0.010m/s, 0.020m/s, 0030m/s, 0.050m/s, 0.080m/s, 0.100m/s, 0.200m/s, 0.300m/s, 0.500m/s, 0.800m/s, and the smaller percent, the higher delicacy of cuspidal restrain.

Note: when using it, must test for select by the fact, and sometimes it is not the higher delicacy is good.

5.3.31 Spike disturbance inhibition time

This coefficient can select the width of time of restrain cuspidal disturb and the unit is ms. If the duration is shorter than flow change in some time, LDCK will think it is cuspidal disturb, and if it is longer, LDCK will think it is natural. It also needs to select parameter in fact.

5.3.32 User’s password 1~4

Users can Classification 5 of passwords to correct these passwords.

5.3.33 Electrical current “0” point adjusting

When the converters are made in the factory, output current has been calibrated to zero scale, that is, accurate 0mA or 4mA output.

5.3.34 Electrical current “full scale” adjusting

When the converters is made in the factory, output current have been calibrated to full scale, that is, accurate 10mA or 20mA output.

5.3.35Meter Fact

This fact is the special one of sensor-made-factory and the factory use this fact to unite LDCK electromagnetic flowmeters converters to make sure all the instruments can interchange by 0.1%.

5.3.36 MeterCode 1 and 2

Converter code records the date of manufacturing and serial number of converter.

6. Alarm information

PCB of electromagnetic flowmeters converters uses SMT, so for user, it is unable to service, and cannot open the shell of converter.

The Intelligent converters have self-diagnose function. Beside the trouble of power and hardware circuit, the normal trouble can be alarmed correctly. This information displays on the left of LCD. The trouble codes and its’ meanings are like this:

FQH ---- Flow high limit alarm; FQL ---- Flow low limit alarm;
FGP ---- Flow empty pipe alarm; SYS ---- System exciting alarm.
UPPER ALARM ---- Flow high limit alarm;
LOWER ALARM ---- Flow empty pipe alarm;
LIQUID ALARM ---- Flow empty pipe alarm;
SYSTEM ALARM ---- System exciting alarm.

7. Trouble shooting

7.1 No display:

a) Check the power supply connection;
b) Check the power fuse to see for OK;
c) Check the contrast of LCD and regulate it to working state;

7.2 Exciting alarm

a) Check if the exciting cables EX1 and EX2 did not connected;
b) Check if the total resistance of sensor’s exciting coil resistances less than 150Ω;
c) If a) and b) are OK, the converter is failed.

7.3 Empty pipe alarm

Check whether or not the measured fluid full of testing pipe of sensor.
If the measured fluid full of testing pipe of sensor:

a) When shorting circuit three connectors SIG 1, SIG 2, SGND of converter, and no “Empty Alarm” displayed then the converter works OK.
In this case, it is possible that conductivity of measured fluid may be small or empty threshold of empty pipe and range of empty pipe are set wrongly.

b) Check if the signal cable is OK;
c) Check if the Sensor Electrodes are OK or not.
Let the flow is zero, then the displayed conductivity should be less than 100%.
In condition of flow passing, to measure resistance of terminal SIG1 and SIG2 to SIGGND respectively, both should be less than 50KΩ (it is better to use Type 500 multiple-purpose electrical meter with pointer for measuring, meanwhile electrical discharging phenomena can be observed, the meter pointer swing right from left to right, indicating 3 to 50kΩ, then discharging from right to left, the value difference of Right-Swing between the two Electrodes will not be over 20%)
d) To measure the DC Voltage between DS1 and DS2 by a digital multiple-purpose electrical meter, it shall be less than 1 V, otherwise, the Sensor Electrodes are being contaminated, cleaning them is necessary.

7.4 Up-limit Alarm

Up-limit Alarm indicating both Current and Frequency are over limits, widening the range to revoke the up-limit Alarm.

7.5 Low-limit Alarm

Low-limit Alarm indicating both Current and Frequency are over limits, shortening the range to revoke the low-limit Alarm

7.6 Incorrect Flow measurement

a) The Fluid to be measured being fully filled in the measuring pipe or not;
b) Signal wiring correct or not;
c) Check Sensor coefficient, Zero Point setting in accordance with Sensor nameplate and its Ex-works Calibration Certificate or not;
d) System Wrong Settings have been intelligently detected and prompted during flow range, flow unit and flow equivalent setting, it convenient for modification;

8. Package Contents

One set of separated style or integrated style LDCK Electro-Magentic Flow Meter as per Purchase Order;

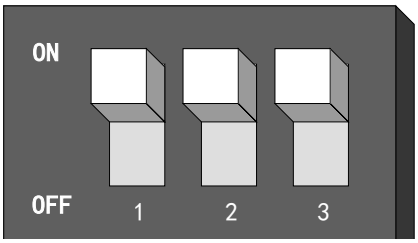
Documents attached including: Instruction Manual for Installation and Operation one copy; Quality Certificate one original

9. Transportation and Storage:

To keep it in the Ex-works original packing condition before it arriving at the job-site to prevent it from being damaged during transfer;

Storage condition: indoor;
a) rain and wet weather-proof;
b) few mechanical vibration and no impact;
c) temperature ranging from －20℃ to ＋60℃;
d) humidity less than 80%

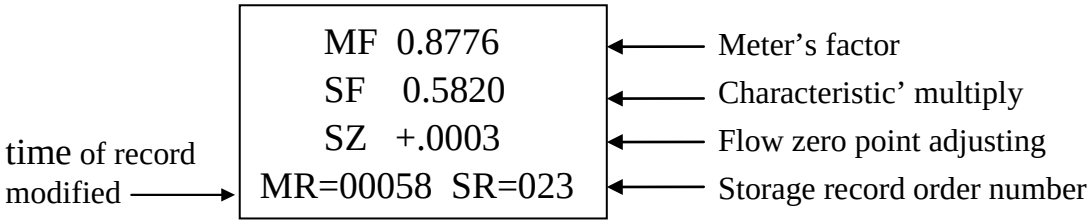
Appendix 1. Coding Switch Explanation (see Figure attached)



Key 1: ON: Supply up power (24V) for ALML output.
OFF: No connection.
Key 2: ON: Pulse output to OC gate when flow verification was taken. Connect pull -up resistor.
OFF: No connection.
Key 3: ON: Supply up power (24V) for ALMH output.
OFF: No connection.
Key 4: ON: Connected to RS485 terminal resistor for communication
OFF: No connection.
Note: Terminal resistor is for long-distance communication, not connected for short distance.

Appendix 2. The function of protecting the Characteristic Flow Factor

LDCK converter has a function of protecting the Characteristic Flow Factor. The key content is that the factor could not be modified easily. LDCK converter increases a new function to record the modified procedure and modified times of flow zero, sensor factor, and meter factor, any change of these three factors could be recorded. The sensor factor and modifying times could be recorded in Test Report, and when next time testing the factor in Test Report and factor in the convertor are compared to check whether the Characteristic Flow Factor has been changed. The detail about the Characteristic Flow Factor protection function can be found in the appendix.



Attention!

The last record is displayed when this item is first entered, if you want to browse the history records press "down key", and could search for the last record to the thirty-two record ahead. Finally the times of record modified (MR) should be written down on the paper before next time test.

Appendix 3. Complementary explanation of the nonlinear error correction function

In principle , nonlinear error correction function, is used for line regulation at lower flow velocity. which under 0.3m/s. The function is designed to four section of error correction,and divided into four flow velocity points and four correction coefficients.

Nonlinear error correction works on the basis of the original transducer's calibration coefficients, so please close nonlinear error correction function , calibrate the transducer's coefficients, and open the function to realize nonlinear error correction after calibrating. Set correction points and correction coefficient according to the nonlinear segment of transducer, if be the appropriate settings, do not have to recalibration.

As a rule, the flow velocity which calculated form transducer coefficient is called "original flow velocity", and the other which gained from non-linear error correction is called "correction flow velocity". The relationship between them is shown as following:

a. Correction point 1 ＞ Original flow velocity ≥ Correction point 2:
   Correction flow velocity = Correction coefficient 1 × Original flow velocity

b. Correction point 2 ＞ Original flow velocity ≥ Correction point 3:
   Correction flow velocity = Correction coefficient 2 × Original flow velocity

c. Correction point 3 ＞ Original flow velocity ≥ Correction point 4:
   Correction flow velocity = Correction coefficient 3 × Original flow velocity

d. Correction point 4 ＞ Original flow velocity ≥ 0:
   Correction flow velocity = Correction coefficient 4 × Original flow velocity

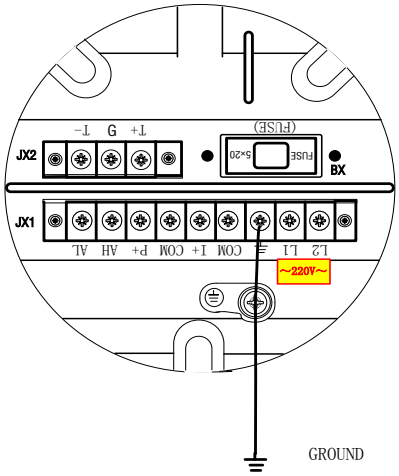
Notice: The flow velocity of the correction points must satisfy the following relationship:

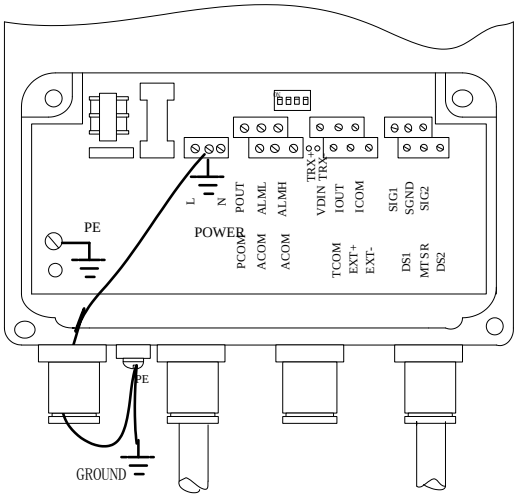
Correction point 1 ＞ Correction point 2 ＞ Correction point 3 ＞Correction point 4

The intermediate value of correction coefficient is 1.0000， when the value of correction coefficient is bigger than 1.0000, it is considered as positive coefficient (increase), and the value of correction coefficient is smaller than 1.0000 , it is considered as negative coefficient (decrease).

Appendix 4. Lightning protection notes

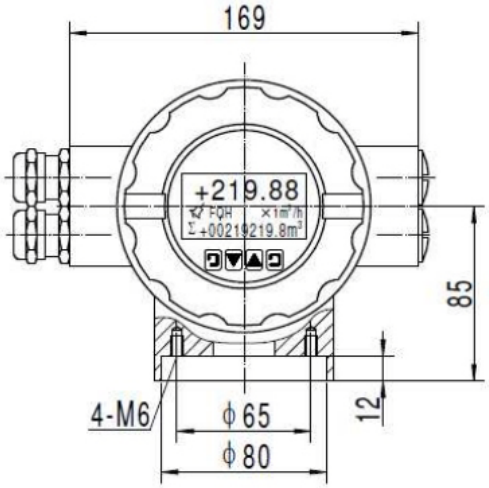
When installing, users must connect the converter's earthing terminal with the shell, and then earthing them reliably, because the electrical current can be put into the earth through the shell by the gas discharger of lightning protection. If the shell has not been earthing reliably, once lightning, it may cause a personal accident when there is somebody operating the converter. The specific details, you can see the connection diagram.

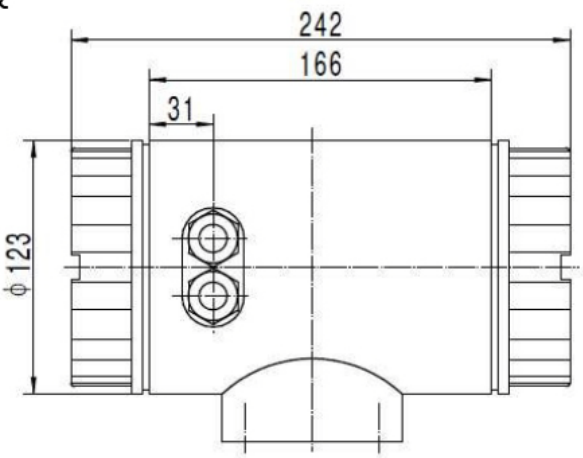




Appendix 5. Convertor Out-appearance & Dimensions (see Figures attached)

Round Convertor Out-appearance & Dimensions





Square Convertor Out-appearance & Dimensions