



FlowMaster

ELECTRICAL FLOWMETER

Instruction Manual



Sichuan Instrument Complex Co., LTD.
Flowmeter Branch

Dear users,

Thanks for your choosing our FlowMaster series flowmeters. Before using please read in detail our instruction manual to have a good understanding of the proper installation and operation, which will help you to successfully install them and have best using effect and improve their use-of-life.

We SIC have been conforming to the philosophy that "SIC by customer's side, customer in SIC's heart", if you have any questions in the course of installation and application, or any suggestions (which we will be very much appreciated), please dial our technical support number: 86-23-62807086, we'll be at your service.



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I .How to choose FlowMasters

Selecting appropriate electromagnetic flowmeter as a tool of measuring the flow should satisfy 2 conditions as following:

1. The subject being electric liquid or liquid and solid medium, and the conductance not lower than $5 \mu \text{ s/cm}$ which equal to the soften water (electricity of the general tap water and the natural water is about $100\text{-}500 \mu \text{ s/cm}$). Therefore, the acid, soda and salt liquid, the paper slurry, the slop, the mineral slurry, etc can all adapt electromagnetic Master for measure. Note that this product cannot measure non-electric medium such as the pure alcohol, the pure acetone, the petroleum and any other fatty matters.
2. The subject can't contain too many Fe-magnetic substances and too many bubbles(full pipe measurement). Having mediums meeting 2 conditions above , users then can select the Electromagnetic flowmeters for measuring purposes according to their parameters and specifications. Please confirm that the specifications and types of the provided products are consistent with the ones that you choose, and check product qualifications (inspection certificates), instruction manual and matched accessories.

II .Cautions

Please give special intentions below before using the electromagnetic flowmeters:

1. Power Supply a.c. or d.c
2. Safety Whether used for explosive-proof situations? Confirm the working areas the instruments can operate.
3. Pressure Whether the pressure rating consistent with the working conditions
4. Temperature Whether the temperature resistance level consistent with the working conditions
5. Protection Whether the protection rating consistent with the working conditions
6. Connection Whether the electrical connection correct and reliable
7. Flow direction Whether the flow direction sign consistent with the working conditions
8. Straight pipeline Whether installation of sensor straight pipeline consistent with the instruction manual
9. Grounding Whether has a reliable grounding connection

Only after each above item meets the use requirements of the instrument can you switch the power supply on and put the instrument into operation.

III. Installation Connections

● Mechanical Installation

A. Installing the sensor upon the process pipeline should satisfy following conditions:

1. The flowmeter can self-check forward/reverse flow, and the flow arrow on the sensor is stipulated by the producer as forward flow direction. Users should make the flow arrow consistent with the process flow when installing the instrument.
2. To ensure measurement accuracy of the flowmeter, the straight pipe of the flowmeter must assure 5D of the upstream part and 2D of the downstream part (D prefers to inner pipe diameter);
3. Selecting proper sensor installation position and direction, the sensor can be installed by linear, vertical and lean installation, but the axial electrode must be nearly horizontal (the sharp angle between the axial electrode and the horizontal not more than 45°)to reduce effects on the measurement resulting from the bubbles mixed in the liquids.
4. The measuring pipe must be fully filled with process medium, assuring that the electrode completely immerge into the measured flow liquid to make the measurement reliable.

B. Installing the sensor upon the process pipeline should also notice following circumstances:

1. For the abrasion medium measurement, vertical installation is the most preferable;
2. High electromagnetic field should be avoided nearby the flowmeter;
3. The sensor can not be installed on free-vibrating pipes;
4. Avoiding measure deviation resulted from the additional gases and the damages against the lining resulted from the vacuum, see Fig. (1);
5. For the opening emission pipe, the flowmeter should be installed at the low pipeline part, see Fig. (2);
6. For pipe fall exceeding 5m, air valve (vacuum) should be installed at downstream flowmeter, see Fig. (3);
7. For the long pipeline, control valve is usually installed at downstream flowmeter, see Fig. (4);
8. The flowmeter could not be installed at the pumping side, see Fig. (5)
9. Underground installation should add supporters in two ends of the pipeline, see Fig. (6)

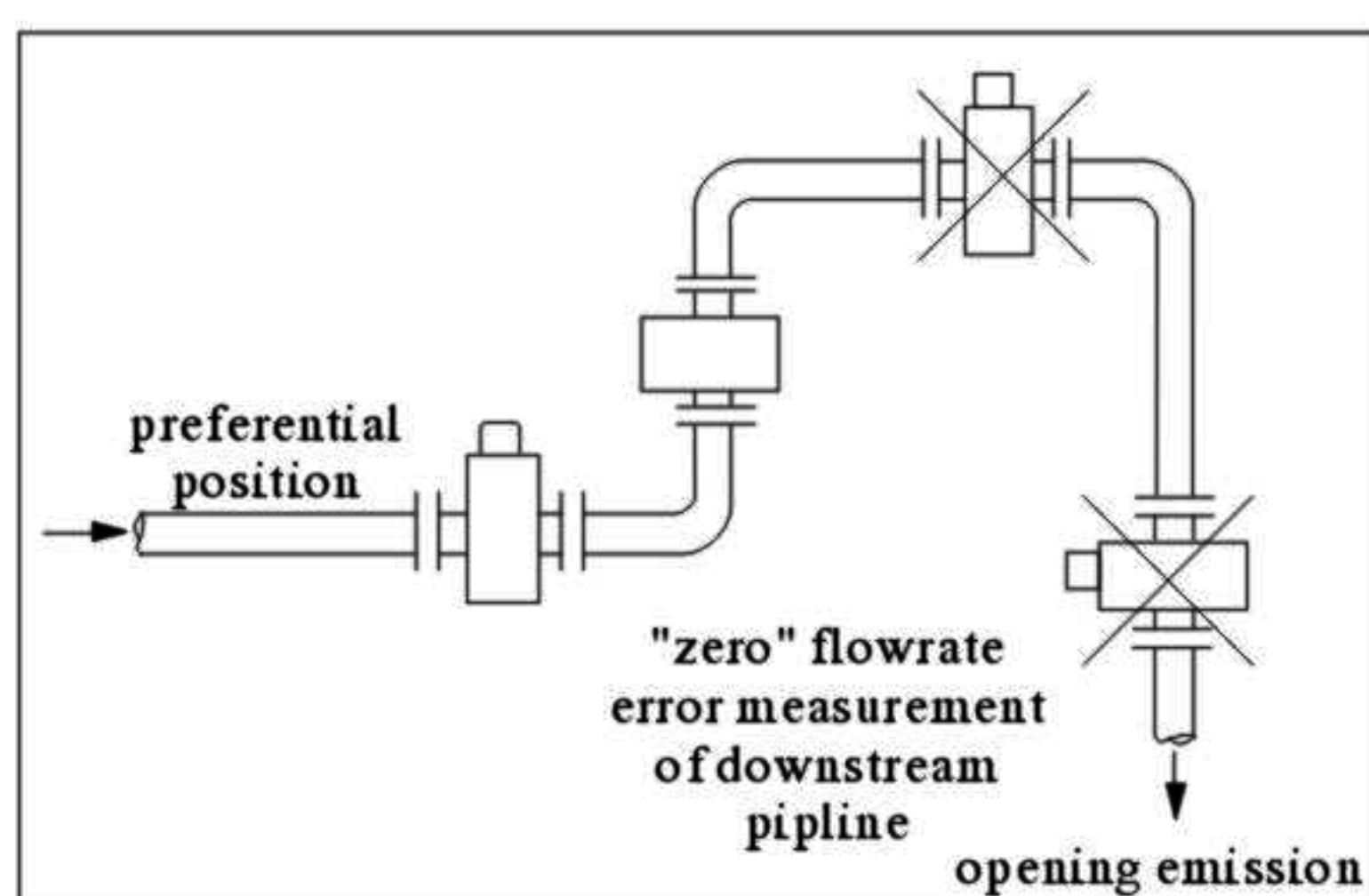


Fig. (1) pipe zenith
(Bubbles in the measurement
pipe error measurement)

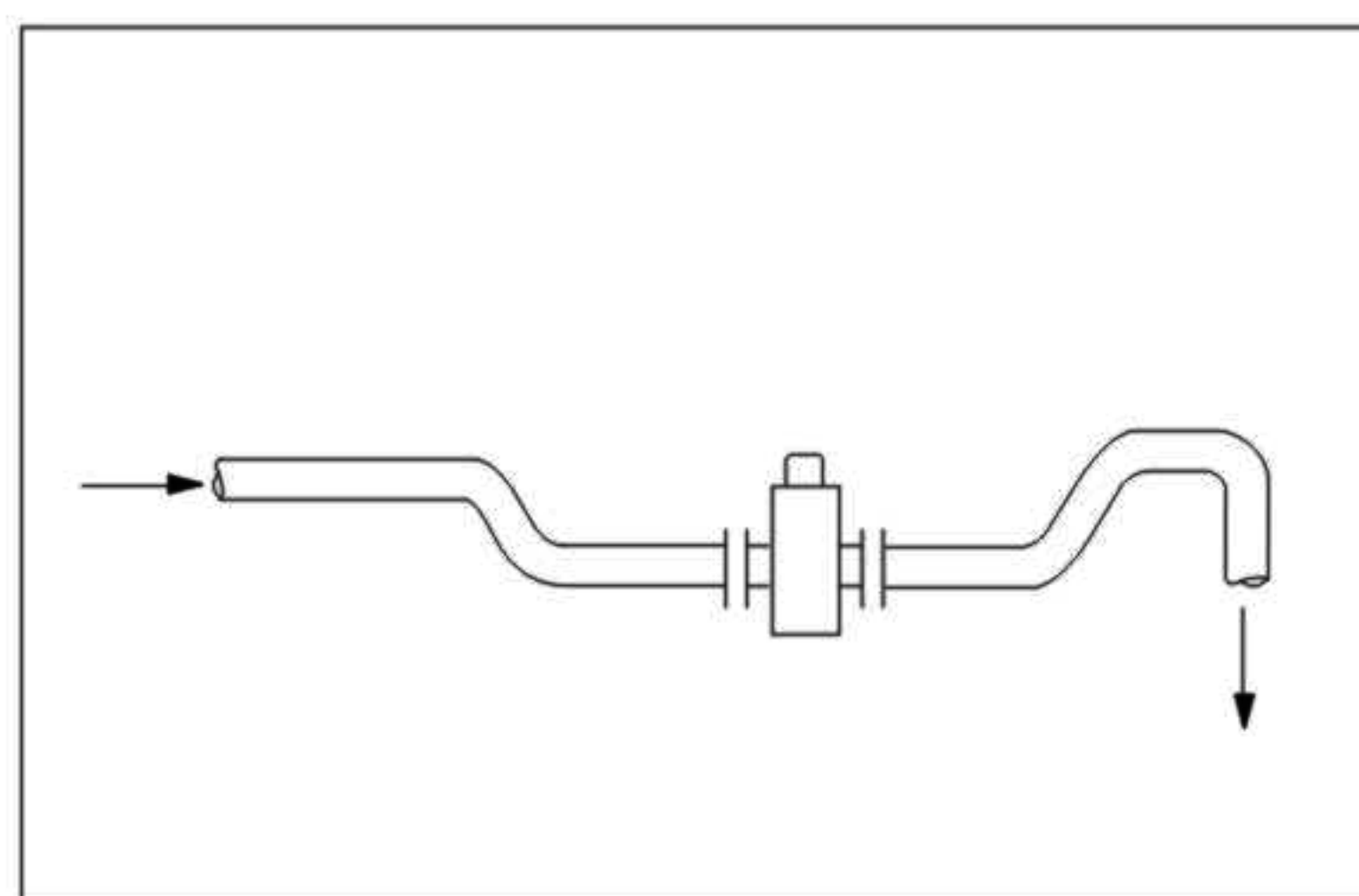


Fig. (2) Install instruments at the
open feed-in or at low pipe part of
emission

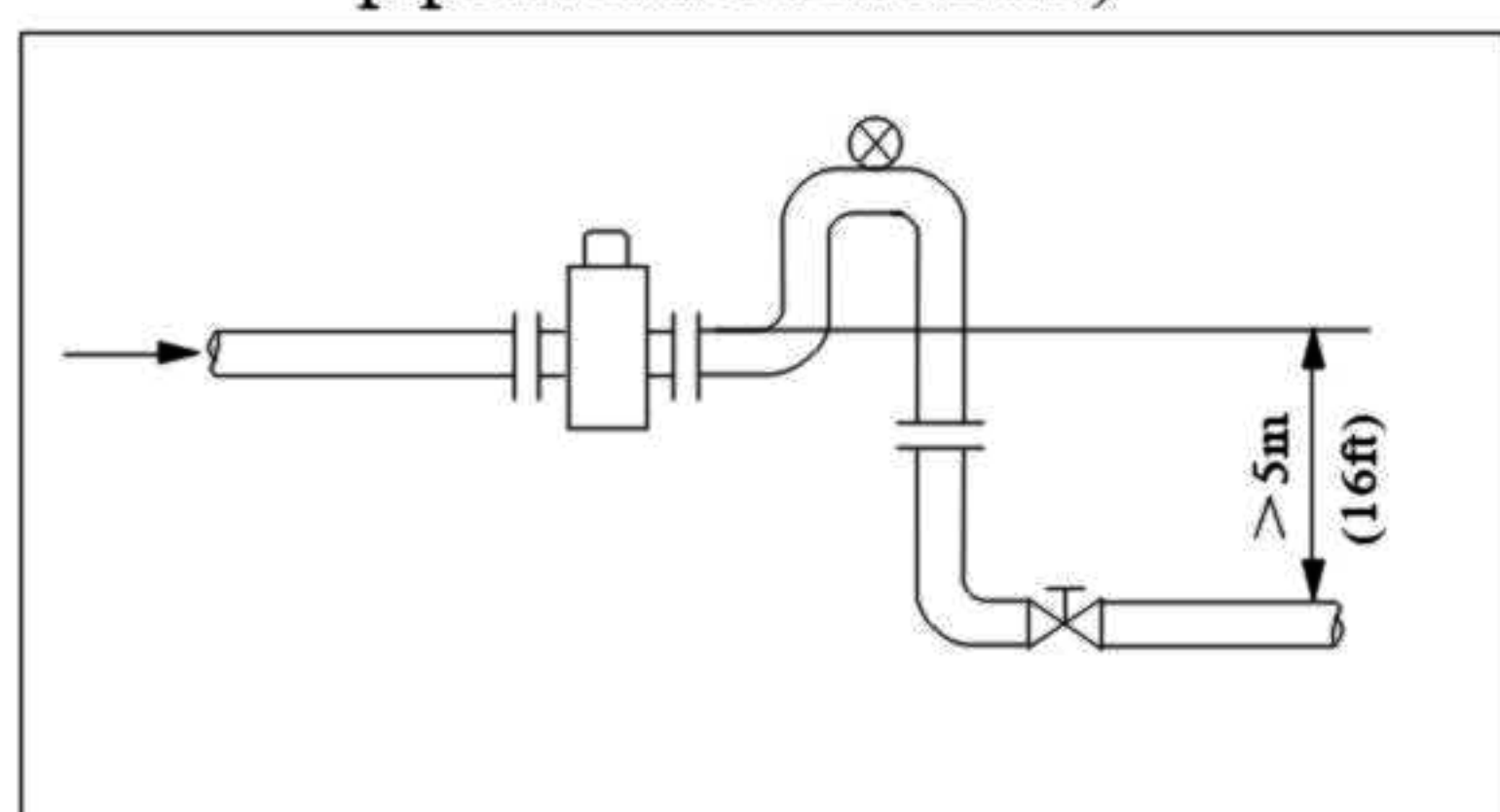


Fig.(3) For pipe fall exceeding
5m(16ft), install air valve (vacuum)
at downstream flowmeter

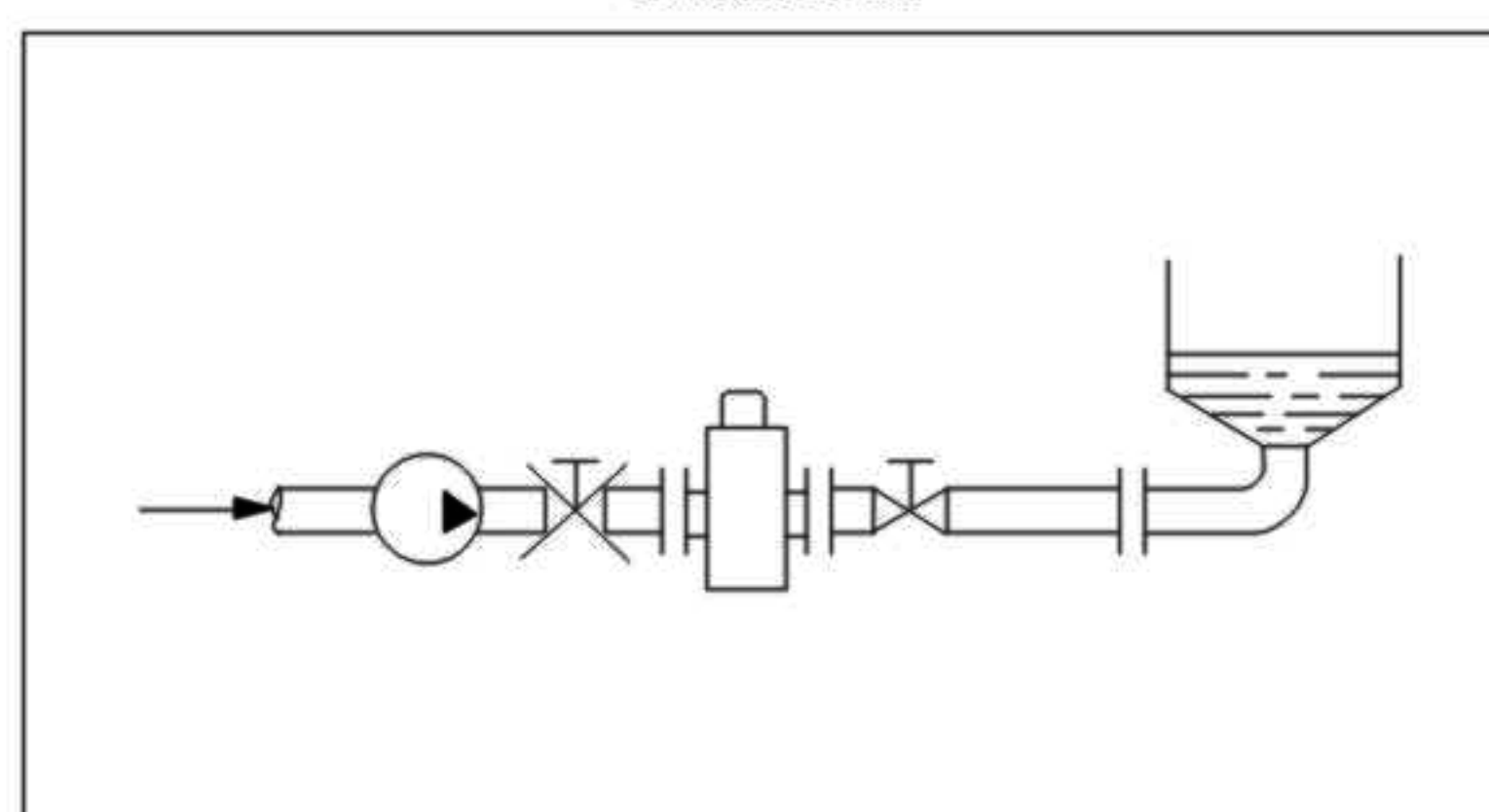


Fig. (4) For the long pipeline,
install control valve at downstream
flowmeter

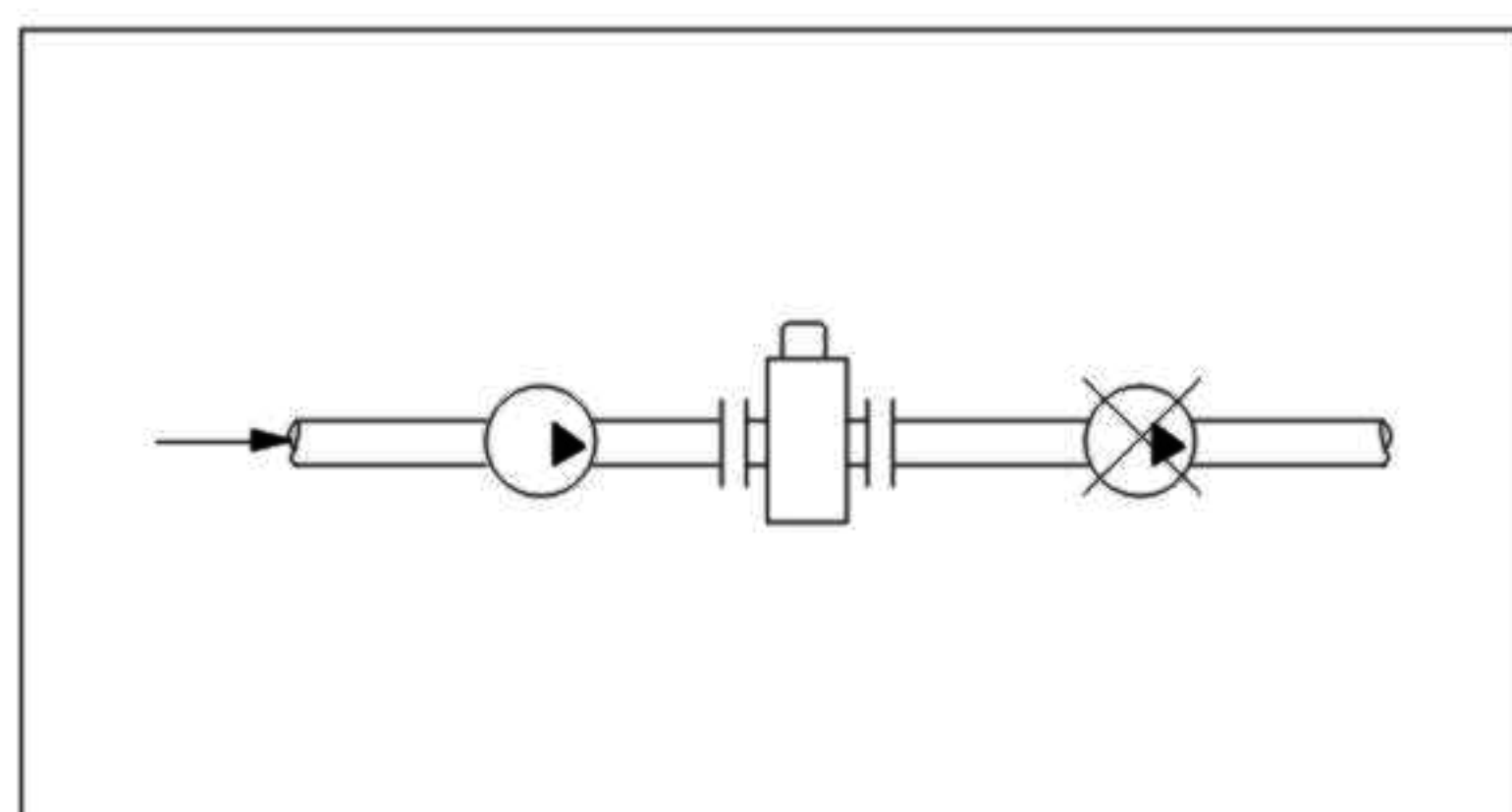


Fig. (5) Flowmeter (vacuum) should
never be installed on the pumping side

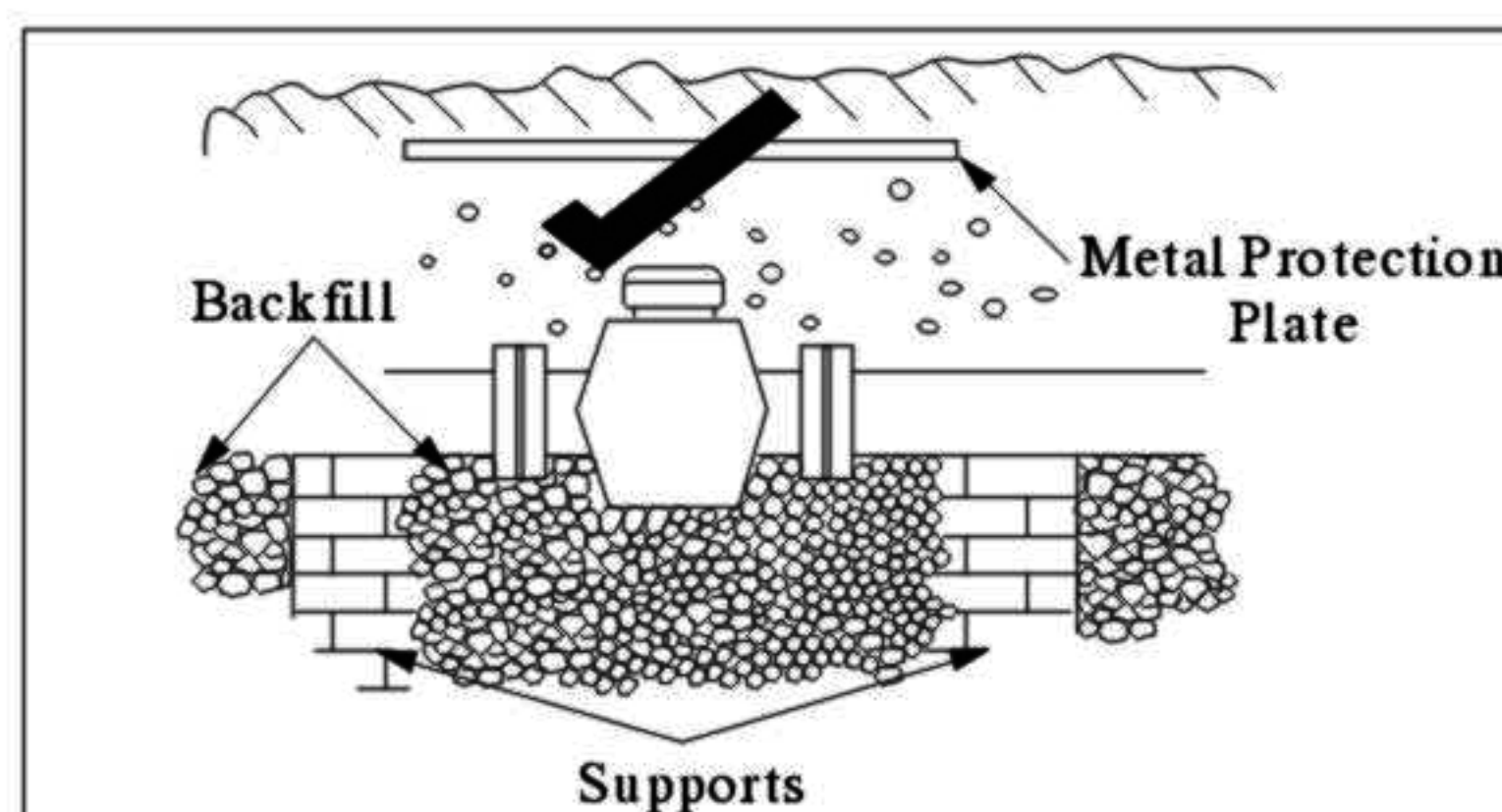


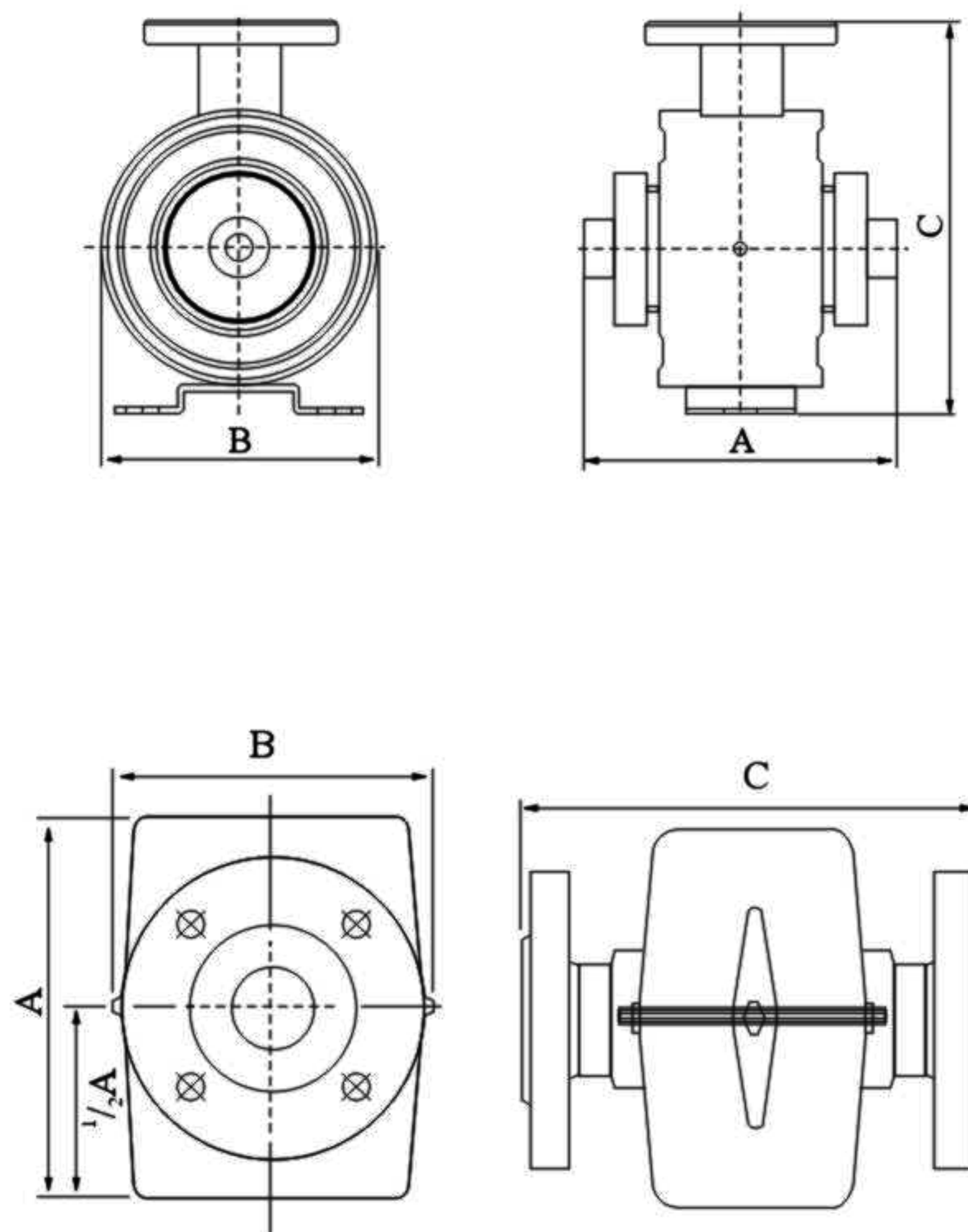
Fig. 6-6 Underground

● Surface dimensions

FlowMaster Sensor

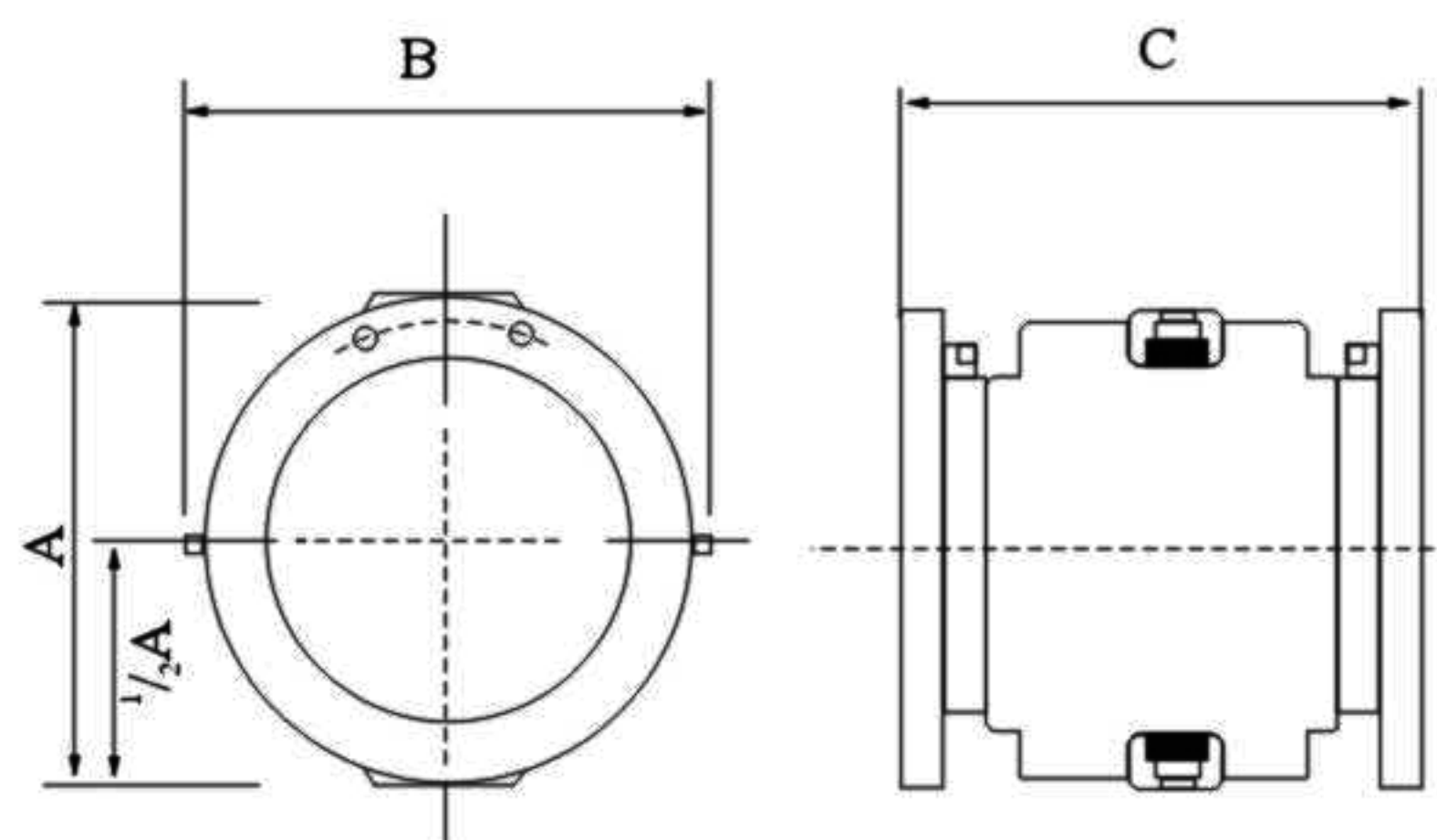
Size: 3 to 150mm(0.12 to 6 in)

Meter Size (mm) (in)	Dimension			Approx Weight (kg)
	A (mm) (in)	B (mm) (in)	C (mm) (in)	
3 (0.12)	114 (4.4)	99 (3.9)	135 (5.3)	2
6 (0.24)	114 (4.4)	99 (3.9)	135 (5.3)	2
8 (0.31)	114 (4.4)	99 (3.9)	135 (5.3)	2
9 (0.5)	114 (4.4)	99 (3.9)	135 (5.3)	2
10 (0.39)	114 (4.4)	99 (3.9)	135 (5.3)	2
12 (0.4)	114 (4.4)	99 (3.9)	135 (5.3)	2
15 (0.5)	174 (6.8)	140 (5.5)	200 (7.9)	7
20 (0.8)	174 (6.8)	140 (5.5)	200 (7.9)	7
25 (1)	210 (8.3)	176 (6.9)	200 (7.9)	7
32 (1.3)	210 (8.3)	176 (6.9)	200 (7.9)	8
40 (1.5)	210 (8.3)	176 (6.9)	200 (7.9)	9
50 (2)	210 (8.3)	176 (6.9)	200 (7.9)	10
65 (2.5)	280 (11.0)	219 (8.6)	200 (7.9)	18
80 (3)	280 (11.0)	219 (8.6)	200 (7.9)	18
100 (4)	312 (12.3)	230.5 (9.8)	250 (9.8)	24
125 (4.9)	312 (12.3)	230.5 (9.8)	250 (9.8)	28
150 (6)	370 (14.6)	281 (11.8)	300 (11.8)	38



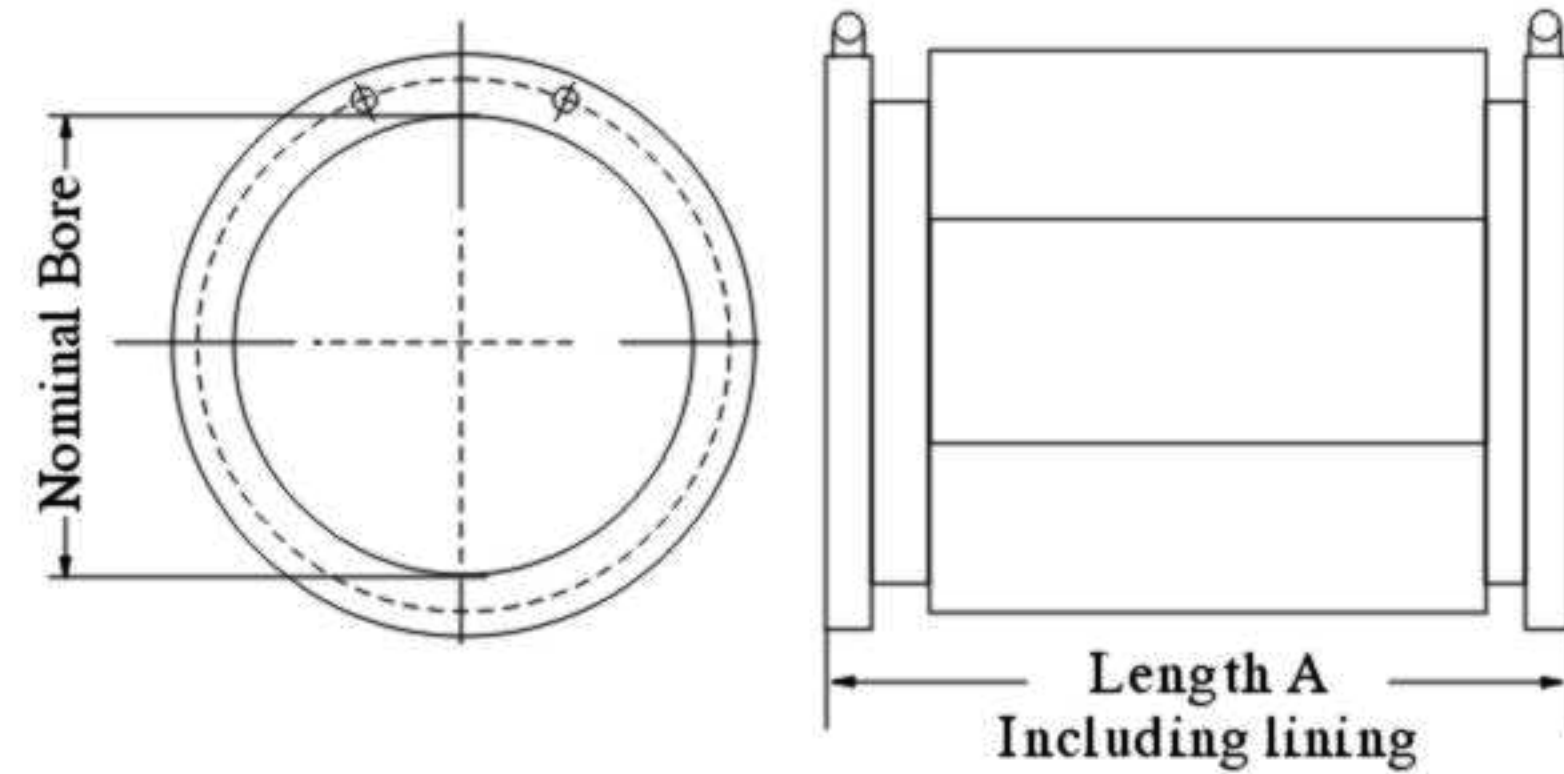
Size: 200 to 600mm(8 to 24in)

Meter Size (mm) (in)	Dimension			Approx Weight (kg)
	A (mm) (in)	B (mm) (in)	C (mm) (in)	
200 (8)	396(15.6)	402 (15.8)	350 (13.8)	53
250 (10)	430(16.9)	440 (17.3)	450 (17.7)	60
300 (12)	461(18.1)	480 (18.9)	500 (19.7)	70
350 (14)	513(20.2)	520 (20.5)	550 (21.7)	100
400 (16)	570(22.4)	576 (22.7)	600 (23.6)	115
450 (18)	632(24.9)	627 (24.7)	600 (27.6)	160
500 (20)	686(27.0)	679 (26.7)	600 (30.2)	217
600 (24)	772(30.4)	770 (30.3)	600 (36.1)	315

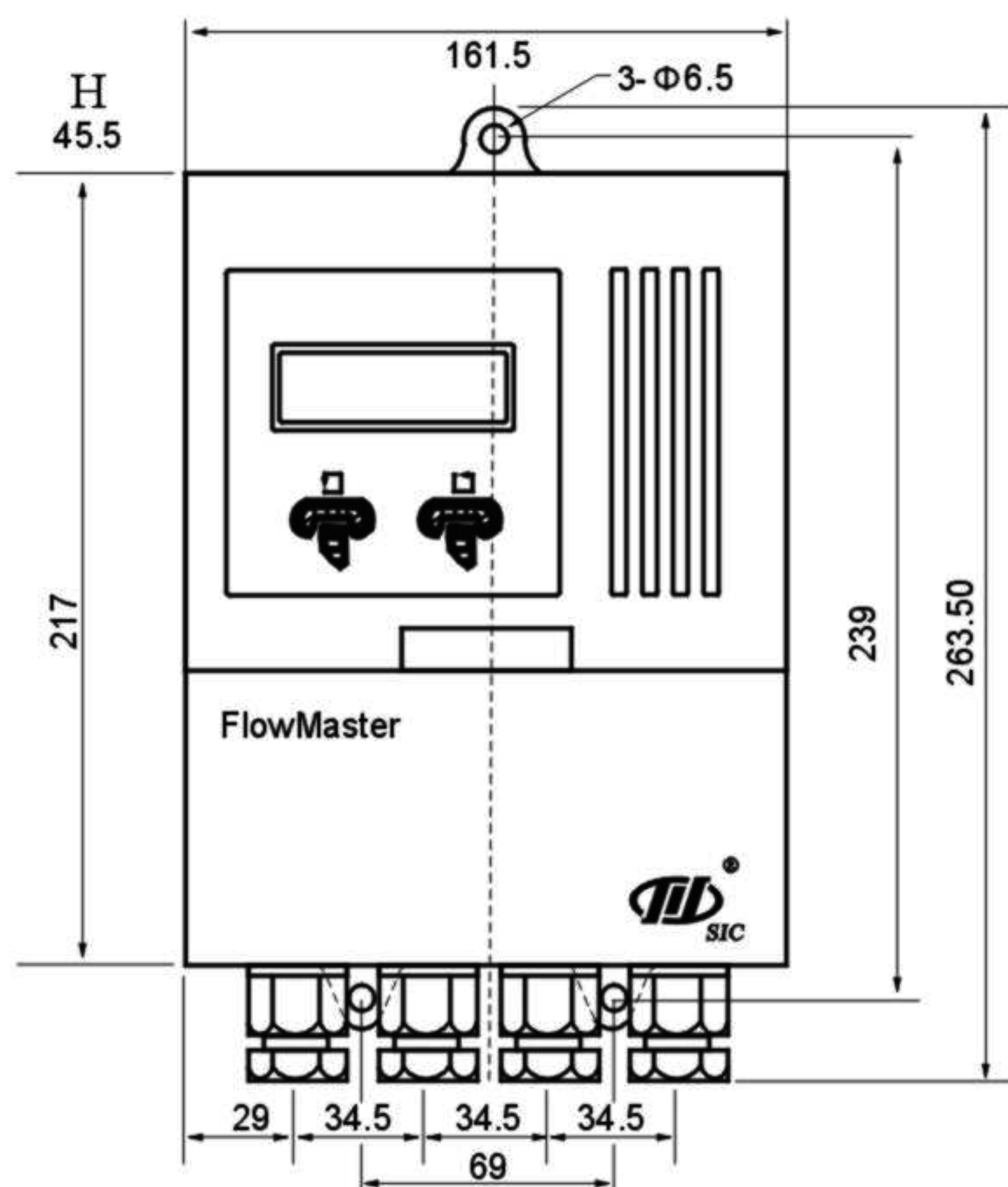


Size: 700 to 1600mm(27 to 78 in)

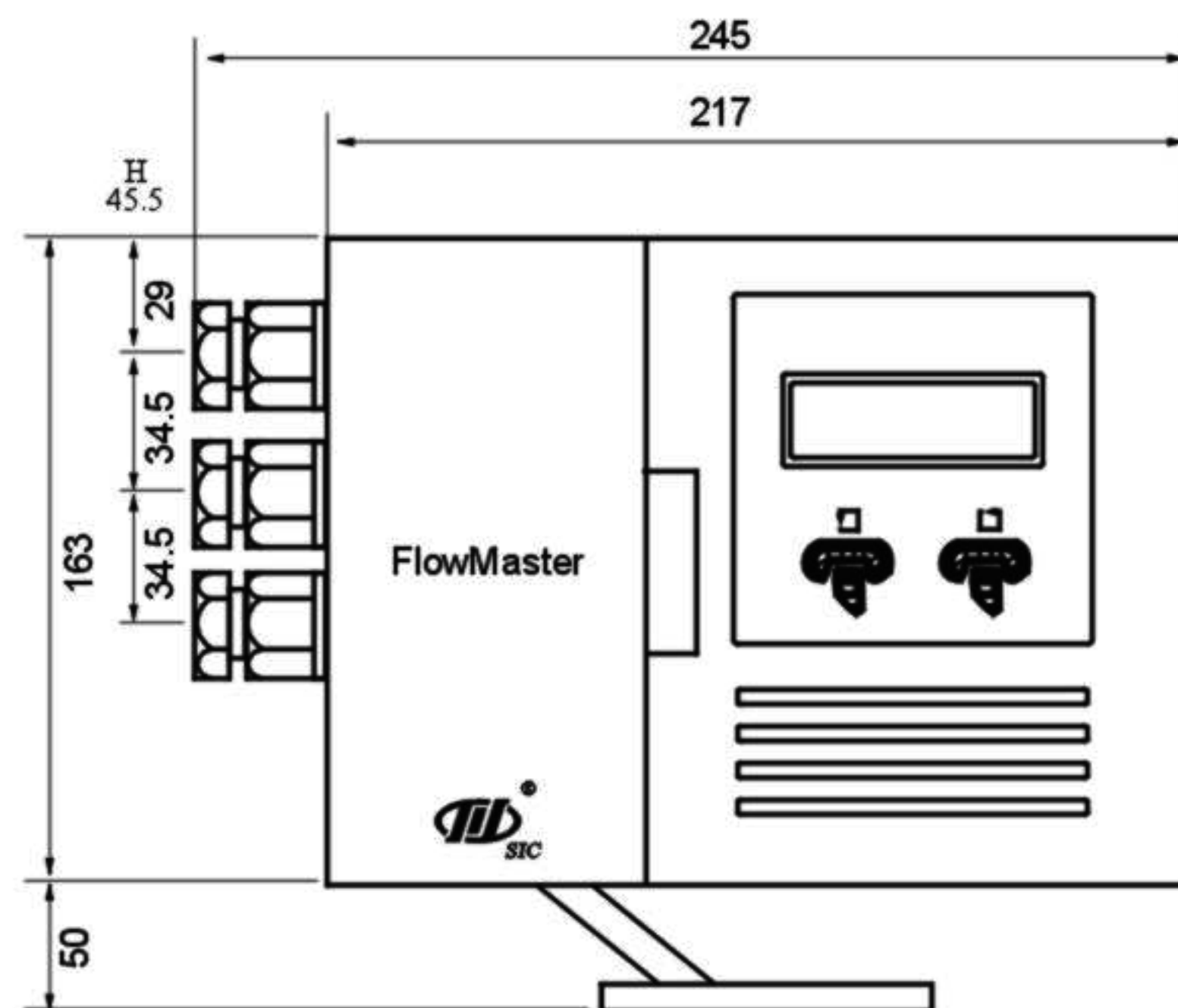
Meter Size (mm) (in)	Length (mm) (in)	Approx Weight (kg)
700 (27)	700 (27)	430
800 (31)	800 (31)	430
900 (36)	900 (36)	540
1000 (39)	1000 (39)	720
1200 (48)	1200 (48)	1000
1400 (54)	1400 (54)	1450
1600 (66)	1600 (66)	2000



● Transmitter surface dimensions



Separation type
transmitter



Integral type transmitter
(mounted on sensor)

● Electrical connections

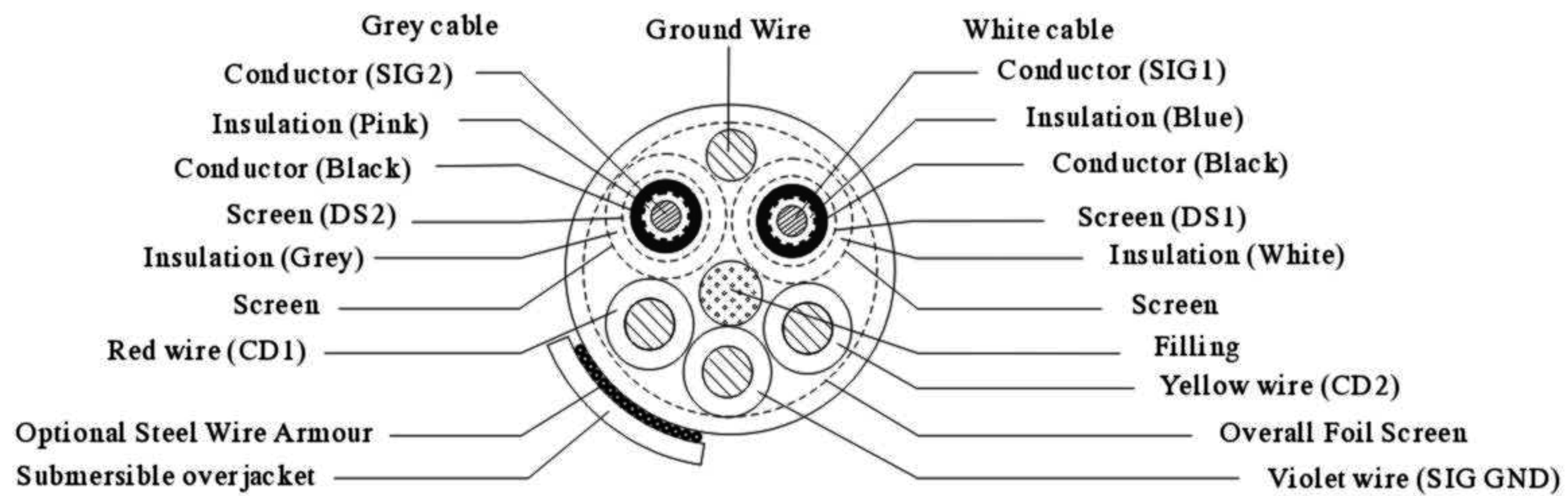
A. Connections between sensor and transmitter

Connections between sensor and transmitter should be correct, and contact well, free from short circuit and open circuit.

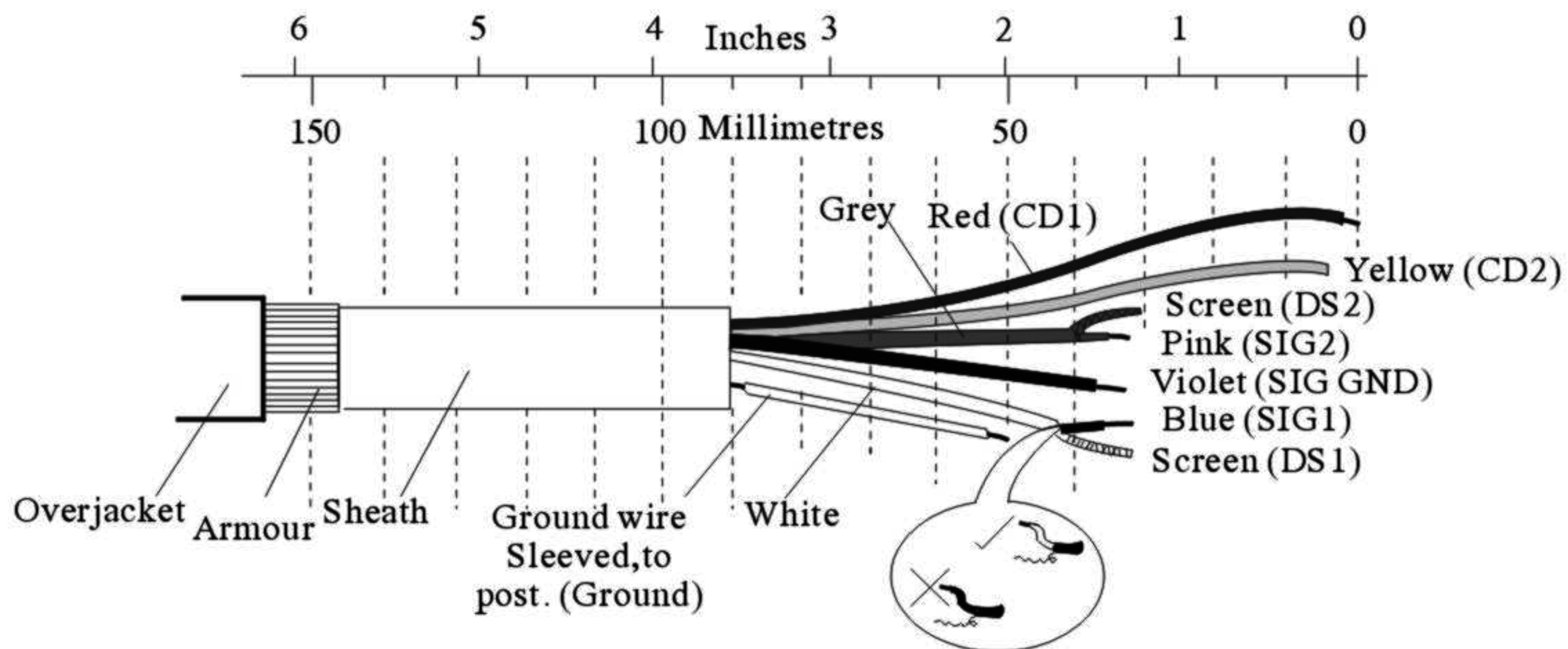
For the integral type, connections between sensor and transmitter are completed by the manufacturer;

For the separation type, this connections but be done by using special SIC supplied cables.

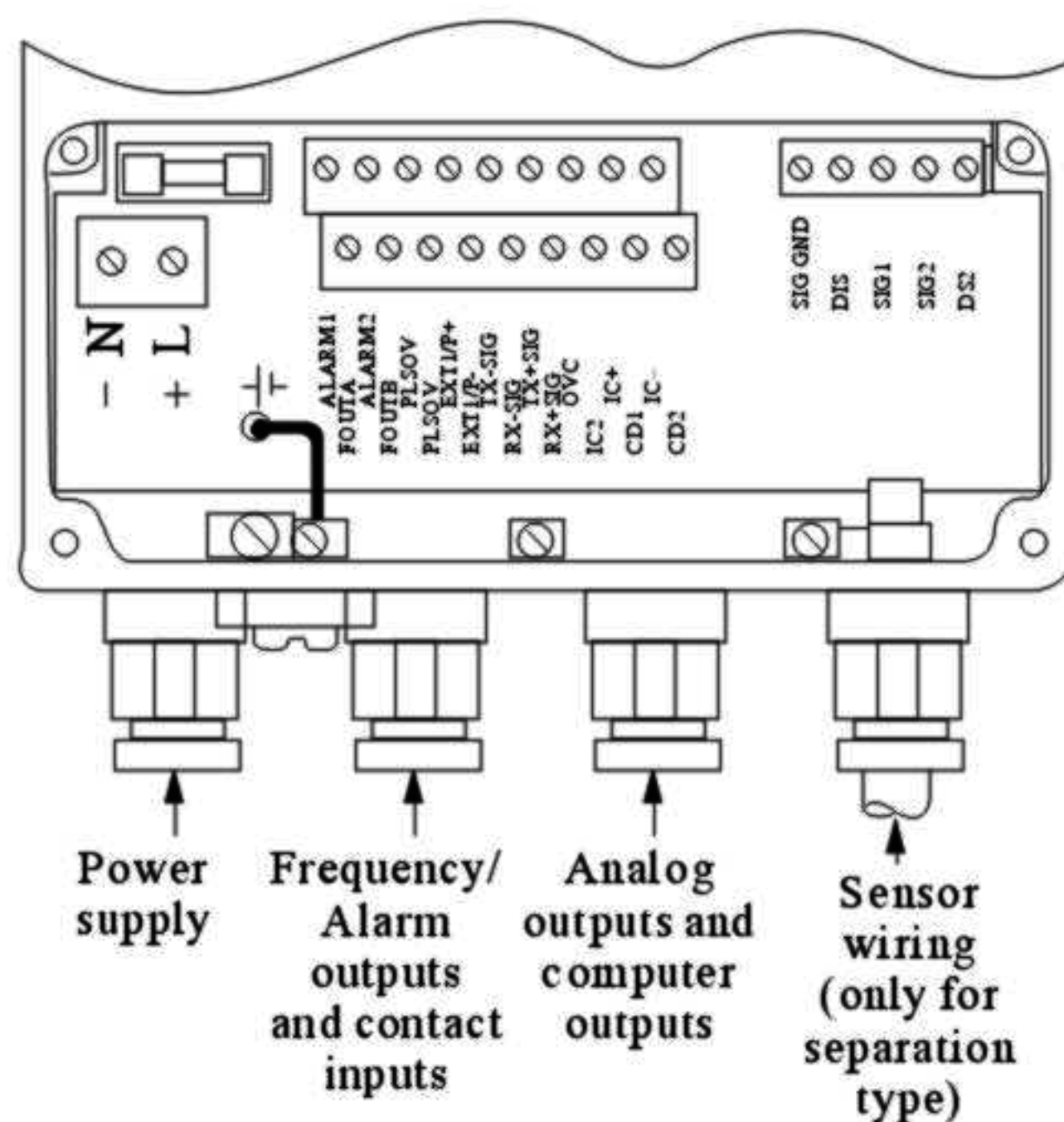
1. Cable



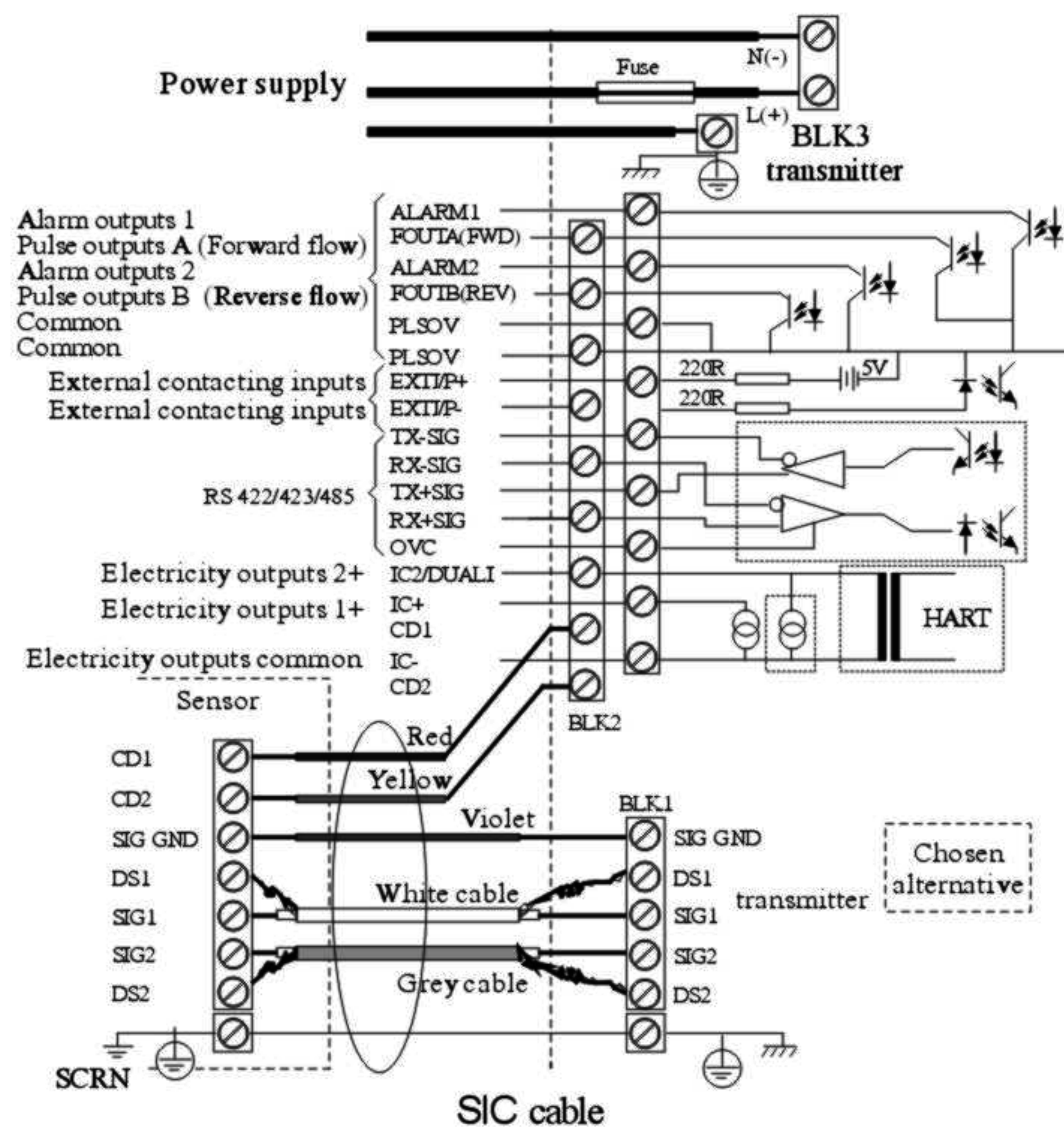
2. Cable operation



3. Transmitter cable/wire guide

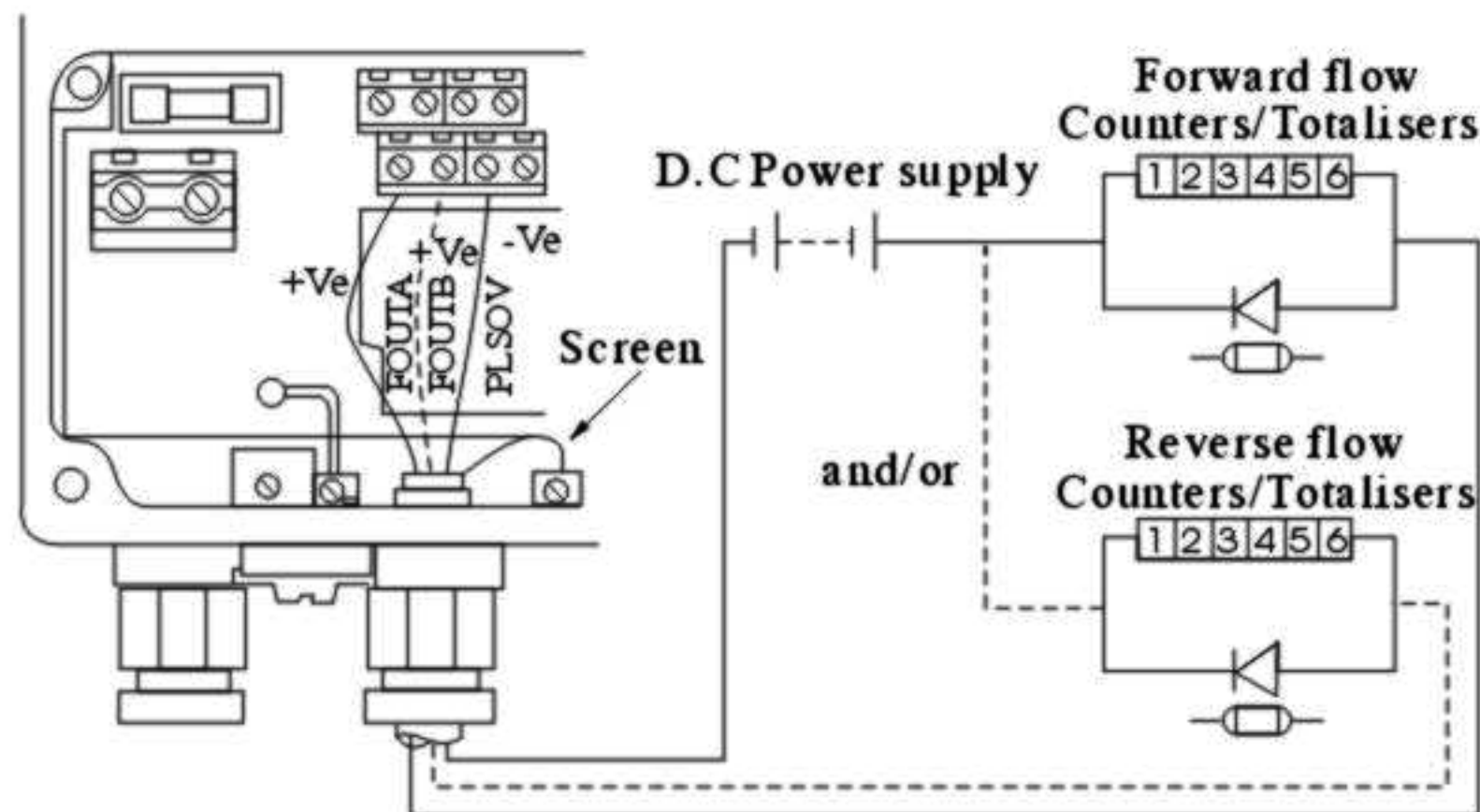


4. Connections between sensor and transmitter

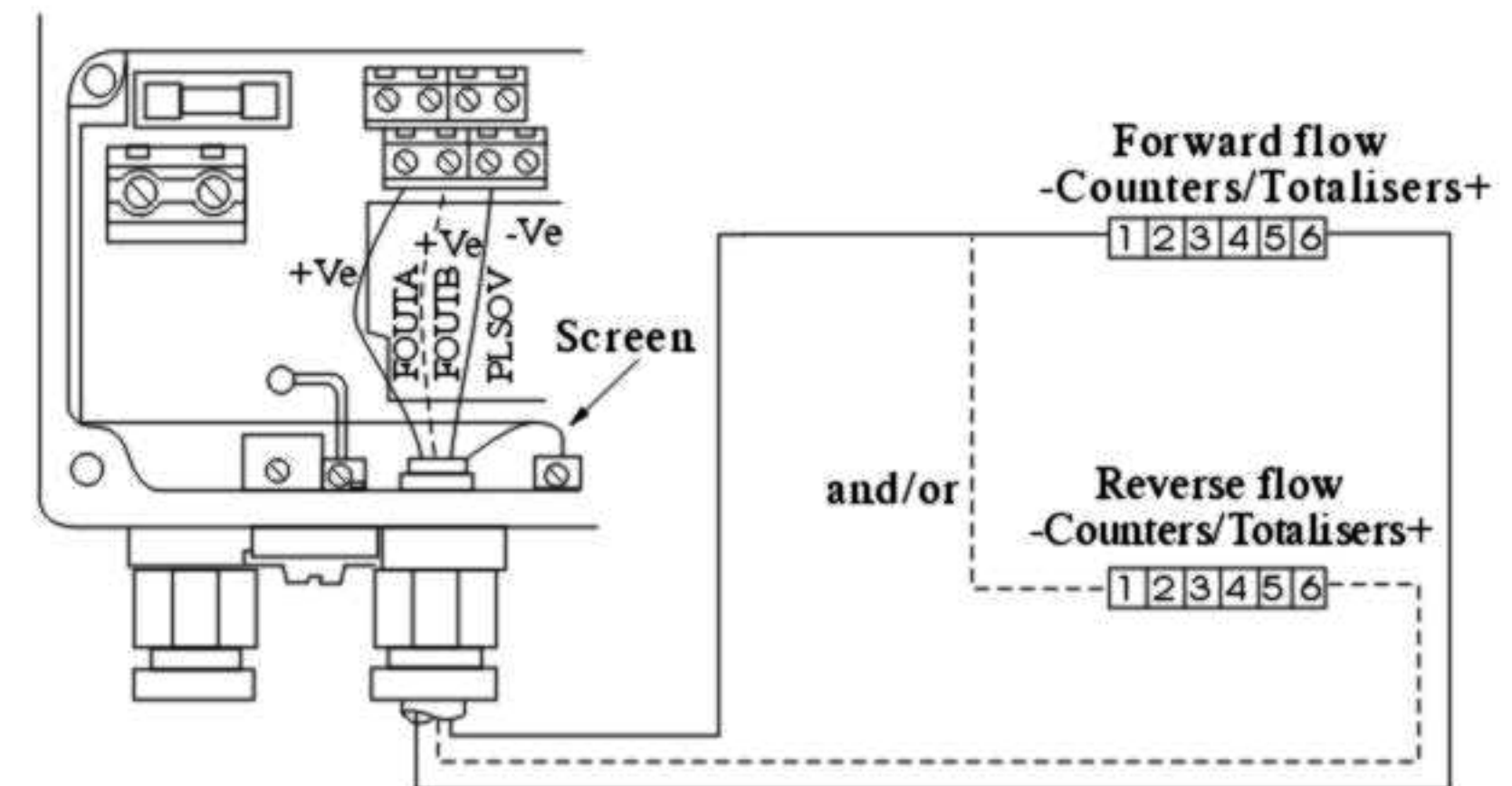


B. Transmitter connections

1. Frequency outputs

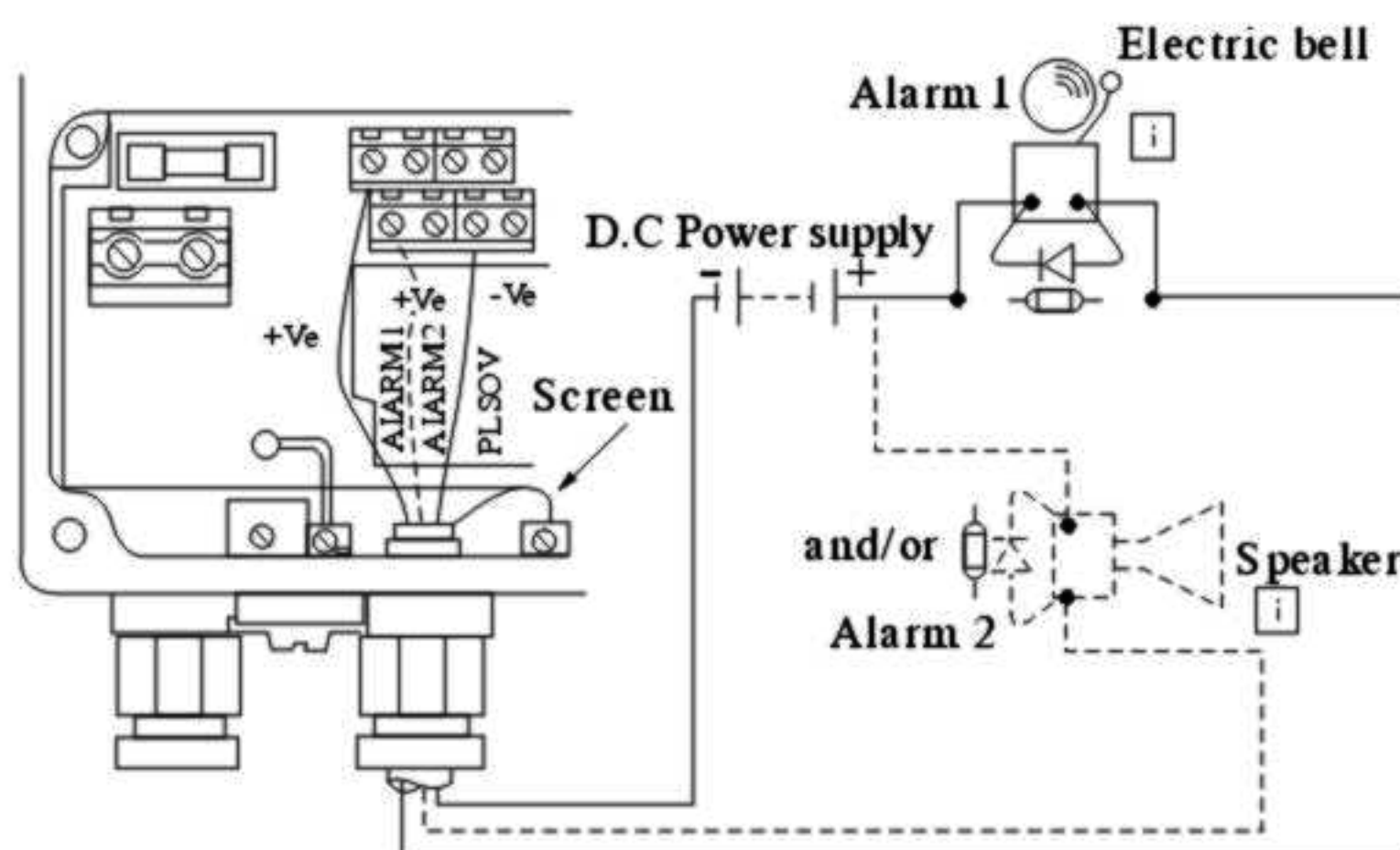


(a) Electromagnetic counter connection

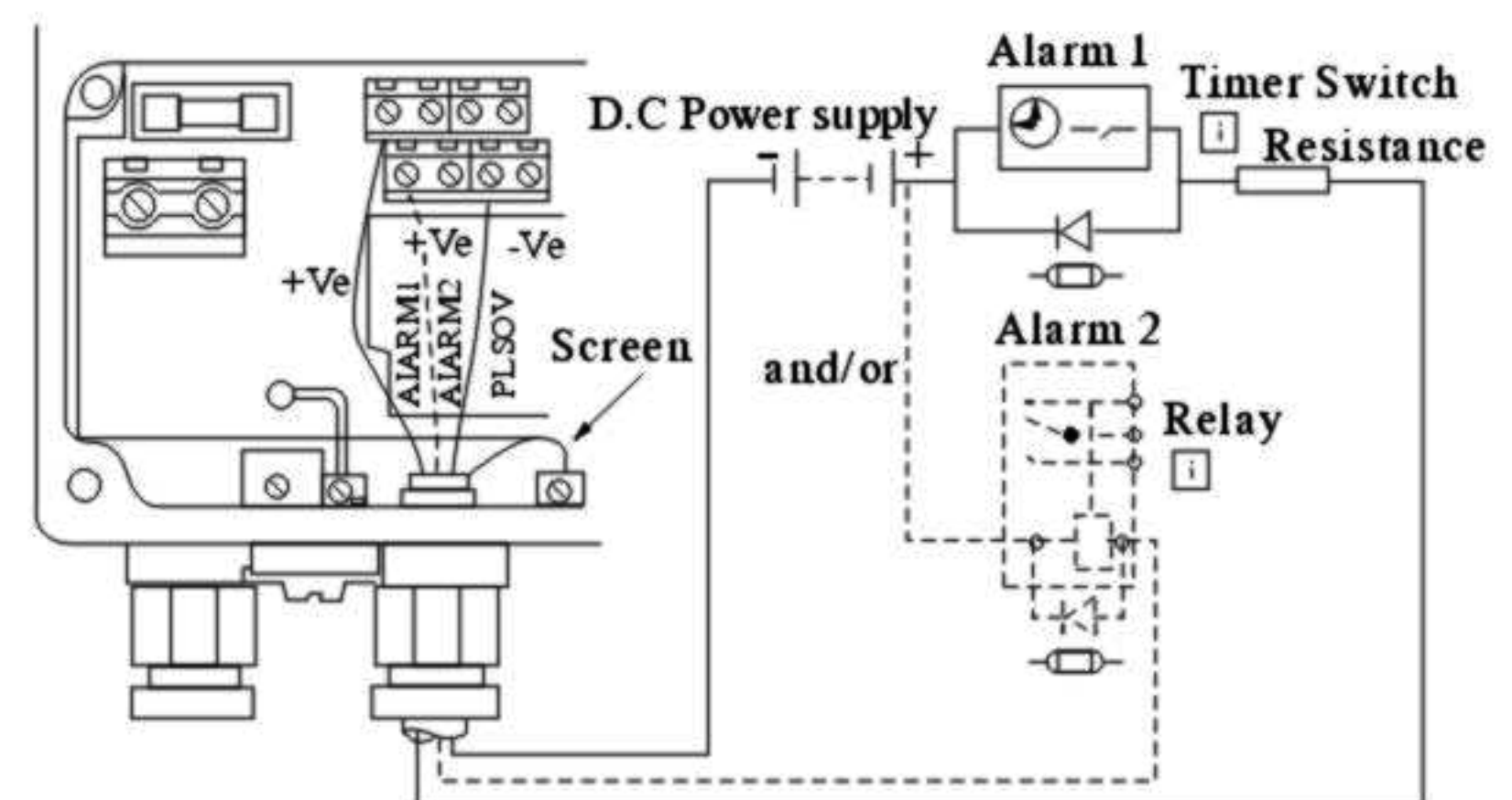


(b) Telemetry, electronic counters etc.

2. Alarm output connections

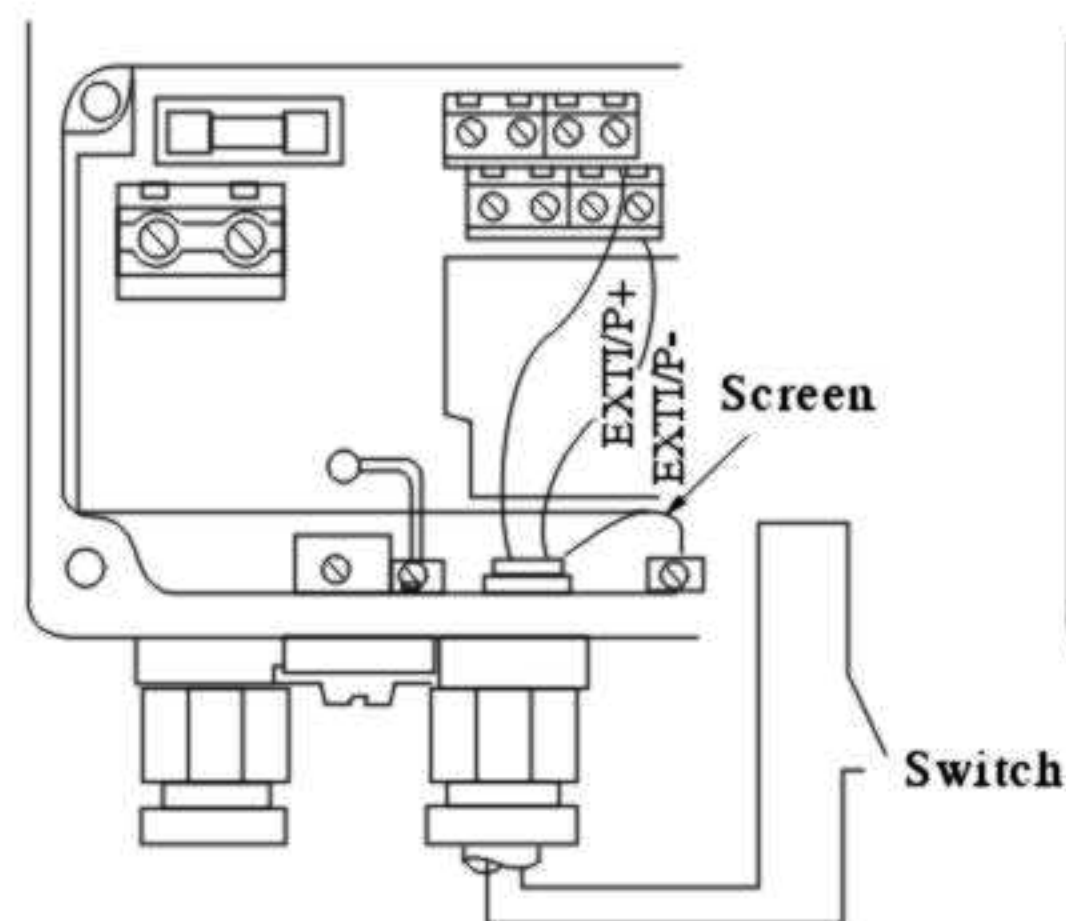


(a) Alarms

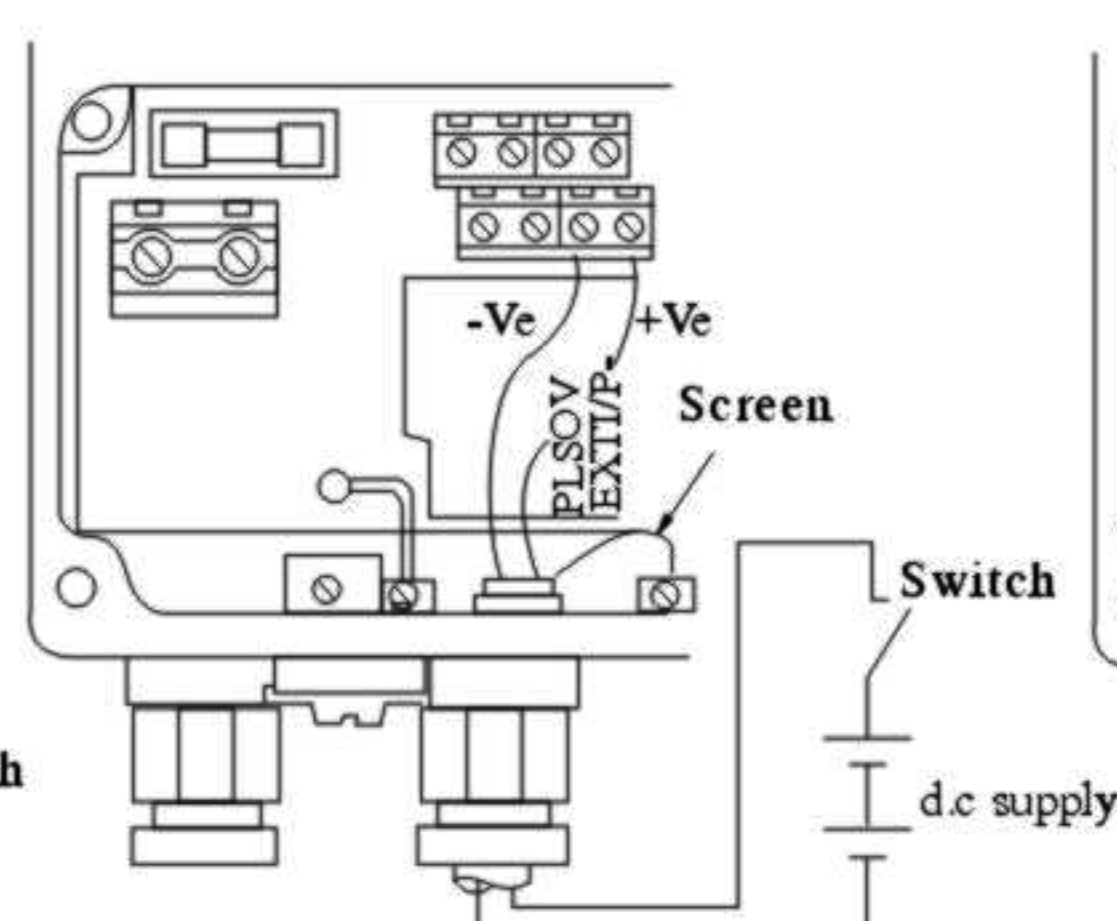


(b) Relays and timers

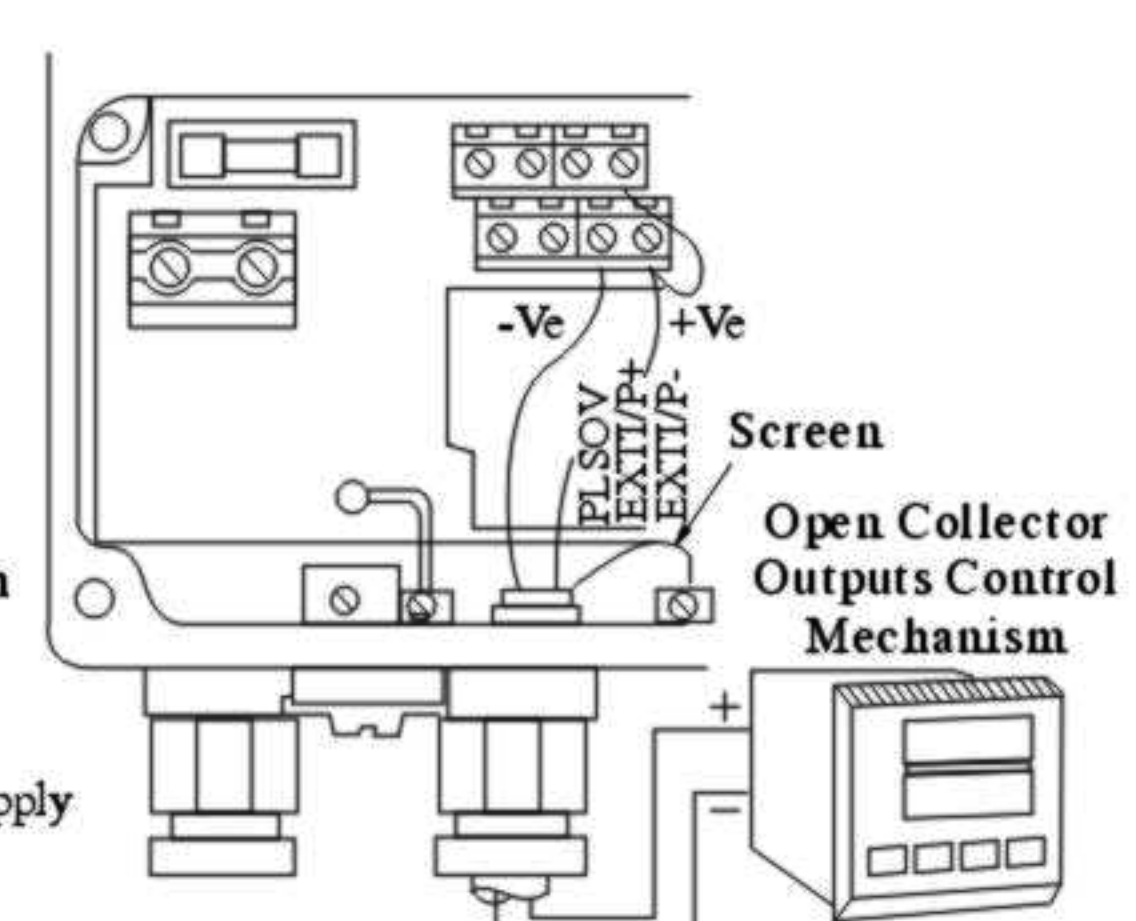
3. Contact input connections



(a) Volt-free contact

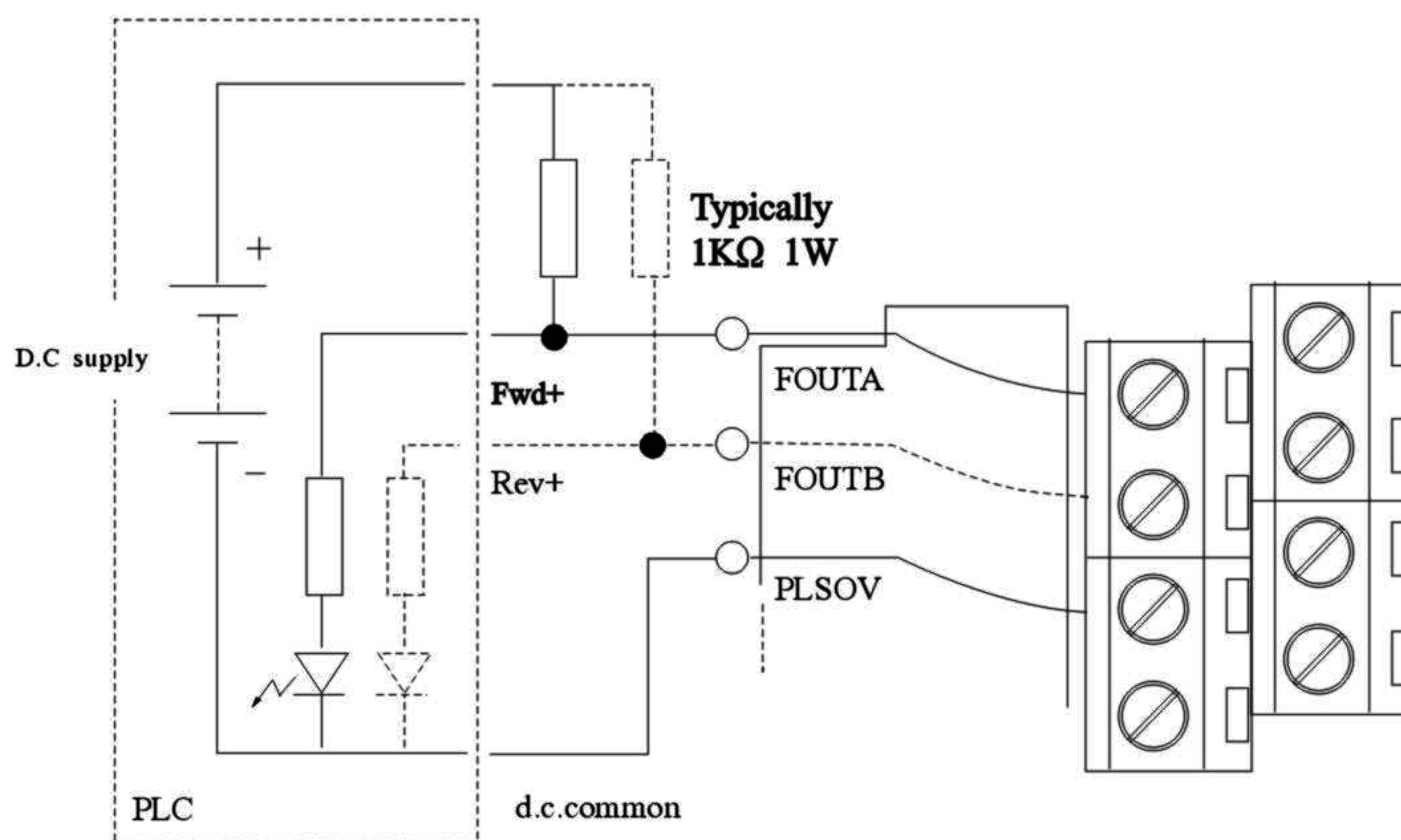


(b) Voltage Signal or
Logic Signal



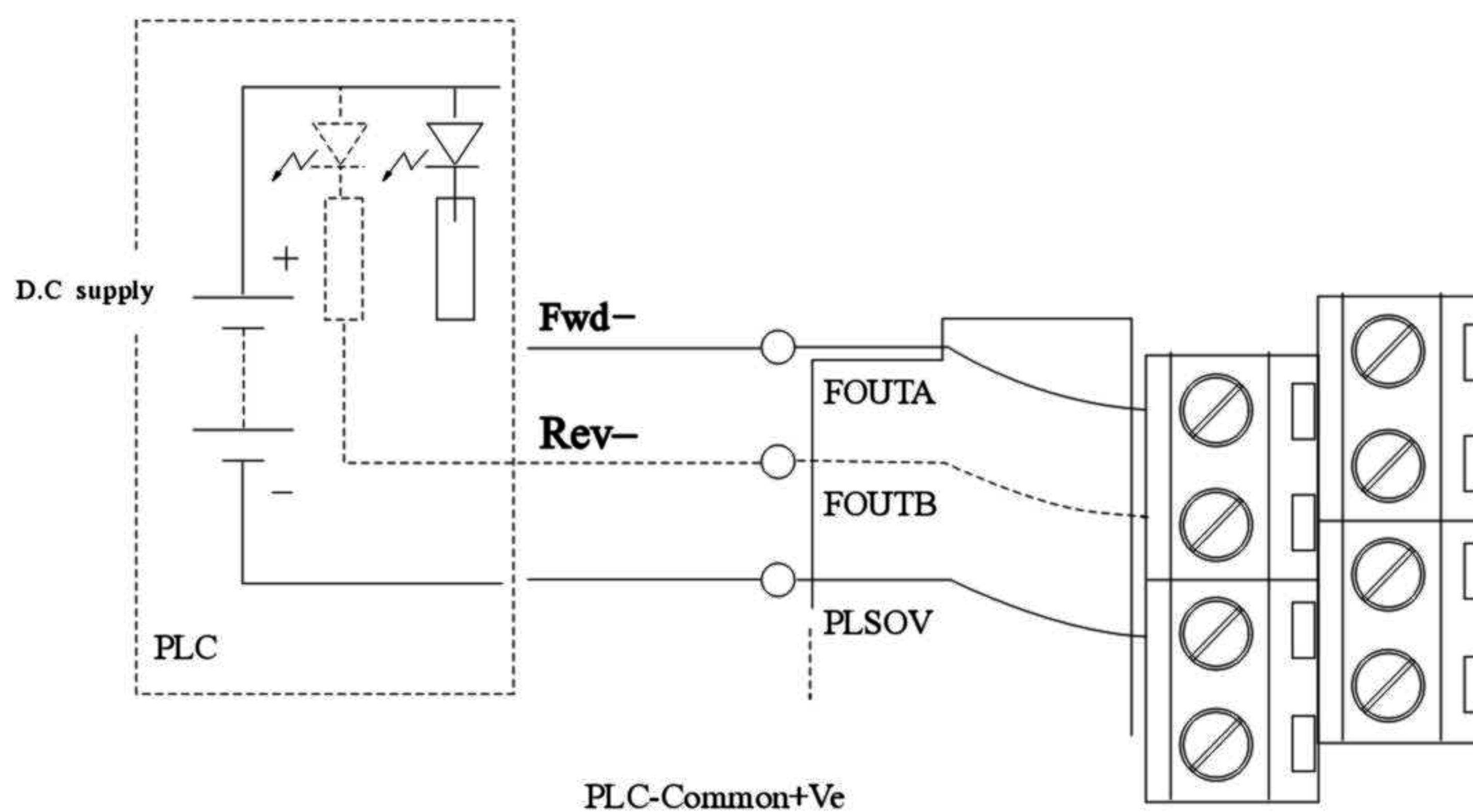
(c) Open Collector
(or Grounded Contact)

4. PLC Interface



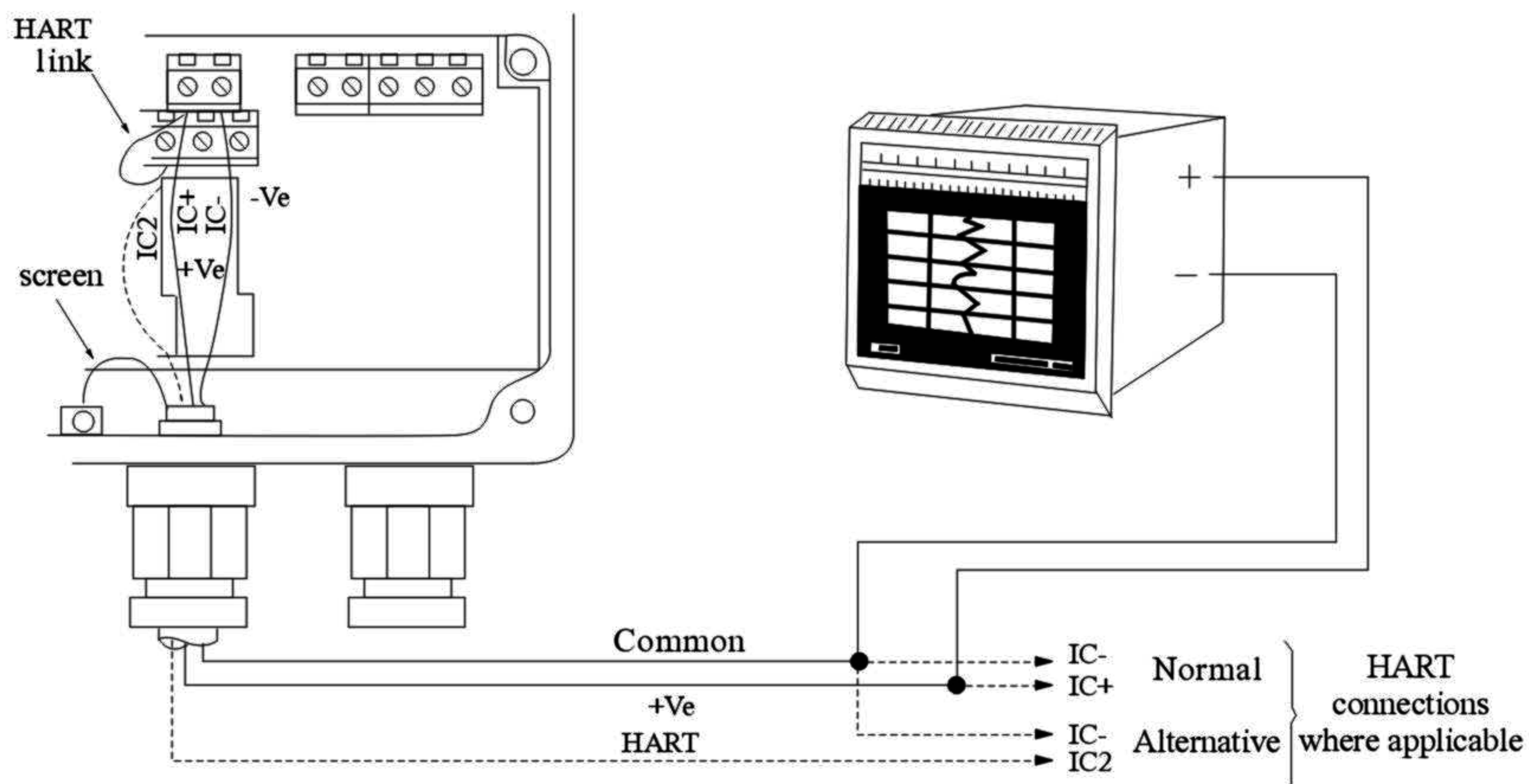
PLC-Common-Ve

PLC Common -Ve

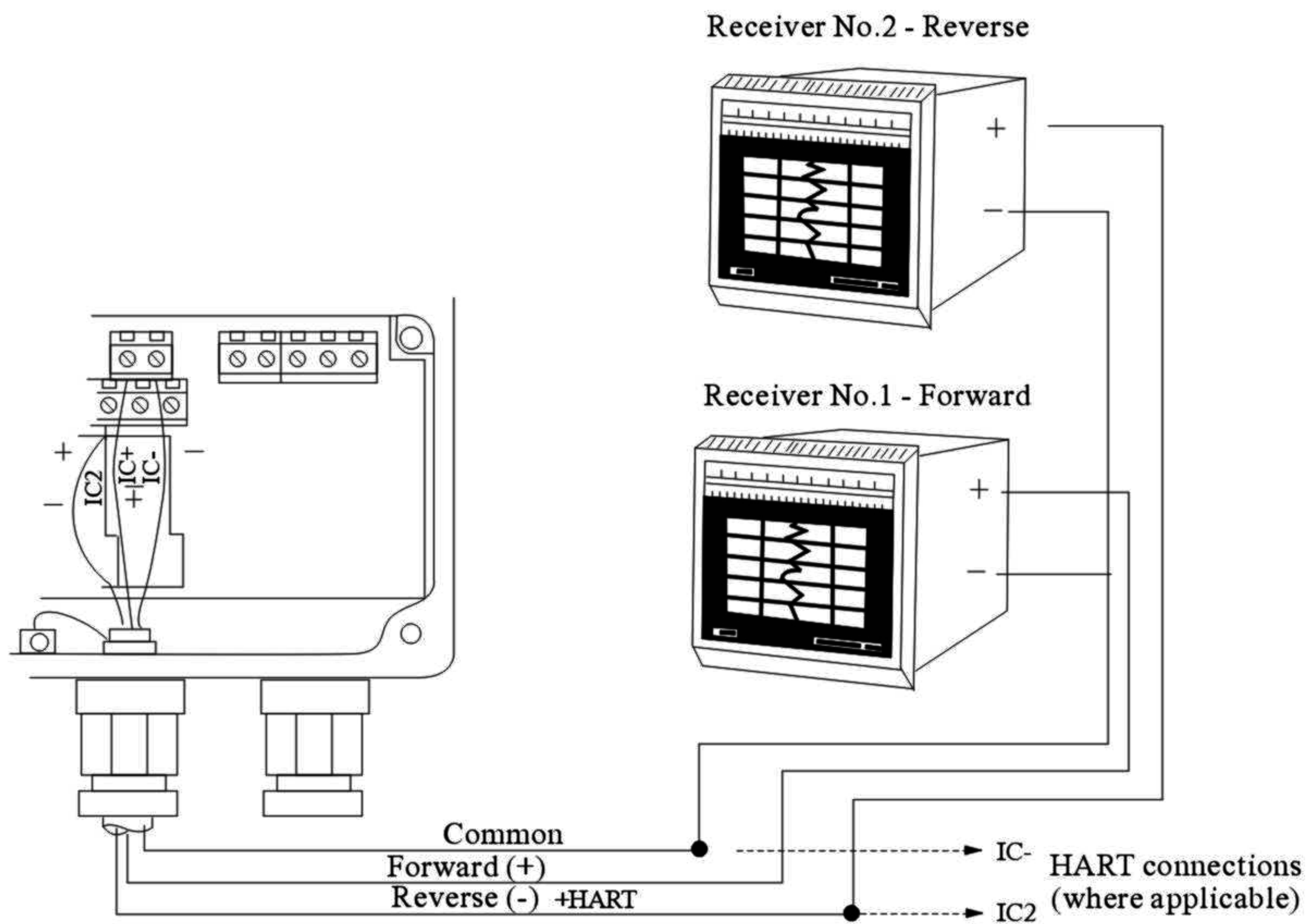


PLC Common +Ve

5. Current Output Connections

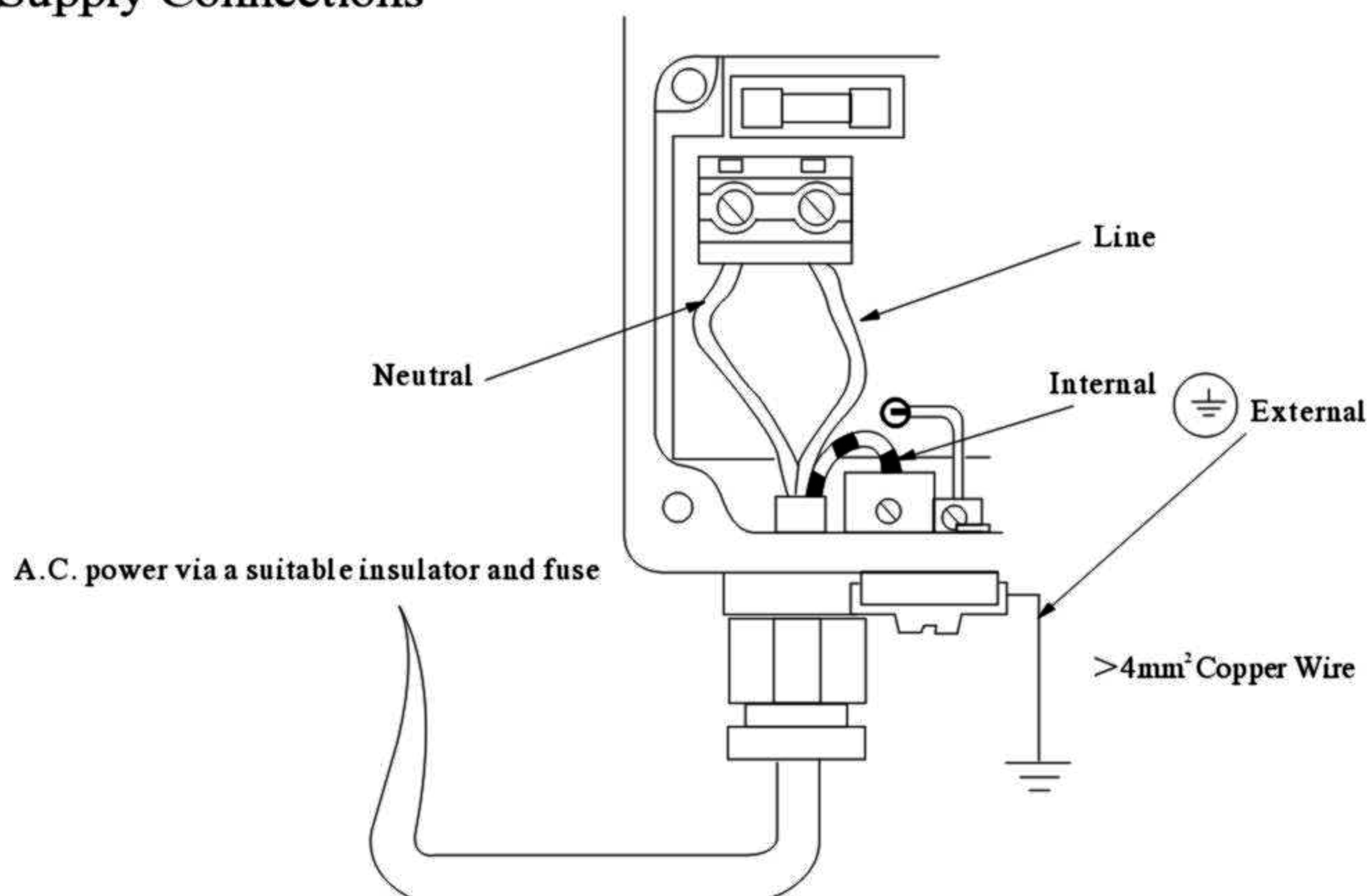


Current Output Connections: Standard



Current Output Connections: Dual Current Option

6. Power Supply Connections

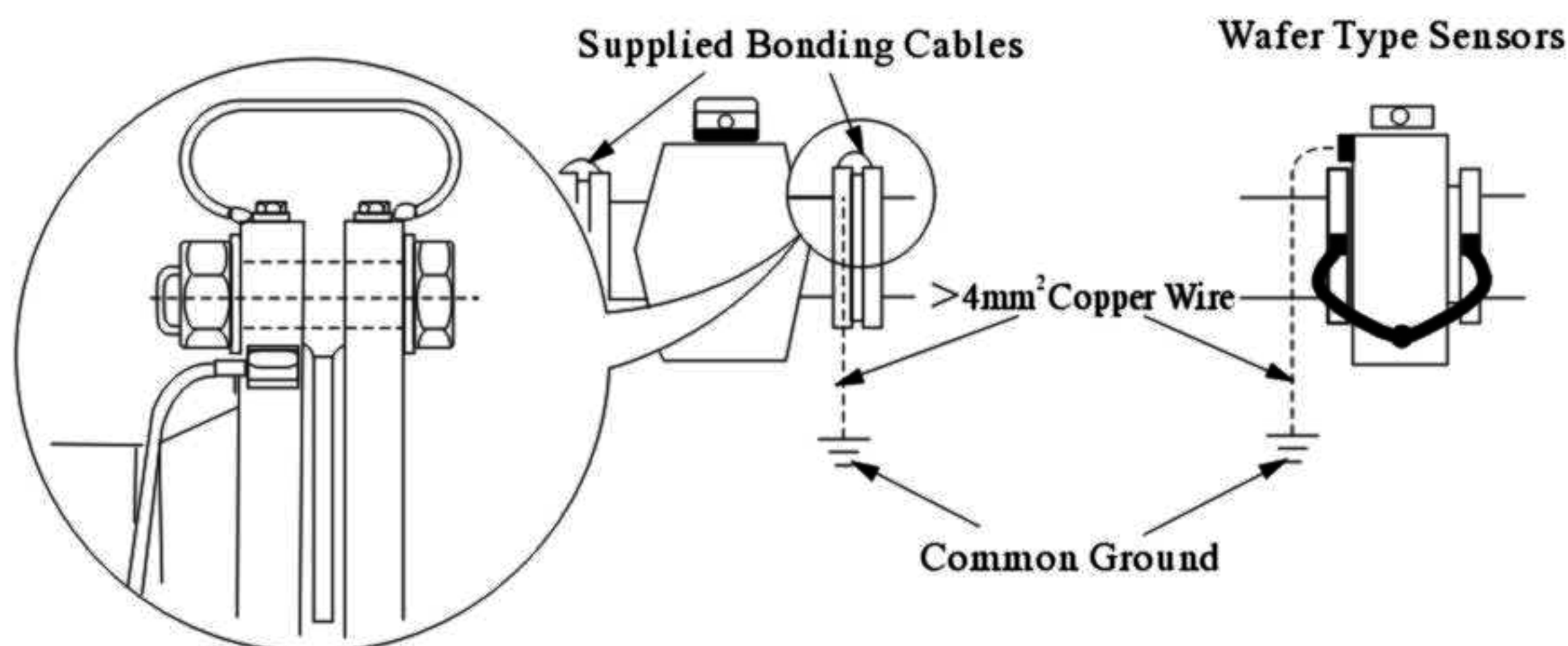


A.C. Power Supply Connections (AC95V~240V)

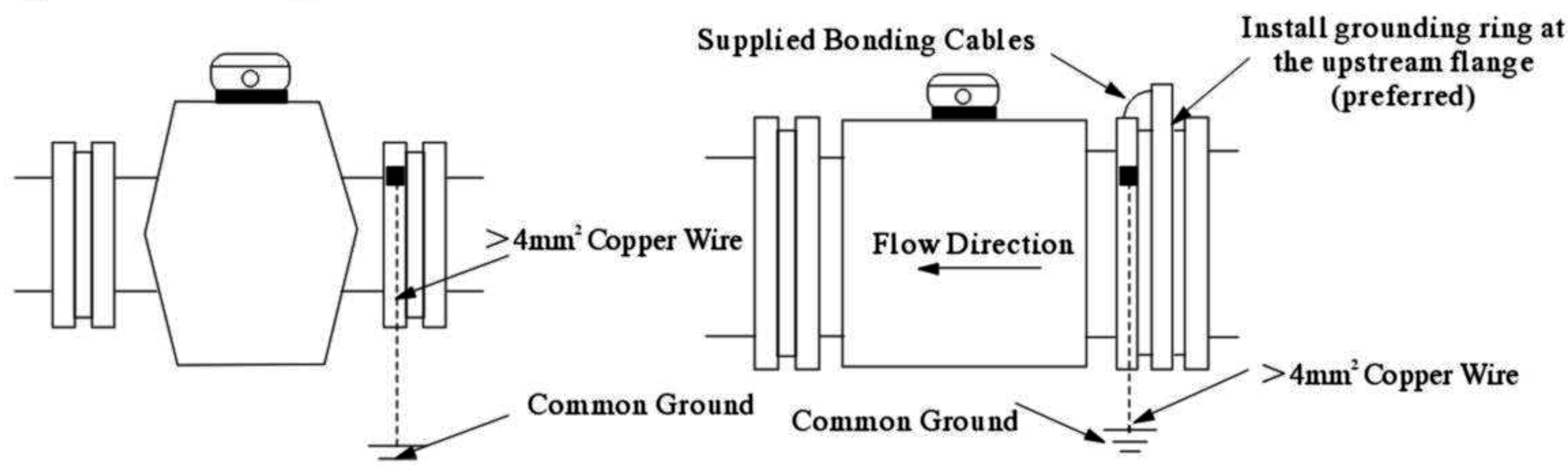
C. Flowmeter Grounded Connection

As the inductive signal related to medium flow is very faint in the sensor of electromagnetic flowmeter, avoiding disturbing signal is of great importance, of which the most important is to have a good grounded connection, and this requires that not only the instrument connects to ground, the medium inside the pipe needs to have a good grounded connection as well.

1. Metal Pipe Grounding



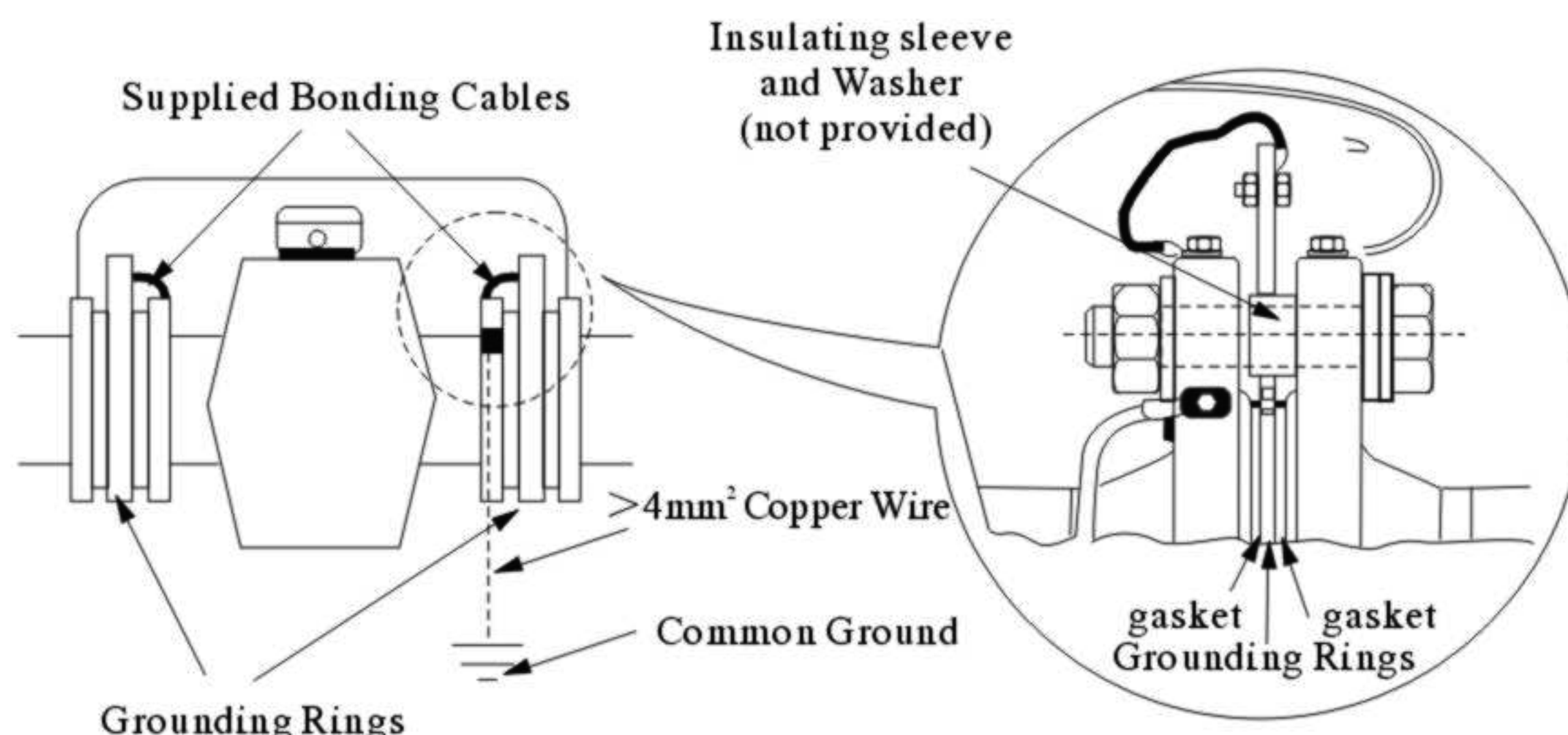
2. Plastic Pipe Grounding



Sensors with grounding electrode

Sensors without grounding electrode

3. Pipelines with Cathodic Protection

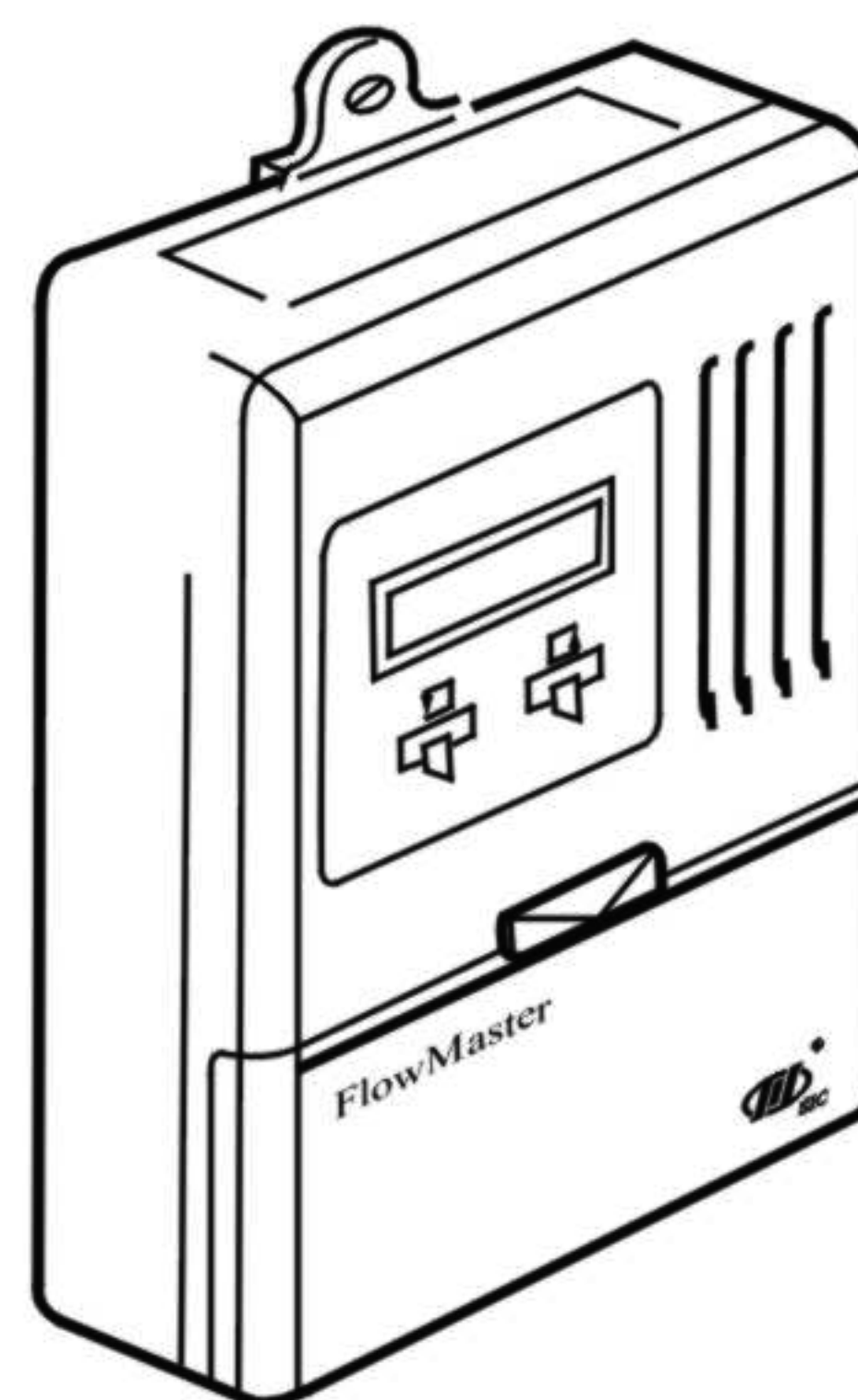


IV. How to use a FlowMaster

When each electrical connection is correctly completed, the power supply then can be switched on, and the following operations can be finished through the transmitter.

● Transmitter Structure

Electromagnetic flowmeter uses two line LCDs and two magnetic operating switches, through which users can watch measuring parameters of the flowmeter, while working parameters cannot be modified and regulated by this way. Users can use SIC hand-held configurators or PCs and through RS232 on the keypad to watch, modify and regulate working parameters of the flowmeter.

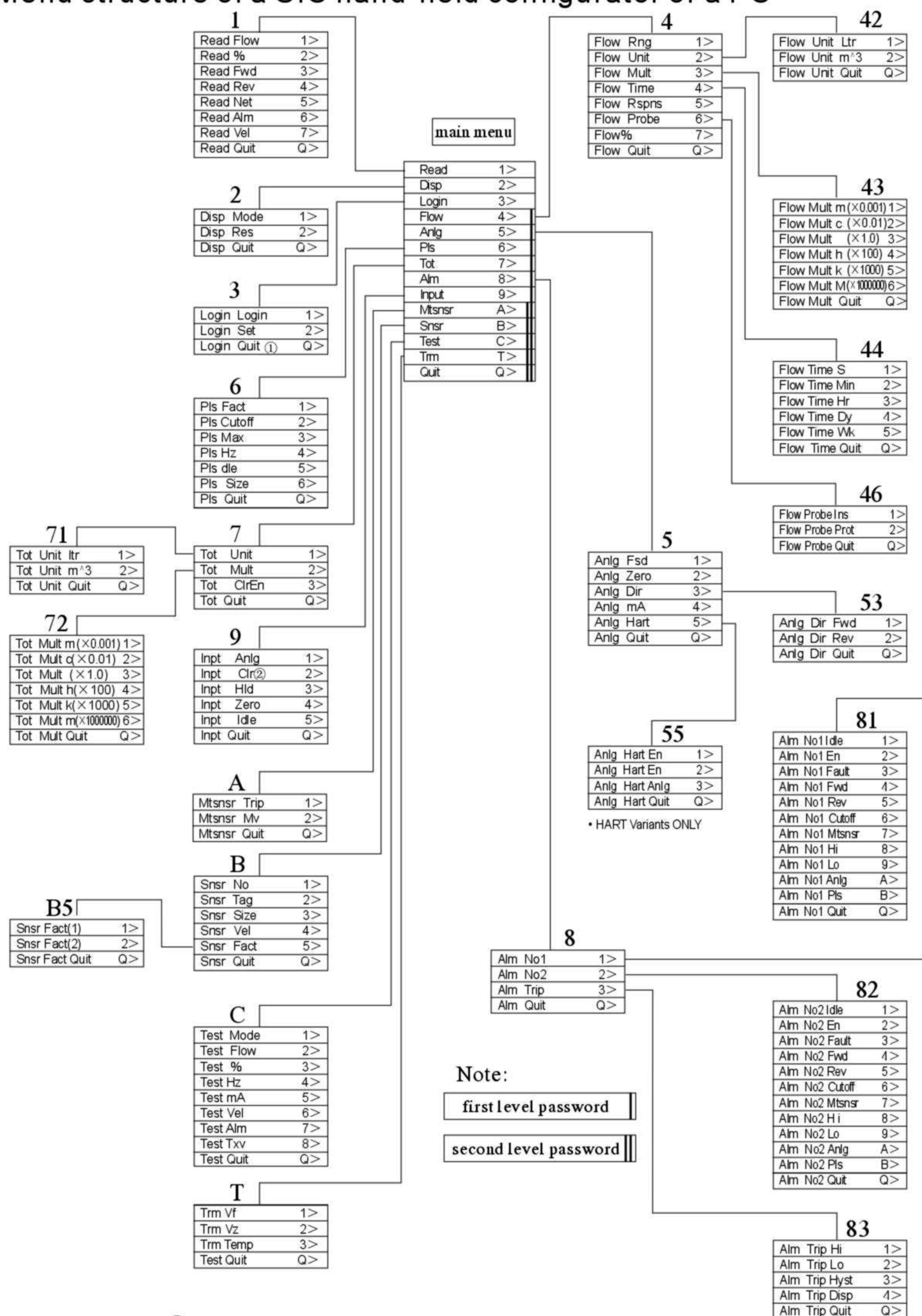


Display Transmitter

● Working Parameter Structure of Transmitter

For users using SIC hand-held configurators and PC operating menu structures, this FlowMaster sets the first level password as "user", permitting users to enter this level to regulate the parameters; sets the second password as "engineer", permitting technical engineers to enter this level to regulate the parameters. Please not to modify user password in case of forgetting them and resulting in impossibility to operate the parameters.

Menu structure of a SIC hand-held configurator or a PC

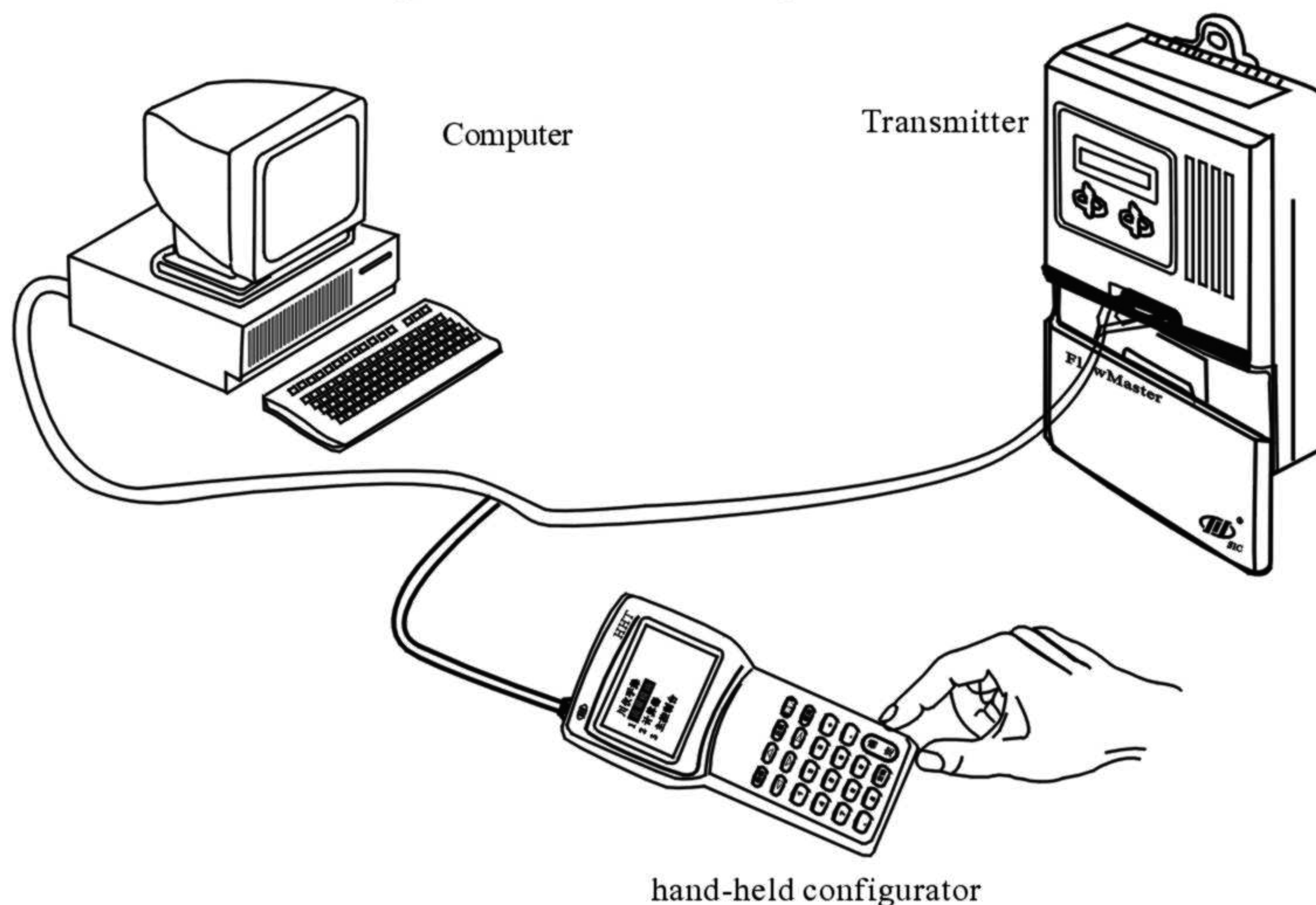


①Using this item to quit after every operation upon the transmitter

②Only item 92 in the transmitter set '1' can Clr on the display keypad be effective.

● Communication connections between transmitter and hand-held configurator transmitter

1. On the transmitter keypad there is a standard RS232 communication connector (9-pin D type plug), which connects a hand-held configurator and a PC as following:



2. Communication connections between transmitter and hand-held configurator

Our corporation can supply users with SIC hand-held configurators, which are small type hand-held PCs and equipped with RS232 communication connector and cables. Users can make connections according to above, switch on hand-held configurator power supply and operate the flowmeter applications.

3. Communication connections between transmitter and PC

Transmitter connects to PC as below;

FlowMaster transmitter 9-pin D type connector	PC	
	9-pin D type connector	25-pin D type connector
1(not connected)		
2	3	2
3	2	3
4	6	6
5	5	7
6	4	20
7	8	5
8	7	4
9(not connected)		

Parameter settings of computer communication port are as following:

Baud rate	4800
Data bits	8
Stop bits	1
Parity	NONE
Handshaking	NONE
COMMS PORT	COM1 或 COM2

Computer communication software packages:

Microsoft Windows	terminal emulator
Nordon Command	terminal emulator

V. Maintenance and error diagnostics

FlowMaster needs very few maintenance tasks, usual daily maintenances are to visually check the reliability of the electrical connections, and the operating conditions of the FlowMaster. For errors appear in the normal applications, the FlowMaster can give adequate alarm information through its self-diagnostics function, see table 5-1 and 5-2:

Normal error diagnostics table

Table 5-1

Errors	Checking Items
No display	<ul style="list-style-type: none"> ① Check whether the cables are switched on ② Check whether the cable fuses work well ③ Check whether the cable connections are correct
Flow measurement incorrect	<ul style="list-style-type: none"> ① Check whether the pipeline is full of mediums ② Check whether signal wire is correctly connected and reliable ③ Check whether following parameters accord with those on the sensor nameplate [B3]=Sensor Diameter [B51]=Instrument quotient 1 [B52]=Instrument quotient 2 ④ Readings vibrating, check whether signal wire and ground connection is OK
Electromagnetism-driven malfunction	<ul style="list-style-type: none"> ① Check whether electromagnetism-driven connections (CD1 and CD2) are switched off ② Check whether resistance of sensor magnetic wire less than 20 Ω
Empty pipe error	<ul style="list-style-type: none"> ① Check whether the measuring pipeline is full of mediums ② Connect SIG1 and SIG2 to SIG GND to see if errors can be excluded ③ Check whether signal wires are correctly connected ④ Check whether electrodes contaminated ⑤ When the flow volume is zero, check whether the value of parameter MtSnsr mv is more than 50 ⑥ When water is the medium and the flow exists, check whether the resistances of SIG1 and SIG2 are less than 50
Analog output error	<ul style="list-style-type: none"> ① If analog outputs above range, please regulate the value of parameter Flow Rng ② Switch off current output cable, check the value of parameter Anlg mA and test current value between output terminals IC+ and IC- to see whether they are equal ③ If the flow is full of range and the current output come up to full scale, check whether the current output circuit resistance is less than 750 Ω
PLS frequency error	<ul style="list-style-type: none"> ① If frequency output is out of range, regulate the value of parameter Pls Fact ② If PLS frequency output incorrect, use the test function to test output frequency to exclude output connection errors
19 20 21 error	Input '0' in the parameter Read Alm to return to originating conditions to recover related parameters before leaving the factory

If errors not excluded after executing above actions, please contact our local sub-division nearby or directly get in touch with our head office.

Self-diagnostics alarm information table
Table 5-2

Alarm information	Alarm Explanation
Mtsnsr	Empty sensor
Hi	Flow higher than upper limits of setting
Lo	Flow below lower limits of setting
Anlg	Analog outputs higher than limits
PLS	Pulse output frequency higher than limits of setting
Coil	Sensor magnet-driven error
19	Total value error
20	Register error
21	Parameter configuration error
A*	Check contact of the signal wire
V	Power cut alarm
N	Hardware alarm 1
E	Hardware alarm 2
D	Hardware alarm 3
1	Alarm appear in alarm 1
2	Alarm appear in alarm 2
C	Sensor open circuit
S	Sensor short circuit
A	Regulating the state

As the FlowMaster transmitter applies surface mount technology (SMT), it can't be maintained by the user. Therefore the user is advised not to open the transmitter. If the FlowMaster doesn't give alarm information and the user is quite sure of the existence of errors, please check it according to table 5-1 to see whether the reasons are found before requesting maintenance services from our corporation.

VI. Appendix

● How to use two mixed backfills

When the FlowMaster needs to be used underground, after the connections are completed, please use the special sealing glues supplied by our corporation to backfill connection terminal of the junction box. For more details please see instruction of the special glue attached with the FlowMaster.



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