

Global Support

The HORIBA Group's world-wide network ensures world-class support for our customers.



World-wide Network

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RU-AE33C

HORIBA  
Semiconductor

Excellent Plasma Control over Reactive Sputtering

Plasma Emission Controller  
RU-1000

The superb feedback control of the reactive gas flow in a reactive sputtering process helps you enhance product quality and achieve greater productivity by monitoring the plasma generated by sputtering or the voltage of the power supply for the sputtering process.

- Faster deposition by controlling the transition region
- Optimized distribution in a large-area, high-capacity chamber
- Plasma stabilization in a long sputtering process (stable deposition)
- Mixture optimization of compounds for reactive sputtering



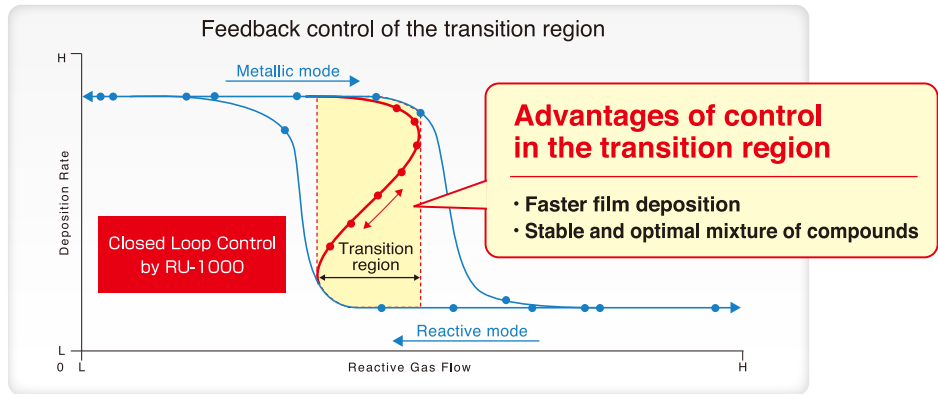


The optical technology developed by HORIBA and the gas control technology offered by HORIBA STEC have joined forces to make further advances in plasma control technology.

The RU-1000 plasma emission controller achieves excellent spatial distribution of deposition on substrates with large surface areas.

Reactive sputtering is performed for film deposition on films and glass substrates used for touch panels. This method is employed to form a deposited film by chemical reactions between sputtered particles and oxygen, nitrogen or the like in a vacuum chamber. Unfortunately, practical application has been deemed too difficult considering the slow pace of film deposition when a constant volume of reactive gas is supplied. However, the film deposition dramatically accelerates, albeit unstably, in a transition region between the reactive mode and metallic mode, the latter of which results in faster film deposition. Such a transition region can be maintained by controlling the reactive gas by adjusting the intensity of plasma emission and the power supply. The RU-1000 plasma emission controller accelerates film deposition to a pace comparable to that in metallic mode and achieves excellent deposition distribution on substrates with large surface areas. This unit captures signals representing the plasma condition transmitted from the PMT unit and plasma power supply and employs an algorithm written by HORIBA STEC to control a highly responsive mass flow controller also developed by the company.

The flow of the reactive gas is controlled to maintain the transition region between the metallic mode and reactive mode.




From plasma emission detection to gas flow, experience the latest control technologies pioneered by HORIBA STEC.

- POINT 1**

**PMT unit**

**Detects the intensity of plasma emission at a particular wavelength**


The PMT unit designed to capture plasma emission can be mounted directly in the vacuum chamber. The plasma emission can be guided from the vacuum chamber to the PMT unit through an optical fiber. Either option can be selected depending on your situation.


- POINT 2**

**Controller**

**Performs feedback control of mass flow controllers**

One controller unit can control up to four PMT units and four mass flow controllers. Signals from the plasma power supply can be captured instead of signals from the PMT units.


- POINT 3**

**Control software**


**Supports various cathode conditions**

An original algorithm written by us achieves excellent reactive sputtering with Al<sub>2</sub>O<sub>3</sub>, which has thus far been considered difficult. The software also demonstrates stable performance with rotary cathodes.
- POINT 4**

**Mass flow controller**

**Highly responsive to changes in plasma emission**

A highly responsive mass flow controller (MFC) is essential for performing control of reactive gas while monitoring changes in plasma emission. HORIBA STEC, enjoying the largest market share of MFC production for semiconductor manufacturing systems\*, offers the best MFC for each system.

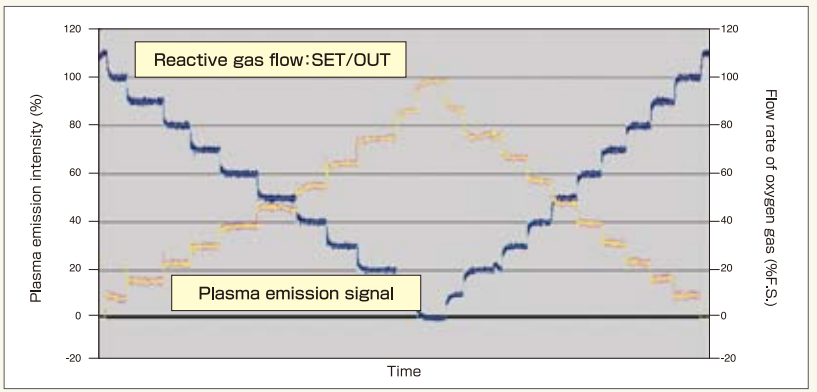


According to survey conducted by HORIBA STEC in 2014

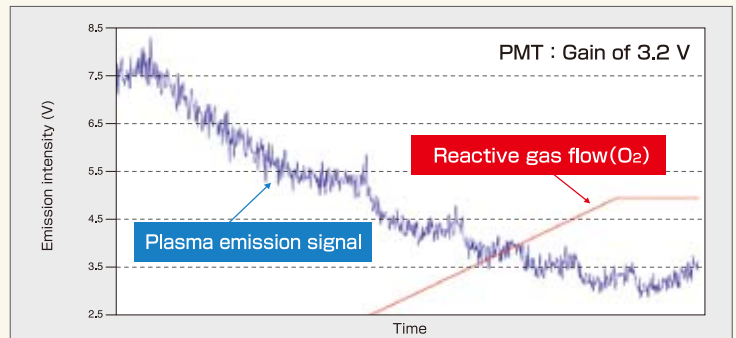
Advantage

Fast and highly reliable feedback control

The RU-1000 plasma emission controller with its newly developed algorithm performs fast and highly reliable feedback control. Customers can change the PID value and thus it is possible to optimize the settings for your particular conditions.



Excellent S/N characteristics with plasma emission



Optimal designs are applied using collimators and other optical parts for accurately measuring slight changes in the amount of light emitted by plasma emission.

Special user-friendly software



The special software was designed while taking customer demands to heart; it promises outstanding operability. Customized software can also be developed according to customers' needs.



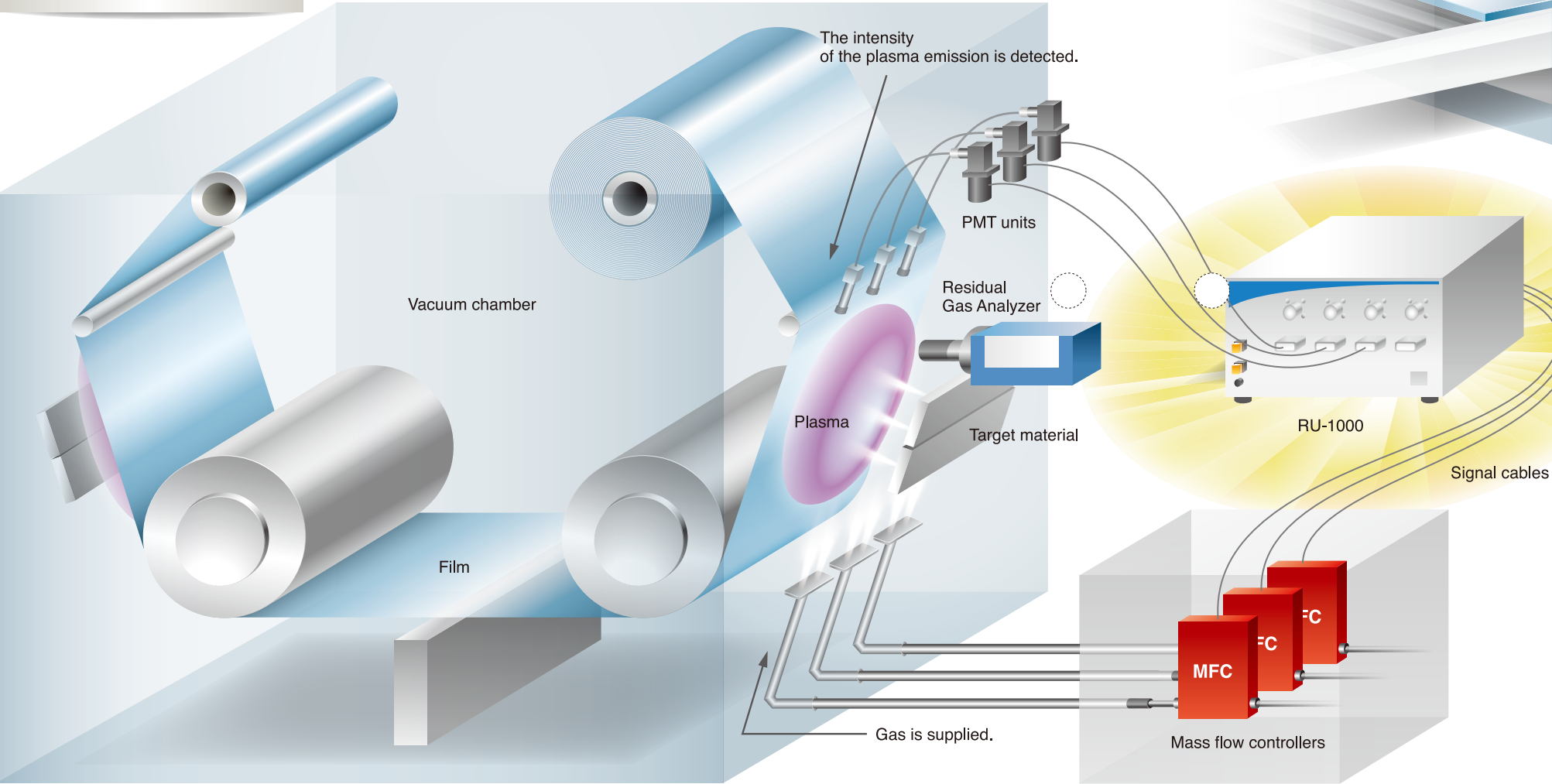
# Condition control of the vacuum chamber

Reactive sputtering with functional films or functional substrates is performed in a continuous process for a prolonged period of time. Stable film deposition processes require real-time measurement of the changing conditions inside the vacuum chamber and the plasma emission, as well as adequate control of the flow rate of the reactive gas being introduced according to the degree of the changes.

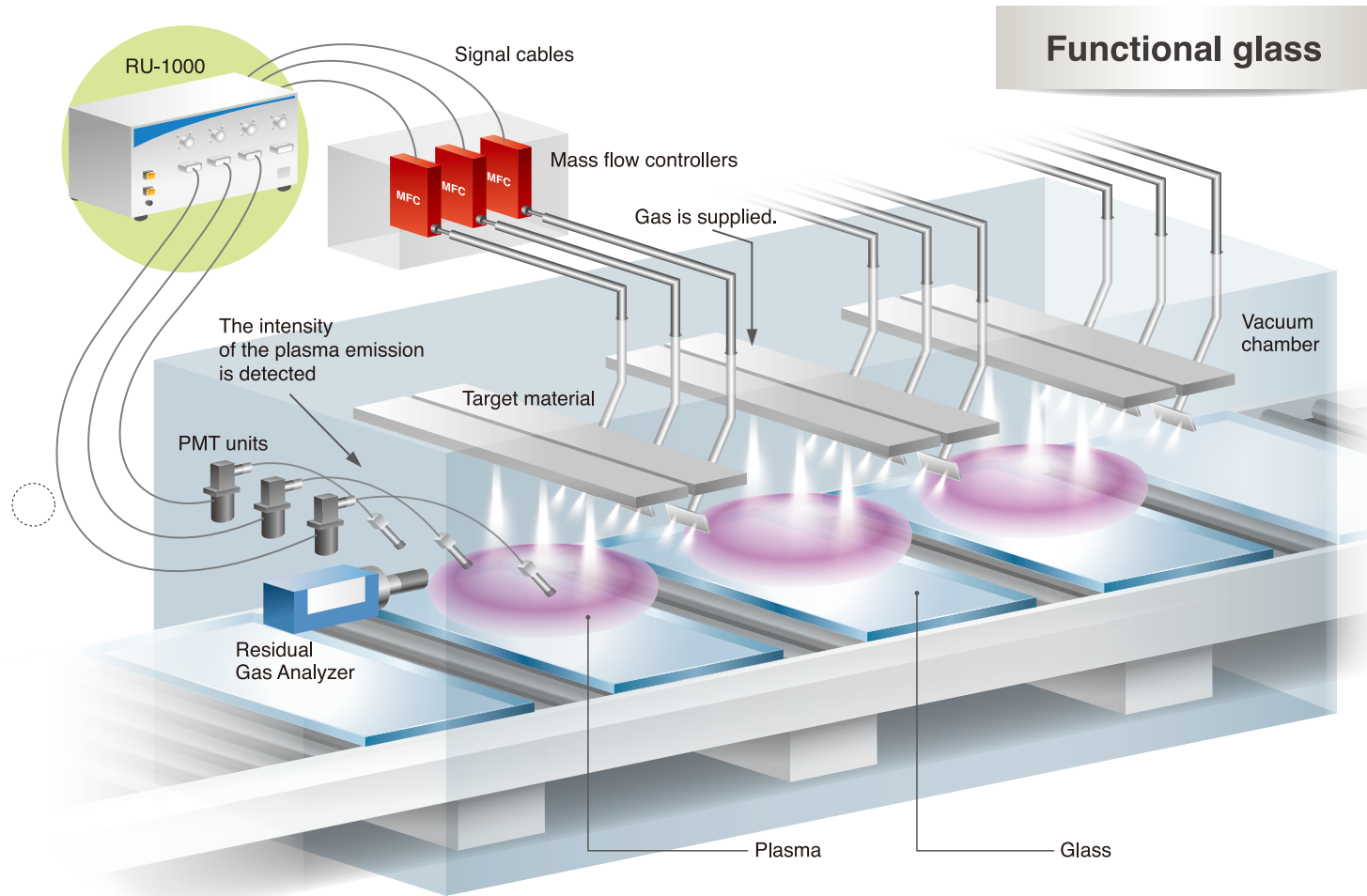
Any process for depositing multi-layer films involves the need for increased control of the deposition rate of each film according to the rolling and conveying speed.

The RU-1000 monitors voltage signals of the impedance in the plasma power supply and the intensity of plasma emission. The feedback given to the mass flow controller based on the monitored signals helps manufactures control the plasma emission at an optimal level and thereby enhance their productivity.

## Functional film



## Functional glass



## Flow controllers and plasma instruments for process optimization

An array of systems is used to measure and control the conditions inside the vacuum chamber. They ensure stable production and boost productivity by monitoring conditions inside the chamber and maintaining an optimal sputtering process.

### Residual gas analyzer

MICROPOLE System

### A system for measurement of traces of residual gas inside the chamber

The compact MICROPOLE System, which includes a controller with excellent operability, can be easily mounted onto the coating systems you are currently using. Additional features are also available, such as connection with more than one PC at a time and software for analyzing the conditions of residual gas inside the chamber.



### Liquid material vaporizer

VC System

### A system for vaporizing traces of water and liquid materials to be added to the deposition process

It is believed that the functionality of functional thin films is enhanced in the deposition processes by adding traces of vaporized water (H<sub>2</sub>O) into the chamber.



### Plasma emission analysis monitor

EV-140C System

### A system for plasma emission analysis in the deposition process

The CCD detector can simultaneously measure a wide range of wavelengths from 200 to 800 nm with a minimum capture time of 20 msec and maximum resolution of 2 nm.



Main controller unit

RU-1000



Input signal	Ethernet(10BASE-T,100BASE-TX) 1CH The monitor signal of PMT, or the monitor signal of the power supply for sputtering (0-10Vdc/0-100%) 4CH MFC output signal (0-5Vdc/0-100%) 4CH
Output signal	PMT Gain setting signal (0-5Vdc/0-100%) 4CH MFC setting signal (0-5Vdc/0-100%) 4CH
Power supply	AC100~240V±10% 50/60Hz 100VA
Weight	Approx. 5.3kg

PMT unit

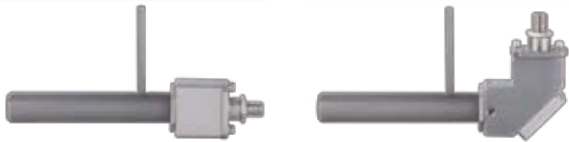
RU-1000P



Input signal	Plasma emission, PMT gain(0-5V)
Output signal	PMT output signal (0-10Vdc)
Power supply	DC15V 60mA
Other	A narrowband filter can be attached with the inside of PMT.
Weight	Approx. 720g

Collimator

RU-1000C-01/02



A category temperature range and the humidity range.	10-300°C, 10-80%RH
Material	Collimator : SUS304 Window lens : synthetic fused silica glass
Weight	Approx. 150g
The diameter of a collimator tip	φ12

Flange for PMT unit

RU-1000F-01/02



A category temperature range and the humidity range.	10-200°C, 10-80%RH
Weight	Normal Type : Approx. 100g Direct connection type : Approx. 160g (Flange type : In the case of KF25)

Cable

Name	Type
Narrowband filter Set	RU-1000B The User specifies center wave length.
Cable for SIG (1M)	RU-1000H-02-01
Cable for SIG (2M)	RU-1000H-02-02
Cable for SIG (3M)	RU-1000H-02-03
Cable for SIG (5M)	RU-1000H-02-05
Cable for SIG (10M)	RU-1000H-02-10

Name	Type
Cable for PMT(1M)	RU-1000H-01-01
Cable for PMT(2M)	RU-1000H-01-02
Cable for PMT(3M)	RU-1000H-01-03
Cable for PMT(5M)	RU-1000H-01-05
Cable for PMT(10M)	RU-1000H-01-10

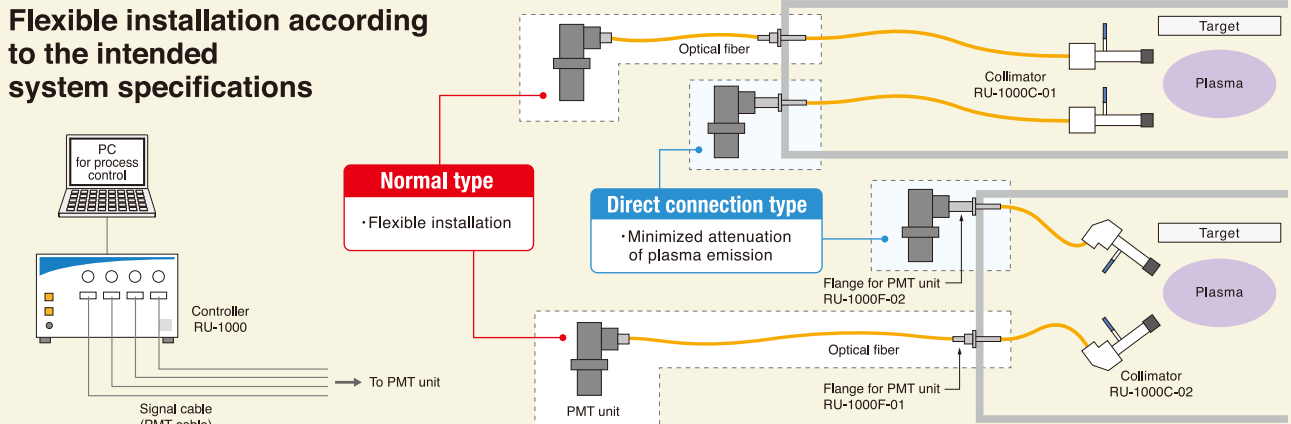
Optical fiber

RU-1000 O

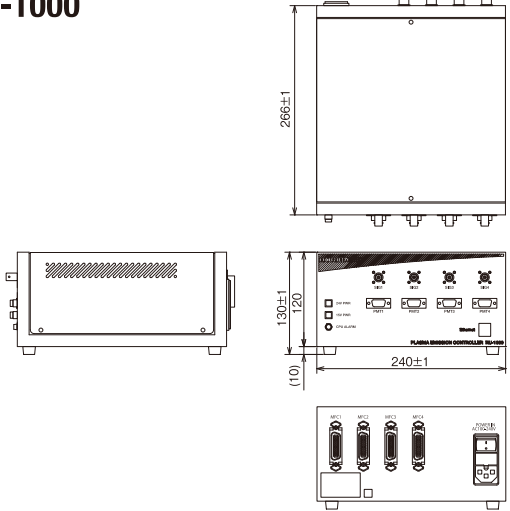
Name	Type
Optical fiber for PMT(0.5M)	RU-1000O-005
Optical fiber for PMT(1M)	RU-1000O-010
Optical fiber for PMT(1.5M)	RU-1000O-015
Optical fiber for PMT(2M)	RU-1000O-020

Efficient capture of plasma emission

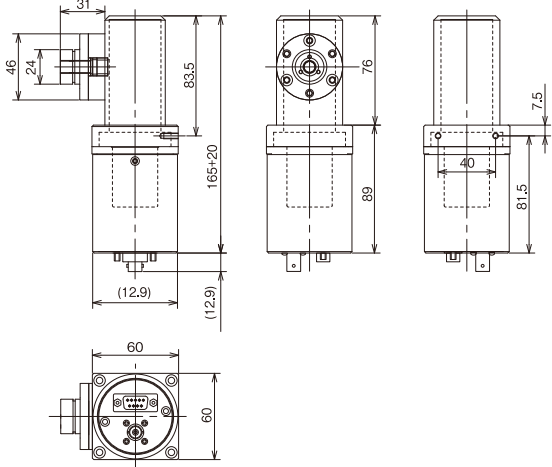
Flexible installation according to the intended system specifications



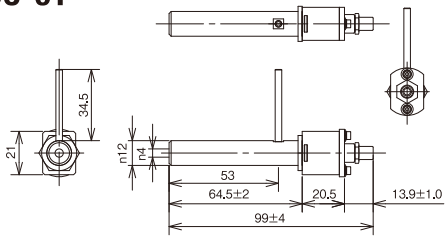
RU-1000



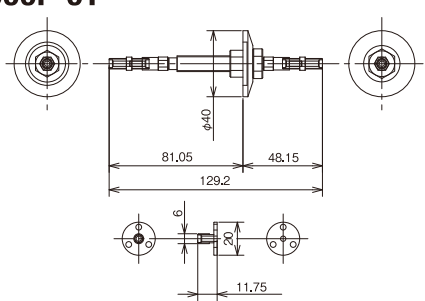
RU-1000P



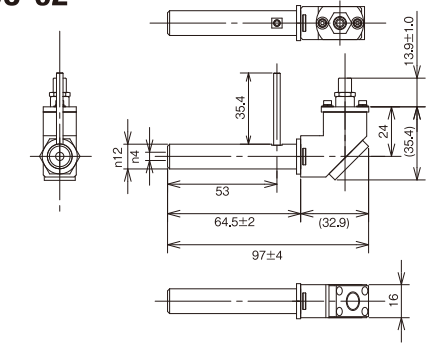
RU-1000C-01



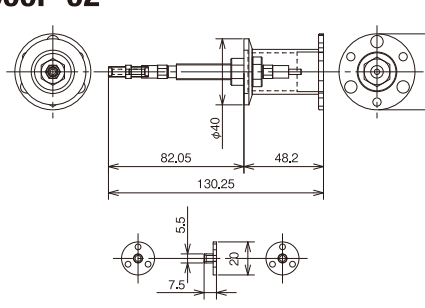
RU-1000F-01



RU-1000C-02



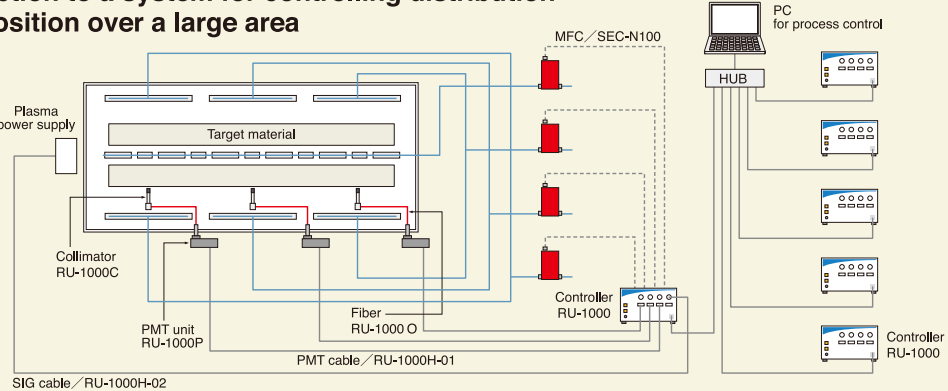
RU-1000F-02



(mm)

Installation example

Connection to a system for controlling distribution of deposition over a large area



- One PC can monitor up to 10 units of plasma emission controllers.
- One plasma emission controller unit can measure signals from four channels and perform feedback control.