

SMI3200
High Performance Focused Ion Beam System
Installation Specification Sheet
Rev.1.5

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SII NanoTechnology Inc.

RBM Tsukiji Bldg. Shintomi 2-15-5
Chuo-ku Tokyo 104-0041, Japan
Telephone: +81-03-6280-0070
Facsimile: +81-03-6280-0076
<http://www.siint.com/>

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1. Introduction

Purpose of this Specification Sheet

This document contains the information necessary for installation of the SMI3200 High Performance Scanning Ion Beam System (hereafter called this system). This document explains the external dimensions of the system as well as the preparations for the installation environment and area that are necessary for installation. The installation environment is determined through discussion with the purchaser (hereafter called purchaser) and SII NanoTechnology Inc. (hereafter called SIINT).

Definitions for this Specification Sheet

This specification sheet was created for all individuals involved with the system. However, the following terms are used to separate the different areas of involvement.

- (1) Purchaser
- (2) SIINT Sales Person
- (3) SIINT Delivery Person
Person that performs operations from installation to turning over the system when dispatched from SIINT for delivery.
- (4) SIINT Delivery Support Person
Person that will support the SIINT Delivery Person the system is delivered. Operations at the purchaser location typically do not last longer than 3 days.

Warranty and Maintenance Service Conditions

The responsibility and maintenance service for this system shall be based on the contract conditions signed between SIINT and the Purchaser. SIINT shall not be responsible and the warranty shall be void if a 3rd party or the Purchaser performs any of the following.

- (1) If the methods in this or other related documentation are not followed.
- (2) Modifications are performed without the prior consent of SIINT.
 - Software is installed on the operation computer other than the software provided by SIINT.
 - Additions or connections of other makers or purchaser designed instruments.
 - Repair or maintenance operations performed by the Purchaser or commissioned by the Purchaser.
- (3) Moving or selling the system without the permission of SIINT.
- (4) Disregarding information necessary for maintenance service.
- (5) When there are activities that are not permitted by the laws governed by the government in the jurisdiction where the instrument will be used.

2. Safety Guidelines

The application standards for this system vary based on the needs and installation environment of the purchaser. To verify the application standards of this system, contact the sales department at SIINT.

Protective equipment is installed on this system to protect service personnel and operators from danger when performing operations and maintenance. Please wait for the SIINT sales representative to discuss the safety related items necessary for installation of this system. Refer to the confirmation checklists for attachments and protective items.

This system has a first consideration of safety for operators and service engineers and places a priority on safety of personnel over the samples and the system during observation and processing. Therefore, the system may deviate from a normal state when protective equipment is used to protect the sample and other things during observations and processing.

3. System Components

This system is comprised of a main unit, an operation table, a control cabinet, a transformer box, a rough pump and an anti-vibration weight. This section provides a description of each piece.

Main Unit	Comprised of the sample chamber, FIB lens-barrel and sub chamber.
Operation Table	Used for placing the computer and printer (option).
Control Cabinet	Houses the power supply for controlling the system.
Transformer Box	Distributes the necessary power supply to the system.
Rough Pump	Vacuum evacuates from atmospheric state areas such as the sample chamber. With the turbo-molecular pump operation status, the total pressure of the turbo-molecular pump maintains a specified pressure.
Anti-vibration Weight	Keeps vibration from the system that is produced from the vibration of the rough pump.

4. Installation Environment

This section describes an environment that is appropriate for the system. Make sure that the installation environment meets or exceeds the following specifications. A measurement of the environment beforehand is recommended. Please contact your SIINT sales representative.

4.1. Room Temperature & Humidity

Set Value	22°C ± 3°C
Allowable Fluctuations	Set Value ± 1°C
Temperature Fluctuations	0.5°C/hr or less
Humidity	35~60%

Make sure the system is not placed in the path of a direct breeze of air from an air conditioner or vent. Failure to follow this caution may result in observation image noise.

The purchaser based on consumed power of this system should design air condition installation. Consumed power varies based on options. Please consult your SIINT sales representative.

4.2. Magnetic Field Fluctuations

External Magnetic Field Fluctuations

	Allowable Value
Stationary Component	0.1μT(1mG)/5min or less
Alternating Component	0.5μT(5mG) p-p or less

Periodical external magnetic fields must be less than a geomagnetism level 30μT or about 0.3G.

Do not place the system in an area with large magnetic fluctuations. Specifically, the following areas should be avoided.
Instruments that use large power supply or have large power changes or next to an instrument that supplies large power supplies.
Next to moving objects such as elevators.
Next to power lines that supply large electric current.

4.3. Floor Vibration

Floor Vibration	Horizontal Direction	Allowable Value
	Frequency	
	1 ~ 5Hz	Amplitude 1.0 μm -p or less
	5 ~ 50Hz	Amplitude 0.5 μm -p or less
	50 ~ 300Hz	Acceleration Rate $5 \times 10^{-2} \text{m/s}^2$ (5gal) or less
	Vertical Direction	
	Frequency	Allowable Value
	1 ~ 5Hz	Amplitude 1.0 μm -p or less
	5 ~ 80Hz	Amplitude 0.2 μm -p or less
	80 ~ 300Hz	Acceleration Rate $5 \times 10^{-2} \text{m/s}^2$ (5gal) or less

Due to the difficulty of accurately measuring floor vibrations of 1Hz or less, there may be times when those affects cannot be predicted.

When the vibration exceeds the allowable amount, countermeasures must be performed. Please consult your SIINT sales representative. An optional anti-vibration stand can be equipped to the instrument. Refer to the specifications for the optional anti-vibration stand.

4.4. Noise

Noise	65dB (A Mode) or less
	70dB (C Mode or F Mode) or less

4.5. Other

Areas inside this system use high voltage. When performing maintenance on the lens-barrel or chambers, dust or debris that gets inside the system can cause an electrical discharge. A clean room or specially prepared clean area is recommended for the installation room.

5. Utilities

This section describes the utilities that need to be prepared by the purchaser.

5.1. Power Supply

Voltage	Single Phase 200V±10%
Frequency	50 / 60Hz ±1Hz
Capacity	4kVA
Ground	Prepare a special breaker for a rated capacity 20A. D Ground

Avoid voltage fluctuations that are short term even in the allowable range. The instrument completely shuts down when a voltage reduction of 50% occurs and continues for more than 20msec. When the occurrence of temporary voltage loss occurs frequently, a loss of power supply protection device should be purchased. Please consult your SIINT sales representative. Refer to the specifications for the loss of power supply protection device.

Attachment Cable	Length: 5m, Terminal: M6×3 Connects directly to the specialized breaker.
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The SIINT service representative shall perform connections under the direction of the person in charge of the purchasers' facility.

Please contact your SIINT sales representative for information on changing the length of the attachment cable.

5.2. Nitrogen Gas

Used for valve operation and ventilation of the vacuum chamber.

Purity	99.95%
Supply	Continuous
Pressure	0.5~0.7MPa (5~7kg/cm ²)
Max. Usage Amount	30L/min During Sample Exchange
Connection Port	6mm or 1/4in Swagelok Couple

Purchaser must prepare a 6mm or 1/4-inch metal pipe or nylon tube.

Gas is separated into the valve operation gas and vacuum chamber VENT gas (see Figure 4). When the gas pressure drops, correct operation of the valve cannot be performed. Therefore, when the pressure sensor in the pipe detects gas pressure drops, a warning is generated in the system and the system cannot be used.

5.3. Evacuation Duct

Used for evacuation of the rough pump.

Connection Port	NW25 Quick Coupling
Evacuation Amount	250L/min

Even though it is an extremely small amount, material used for deposition is emitted from the rough pump evacuation port. In order to avoid emitting to the installation room, an evacuation duct must be connected.

The rough pump can be changed to meet the needs of the purchaser. Please contact your SIINT sales representative. Refer to the specifications for the optional rough pump.

5.4. Network

This system can be connected to a network. Connecting to the network enables observation image data to be transmitted on the network.

Specifications	10BaseT/100BaseT
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The purchaser is responsible for the installation, preparation and settings for the LAN connection.

5.5. Utility Reference Diagram

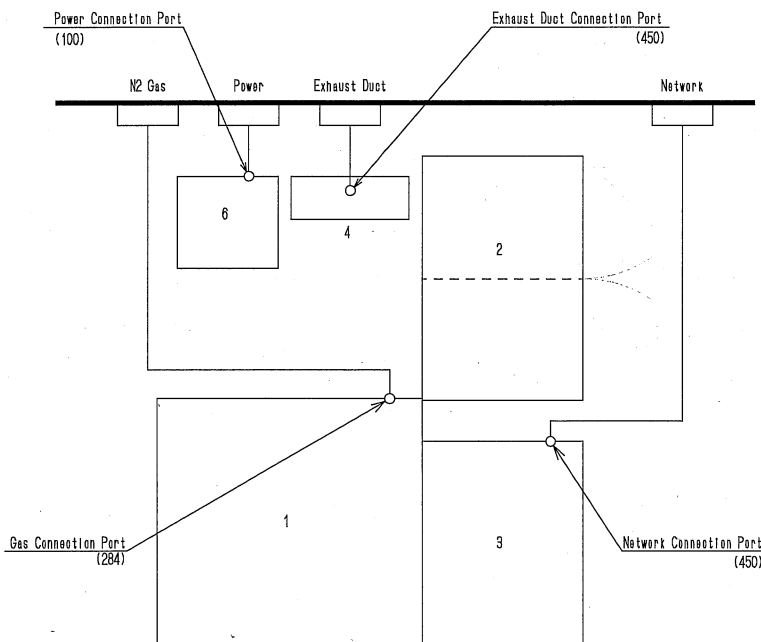


Figure 5.1 Power Supply and Gas Connection Positions

Numerical values in () are values from the floor surface (units: mm).
 Slight variances may exist depending on installation method and instrument components.

- 1 Main Unit
- 2 Control Cabinet
- 3 Operation Table
- 4 Rotary Pump
- 5 None
- 6 Transformer Box

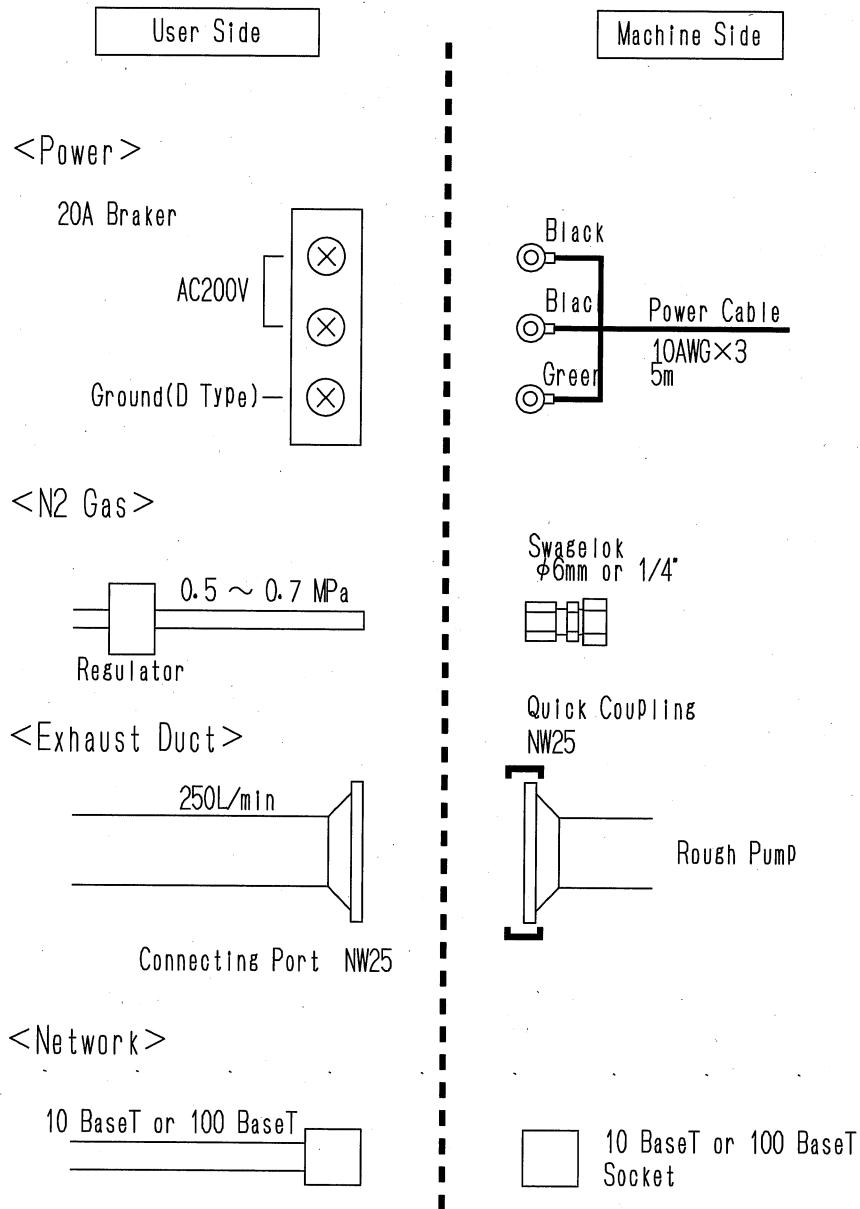


Figure 5.2 Utility Arrangement

Standard Components

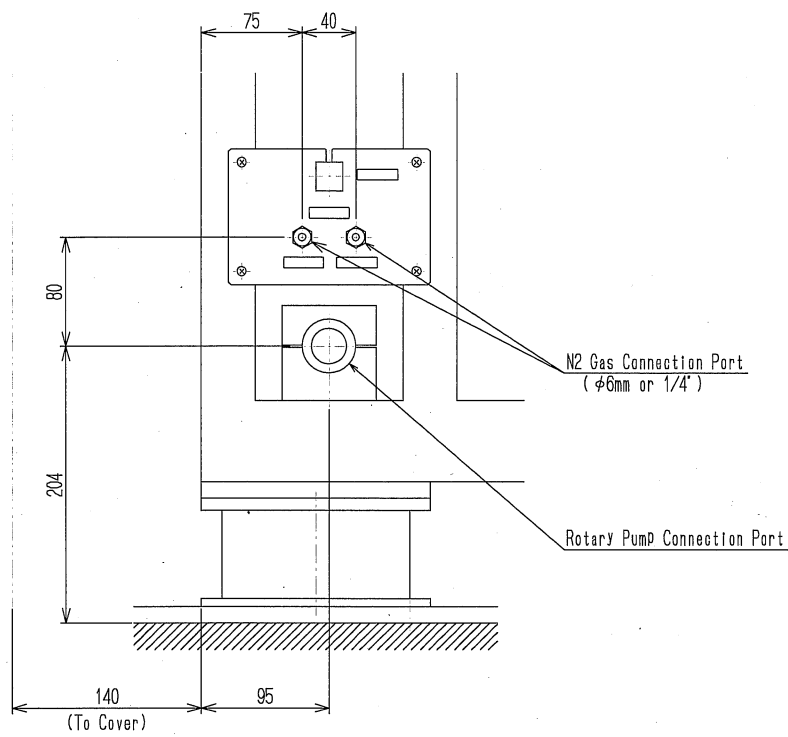


Figure 5.3 Nitrogen Gas Connection

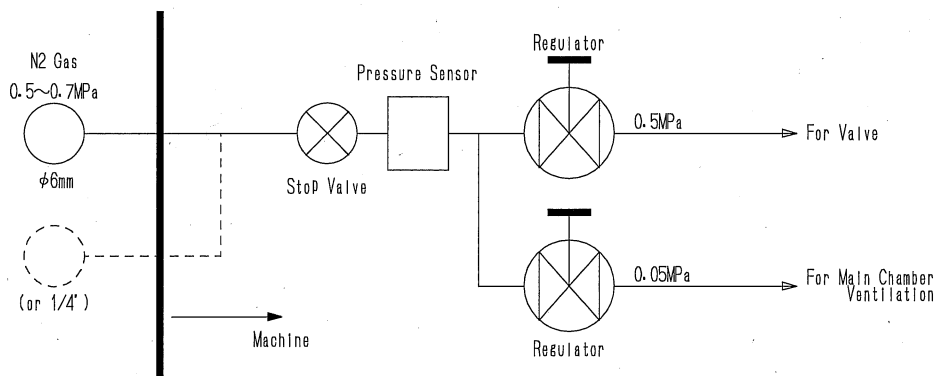


Figure 5.4 Gas Piping Schematic

6. Installation Area & Floor Weight

6.1. System Dimensions & Weight

The following table shows the dimensions of the main units (not including protrusions).

	W (mm)		D (mm)		H (mm)	Weight (kg)
Main Unit	1310	×	1222	×	1700	1500
Operation Table	800	×	1030	×	1337	200
Control Cabinet	1100	×	800	×	1483	300
Transformer Box	450	×	500	×	450	100
Rough Pump (Including Oil Pan)	210	×	580	×	300	30
Anti-vibration Weight	170	×	250	×	155	24

6.2. Installation Space

Displays the installation space based on a standard installation method.
Includes space necessary for maintenance.

Installation Area	(W) 3210×(D) 3100 mm ² or more
Ceiling Height	2200mm or more

Please consult with your SIINT sales representative if it is necessary to deviate from the standard installation method or positions.

6.3. Floor Weight

Floor Weight	4000N/m ² (400kg/ m ²) or more
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When other instruments or heavy objects are placed near this system please take into consideration the total weight of all objects and make sure there is sufficient floor strength.

6.4. Floor Flatness

Floor Flatness	Allowable: within 2mm @600mm□, within 5mm @1.8m□
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6.5. Installation Layout

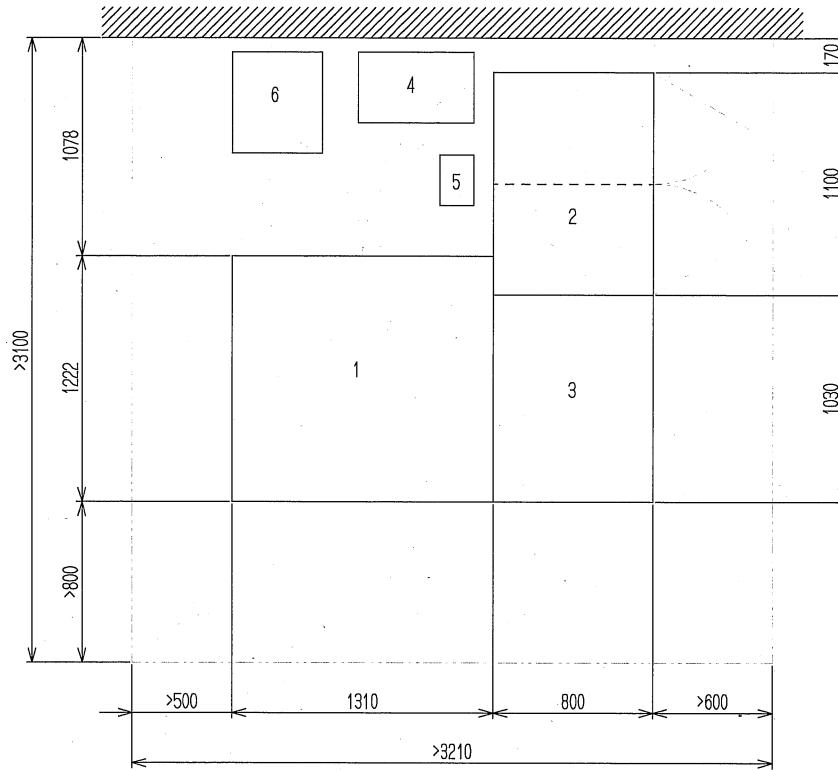


Figure 6.1 Standard Installation (Standard Components)

units: mm

- 1 Main Unit
- 2 Control Cabinet
- 3 Operation Table
- 4 Rotary Pump
- 5 Anti-Vibration Weight
- 6 Transformer Box

6.6. Securing the System & Earthquake Countermeasures

Main Unit

Holes are prepared on the bottom of this system for fastening to the floor. To utilize the performance of the system, be sure to secure the system. Refer to the figure below for the fastening positions.

Other

When fastening other units to the floor, design and creation of the securing will be performed according to the purchaser specifications. Please consult your SIINT sales representative.

Noise may appear in the observation image if the system is not secured to the floor.

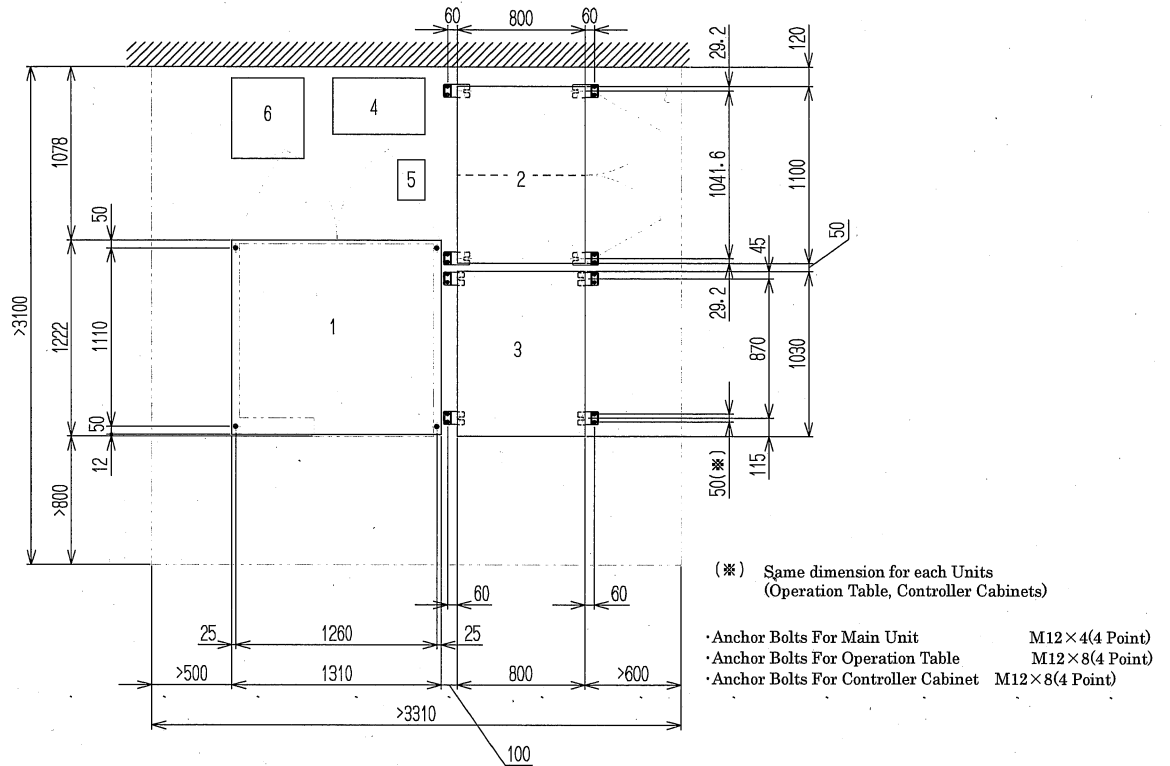


Figure 6.2 Fastening Standard Components

- 1 Main Unit
- 2 Control Cabinet
- 3 Operation Table
- 4 Rotary Pump
- 5 Anti-Vibration Weight
- 6 Transformer Box

6.7. External View

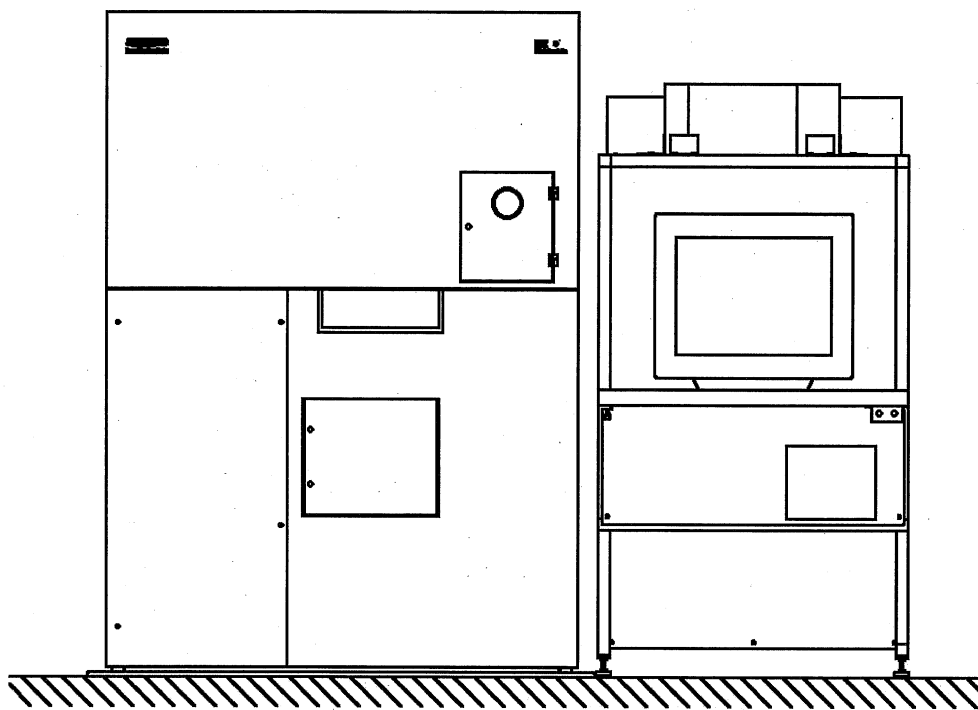


Figure 6.3 External View of the System Front

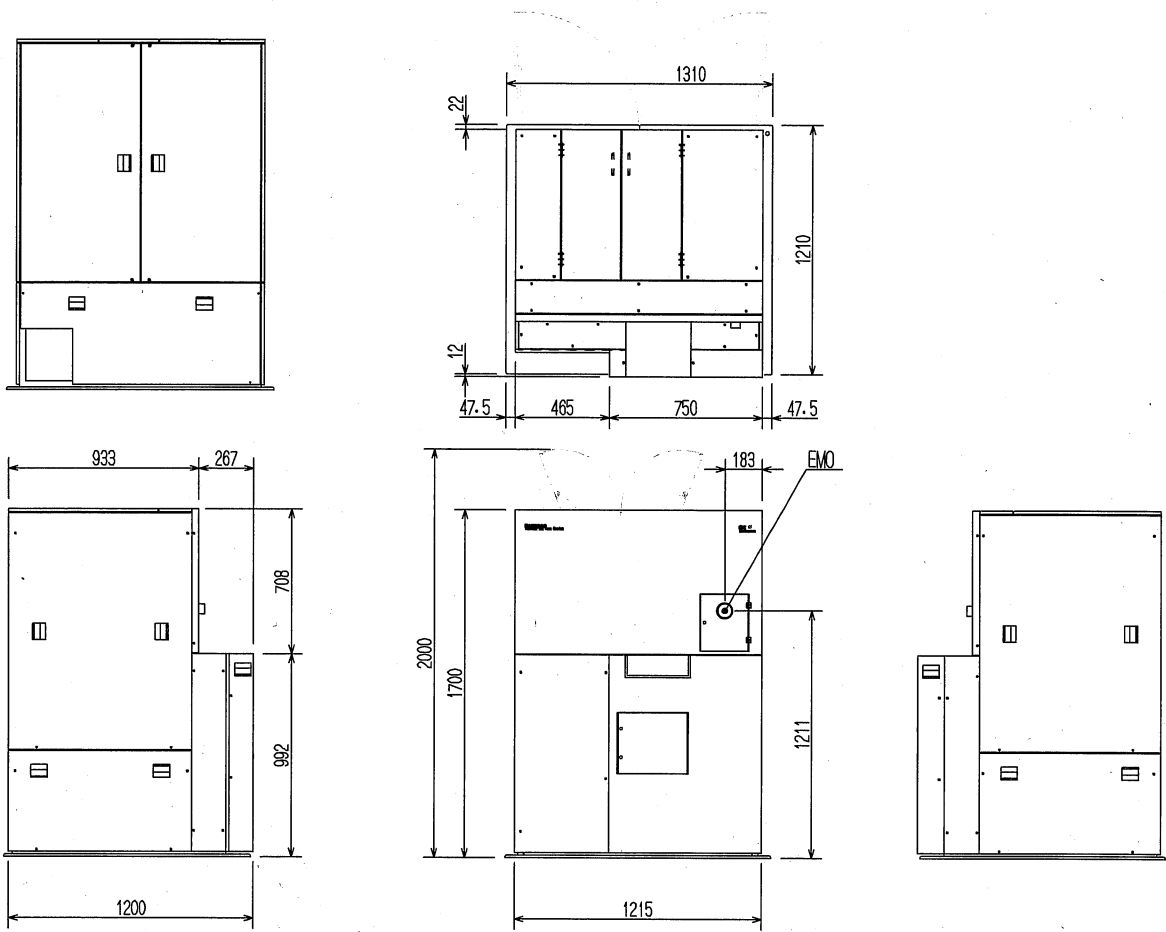


Figure 6.4 Main Unit

units: mm

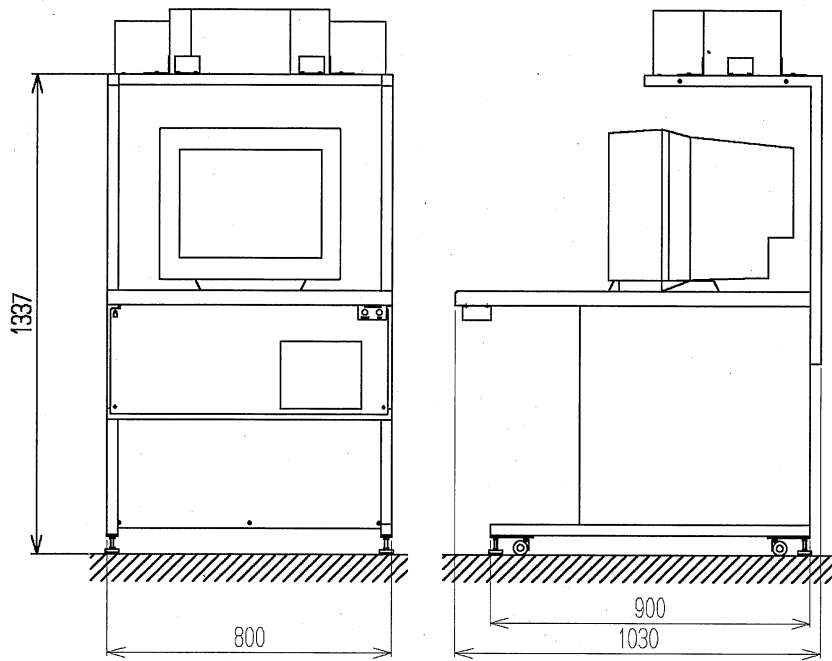


Figure 6.5 Operation Table

Units: mm

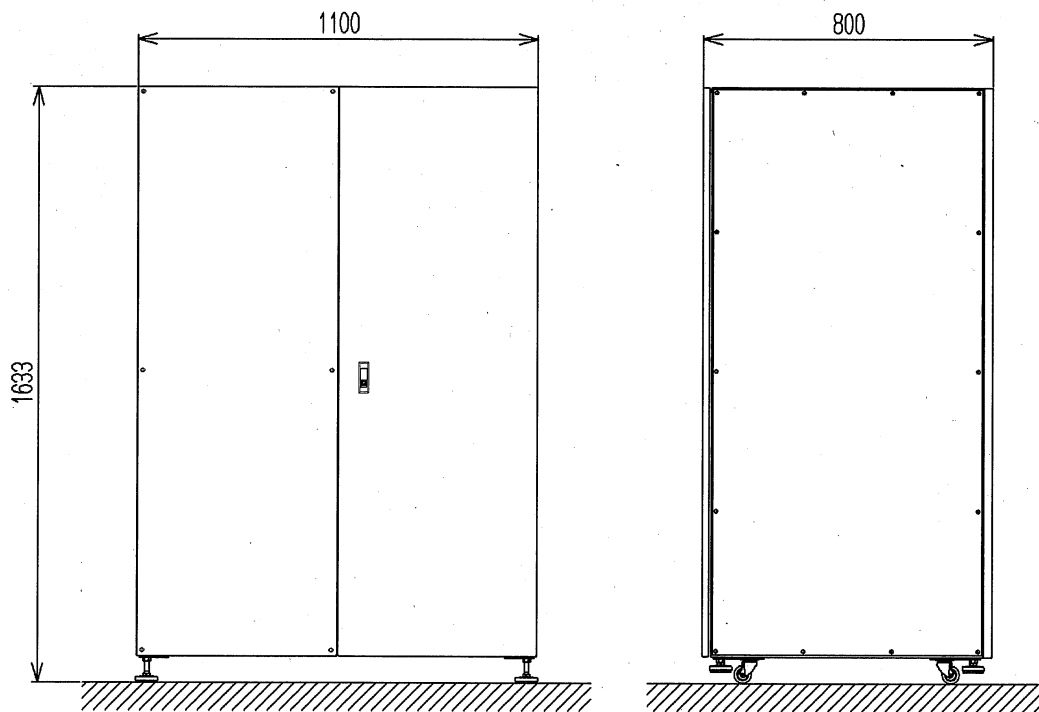


Figure 6.6 Control Cabinet

Units: mm

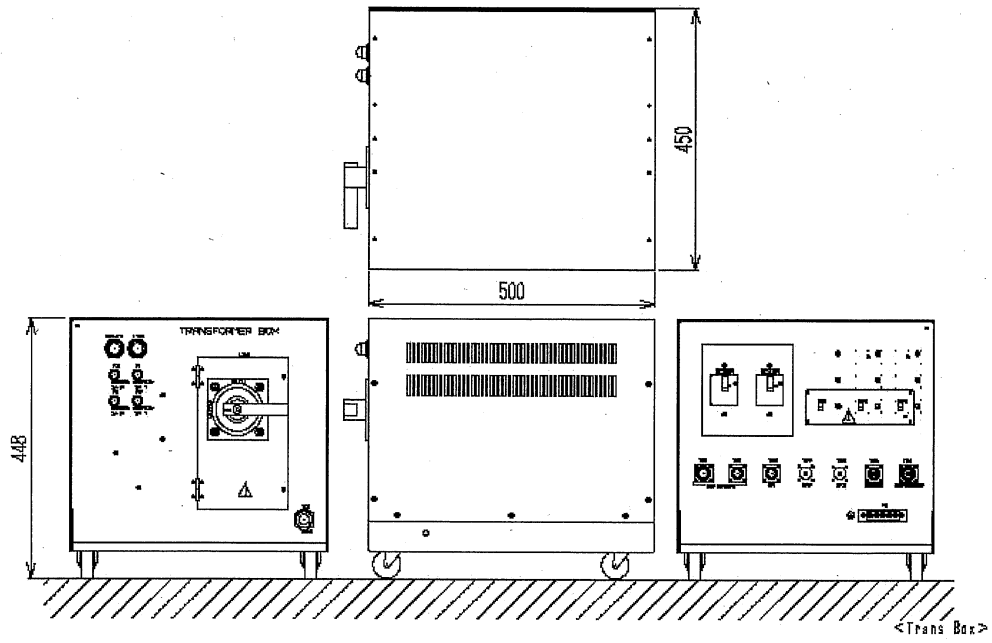


Figure 6.7 Transformer Box

7. Purchaser Preparations

This section describes the items necessary at the time of delivery such as training and adjustment to be performed by the SIINT delivery support person and SIINT delivery person that need to be prepared by the purchaser.

7.1. System Delivery

The following must be prepared for moving and placing the system.

- (1) Ensuring a pathway
- (2) Securing the machinery for movement
- (3) Movement company preparation

7.2. Furniture

This instrument does not come with a chair for operation and must be prepared by the purchaser.

7.3. Maintenance Space

Preparations of a space for spare parts, documentation and tools are necessary.

Maintenance Space	2,000×2,000mm ² During installation
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7.4. Communications

In order for the SIINT delivery person to complete the job smoothly, please prepare a communication environment for the SIINT delivery person to communicate information with SIINT privately.

- (1) Telephone
Phone for the SIINT delivery person. Please let the SIINT delivery person know where a phone they can use is located.
Receiving Phone Please let the SIINT delivery person know a phone number where they can receive calls on from SIINT.
- (2) FAX
Fax for the SIINT delivery person. Please let the SIINT delivery person know where a fax is that they can use.
Receiving Faxes Please let the SIINT delivery person know the fax number where they can receive faxes from SIINT on.
- (3) E-mail Address
Please prepare an environment for e-mail communication on the system PC.

7.5. Safety Training

Please instruct the SIINT delivery person on the safety rules and regulations for the purchasers' location. Please instruct the day before instruction.

The purchaser shall provide safety training for the SIINT delivery support person.

7.6. Entrance Access

Please provide the SIINT delivery person with entrance access so delivery can be performed smoothly. Regular SIINT personnel that will be visiting for short period of times will perform the regular entrance requirements.

7.7. Use of Purchaser Facilities

Please allow access the following facilities.

- (1) Cafeteria
- (2) Infirmary

8. Options

8.1. Anti-vibration Pad

The anti-vibration pad attaches to the legs of the main unit.

There are no changes to the system dimensions when the anti-vibration pad is added.

8.2. Power Supply for Temporary Voltage Loss

8.2.1. Components

Model	PS-1205U
Maker	Densei-Lambda

8.2.2. Utilities

Power Supply Voltage	Single phase AC200V \pm 10%, 50/60Hz \pm 1Hz
Attachment Cable 1	Length: 5m, Terminal: M6 \times 3 Connect between the specialized breaker and power supply.
Attachment Cable 2	Length: 2m Connect between the transformer box and power supply.

8.2.3. System Dimensions & Weight

System Dimensions 430(W) × 499(H) × 400(D) mm³ (not including protrusions)
 Weight 54kg

Installation Example

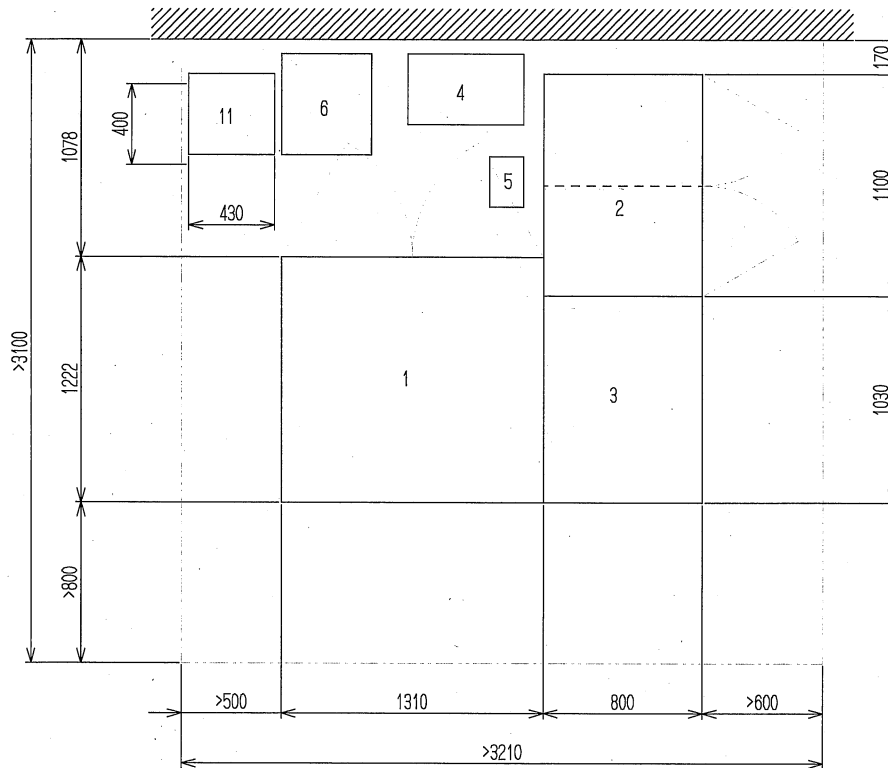


Figure 8.1 Temporary Voltage Loss Protective Equipment Installation Example

Units: mm

- 1 Main Unit
- 2 Control Cabinet
- 3 Operation Table
- 4 Rotary Pump
- 5 Vibration Reducer Weight
- 6 Transformer Box
- 11 Temporary Voltage Loss Protective Equipment

Follow the equipment maker instructions for details regarding installation.

8.3. Multiple Gas Supply System

8.3.1. Components

MGS Cabinet	Housing for the gas material cylinder and control power supply.
Gas Injector	Attaches to the sample chamber attachment port of the main unit.
Rough Pump	Changes the rough pump equipped to the system to the Fomblin Oil specification rotary pump.

8.3.2. Utilities

Connect an evacuation duct for MGS to evacuate the inside of the MGS cabinet.
Power is supplied from the instrument.

Prepare a gas detector to detect gas material leaks.

Evacuation Duct	
Evacuation Port	φ50mm
Evacuation Amount	250L/min

Connection Diagram

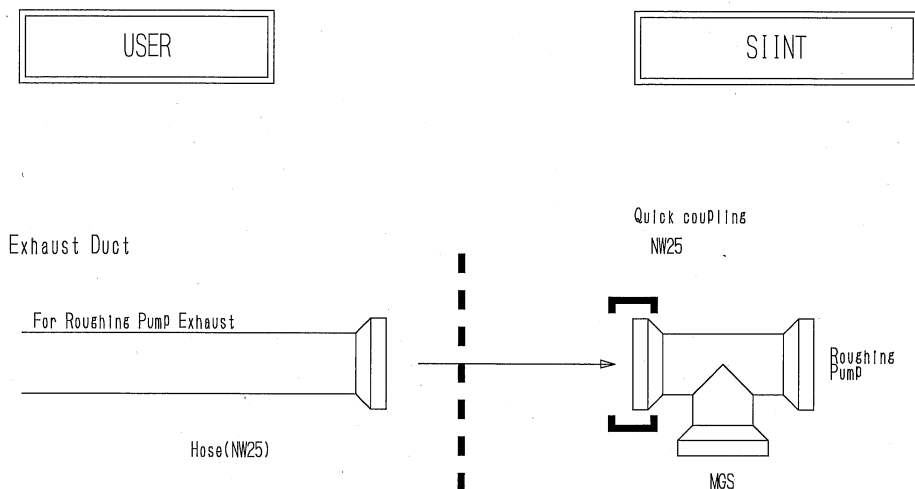


Figure 8.2 Utility Arrangement Schematic

8.3.3. System Dimensions & Weight

MGS Cabinet
Instrument Dimensions 530(W)×430(D)×1492(H)mm
Weight 100kg

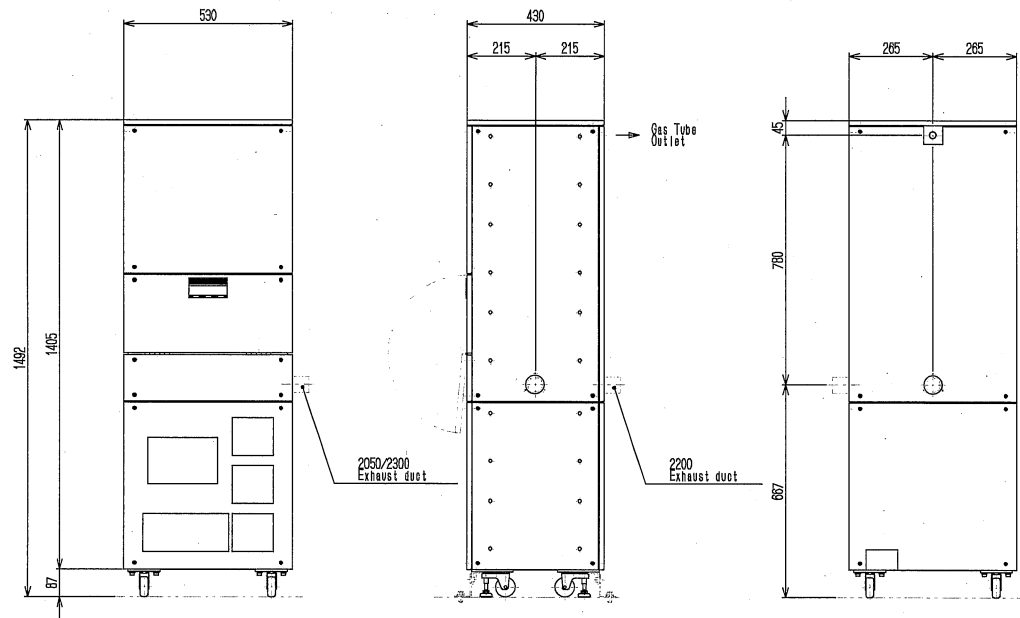


Figure 8.3 MGS Cabinet External View

8.3.4. Installation

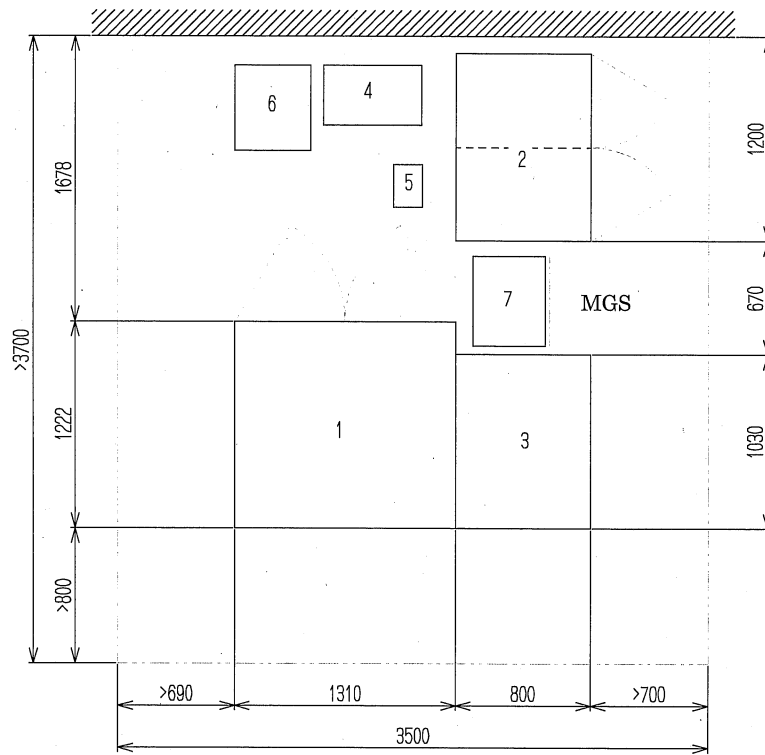


Figure 8.4 MGS Equipped System Installation Placement Schematic

- 1 Main Unit
- 2 Control Cabinet
- 3 Operation Table
- 4 Rotary Pump
- 5 Vibration Reducer Weight
- 6 Transformer Box
- 7 MGS

8.4. Inkjet Printer

8.4.1. Components

Inkjet Printer & Attachments

8.4.2. Utilities

Power Supply

Supplied from the SMI Series Main Unit.

Other

In accordance with the SMI Series Main Unit.

8.4.3. Dimensions & Weight

Refer to the inkjet printer operation manual.

8.4.4. Installation

Place on the printer shelf of the operation table.

Follow the instructions from the manufacturer for information regarding installation.

8.5. Sample Holder

The system can use an optional sample holder or a standard attachment sample holder. Sample holders are a vacuum product and must be kept in a clean environment.

Standard Sample Holder	Maintain in a vacuum state in the sub-chamber when not in use.
Additional Sample Holder	Purchaser shall prepare a desiccator or isothermal container for storing the optional or special purchase sample holder.

9. Rough Pump

The rough pump can be changed based on the needs of the purchaser. Please consult with your SIINT sales representative.

9.1. Fomblin Oil Specification Rotary Pump

Changes the oil of the standard attachment rotary pump to Fomblin oil. Installation specifications are common with the standard rotary pump.

9.2. Scroll Pump

Does not use oil.

However, the noise immediately after starting a vacuum evacuation is larger than the rotary pump.

9.2.1. Components

Model	TriScroll300 (Single Phase)
Manufacturer	ANELVA
Attachments	Cables, etc

9.2.2. Utilities

Power is supplied from the main instrument.

Evacuation Duct	
Connection Port	NW25 Quick Coupling
Evacuation Amount	250L/min

9.2.3. Dimensions & Weight

Dimensions	274(W)×422(D)×340(H)mm
Weight	26.4kg

9.3. Rotary Pump Cover

9.3.1. Components

Rotary Pump Cover	Covers the standard attachment rotary pump.
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9.3.2. Utilities

Evacuation Duct	
Evacuation Port	φ50mm
Evacuation Amount	250L/min

Correctly performs the evacuation inside the cover.
If evacuation is not performed correctly, the temperature in the cover rises. When the sensor in the cover detects an abnormally high temperature, the rotary pump stops.

9.3.3. Dimensions

Dimensions	360 (W)×750 (D)×600 (H) mm
------------	----------------------------

9.4. Dry Pump

Pumps other than those described above can be supplied based on the needs of the purchaser. Please contact your SIINT sales representative.