

PC100-D PC

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# User's Manual



Jan, 2023

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## Instruction of PC


### 1.1 Declaration

The copy right of *The user's manual of pressure controller and mass flow meter* is subjected to Beijing Sevenstar Flow Co., Ltd (following abbr. Sevenstar), which is not allowed to duplicate, store and distribute any part of this manual in mean of electric, mechanical, photocopy, recording or other way without permission of Sevenstar. This manual is not assured that there is no mistake and missing in which have been corrected strictly, and the publisher is under no obligation to the mistake or missing, meanwhile the publisher is not in charge of any loss that this manual leads to.

Beijing Sevenstar Flow Co. , Ltd

## 1.2 Attention

Dear customer, thanks for using PC pressure controller. This manual describes in detail important issues about correct and safe operations of the product.

User of the product should read and comprehend this manual and pay attention to the text with labels  and notices.

Sevenstar assumes no liability for the customer's failure to comply with this manual. This manual is necessary for your installation and maintenance, please keep it carefully.

## 1.3 The notice of safety

Please pay attention to the below notices when reading this manual. We are not responsible for any result without abiding by the below notices.

**a) Do not replace any components or disassemble instrument.**

Do not replace any components, or disassemble the instrument without any authorized and make sure that the label or/and seal of product is not removed when returning for reworking, recalibration and maintenance.

**b) Please contact professional for technical service.**

Do not replace any components. Any technical support is provided by professional who must be authorized by Sevenstar.

**c) Please pay more attention to use dangerous gas.**

Instrument should be purged completely and keep safety if dangerous gas is used. Meanwhile make sure that moist gas must not react with material of seal and instrument.

**d) Please pay attention to purging instrument.**

The whole system should be purged by dry gas after and before the instrument is installed.

**e) Please abide by proper steps of purging.**

Product should be purged and handled with gloves.

**f) Do not use the instrument in explosive environment.**

Do not use the instrument in explosive environment, unless the safety certificate is available.

**g) Please use proper fittings and keep the rules.**

All fittings of instrument must be matched according to the listing in manual. Please read manual carefully before screwing tightly.

**h) Please do leakage check.**

Please check carefully all of vacuum parts and make sure that there is not leakage in the system.

**i) Please make sure that instrument is working under safe pressure.**

Please make sure that the pressure of inlet gas is less than maximum working pressure.

**j) Please keep the whole system away from pollution.**

When system running, do not use polluting gas, such as particle of dust, dirt, fibre, glass or scrap iron.

**k) Please do warm-up instrument before working.**

Please do warm-up instrument, especially in using dangerous gas. Please close valve completely to make sure that there is not error flow.

## 1.4 General

Pressure controller (PC) accurately measures and controls mass flow rates, which is widely applied in the fields as: semiconductor and IC fabrication, special materials science, chemical industry, petrolic industry, pharmaceutical industry, environmental protecting and vacuum system researching, etc.. The typical applications include: microelectronic process equipment such as diffusion, oxidation, epitaxy, CVD, plasma etching, sputtering, ion implantation, vacuum deposition equipment, optical fiber melting, micro-reaction equipment, mixing & matching gas system, capillary flow pressure control system, gas chromatograph and other analytical instruments.

The PC100-D PC is a latest generation PC for use in semiconductor applications and demanding industrial uses where its high accuracy and flexibility in interfacing are required.

The PC100-D PC incorporate a dual interface, voltage (0~5V) and as well as RS-485 digital interfaces. It is possible to operate the instrument completely digitally or it can be operated in analog mode with digital monitoring. PC100-D series have wide range of power supply(available for +15 ~ +24VDC).Customer Secondary Development of control and sample software is available through the open protocol.

PC100-D PC default setting:

MAC address: 32;

RS485 baud rate: 19200;

Control mold: 0-5V analog signal control.

For more information, please refer to [www.mfcsevenstar.cn](http://www.mfcsevenstar.cn).

Path: Service >> Downloads>>Software download>>Communication Protocol.

## 1.5 Specification

Pressure Type	Absolute
Pressure Full Scale Ranges	1000Torr, 1200mbar
Proof Pressure	3MPa
Orifice Full Scale Ranges	50、500sccm; 1、2、3、5SLM
Control Modes	Upstream
Temperature drift	Zero: $\pm 0.02\%$ of FS/ $^{\circ}\text{C}$ ; Span: $\pm 0.04\%$ of Reading/ $^{\circ}\text{C}$
Pressure Resolution	0.1 Torr
Pressure Control Accuracy	$\pm 1.0\%$ of Reading ( $\geq 10\% \text{FS}$ ); $\pm 0.2\%$ of FS ( $< 10\% \text{FS}$ )
Typical Response Time	$< 1.0$ second
Operating Temperature Range	$10^{\circ}\text{C}$ to $50^{\circ}\text{C}$
Mechanical interface	1/4" Compression Fitting、1/4VCR M
Valve Type	Normally Closed
Leak Integrity, External	$< 1 \times 10^{-10}$ (scc/sec He)
Leak Integrity, Through closed valve	$< 1.0\%$ of orifice Full Scale (Nitrogen at 25 psig on inlet to atmosphere)
Power supply	+15 to +24 VDC ( $< 4$ watts)
Electrical interface	DB-9 M、EtherCAT

### Notes :

**PC is calibrated by  $\text{N}_2$  as a standard gas.**

**Units:** Torr ;  
mbar

**Standard Situation:** Tem —  $273.15\text{K}$  ( $0^{\circ}\text{C}$ );  
Air Pressure —  $101325\text{ Pa}$  ( $760\text{mm Hg}$ )

**For Sevenstar PC, the unit of SCCM is identical to “mL/min,  $0^{\circ}\text{C}$ , 1atm”, and the unit of SLM is identical to “L/min,  $0^{\circ}\text{C}$ , 1atm”.**

**F.S. : Full Scale; S.P. : (Set Point)**

## **1.6 Calibration Features**

Normally, the PC are calibrated close to customer's requirement ( the requirement should be accorded with the specification). Without customer's information, the PC are calibrated under standard conditions.

### **1.6.1 Standard conditions**

Without special conditions specified by the customer, the PC is calibrated under the following standard conditions:

Pressure Outlet: Atmospheric.

Normally gas mass flow rate is transferred to gas volume flow rate at standard state.

Mass flow rate unit:

SCCM——standard cubic centimeter per minute.

SLM——standard liter per minute.

Standard state: Temperature —— 0 °C (273.15K)

Pressure —— 101325Pa (760mmHg)

At standard state, the gas density will be constant. The multiplication of density and volume flow rate is equal to the mass flow rate. Therefore at the standard state, the volume flow rate can represent mass flow rate.

### **1.6.2 Manufacturing Environment**

The PC are assembled, calibrated, packaged and controlled in class 1000 environment. The temperature is  $22 \pm 2^{\circ}\text{C}$ .

### **1.6.3 Precision Adjustment**

Each PC is accurately controlled for 24 hours after manufacturing on a different calibration bench. The accuracy, the dynamic response, the stability to pressure variations is double checked, only qualified product available for sale.



## **SECTION 2 INSTALLATION**

### **2.1 General**

**WARNING:** Toxic, corrosive or explosive gases must be handled with extreme care. After installing the PC, the system should be thoroughly checked to ensure it is leak-free. Purge the PC with a dry inert gas for one hour before using corrosive gases.

**IMPORTANT:** When installing the PC, ensure that the arrow on the back of the unit in the same direction as the gas flow.

### **2.2 Unpacking**

The PC100-D are assembled, calibrated and clean packaged under clean room conditions. These series products are packaged with two separately sealed plastic bags. The outside is common plastic bag, the inside is clean bag. The outside bag should be removed in the entrance to the clean room. In order to minimize the contamination, the second clean bag should be removed in the clean room when PC installed in the system.

### **2.3 Mechanical Installation**

#### **2.3.1 General**

PC100-D should be mounted in the position accord with the requirement in the purchase order. The gas should be clean and dry. The mounting should be free from shock or vibration. The pictures of the product are shown in figure2-1, the dimensions of the product are shown in figure2-2 and figure2-3, the dimensions of the PC100 EtherCAT product is shown in figure2-4. Different fittings(Compression Fitting1/4 and VCR1/4 M) are optional for customer, The length of the product L are shown in Table 2-1. Do not remove the protective end caps of the fittings until installation.



Figure 2-1 PC100-D

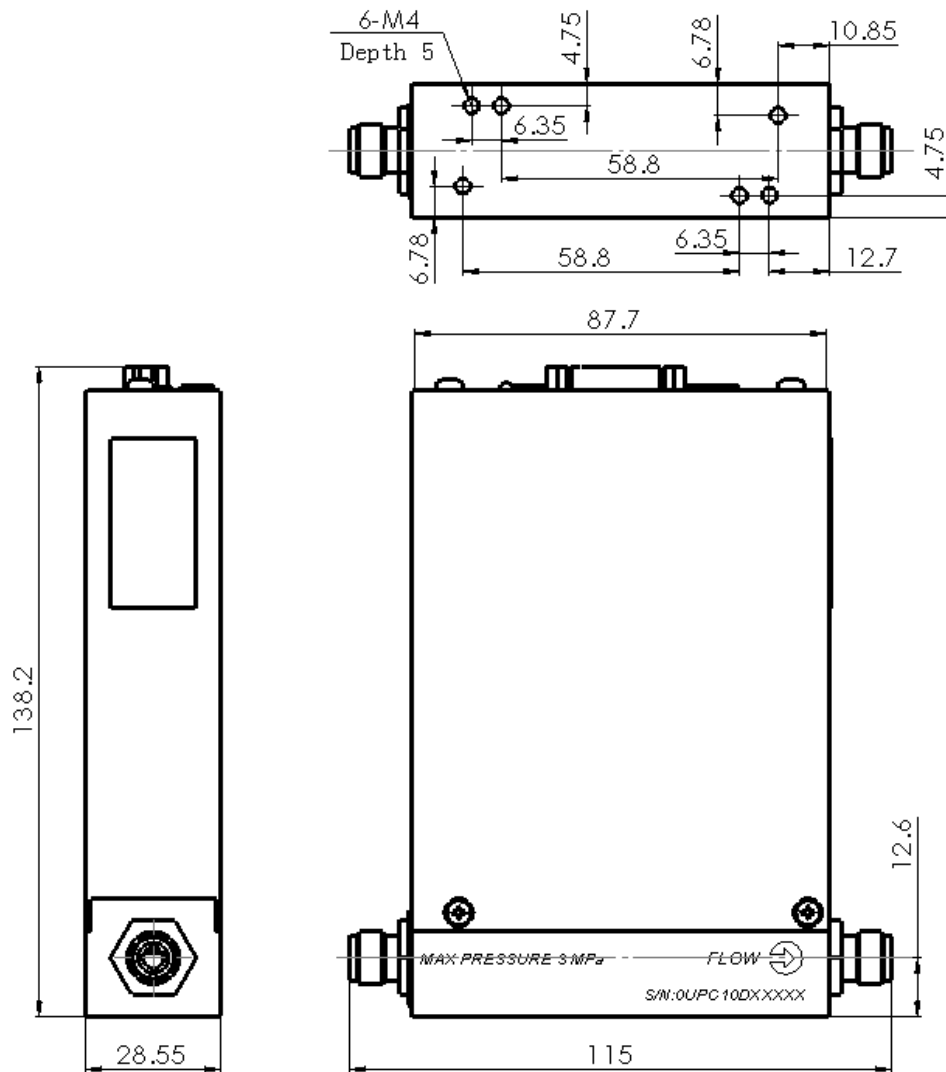


Figure 2-2 Product with Compression Fitting 1/4 inch dimensions

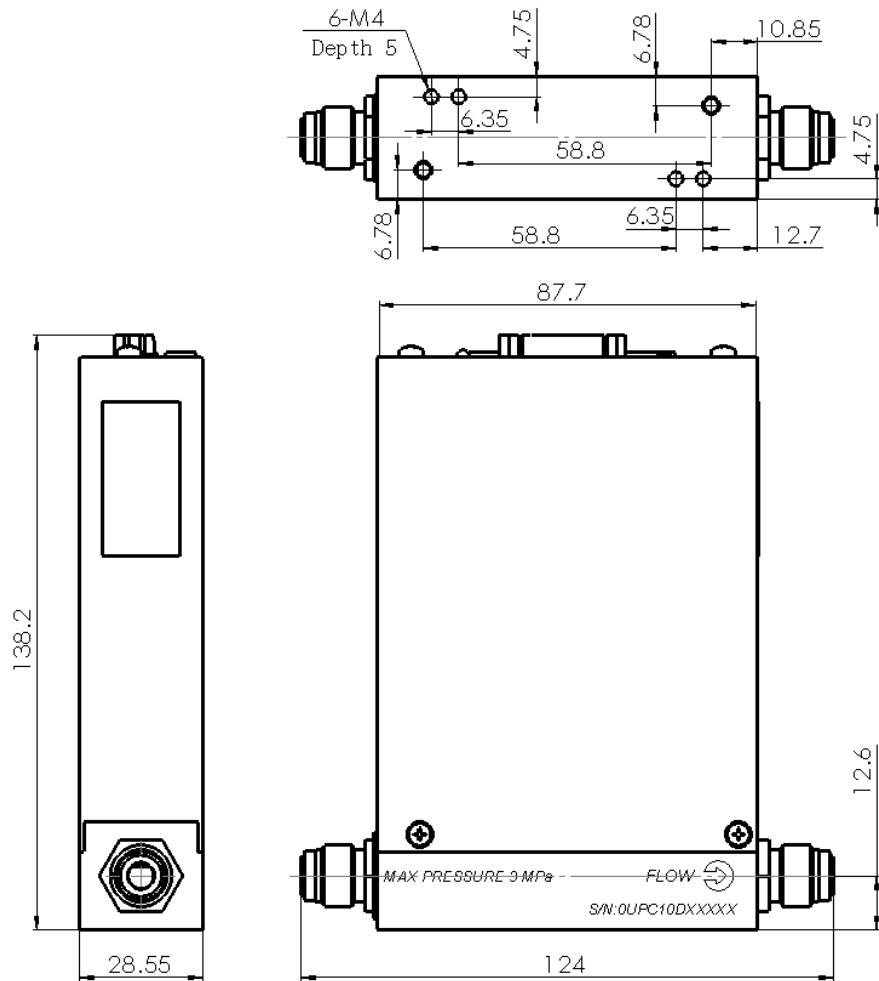


Figure 2-3 Product with VCR1/4 M dimensions

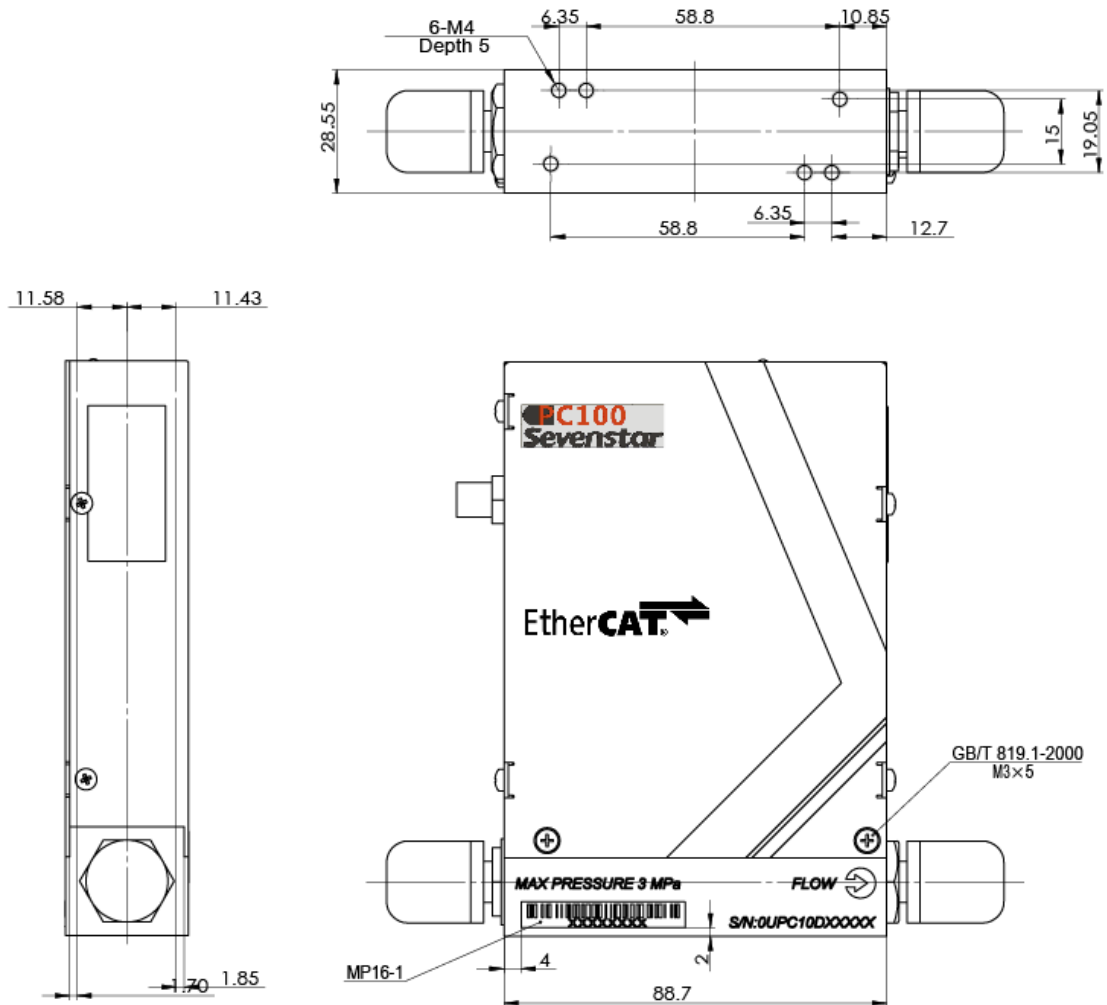


Figure 2-4 PC100 EtherCAT product dimensions

## Attention :

The height (which is showing in figure 2-2 and figure 2-3) of 138.2 mm without electric connectors of cable. It should be added around 50mm more after adding the electric connector.

## 2.3.2 Installation

Place PC according to the flow direction.

### 2.3.2.1 1/4VCR Connection

Refer to figure 2-5 and figure 2-6 Check the gland to gland space, including the gaskets. Remove the plastic gland protector caps. When using loose VCR original style gaskets, inserting the gasket into the female nut. For VCR retainer gaskets, snap the gasket onto the male coupling. Tighten the nuts finger tight. Scribe both nut and body in order to mark the position of the nut. While holding the body with a wrench, tighten the nut: 1/8 turn past finger tight for 316L stainless steel and nickel gaskets.

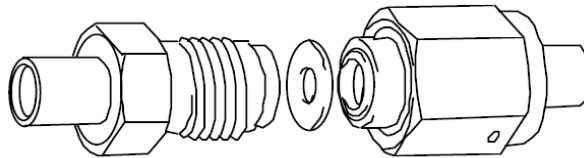


Figure 2-5 VCR original style gasket

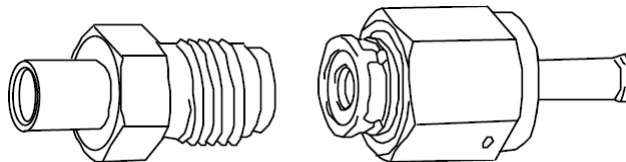


Figure 2-6 VCR retainer gasket

### 2.3.2.2 Two-ferrule (Compression Fitting) Connection

Refer to figure 2-7. Check the gland to gland space. Remove the gland protector caps. Insert the tubing to the shoulder inside the fitting, and check that the ferrules are positioned as shown in figure2-6. Tighten the nuts finger tight. Use two spanners, one spanner locking

the fitting stable, wrench another one to tighten in 1.25 turns to prove it's not blow-by after installing the front ferrule, back ferrule and nut.

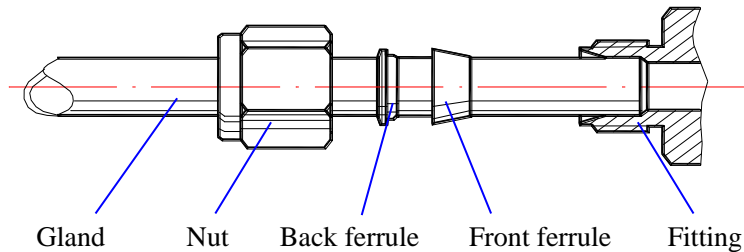


Figure 2-7 Compression Fitting Connector Installation

### Attention⚠:

When installing the fitting, you should manually use spanner to wrench it tighten by 1/2 turn pulling up, (imported Compression Fitting should use spanner to be tighten in 1,25 turns) to prove its not blow-by after your installing the front ferrule 、 back ferrule and nut. Please note you should use two spanners to operating, one spanner for locking the fitting stable and another one for revolving the nut. Especially when you dismantle the tube, you should operate by the two spanners otherwise fitting will become flexible which will affect its airproof function.

## 2.4 Electrical Installation

### 2.4.1 General

With simple switching power supply, PC100-D PC is available for +15 to +24 VDC (single-ending). Customer can choose as need. With simple switching power supply, PC100 EtherCAT product is available for +24 VDC (single-ending).

Customer can choose 9 pin male Sub-D. 9 pin male Sub-D connector is the SEMI Standard compatible, both 0-5V analog signal control and output and communicate with PC via RS485 available. PC100 EtherCAT product uses RJ45 interface and supports the

EtherCAT communication protocol.

### 2.4.2 Connections

The 9 pin male Sub-D connector RB and RM are shown in figure2-8.

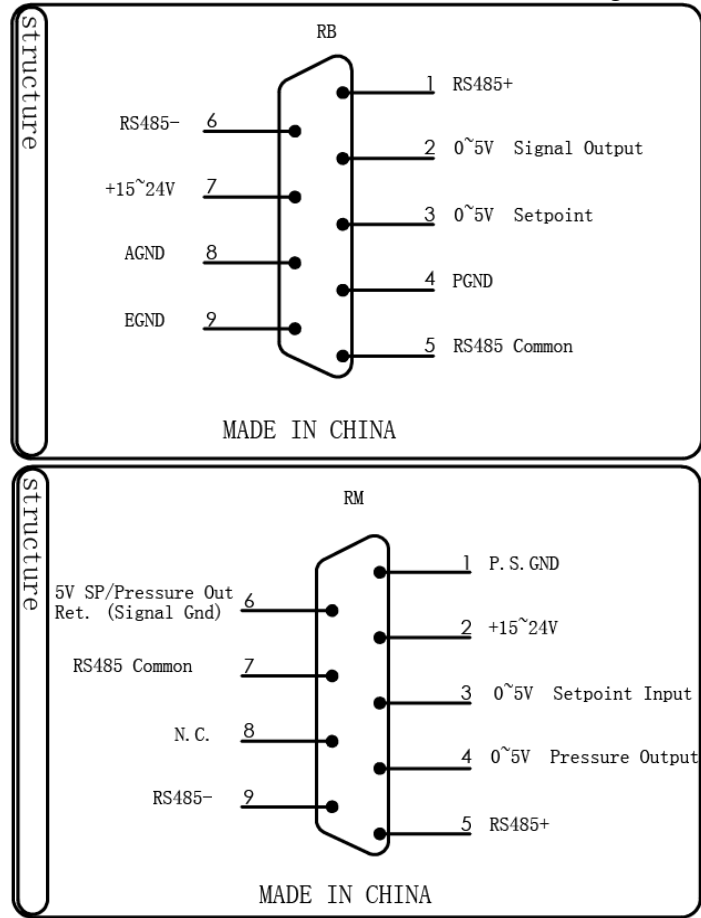


Figure 2-8 9 pin male D-sub connector



The PC100 EtherCAT connector of RJ45 interface are shown in figure2-9.

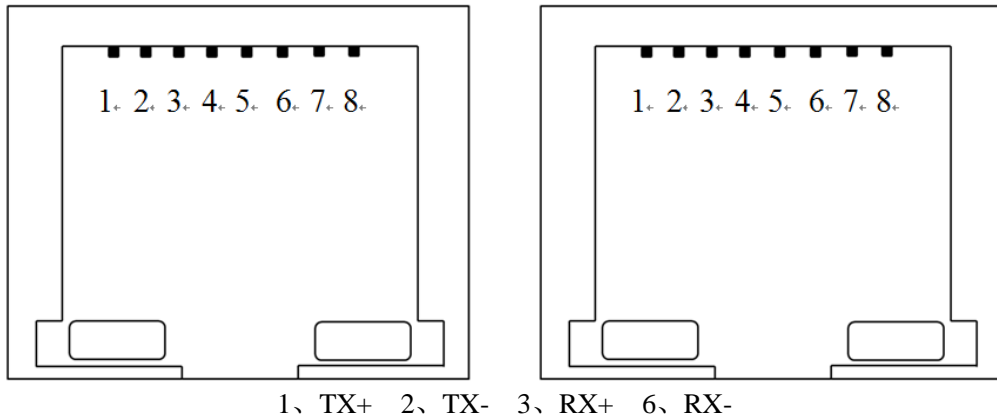


Figure 2-9 PC100 EtherCAT connector of RJ45 interface

Sevenstar manufactures all standard cables, RS485 adaptor, customized cables and some accessories. For more details, contact Sevenstar or its local agent.

## 2.5 Checking Before Operation

Before operating the PC the following checks should be completed:

- 2.5.1 Check that tubing is leak free.
- 2.5.2 Check the process sequence and proper function of all other gas components involved.
- 2.5.3 Check the voltage of command signals and power supply to the PC.
- 2.5.4 Check that the appropriate type of gas is being supplied at the rated pressure.
- 2.5.5 Use dry inert gas for test runs.
- 2.5.6 Prior to using the PC for extremely corrosive gases, purge PC with a dry inert gas for one hour.

## **SECTION3 FUNCTIONS**

### **3.1 General**

Based on new sensor driver technology, PTS technology and AI technology, PC100-D presents high performance and reliability.

### **3.2 Control Mode**

PC100-D is available for digital, 0-5V voltage control mode and output and RS485. The pressure output of the PC100-D will be available through the RS485 interface, even in the analog control mode. The setting of the PC100- D PC can be provided to the PC in digital or analog mode.

For more information, please refer to [www.mfcsevenstar.cn](http://www.mfcsevenstar.cn).

Path: Service >> Downloads>>Software download>>Communication Protocol.

### **3.3 Valve Type**

The type of PC100-D valve is Normally closed(NC) . When PC do not have power supply, the “NC” type valve is closed.

PC100-D is available for valve-close or valve-open by input digital signal or analog voltage directly.

### **3.4 LED**

There is a green-red LED located on the top of the PC. The constant green LED indicates the power on. Green blinking indicates that the PC is automatically zeroing.

As shown in figure 3-1, there are a PC LED and a ECAT\_ERR LED located on the top of PC100 EtherCAT product. Normally under the power situation PC LED green steady on, green steady on means normal work, green blinking means PC is automatically zeroing.

The ECAT\_ERR indicator is on indicates that a communication error occurs.

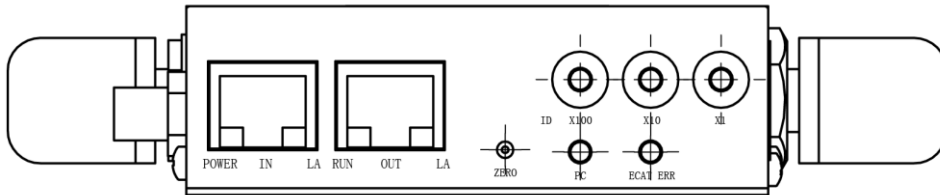


Figure 3-1 Top of PC100 EtherCAT product

## SECTION 4 MAINTENANCE

### 4.1 General

No routine maintenance is required to be performed on the PC, Other than occasional cleaning and re-calibration:

It can be used about 3 or 4 years with an ultra-clean and non corrosive gas.

It can be used about 1 or 2 years with a low purity gas or a corrosive gas.

For any other problems, contact Sevenstar.

### 4.2 Caution⚠

#### 4.2.1 Medium Forbidden

The used gas should be purified without dust, liquid and oil stain. If necessary, the filter should be added to gas system for purification. If the outlet of PC is connected to liquid sources, a One-way valve should be added to avoid the liquid back to destroy PC.

#### Attention⚠:

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For the cases that the PC used with toxic, pyrophoric, flammable or corrosive gas, you should ensure that the fixing and fitting are airtight. It becomes necessary to remove the controller from the system, purge the controller thoroughly with a dry inert gas such as nitrogen, before disconnecting the gas connections. Failure to purge the controller could cause a fire or explosion resulting in death.

## SECTION 5 TROUBLESHOOTING

### 5.1 Initial Check

5.1.1 Check the gas supply pressure and check the flow-path to the PC has been opened.

5.1.2 Ensure that the power supply and command signals are correctly transmitted to the D-connector pins and RS485.

5.1.3 Check that the output signal matches the external reading.

### 5.2 Troubleshooting

Use the following table to locate the fault.

	SYMPTOMS	Possible cause	Action
1	PC will not control	Gas connection incorrect	Check gas connection
		Pressure incorrect	Check pressure condition
		Wrong control mode	Change the control mode by the software
		Power failure	Check Power and pin position
		Setpoint incorrect	Check setpoint signal
		Contamination	*Contact Sevenstar
		Defective sensor	*Contact Sevenstar
		PCB problems	*Contact Sevenstar
2	PC100 will not communicate with PC	Defective Mechanics	*Contact Sevenstar
		Power failure	Check Power and pin position
		Cable problems	Check cable and connector
		Address conflict	Check address of PC
		Baud rate error	Check baud rate of PC
		PCB problems	*Contact Sevenstar

#### **Attention**

\* Mark indicates that reparation and adjustment must be dealt under specialist advices. For any other problems, contact Sevenstar.

## **SECTION 6 WARRANTY AND SERVICES**

### **6.1 Guarantee of Sevenstar**

Sevenstar and its authorized distributors assure that there are not flaw of the material and quality of product within 12 months since the date of the product purchased by you.

The compensation for customer is only limited to invalid part for substitution, installation and processing flaw.

It is guaranteed that all part chose by customers are suitable to relative manufacturer.

Other relative statements, guarantee and obligation of status and usage of product, whether direct or indirect, are definite to be excluded. In any circumstance, Sevenstar and its authorized distributors are not charged of any obligation of direct or indirect loss for customers or others.

### **6.2 Product Warranty**

6.2.1 Sevenstar products are guaranteed against defects in materials and workmanship if used in accordance with specifications and not subject to physical damage, contamination, alteration or retrofit. Warranty periods: One year

6.2.2 Buyers undertake to check and inspect the goods and to notify Sevenstar of shipment incidents by fax, phone or e-mail as soon as possible after receipting the goods.

6.2.3 During the warranty period, products must only be repaired by authorized Sevenstar service centers; Otherwise, the Sevenstar product warranty will be invalidated.

6.2.4 Repairs will be performed free of charge during the one-year warranty period. If PC are out of warranty, Sevenstar will notify the owner of replacement or repair costs before proceeding. Factory service and repairs are guaranteed 90 days. The warranty excludes consumable materials and wear parts (in teflon, viton, etc.).

6.2.5 No PC will be accepted for repair or warranty without a decontamination and purge

certificate.

6.2.6 Each PC is individually checked (visual inspection of fittings, helium leak test and flow calibration). Sevenstar shall not be responsible for any damage caused by gas leakage or the use of a dangerous gas. Users are responsible for following the safety rules applicable to each gas they use. Improper use of a Sevenstar PC will void the warranty, and PC that have been damaged as a result of improper use will not be replaced by Sevenstar.

6.2.7 Specific warranty requirements are as follows :

A, Gas must be clean and particle-free, which means a filter must be fitted in the gas line upstream of the PC.

B, Gas must comply with the following pressure specifications: Gas pressure must never exceed 3MPa.

C, Electrical connection requirements are as follows:

The system must be wired carefully: non-observance of the pin-out may irreversibly damage the electronic board inside the PC, in which case the warranty will be invalidated.

D, Gas connections: The fittings must be handled carefully. Sevenstar guarantees that all fittings have been individually inspected and are scratch-free.

E, Fitting procedure: The fitting procedure set out in the manual must be followed meticulously. Specifically, the purge procedure is very important if corrosive gases or toxic gases are used.

F, The PC must not be dismantled: The PC warranty will be invalidated if the seal between the PC block and cover is torn.

## 6.3 Services

Sevenstar can provide services like start-up service, software development, gas system design, training, etc.

Please visit [www.mfcsevenstar.cn](http://www.mfcsevenstar.cn) for more information.

## 6.4 Disclaimer

Beijing Sevenstar Flow Co., Ltd is not responsible to loss as following situation:

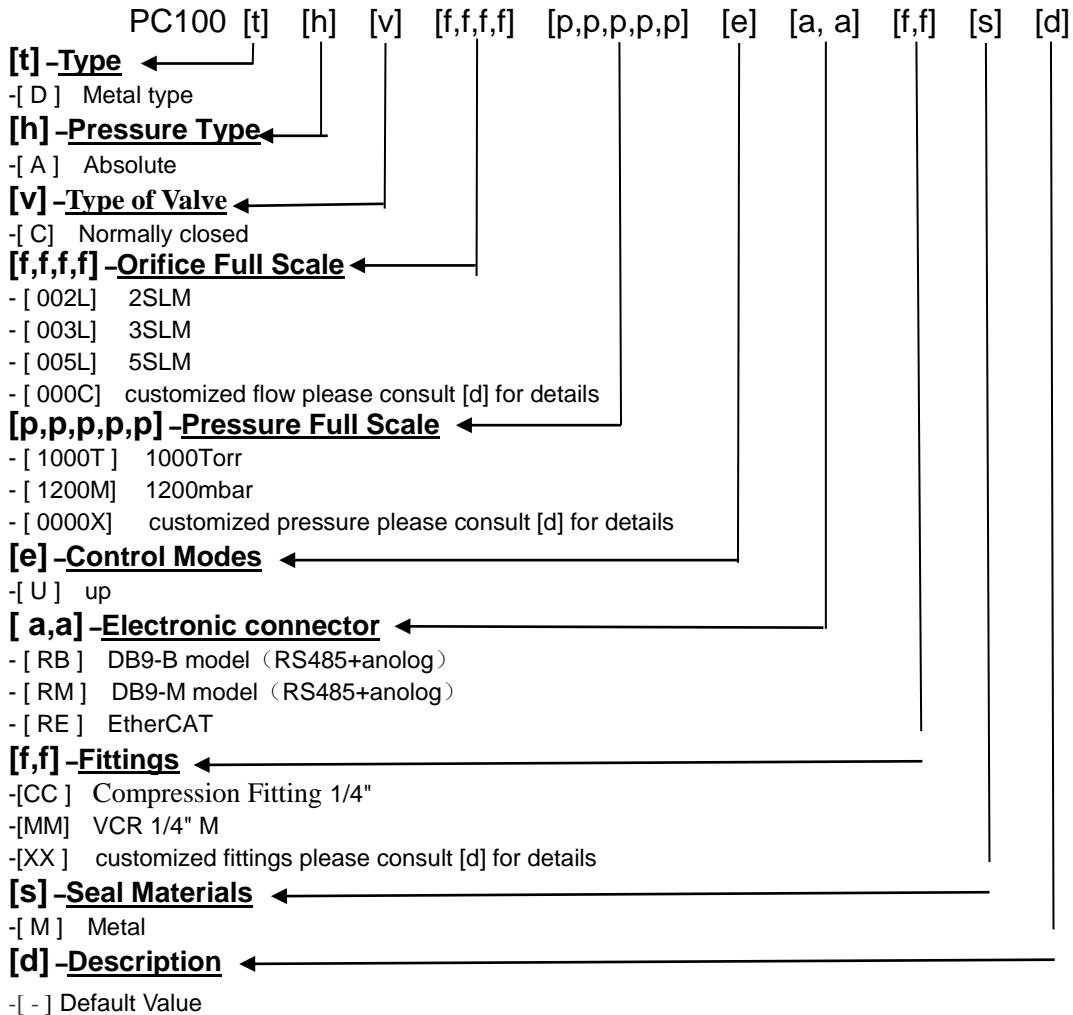
1. Nature disaster and calamity;
2. Unsuitable operation and unreasonable usage;
3. Operating and storing in inappropriate or execrable circumstance;
4. Usage of instrument beyond user's manual;
5. Unauthorized change or replacement of product.

For example:

It is whether that gas path is not cleared before using corrodible gas or PC is contaminated or blocked by particle such as dust.



## Appendix I PC100 Selection Guide

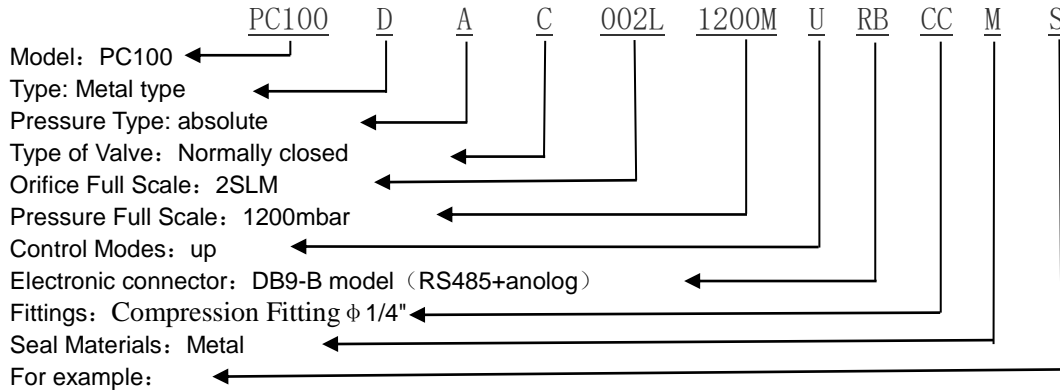


The letters on cover and tag: In English

Proof pressure :3 MPa (435.1 psig)

Calibration temperature : $(22\pm 2)^{\circ}\text{C}$

Take PC100DAC002L1200MURBCCMS as the example



Customized requirement: In Chinese. customized fittings, customized calibration temperature,  $40^{\circ}\text{C}$ .

## PC Series

## Pressure Controller

### Beijing Sevenstar Flow Co., Ltd.

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\*Description may be changed following improvements to product. The information contained in this document is subject to change without notice.

\*If there is any mistake in this uses manual, please feel free to contact us.

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