SRK-20FD high-precision mass flow controller/flowmeter

# Mass Flow Controller/Flowmeter

## Brief introduction

Silver Automation Instruments specializes in manufacturing gas/liquid mass flow meters and controllers. The instruments are designed according to the actual working conditions and needs of customers, and are widely used in various industries for precise measurement and control of gas/liquid mass flow rates.

It plays an important role in scientific research and production in various fields such as semiconductor and integrated circuit industry, special materials discipline, chemical industry, petroleum industry, medicine, environmental protection, and vacuum. Its typical application scenarios include: electronic process equipment, such as diffusion, epitaxy, CVD, oxidation, plasma etching, sputtering, ion implantation; And coating equipment, fiber optic melting, micro reaction equipment, mixed gas distribution system, capillary measurement, meteorological chromatograph, and other analytical instruments.


## Performance and Principle

SRK-20FD is a high-precision series of flow meters/controllers, with a measurement error of only ± 0.5% of full scale. The outstanding accuracy of this series comes from a unique sensor probe. This sealed probe consists of two sensing elements - a speed sensor and a temperature sensor, which can automatically correct the effects of temperature and pressure changes. The instrument circuit heats the speed sensor to a constant value higher than the gas/liquid temperature, and then measures the cooling effect of the gas flow rate. Calculate the flow rate by measuring the principle that the electrical power consumed to maintain a constant temperature difference is proportional to the gas mass flow rate. Both sensors are standard grade platinum resistance temperature detectors (RTDs), sealed in 316 stainless steel packaging.

### Applied to laboratories and industrial environments

The SRK-20FD series high-precision flow meter/controller has a measurement error of ± 0.5% of full scale, which is sufficient to meet the needs of most customers. It can be used for various experiments in laboratories and complex industrial environments.

In order to adapt to complex industrial environments, we also have some models that support IP67 dust and waterproof rating, as well as IICT4 intrinsic safety explosion-proof. In addition to the standard analog input/output interface, it also supports the 485/232 interface, and the communication protocol is the standard modbus RTU protocol.

## Product application

| | | |
|---|---|---|
| vacuum | Coating | solar energy |
| semiconductor | Petrochemical | Coal metallurgy |
| Gas production | environment protection | Instrumental analysis |

## Basic characteristics of ACU20FD

- Accuracy can reach ± 0.5% F.S
- Repeatability can reach ± 0.2% F.S
- Fast response and adjustment speed
- Touchable display screen
- Direct measurement of mass flow rate
- Automatic temperature compensation
- Integrated PID controller to regulate flow rate
- The measured gas medium can be manually switched
- Thermal principle, fast response, high accuracy
- Tubular diversion, not easily blocked
- Suitable for various high and low pressure pipelines
- Short preheating time, small zero drift, and high reliability

## Technical Parameter

| High precision quality flow controller | | High precision mass flow meter |
|---|---|---|
| **Technical indicators** | | |
| Range range | 2SCCM~6000SLM | 2SCCM~6000SLM |
| Measurement and control range | Controller valve control range 50:1 | Flow metering ratio 100:1 |
| Accuracy | ±0.5%F.S （Full range） | |
| linear | ±0.25%F.S | |
| Repetitive accuracy | ±0.2%F.S | |
| response time | <0.2s | <0.1s |
| temperature coefficient | ±0.025%F.S/℃ | |
| working temperature | 0~50℃ | |
| Preheating time | 30S available, 5Min reaches optimal state | |
| working pressure | Working pressure difference: 0.1~0.5Mpa | Working pressure drop: <0.01Mpa |
| Maximum withstand voltage | 3MPa/10MPa | |
| Leakage rate | 1 X $10^{-9}$ Pam3/S | |
| **Mechanical Components** | | |
| Base material | Stainless steel | |
| Joint | ϕ 8, ϕ 10, ϕ 12. Flange installation | |
| Sealing material | Fluorine rubber, chloroprene rubber, nitrile rubber, metal seal | |
| Shell protection level | IP40 | |
| Installation location | Horizontal installation | |
| **Electrical Performance** | | |
| Electrical connections | DB9 hole, RJ11, 5.5x2.1 power fast plug | |
| Display status | With LCD display, without LCD display | |
| Digital quantity | RS232/485, MODBUS protocol, PROFIBUS protocol | |
| Analog quantity | 0~5V,4-20mA,1~5V | |
| power supply | 24VDC,±15VDC | |

## Model and Range Range

| Controller |  |  |  |  |  |
|---|---|---|---|---|---|
| Model | SRK-20FD-LC | SRK-20FD-MC | SRK-20FD-BC | SRK-20FD-HC | SRK-20FDR-BC |
| Range | 2SCCM~30SLM | 30SLM~300SLM | 300SLM~3000SLM | 3000SLM~5000SLM | 1000SLM~3000SLM |
| Flowmeter |  |  |  |  |  |
| Model | SRK-20FD-LM | SRK-20FD-MM | SRK-20FD-BM | SRK-20FD-HM | SRK-20FDR-HC |
| Range | 2SCCM~30SLM | 30SLM~300SLM | 300SLM~3000SLM | 3000SLM~5000SLM | 4000SLM~6000SLM |

## Product selection

| | Code | Description |
|---|---|---|
| MARK | SRK-20F | High Precision flow meter |
| Model | D | Thermal mass flow meter Type |
| | DR | Low DP thermal mass flow meter type |
| Rage | L | 2 sccm-30 SLM |
| | M | 50-300 SLM |
| | B | 500-2000 SLM |
| | H | 3000-6000 SLM |
| Type | C | Flow Controller |
| | M | Flow Meter |
| Pressure Rating | M | 3Mpa |
| | Z | 10Mpa |
| | T | Others |
| Display | N | Without display |
| | X | With display |
| Range | 002C | 2 SCCM |
| | 001L | 1 SLM |
| | 030L | 30 SLM |
| | 050L | 50 SLM |
| | 100L | 100 SLM |
| | 300L | 300 SLM |
| | 500L | 500 SLM |
| | 1000L | 1000 SLM |
| | 2000L | 2000 SLM |
| | 3000L | 3000 SLM |
| | 4500L | 4500 SLM |
| | 6000L | 6000 SLM |
| | X | Others |
| Input | A1 | 0~5V DC |
| | A2 | 4~20mA |
| | A3 | 1-5V DC |
| Output | B1 | 0~5V DC |
| | B2 | 4~20mA |
| | B3 | 1-5V DC |
| Power supply | 5 | ± 15 V DC |
| | 4 | 24V DC |
| Communication | 8 | RS485 |
| | 2 | RS232 |
| Sealing Material | V | Fluororubber |
| | T | NBR |
| | N | neoprene |
| | J | Metallic seal |
| | Y | Others |
| Process Connection | C | Φ8 |
| | D | Φ10 |
| | E | Φ12 |
| | Y | Others |

# Instructions for using conversion coefficients

The mass flow controller and mass flow meter are generally calibrated with N2 when leaving the factory. In actual use, if it is other gases, reading correction can be carried out if necessary. The method is to multiply the flow rate displayed on the flow meter by the flow conversion coefficient, if it is a single component gas. The conversion coefficient can be found in the coefficient conversion table; If it is a multi-component gas (assuming it is composed of n gases), please calculate its conversion coefficient C according to the following formula:

Basic formula: C=0.3106N/ρ (Cp)

Among them:

ρ—— Density of gas in standard state

Cp - specific heat of gas at constant pressure

N - is the molecular composition coefficient of the gas (related to the composition of the gas molecules, as shown in the table below)

| Gas molecular composition | Example | N value |
|---|---|---|
| Monatomic molecule | Ar He | 1.01 |
| Diatomic molecule | CO N2 | 1.00 |
| Triatomic molecule | CO2 NO2 | 0.94 |
| Polyatomic molecule | NH3 C4H8 | 0.88 |

For mixed gases: N=N1(ω1/ωT) +N2(ω2/ωT) +...+Nn(ωn/ωT)

Among them:

ω1... ωN --- is the flow rate of the corresponding gas

ωT --- is the flow rate of the mixed gas

ρ1... ρn --- represents the density of the corresponding gas in the standard state (values can be found in the gas conversion coefficient table)

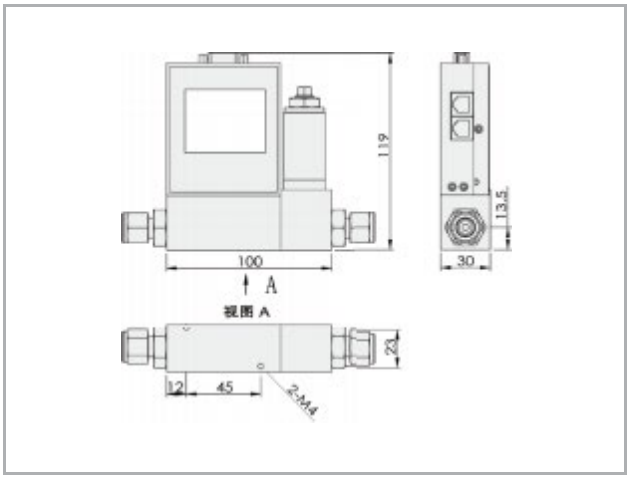
Cp1... Cpn --- is the specific heat at constant pressure of the corresponding gas (values can be found in the gas conversion coefficient table)

N1... Nn --- the molecular composition coefficient of the corresponding gas, with values shown in the gas molecular composition coefficient table

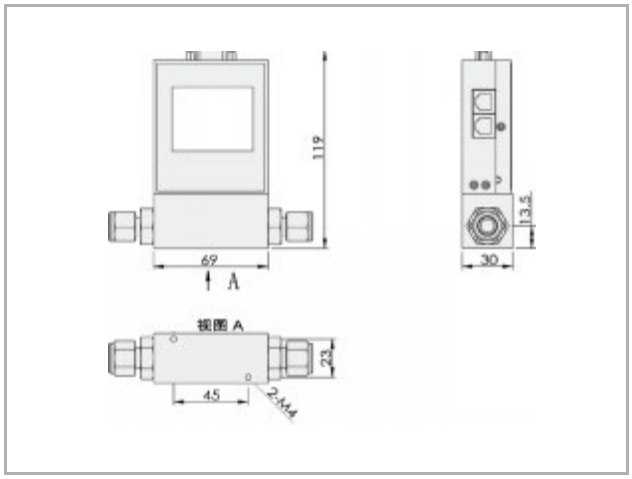
Explanation: 1) The standard state is: pressure -101325Pa (760mmHg), temperature -273.15K (0 ℃).

2) The relevant parameters of gases not listed in the gas mass flow conversion coefficient table can be consulted with the manufacturer.

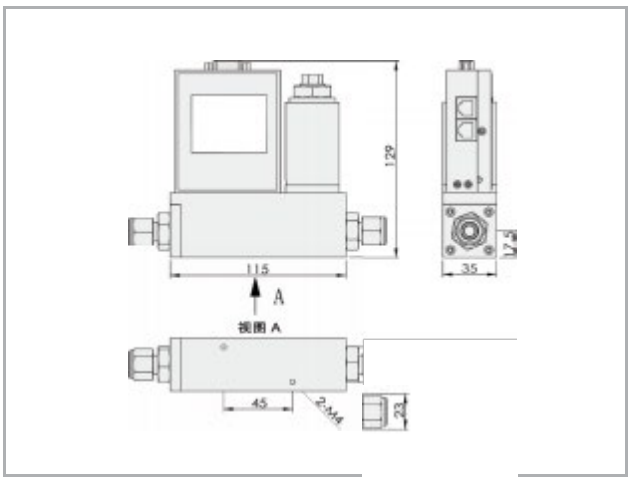
## Product dimension diagram （mm)



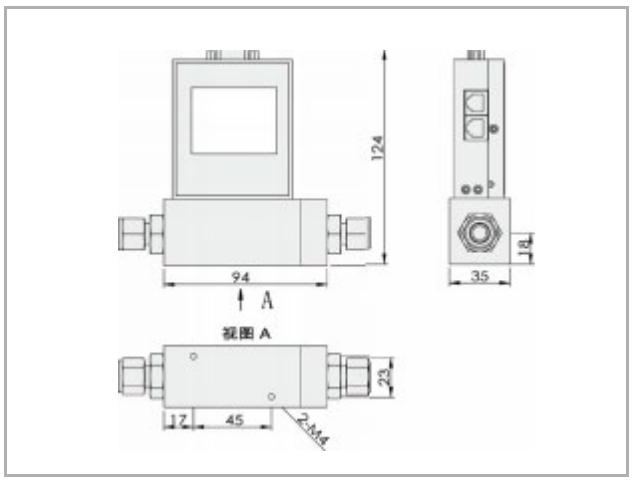

▲SRK-20FD-LC Gas mass flow controller (low range)



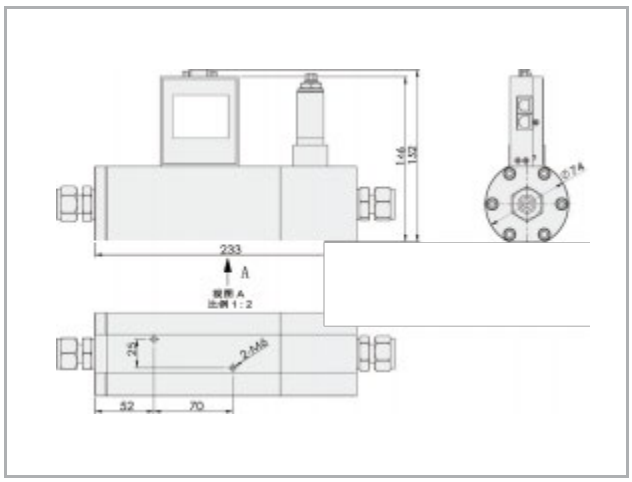

▲SRK-20FD-LM Gas mass flow meter (low range)



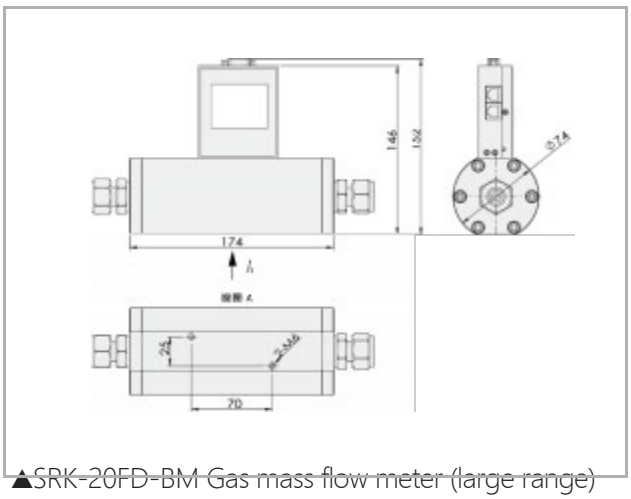

▲SRK-20FD-MC Gas mass flow controller (medium range)



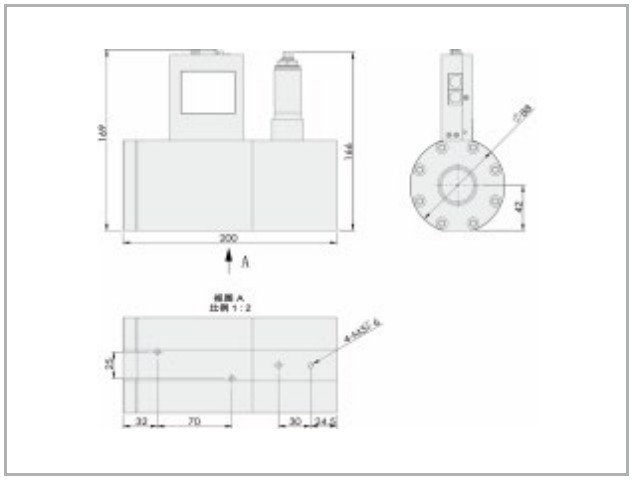

▲SRK-20FD-MM Gas mass flow meter (medium range)



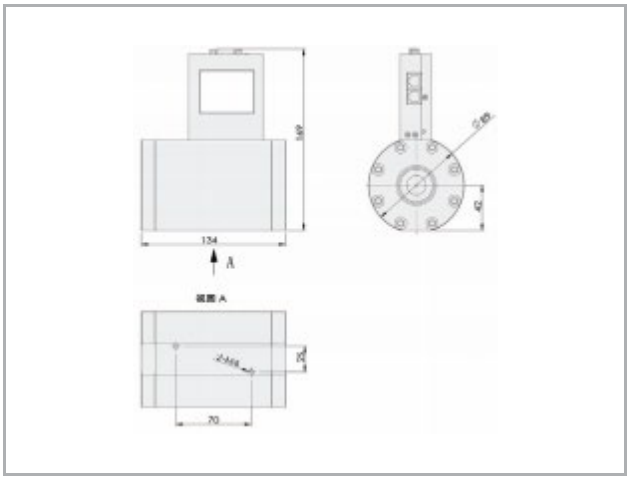

▲SRK-20FD-BC Gas mass flow controller (large range)



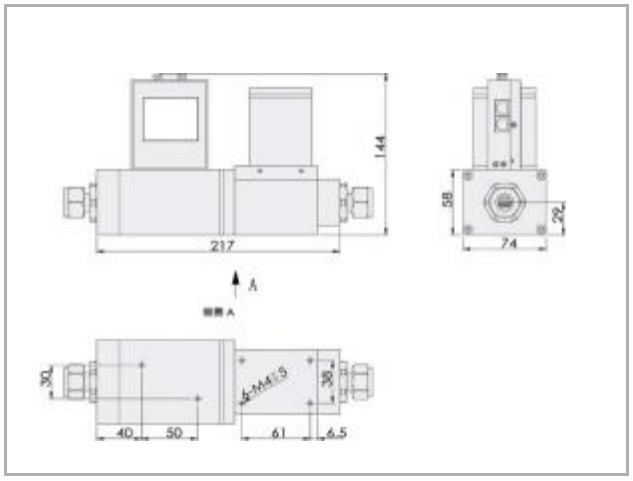

▲SRK-20FD-BM Gas mass flow meter (large range)



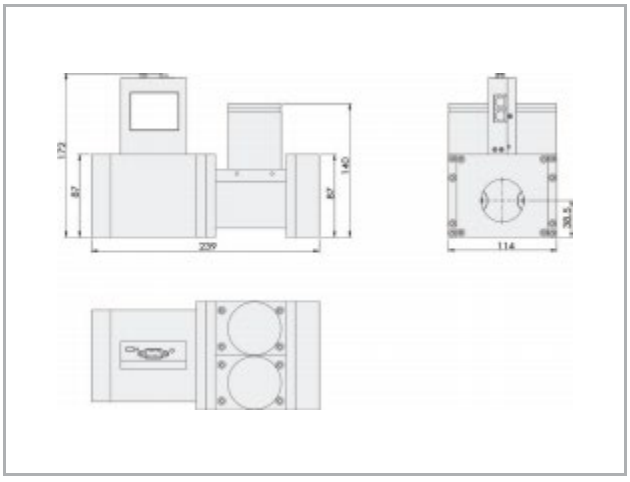
▲SRK-20FD-HC Gas mass flow controller (ultra large range)



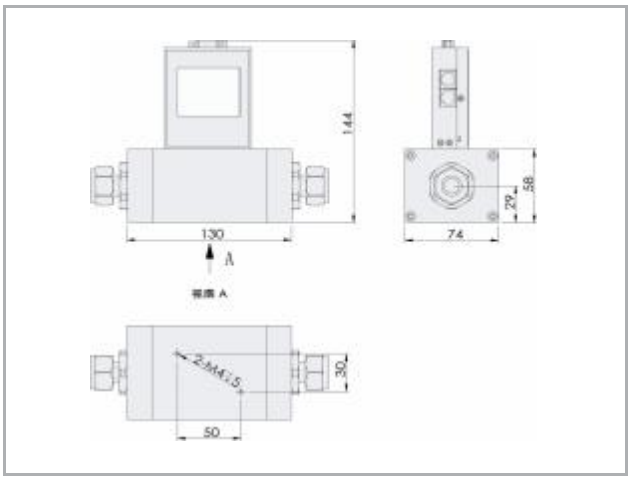
▲SRK-20FD-HM Gas mass flow meter (ultra large range)



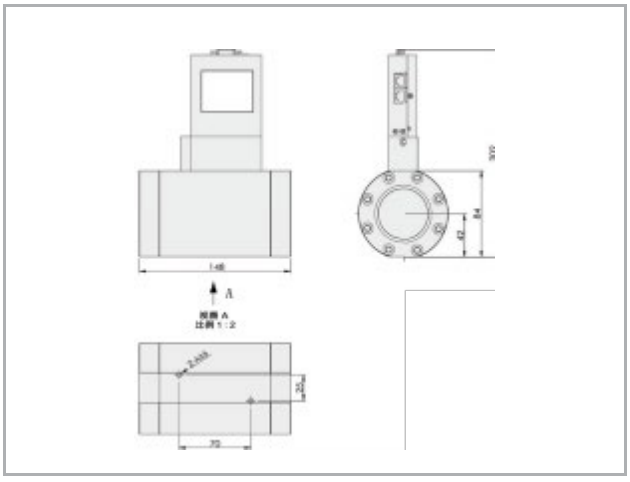
▲SRK-20FDR-BC Gas mass flow controller (large range)



▲SRK-20FDR-HCDual valve gas mass flow controller (ultra large range)



▲SRK-20FDR-BM Gas mass flow meter (large range)



▲SRK-20FD-HM Gas mass flow meter (ultra large range)