Instruction Manual

Manufacturing Certificate
CMC Shanghai No.02220105

TYPE XSJ-39A
XSJ-39AI

Digital Flow Totalizer

SHANGHAI NO.9 AUTOMATION INSTRUMENTATION CO., LTD.

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1. General Description

This manual is for the installation, application and maintenance of Type XSJ-39 Series Digital Flow Totalizer designed and made by SAIC No.9 .

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Type XSJ-39A, XSJ-39AI Digital Flow Totalizer (hereinafter referred to as Meter) are usually working with flow sensor that generates pulse signals as output, in which compensation is not needed, like with Turbine Flow Meter, Oval Gear Flow Meter and Rotating Piston Flow Meter. XSJ-39A is a model with non-standard current output, while XSJ-39AI is a model with standard current output.

Meter functions as follows:

1) Fluid Instant Flow Rate (Volume/Time) and Total Flow accumulated can be displayed on the same screen; optional display unit for instant flow is m^3/h or m^3/min, L/h or L/min, being displayed by LED;
2) Up-limit and Low-limit alarm with hysteresis
3) Standard Current Output 4 to 20mA, proportional to flow rate, is available with XSJ-39AI
4) Power failure protection

Structural integration, good stability, dependable reliability, high accuracy, quick response, easy access and care are advantages of this Meter; So it is widely used in petrol, chemical, metallurgical and power industries.

2. Technical Specifications

1) Input impedance: ≥ 3000Ω
2) Input signal:
   a. Frequency range: 2 to 5000Hz
   b. Amplitude: >3Vpp (20-5000Hz) or >10Vpp (2-20Hz)
   c. Wave form: Sine wave or basically symmetric square wave
3) Pulse Equivalent Range: 4 effective digits in decimal
4) Accumulated Capacity: decimal 11 digits (LED display)
5) Flow Display: 5 digits for unit m^3/h or L/h
   4 digits for unit m^3/min or L/min (LED display)
6) Up/Low Limit Setting Range: 5 digits for unit m^3/h or L/h
   4 digits for unit m^3/min or L/min (The highest digit is 0)
7) Hysteresis Setting Range: decimal 3 digits
8) Accumulating fundamental Deviation: ±1 displayed unit
9) Flow Display Deviation: theoretically ±0.2% (±1 displayed unit)
10) Alarm fundamental Deviation: ±0.2% (±1 displayed unit)

11) Output Signal:

A: Up/Low limit alarm output: two independent Normal-Open Contacts with capacity less than 24V×0.2A

B: Current Output Signal (Type XSJ-39AI)

a. Output signal: 4-20mA standard current signal

b. Current signal frequency converting segments: 35-210Hz; 210-1200Hz; 1200-5000Hz; (continuously adjustable within one segment)

c. Current Output Tolerance: ±0.1%F.S

d. Current output signal responding time: ≤2s

e. Loading Resistance: ≯300Ω

f. Current constant function: ≤0.1%/Δ250Ω

12) Data reserved period when power failure: ≮5 years

13) Working Condition:

a. Ambient Temperature: 0-40℃

b. Relative Humidity: <85%

c. Power supply: 187-242V; 47.5-52.5Hz

14) Power Consumption: <10VA

15) Dimensions (L x W x H); 120X160X80mm

16) Panel Mounting Opening Size (W x H): 152x76mm (+1/-0 mm)

17) Weight: about 3 kg

3. Dimensions & Installation Reference

Meter out dimensions (L × W × H): 120×160×80mm; clamping structure by international standard being adopted; for instrument panel console mounting, just by pushing it softly into the panel;

Panel Mounting Opening Size (W × H): 152×76mm (+1/-0 mm), see Fig.1

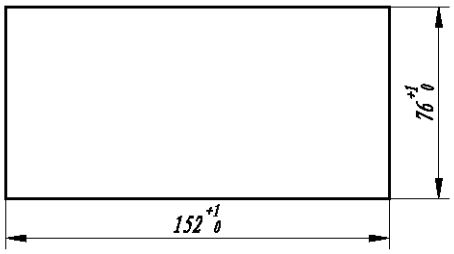


Fig.1

4. Working Principle

Meter working principle refers to Fig.2

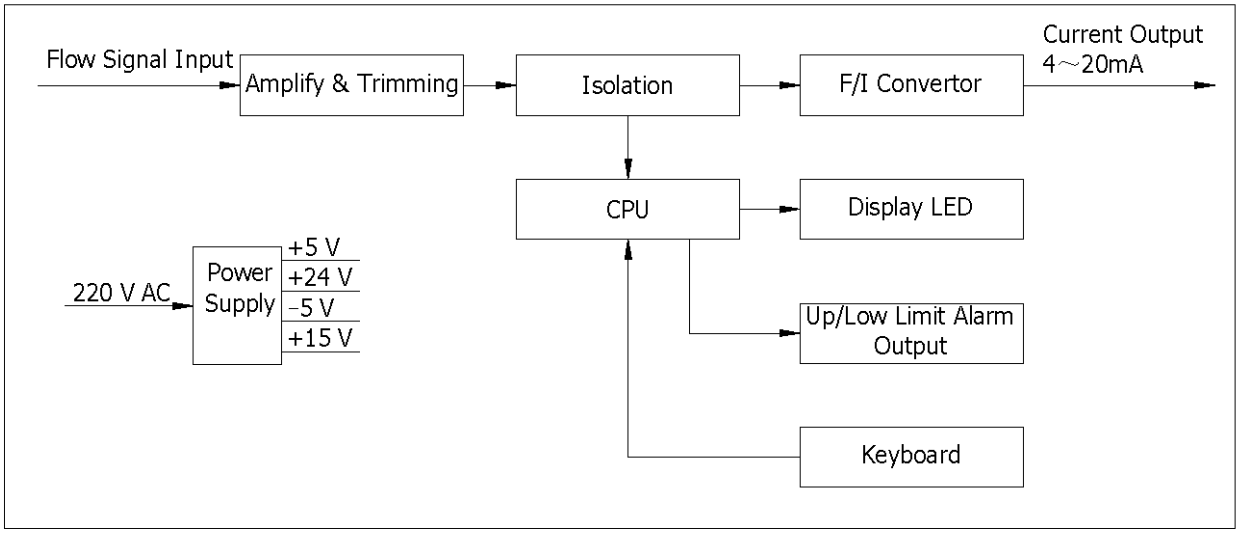


Fig.2

Referring to Fig.2, Flow Q of fluid to be measure passing through Flow Sensor that converts the Flow Rate into pulse signal N as an input for Meter; Meter circuit amplifying the pulse signal N, trimming, isolating and changing it into a square-form pulse, which is being sent out in two ways respectively, one to F/I converting circuit for generating 4-20mA standard output, while the other to CPU for displaying fluid total flow accumulated and instant flow rate; once over-limit happens, Meter displays Up or Low alarm and issues alarm output。

Signal processing brief description:

The relationship between total flow Q passing thorough the flow sensor and the number of pulse N generated by the sensor is linear within a certain flow range:

$$Q=N \times C$$

Here C is regarded as Pulse Equivalent, $C=l/K=l/\xi$ (liter/pulse); K or ξ is sensor coefficient, physically it means when each unit volume of fluid (for instance, 1 liter) flowing through the sensor, how many pulses (pulse number/ liter) it generates;

C to K or ξ is reciprocally related; it is given by flow calibration according to different Sensor nominal diameter;

Based on the above formula, Meter is able to fulfill calculating operation for the total flow and instant flow rate, being supported by hardware and software configuration.

The signal being fed to F/I converting unit is subjected to a mono-stable circuit in forming a square pulse with certain width, which is treated by its Integral, Constant Current Supply circuits, then becoming 4-20mA standard current output.

5. Structure, Installation & Wiring

1) Structure

(1) Front Panel: see Fig.3

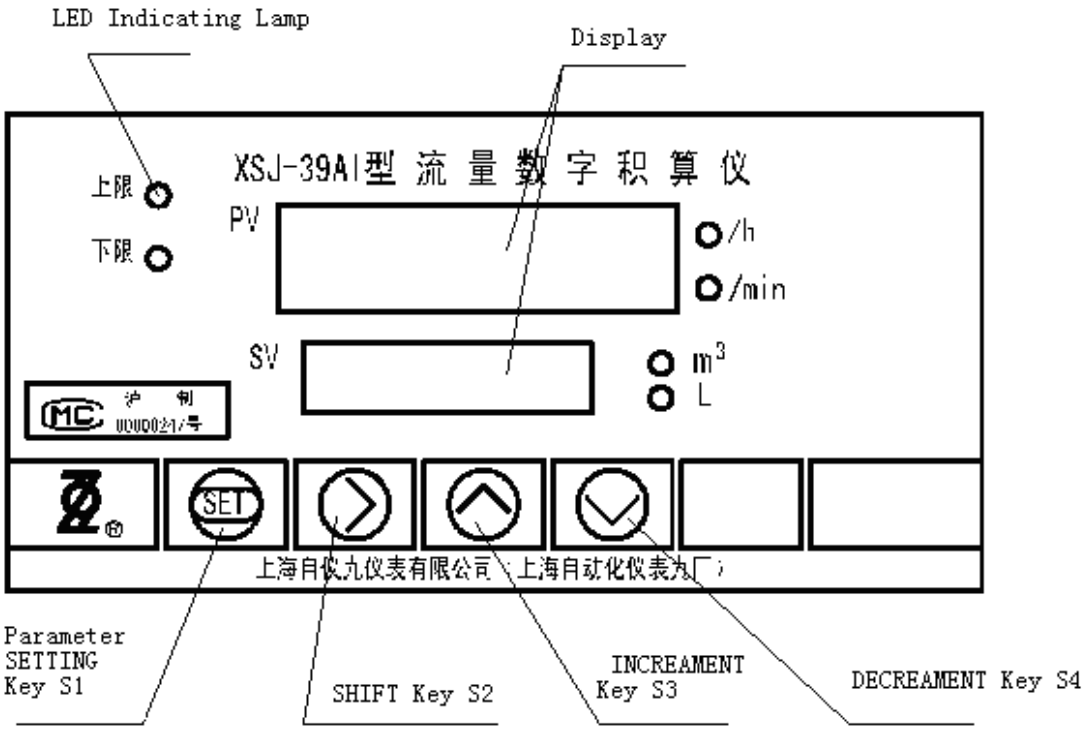


Fig.3

(2) Rear Panel: see Fig.4

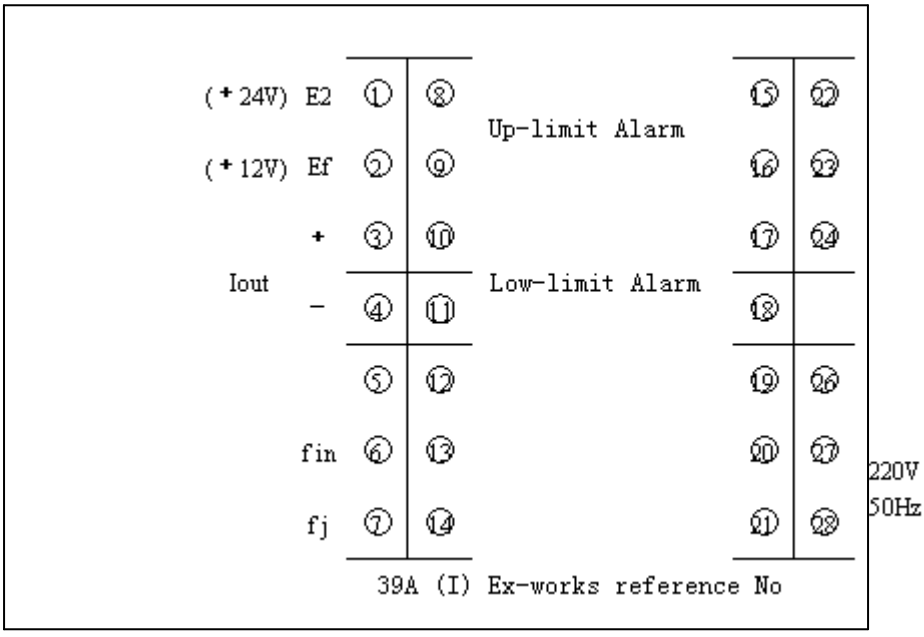
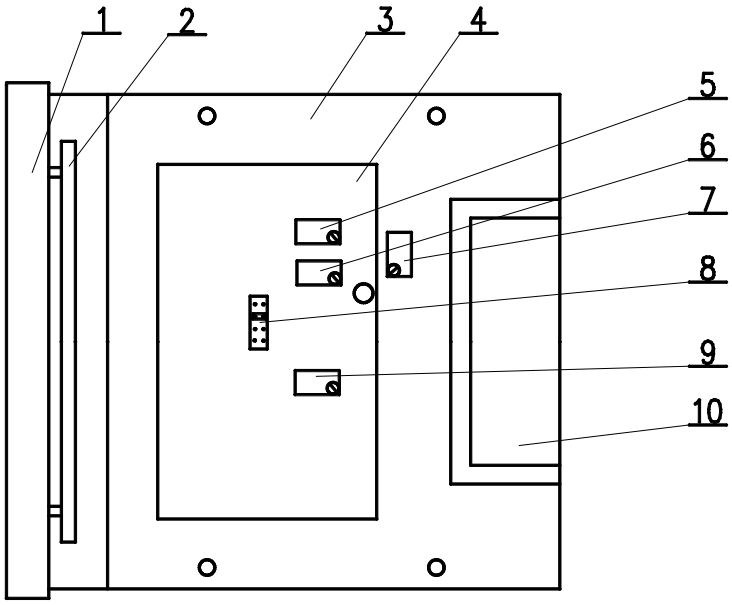


Fig.4

(3) Assembly, see Fig.5



1. panel frame 2. display unit 3. main board 4. F/I convertor
5. Standard Current Full Scale coarse adjusting potentiometer W201
6. Standard Current Full Scale fine adjusting potentiometer W202
7. Input sensitivity adjusting potentiometer W101
8. Full Scale Frequency Range setting connector J202
9. Standard Current Zero Point adjusting potentiometer W203
10. Power Transformer

Fig.5

2) Installation

The Meter shall be horizontally put or mounted on the instrument console panel; the mounting height is subject to easy reading and operation;

3) Wiring

All terminals on the rear panel see Fig.4

4) Wiring Examples:

(1) Wiring with Vortex Flow Meter (see Fig. 6)

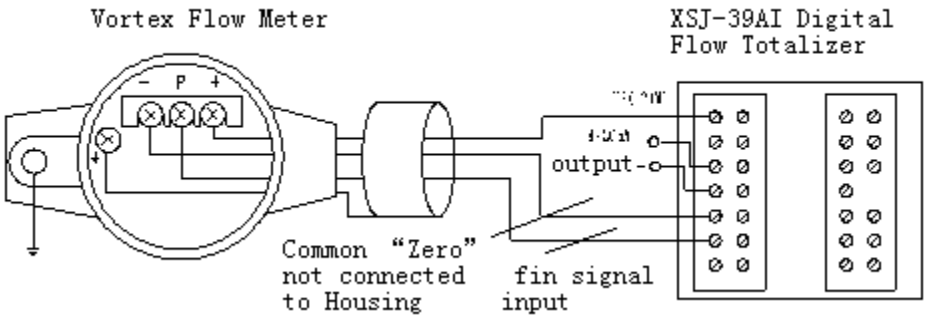
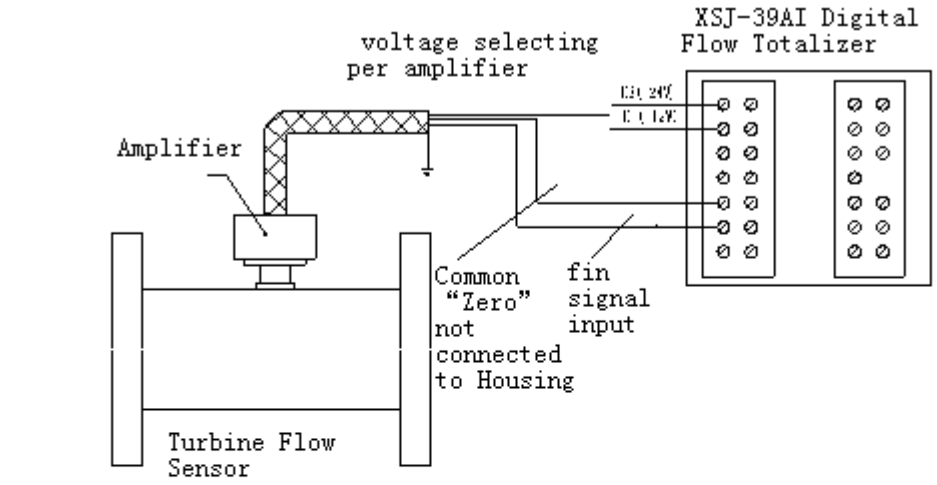
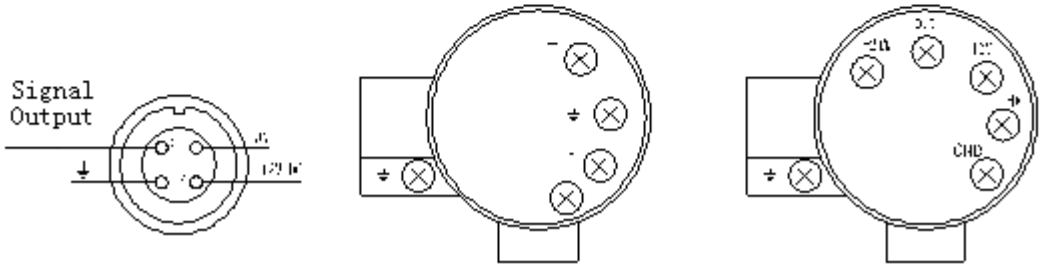


Fig.6

(2) Wiring with Turbine Flow Meter (see Fig.7)





LWF-T Regular Pre-amplifier Terminal Diagram

LWF-11A (B)/ Type P Amplifier Terminal Diagram

LWF-11A (B) Amplifier Terminal Diagram

XSJ-39A(I)	Ef +12V	fin	⊥
LWF-T	3 +12V	2 output	1 0V

XSJ-39A(I)	E2 +24V	fin	⊥
LWF-11A(B)/P	+ +24V	P	–

XSJ-39A(I)	E2 / Ef	fin	⊥
LWF-11A(B)	+24V / +12V	out	GND

Fig.7

5) Wiring Notice

(1) using 3-core- shielded-cable to connect pre-amplifier or convertor to Meter input;The shield grid shall be connected to the Ground;

(2) Wiring strictly in line with the Wiring Diagram to avoid damaging caused by wrong wiring;

6. Adjusting & Operating

1) Function Keys

A. Parameter SETTING Key **S1**

Pushing S1, one of the following displayed modes can be selected

(1) **$X_4X_3X_2X_1X_0$**;

Here: X_4 Segment Constant per Sensor Coefficient, see Table 1

X_3~X_0 4 effective digits for pulse equivalent 1/K

F-- -- -- X_0;

Here: X_0 is Instant flow Unit selected, when X_0=0, Unit is m^3/h or L/h

X_0=1, Unit is m^3/min or L/min

(2) **dH$X_2X_1X_0$**; X_2~X_0 up-limit alarm hysteresis
H $X_4X_3X_2X_1X_0$: X_4~X_0 up-limit alarm values
(3) **dL$X_2X_1X_0$**; X_2~X_0 low-limit alarm hysteresis
L $X_4X_3X_2X_1X_0$; X_4~X_0 low-limit alarm values
(4) **$X_4X_3X_2X_1X_0$**; X_4~X_0 instant flow
$X_5X_4X_3X_2X_1X_0$; X_5~X_0 total flow accumulated; lower 6 digits
(5) **$X_4X_3X_2X_1X_0$**; X_4~X_0 total flow accumulated; higher 5 digits; at the time instant flow unit indicating lamp off;
$X_5X_4X_3X_2X_1X_0$; X_5~X_0 total flow accumulated; lower 6 digits; at the time Total Flow accumulated displayed is totally in 11 digits;

B. SHIFT Key S2 (shift to right)

In number setting mode, like above (1), (2), (3), S2 makes cursor move to Right to reach the digit to be changed (cursor blinking);

In working mode, like above (4), (5), S2 is for clearing request, to be indicated by X5 blinking as clearing allowed;

C. INCREAMENT Key **S3**

In setting mode, each time, to push S3 makes the blinking digit to plus 1;

In working mode, when clearing is allowed (X5 is blinking), to push S3 one time, all 11digits for total flow accumulated are cleared to "0";

When the Meter is in "clearing not allowed" status (X5 not blinking), pushing S3 is void;

D. DECREAMENT Key **S4**

In setting mode, each time, to push S4 makes the blinking digit to minus 1;

In working mode, when clearing is allowed (X_5 is blinking), to push S4 one time, all 11digits for total flow accumulated are cleared to "0";

When the Meter is in "clearing not allowed" status (X5 not blinking), pushing S4 is void

2) Adjusting

A. Segmental Constant based o Flow Sensor Coefficient K, see Table 1

Table 1 Segmental Constant

No.	Range for Flow Coefficient K	Segmental Constant as per K	Display Unit as per Minute	Display Unit as per Hour
1	0.1<K≤1	1	m^3/min; m^3	m^3/h; m^3
2	1<K≤10	2		
3	10<K≤100	3	L/min; L	L/h; L
4	100<K≤1000	5		
5	1000<K≤10000	6		
6	10000<K≤100000	7		

B. In display: **$X_4X_3X_2X_1X_0$**

F-- -- -- -- --X_0

Set X_4, by Segmental Constant on Table 1 per K;

Set X_3 - X_0, by 4 effective digits made from reciprocal K (taking 5 digits and round the last one into 4th digit); thus, the connection between Meter and combined Sensor is set;

Set instant flow Unit, if adopting m^3/h or L/h, F row X0 is to be set as "0" if adopting m^3/min or L/min, F row X0 is to be set as "1"

Thus, both displayed Unit and decimal point position are set and displayed on the panel;

C. Set Alarm Up-Limit

In display: **$dHX_2X_1X_0$**

$HX_4X_3X_2X_1X_0$

To set the flow Up-Limit on H row digits

To set the Hysteresis on dH row digits

D. Set Alarm Low-Limit

In display: **$dLX_2X_1X_0$**

$LX_4X_3X_2X_1X_0$

To set the flow Low-Limit on L row digits

To set the Hysteresis on dL row digits

Note: the Unit for Up/Low limits must be in line with the Unit set at step B

E. Standard DC Signal Adjusting (XSJ-39AI)

(1) Zero Point Adjusting

The Zero Point of Standard DC signal (4mA) adjustment being accomplished prior Ex-works; in general, no further adjusting is needed by user; if bigger deflection is found, adjusting it to 4mA by Potentiometer W203

(2) Calculation for Calibrated flow q_{max} and responding f_{max}

According to the different measuring units to be chosen for q_{max}, following formulas are used for calculating the responding frequency f_{max}:

When q_{max} is m^3/h, $f_{max} = (K \times q_{max})/3.6$ (Hz)

When q_{max} is m^3/min, $f_{max} = (100K \times q_{max})/6$ (Hz)

When q_{max} is L/h, $f_{max} = (K \times q_{max})/3600$ (Hz)

When q_{max} is L/min, $f_{max} = (K \times q_{max})/60$ (Hz)

Here, Unit for K is N/L, pulse number per Liter, i.e. the combined Sensor Flow Coefficient, which is obtained in practical calibration by the Manufacturer; please refer to the Sensor (Flow Meter) Quality Certificate;

(3)As per f_{max} calculated, to select a segment; then to insert the "hopping plug" into the related segment as shown on Fig.8

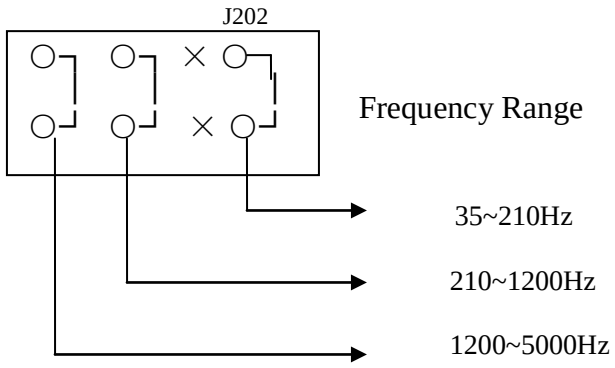


Fig.8

(4) Full Scale (20mA) Current Adjusting

To feed suitable signal into Meter, when signal frequency reaching f_{max}, adjusting Potentiometer W201 and W202 to make output current 20mA; W201 for coarse adjustment

and W202 for fine; Full adjusting by W201, W202, and Zero adjusting by W203, all Potentiometers are clock wising for current increasing;

(5) Meter Clearing

To clear accumulated Total Flow during working mode, pushing S2 Key one time, the highest digit of low- row-Total Flow is blinking (X5 blinking), that means Clearing allowed, pushing Key S2 again, blinking disappears, back to normal; when Clearing allowed, pushing either S3 or S4 to clear Total Flow accumulated completely;

(6) Checking Meter

By using conducting wire to make fin and fj terminals short circuit; 50 Hz power frequency, as self-checking pulse signal, is simulating Sensor signal to the Meter input circuit to set the Meter in Self-Check mode;

3) Operation

Wiring the Meter correctly per wiring diagram, let power on; take the steps below:

(1) Set Segmental Constant of K and Pulse Equivalent; to select and set instant flow displaying unit, Up/Low Alarm limit and Hysteresis;

(2) * confirming the calibrated flow value q_{max} and calculating corresponding frequency f_{max}; selecting the "Hopping Plug" position on J202 according to $f_{max;}$Feeding frequency signal of f_{max} to Meter and adjusting full-scale to 20mA;

* Note: applicable to type XSJ-39AI only

(3) Clearing the Meter as needed; if the fluid passing, Meter works;

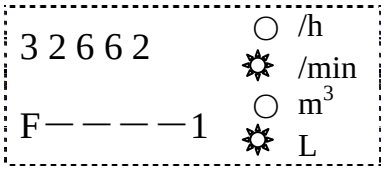
4) Application Example:

Example 1: a Sensor with 50mm diameter, K=37.56P/L given by Sensor Ex-work Quality Certificate;

A. refer to Table 1, Segmental Constant of K is 3; C=1/K=1/37.56=0.026624, its effective 4 digits is 2662 (round the 5th digit), setting the Meter with 32662;

If instant flow displayed unit l/min being selected, set the last digit of F------X_0 as 1;

Result Display:



At the time corresponding Unit lamps are on, which means Instant Flow unit is L/min; Total Flow unit is L;

B. Sensor maximum flow is 666.7L/min, take calibrated flow as 600L/min,

Then, $f_{max} = (K \times q_{max})/ 60=375.6$ (Hz)

Put "Hopping Plug" to 210~1200 Segment slot, adjusting the signal frequency to 375.6Hz, then adjusting W201 and W202 to make 20mA output; if at job-site, to adjust the pipeline flow to make the Meter display 600l/min, then adjusting W201 and W202 to make 20mA output;

C. Up-limit setting, taking Up-limit as 650L/min and Hysteresis as 50L/min; if Up-limit alarm is not needed, taking it as 1000L/min;

d H 0 5 0

H 0 0 6 5 0

D. Low-limit setting, taking Low-limit as 60L/min and Hysteresis as 10L/min; if Low-limit alarm is not needed, taking it as 0L/min;

d L 0 1 0

H 0 0 0 6 0

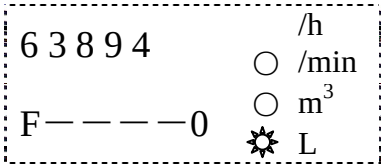
After above settings, Meter is ready to work;

Example 2: a Sensor with 10mm diameter, K=2568 P/L given by Sensor Ex-work Quality Certificate;

A. refer to Table 1, Segmental Constant of K is 6; C=1/K=1/2568=0.00038940, its effective 4 digits is 3894, setting the Meter with 63894;

If flow displayed unit L/h being selected, set the last digit of F------X_0 as 0;

Result Display:



At the time corresponding Unit lamps are on, which mean Flow unit is L/h; Total Flow unit is L;

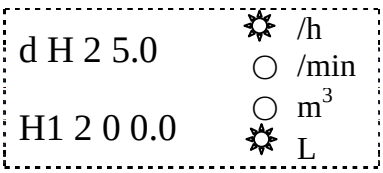
B. Sensor maximum flow is 1200L/h, take full-scale flow as 1000L/min,

Then, fmax = (K x qmax)/3600=713.3 (Hz)

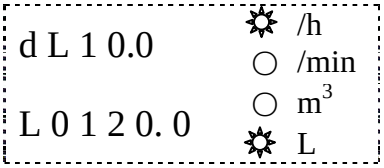
Refer to the steps in Example 1, put the" Hopping Plug" into 210-1200Hz segment in the middle; make use of signal generator to feed 713.3Hz input, adjust the current to

20mA; or use practical flow signal while adjusting valve to make the instant flow display 1000.0L/h, adjust current to 20mA to finish it;

C. set up-limit alarm to 1200.0L/h, hysteresis to 25L/h; if up-limit is not needed, set the up-limit to a bigger value like 2500L/h



D. set low-limit alarm to 120L/h, hysteresis to 10L/h; if low-limit is not needed, set the low-limit to 0L/h;



After above settings, Meter is ready to work;

Note: 1. Flow Coefficient K for each Flow Sensor is given by the Manufacturer through actual calibration, which is recorded on the Sensor Ex-works Quality Certificate; user must use K value on the Certificate and set it in the format of Pulse Equivalent C (1/K) to the combined Meter to make the Meter with effective datum display;

2. for type XSJ-39AI, Ex-works full-scale current output has been set in corresponding to 1000 Hz;

3. When the Meter is used in combining with the Flow Sensor (Flow Meter) made by this company, if user is willing to offer full-scale flow value, up/low alarm limits and hysteresis, this company can fulfill the ex-works settings for clients' direct using convenience;

7. Maintenance & Cares

1) To keep the Meter clean during operation, to avoid dust and strong vibration; to maintain it in time if troubled;

2) To cut the power supply first once troubled, then check the external wiring if circuit broken or shorten; check input signal no or yes;

3) To remove the external wiring on fin terminals; refer to "Meter Adjusting", by using conductive wire to make the fin and fj terminal short-circuit to confirm if Meter being the troubled inside;

4) If the measuring data are incorrect, to check the Meter Pulse Equivalent setting proper or improper first; in case of abnormal output current, to check IC working voltage of each unit stage-by- stage as well as output signal by using Multiple-Electrical-Meter and Oscilloscope;

5) Meter should be operated as per Instruction Manual; please contact our sales department if Meter abnormal or failed;

8. Storage

Storage condition for the Meter: ventilated indoor; ambient temperature ranging from 5-40%; relative humidity no more than 85%; atmosphere containing no harmful impurities corrosive to Meter;

9. Accessories

1) Instruction Manual one copy
2) Quality Certificate one original

This Instruction Manual is subject to change without prior notice