

# Instruction Manual

Manufacturing Certificate  
CMC Shanghai No.02220105

**TYPE LPJ-12D  
LPJ-12D/FI**

**Optical-electrical  
Pulse Convertor**



 **SHANGHAI NO.9 AUTOMATION INSTRUMENTATION CO., LTD.**

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# CONTENTS

1. General Description .....	1
2. Technical Specifications .....	1
3. Structure and Working Principle .....	2
4. Dimensions, Installation and Wiring .....	3
5. Key Points to the Installation of Explosion-Proof Product.....	4
6. Adjusting for Use.....	5
7. Operations and Cares .....	8
8. Transportation & Storage.....	8
9. Notice to Order .....	8
10. Accessories .....	8

**READ THIS MANUAL CAREFULLY BEFORE INSTALLATION AND USE**

## 1. General Description

This manual is for the installation, application and maintenance of Type LPJ-12D Optical-Electrical Pulse Converter designed and made by SAIC No.9 .

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Type LPJ-12D Optical-Electrical Pulse Converter (hereinafter referred to as Converter) is used to change the angular displacement on output shaft of volumetric flow meter into electrical pulse signal, which is then remotely transferred to receiving meters for displaying angular total displacement and angular speed; being combined with volumetric flow meters made by this company, the Converter outputs electrical pulse corresponding with the flow to the secondary instruments or other receiving meters as their inputs for instant flow rate and total flow display.

Type LPJ-12D/FI Optical-Electrical Pulse is based on Converter LPJ-12D Optical-Electrical Pulse Converter, but with additional current output; it outputs the electrical pulse and standard current signal simultaneously.

**The Converter Standard: Q/TDSM11-2014**

## 2. Technical Specifications

**1) Rotating Speed Adaptable Range:** 2 to 480 r/min

**2) Output Signal:**

**(1) Flow Pulse signal**

1.Terminal Z Signal (1 pulse/round)

Wave Form: Square Wave; Low electric level  $\leq 1V$ ;

High electric level: Supply Voltage - 2V (when Load 2k $\Omega$ )

2.Terminal A, Terminal B, \* Terminal P Signal (1000 pulses/round)

Wave Form: Square Wave; Low electric level  $\leq 1V$ ;

High electric level: Supply Voltage - 2V (when Load 2k $\Omega$ )

**(2)\*DC Signal**

Iout Terminal: 4-20mA standard DC Current Signal

Output Current fundamental deviation:  $\pm 0.3\%F.S$

Output Current Signal Responding Time  $\leq 0.5s$

Load Resistance: 250 $\Omega$

Constant Current Performance:  $\leq \pm 0.15\%/\Delta 250\Omega$

**(3) Working Condition**

Ambient Temperature: -10 $^{\circ}C$  to +60 $^{\circ}C$

Relative Humidity:  $\geq 85\%$

**(4) Power Supply**

12~24V DC $\pm 10\%$  (Type LPJ-12D)

24V DC±10% (Type LPJ-12D/FI)

Consumption: <3W

(5) **Dimensions:** see Fig.2

(6) **Weight:** approximately 1.5 kg

(7) **Explosion-Proof:** In accordance with GB3836.1-2010 « Explosive atmospheres – Part 1: Equipment – General requirement» and GB3836.2-2010 « Explosive atmospheres – Part 2: Equipment protection by flameproof enclosures “d”»

Explosion-Proof Mark: Exd II BT4

**Note:** \* means Functions only for LPJ-12D/FI

### 3. Structure and Working Principle

#### 1) Structure (see Fig.1)

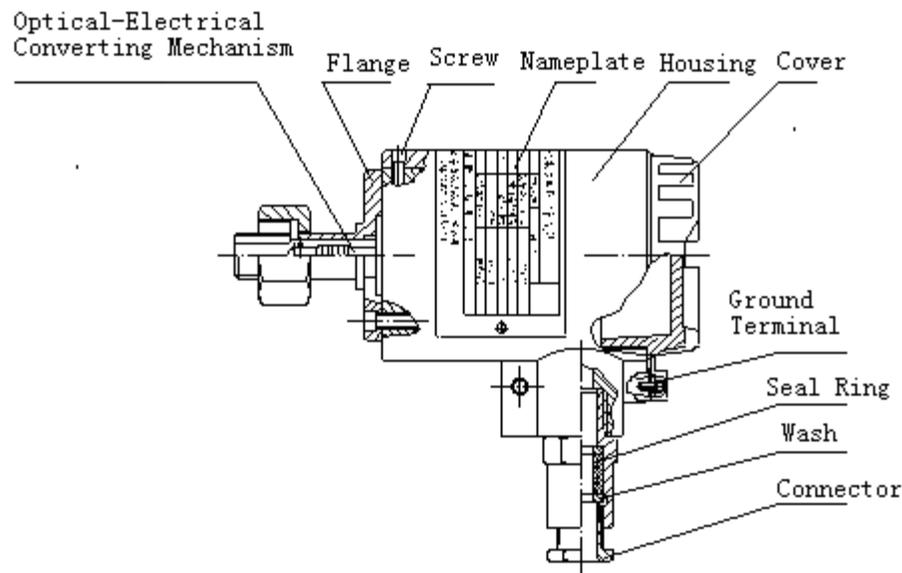


Fig.1 Converter Out-Appearance and Structure

#### 2) Working Principle

The Optical-Electrical converting component is mainly consists of LED, 2 pieces of grating glass with etched strips separated by very small gaps, and related circuits; LED is used as light source;

During operation, by angular displacement of rotating axis, 2 pieces of grating glass are being moved relatively, one is as moving grating glass while the other is as indicating grating glass; based on optical theory, they are making Moore strips which issue bright and dark- light signals one after another to be absorbed by light-sensitive tube; signals are amplified by electric circuit into electrical pulse signals; since the moving grate is etched with 1000 strips, an angular displacement of 360° (1 turn for axis) makes 1000 pulses; for positive rotating, Phase A is surpassing Phase B with 90°; for negative rotating, Phase B is surpassing Phase A with 90°; if both Phase A and Phase B signals are to be used simultaneously, it is not suitable for being transmitted within one bundle of cables due to the reason of mutual interference.

Flow Pulse signal passing through F/I converting unit is being transformed as square wave pulse with certain width by mono-stable-circuit; then it is passing through the integral circuit to form standard DC current signal 4-20mA in constant current way.

## 4. Dimensions, Installation and Wiring

### 1) Out-appearance & Dimensions (see Fig.2)

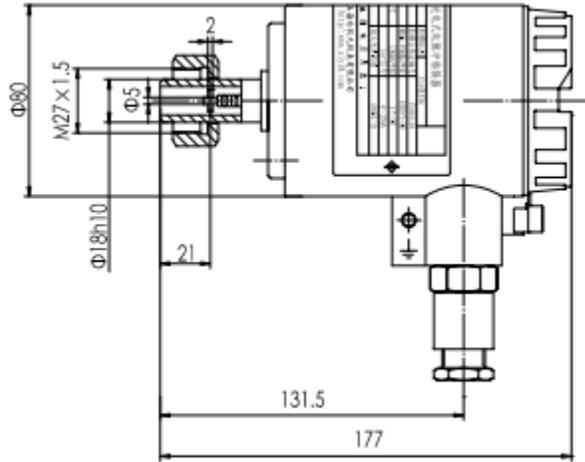


Fig.2 Converter Dimensions & Installation Diagram

### 2) Installation & Wiring

#### (1) Converter Installation (see Fig. 2)

To insert the Converter via slot-tube  $\phi 18h10$  into flow meter rotating speed outlet, and let the  $\phi 2$  pin on the flexible shaft inserting into the slot on the speed output shaft, then to finish it by fastening Nut  $M27 \times 1.5$  on the Converter.

#### (2) Converter wiring (see Fig.5)

#### (3) Cable Installation (see Fig.3 and Fig.4)

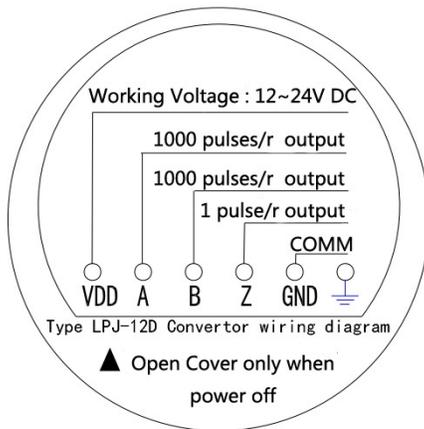


Fig.3 Type LPJ-12D Converter Terminal Diagram

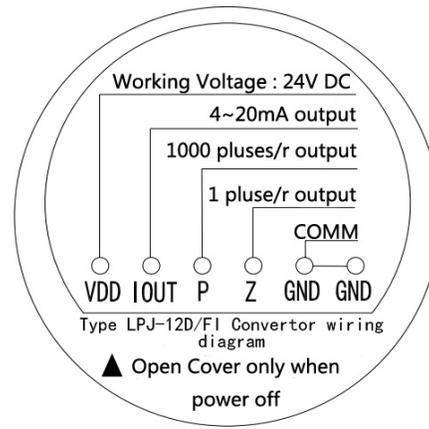


Fig.4 Type LPJ-12D/FI Converter Terminal Diagram

## 5. Key Points to the Installation of Explosion-Proof Product

LPJ-12D Optical-Electrical Pulse Converter can be used in the environment stipulated in the following standards:

GB3836.1-2010 « Explosive atmospheres – Part 1: Equipment – General requirement» and GB3836.2-2010 « Explosive atmospheres – Part 2: Equipment protection by flameproof enclosures “d”»

for Explosion Class not higher than Class II, Grade B, Natural Temperature T1-T4 Group, Zone I or Zone II hazardous areas.

To secure SAFETY, user must be very careful in installation with bolts, cables and pipes and should pay high attentions to safety regulations during maintenance.

### 1) Installation of Explosion-Proof Seal Connector: (see Fig.5)

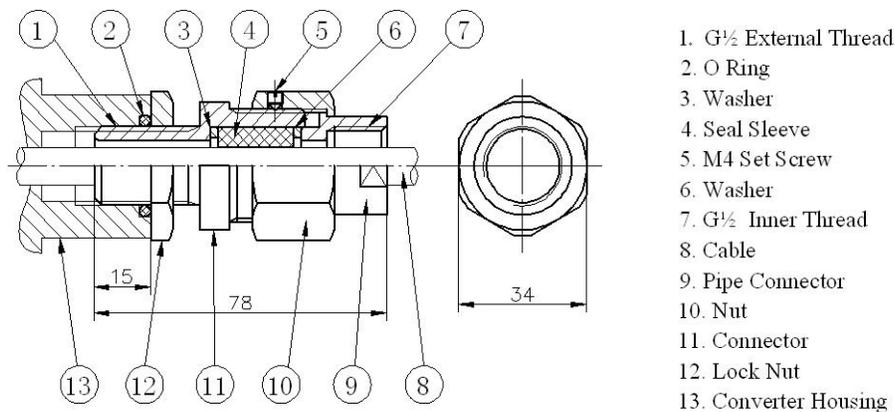


Fig. 5 Explosion-Proof Seal Connector

- (1) Ground terminal is available; good “grounded” is necessary in use
- (2) During operation or/maintenance on site, always strictly observe the WARNING “Don’t open the cover when power is on”
- (3) The sleeve-out-diameter of leading cable is approximately  $\phi 8-9$  (mm); 3-core-shielded-cable RVVP3x32x0.2 or RVVP3x48x0.2 is recommended;
- (4) Maintenance must be carried out in the safe area, where no combustible gas exists.

### 2) Ambient Conditions for Installation:

- (1) Ambient atmosphere pressure 80kPa ~110kPa; temperature  $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$ , maximum relative air humidity 90%
- (2) If there are combustible gases or vapors of flammable liquids working around, their explosion class must not be higher than Class II /Grade B; Natural Temperature within T1 ~ T4 Group; and Installation of the product is within Zone I or Zone II hazardous gas area.
- (3) Listed below is a Table that stipulates the limitations to the Temperature Class with the maximum out-exposed-surface temperature between the explosion-proof product and equipment as well as the medium temperature:

Temperature Class	T1	T2	T3	T4	T5	T6
Medium Temperature Allowed ( $^{\circ}\text{C}$ )	450	300	200	135	100	85

## 6. Adjusting for Use

### 1).Type LPJ-12D/FI Convertor adjusting (see Fig.6)

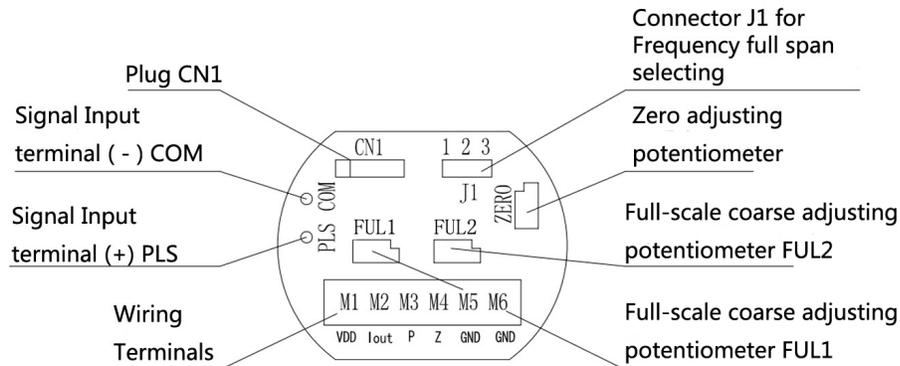


Fig.6 Type LPJ-12D/FI Convertor adjusting

#### Note: Take out Plug CN1 before adjusting

(1) Connector J1 for Frequency full span selecting According to calibrated flow, calculating the corresponding full span Frequency;

Then, as per full-span Frequency, inserting Short-Circuit Plug into relevant positions on Connector J1; when the Plug in Position 3, Frequency range is 2800-5000Hz; when Plug in Position 2 & 3, Frequency range 600-3000hz; Position 1 & 2 for 180-800Hz.

(2) Adjusting Input Signal terminals PLS, com when the full scale Frequency is known from calibrated flow, to feed full-scale Frequency in the form of square-wave as adjusting signal ( its amplitude about 5V) to the input signal terminals PLS and COM ( PLS as Positive Input Terminal, COM as Negative) by using Signal Generator.

(3) Potentiometer ZERO, FUL1 and FUL2 is zero adjusting potentiometer; FUL1 is full-scale fine adjusting potentiometer; FUL2 full-scale coarse adjusting potentiometer.

#### 2).Use

1) Check the correct wiring; turn the power on; when there is no input signal, adjusting ZERO potentiometer; checked by electrical current meter for output 4mA.

2) Get flow coefficient from the specifications of volumetric flow meters (see Table 1 for flow coefficient) and pipeline up-limit Flow  $Q_f$  (i.e. calibrated flow; unit  $m^3/h$ ); By formula  $F_f = K \times Q_f / 3.6$ , to get full scale frequency for pulse signal; as per Frequency to determine the Short-Circuit Plug position on J1; to feed full-scale Frequency in the form of square-wave as adjusting signal (its amplitude about 5V) to the input signal terminals PLS and COM by using Signal Generator; adjusting the full-scale coarse adjusting potentiometer FUL2 and the fine adjusting potentiometer FUL1; checked by electrical current meter for output 20mA.

Remove all instruments for adjusting like Signal Generator and Current Meter when Adjustment is finished; the converter is working now, if flow passing through the pipeline.

Table 1 Flow Coefficient Reference List

Flow Meter Type	Flow Coefficient K (pulses/Liter)
LS-15A, LS-15B	10000
LS-25A, LL-15,LL-25	1000
LL-40, LL-50A, LL-80, LL-100 LB-50, LB-80, LB-100	100
LL-150A, LL-200, LL-250, LL-300 LB-150, LB-200, LB-250, LB-300	10

**3).Application Examples:**

**Example 1:** A Roots Flow Meter with flow coefficient K=1000; pipeline up-limit 6m³/h, Flow pulse signal and standard 4-20mA DC signal are required;

(1) As per pipeline up-limit flow, to get full-scale frequency:

$$F_f = K \times Q_f / 3.6 = 1000 \times 6 / 3.6 \approx 1666.7 \text{ (Hz)}$$

(2)Put the Short-Circuit plug to position 2 & 3 on J1.

(3)Power on

when there is no signal, checked by current meter in relevant terminals(Iout as +; GND as-) adjusting ZERO potentiometer for 4mA; (current meter must be connected in series with a standard resistance of 250 Ω) .

(4) to feed 1666.7 Hz frequency square-wave with amplitude about 5V as full-scale adjusting signal to the input signal terminals PLS, COM (PLS +; COM -) by using Signal Generator; adjusting full-scale Coarse adjusting potentiometer FUL2 to get current meter indicating about 20mA, and then adjusting the Fine adjusting potentiometer FUL1; to let the electrical current meter for exact 20mA indicating.

(5)By using Oscilloscope, to observe the pulse signal at output terminal P,wave form can be seen on the screen, adjusting is completed.

**Example 2:**A Roots Flow Meter with flow coefficient K=10, the up-limit of weight flow 250T/h; fluid medium density 0.95T/m³.

(1)as per the up-limit of weight flow and medium density, to obtain the up-limit for volumetric flow:

$$Q_{vf} = Q_{wf} / D = 250 / 0.95 = 263.16 \text{ (m}^3\text{/h)}$$

as per pipeline up-limit volumetric flow, to get full-scale frequency;

$$F_f = K \times Q_{vf} / 3.6 = 10 \times 263.16 / 3.6 \approx 730.99 \text{ (Hz)}$$

(3)Put the Short-Circuit plug to position 1 & 2 on J1.

(4)Power on when there is no signal, checked by current meter in relevant terminals (I out as +; GND as-); adjusting ZERO potentiometer for 4mA; (current meter must be in series with a standard resistance of 250 Ω).

(5)to feed 730.99 Hz frequency square-wave with amplitude about 5V as full-scale adjusting signal to the input signal terminals PLS, COM (PLS +; COM -) by using

Signal Generator; adjusting full-scale Coarse adjusting potentiometer FUL2 to get current meter indicating about 20mA, and then adjusting the Fine adjusting potentiometer FUL1; to have the electrical current meter for exact 20 mA indicated.

(6)By using Oscilloscope, to observe the pulse signal at output terminal P, wave form can be seen on the screen; adjusting is completed.

#### **4).Explanation:**

The Convertor can simultaneously send out flow pulse signal and standard DC current signal to meters for reception; just use one of the signals is also applicable.

(1) Ex-works setting and adjusting have been made at full-scale frequency of 1000Hz, DC signal output of 4-20mA in case that the user's working condition is unknown.

(2)During order placing, if user knows the flow coefficient of Oval Gear Flow Meter to be matched, pipeline up-limit flow and fluid medium density (when up-limit flow unit is in T/h), the Manufacturer will follow the Inquiry List provided by the user for Ex-works setting & adjusting; so after delivery user can directly use it without further adjusting.

(3) During Ordering, if user does not know the above-mentioned parameters, or after certain operation, user needs to change one or all of the above-mentioned parameters, please refer to the procedures above for self-adjusting.

## 7. Operations and Cares

- 1) To avoid strong vibration and impact during installation and operation, because the grates inside convertor are made of glass;
- 2) Do not open the cover when power is on!
- 3) To prevent convertor from dust entering during wiring;
- 4) During installation, to make sure that the  $\phi 2$  pin on the flexible shift is being inserted into the slot on the flow meter output shaft, not to fasten the Nut roughly;
- 5) For long distance signal transfer, if signal attenuation via transmission wire is too much, replacing the wire with a bigger one.

**Note: Correct Power Supply polarity!**

## 8. Transportation & Storage

- 1) The Convertor packing condition should be kept like original ex-works packing for transportation or moving (to job-site or return it for repair) in order to prevent it from being damaged.
- 2) The Convertor should be stored indoor, with temperature ranging from 5 to 40°C, Relative humidity not exceeding 85%, in good ventilation and non-corrosive atmosphere.

## 9. Notice to Order

Output Signal Wire is user's responsibility; this company optionally supplies Type RVVP Metal-shielded, PVC insulating Cable with 3 specifications of 3x23/0.15; 3x28/0.15; 3x32/0.15; if purchase is needed, please specify cable specifications and length in Order.

## 10. Accessories

- 1) Instruction Manual one copy
- 2) Quality Certificate one original
- 3) Seal Ring 2 pieces
- 4) Wiring Strip 6 pieces
- 5) Inner-Hex Wrench 1 piece

**This Instruction Manual is subject to change without prior notice**