

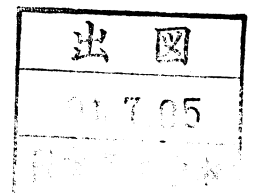
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Aera Source Unit
AS50CR
Instruction Manual

March 2001



AERA JAPAN LTD



CONTENTS

1	INTRODUCTION	1
2	HANDLING PRECAUTIONS	1
3	SYSTEM CONFIGURATION	2
4	SPECIFICATIONS	2
4.1	GENERAL SPECIFICATIONS	2
4.2	EACH SPECIFICATIONS	2
5	NAME AND FUNCTION OF EACH PART	5
6	SYSTEM INSTALLATION	9
6.1	POWER SUPPLY	9
6.2	GAS TO BE SUPPLIED	9
6.3	FITTINGS FOR EACH PORT OF GAS IN/OUT	9
6.4	INSTALLATION ENVIRONMENT	9
6.5	MAINTENANCE SPACE	9
7	CAUTION ABOUT SETUP	9
8	OPERATION	10
8.1	TUBING	10
8.2	LEAKAGE CHECK	10
8.3	TEMPERATURE CONTROL FOR THE REACTOR LINE	10
8.4	PURGING	10
8.5	OPERATION	11
8.6	OPERATION STOP	12
8.7	DRAINING	12
9	CONNECTING DIAGRAM OF EXTERNAL IN/OUT	13
9.1	CN402 EXTERNAL CONNECTOR	13
9.2	CN405 EXTERNAL CONNECTOR	14
10	TROUBLE SHOOTING	14
11	OPTIONAL FUNCTION	15
12	WARRANTY	15

- (1) No part of this publication may be reproduced in any form or by any means without the prior written permission of Aera.
- (2) We may change the information/specification contained in this manual without notice for improvement.
- (3) We have prepared this manual with the utmost care to make assurance of correctness of contents of this manual. If you have any indistinctness or a typographical error, however, please do not hesitate to contact our sales office nearest you or our service center.

1 Introduction

The AS50 AERA Source Unit has been developed using the one of the most advanced technology, and the design will satisfy customers in terms of ease repair and maintenance. Please be sure to read this instruction manual before using the system.

If you have any questions or problems concerning the system, please contact us for a quick response.

2 Handling Precautions

The system is inspected carefully before the shipment. Especially the inspection of leak integrity is completed because of condensing gas being used in it.

If impurities are involved in unfortunately, the tubing will be stuffed up and the operation in good condition will become unavailable.

Care should be taken to avoid the unexpected involvement of air and gas of low purity at the time of replacement of gas cylinder.

Attachment

- Please check the packed attachments on the list for the device.

MFC

- The MFC for this unit consists of a sensor/valve part and PCB part. If you replace the MFC, please change the sensor/valve part and PCB part at one time because they are adjusted and inspected as one set.
Reset the sensor/valve part on the chamber, PCB part inside of front door.

◆ WARNING ◆

- Repair of this equipment is only permitted by the trained staff in our office for the safety purpose.
- Cut the power for this equipment when you open the cover of this equipment.
- Inside of the chamber part is hot, and still hot after cutting the power. Take care when open the cover of the chamber part.

Data List of Mass Flow Controller

Item	Data
Model	MFC designed for AS50 (N/C type valve)
GAS	Si(OC ₂ H ₅) ₄
Full Scale	500SCCM
Calibration Temperature	85°C
Pressure at second side	Reduced Pressure / Normal Pressure (less than 1333Pa)

Data List of this unit

Controllable Range	50 ~ 250 SCCM
Setting temperature of the tank	82°C
Setting Temperature of the chamber	85°C
Power supply	AC100V

3 System Configuration

This unit is a compact, a low-cost, easy built-in, gas supply module which vaporizes the liquid material, controls the flow of vaporized material through a Mass Flow Controller (hereafter is called MFC) and supply it to a reactor. This unit has no control panel, indication of flowrate or status signal and operates by a signal from the equipment like a CVD system.

4 Specifications

This unit only consists of a main module.

4.1 General Specifications

- | | |
|--------------------------------------|--|
| ■ Source Output Line | : One line |
| ■ Charging Method of Material Source | : Batch charge by refill tank(option) |
| ■ Fittings for External Connections | : 3/8, 1/4" VCR SUS316 |
| ■ Fittings for Internal Connections | : 3/8, 1/4" VCR SUS316, SUS316L |
| ■ Leak Rate | : Less than 1×10^{-9} Pa·m ³ /sec(He) per fitting. |
| ■ Outer Dimension | : 164(W) × 235(H) × 334(D) |
| ■ Weight | : Approx. 15kg |
| ■ Paint color | : Munsell No. 5Y7.5/1 leather |

4.2 Each Specifications

1) Valve control

Each solenoid valve for operating air valve operates through the external 24V input signal.

2) Control of source remainder in a tank

Sensor checks 3 fixed point with each photo-coupler output.

- | | |
|-------------|-----------------|
| ■ Detection | : Floating type |
| ■ Level H | : > 1.1 litre |

- Level M : 1.0 < M < 1.05 litre
 - Level L : < 0.5 litre
- AV1 close automatically at H or M level.

3) Charge interlock function

AV1 will close if AV3 open when the charge interlock function is set. This function protects from mis-operation that AV1 open at process time. If 24V is supplied to AV1 every time and the charge interlock function is set, AV1 open automatically after process time (AV3 close), close at M level after charging. A few liquid (only supplied quantity) will be charged after each process by this way, a few temperature drop in the tank will recover quickly. If the same function is prepared on master equipment or not necessary, reset the DIP SW of this function. See "Item 5.Name and function of parts No.9".

◆CAUTION◆

- ☆ AV1 and AV3 never open at the same time if the charge interlock function is set when purging all tubing at the installation, reset charge interlock function during the installation. Set the DIP SW of the charge interlock function to appropriate position after the installation.
- ☆ Liquid source must be pressurized from the external refill system when the charge interlock function is needed.

4) Refill interlock function

AV1 close when refill interlock signal like a cylinder changing, is input. See "Item 9-1.Wiring Diagram of External IN/OUT".

◆CAUTION◆

- ☆ AV1 never open if the refill interlock signal is input when purging all tubing at the installation, cut the refill interlock signal during the installation. Re-connect to appropriate wiring after the installation.

5) MFC purge

Set the adequate voltage to the MFC when AV2 open and purge the MFC in this unit. Too much gas flow for purging causes temperature drop inside of the tubing of this unit and MFC may controls unsteady state at early time of process so that connect the needle valve to the purge line to control nitrogen, and set less than 0.5SLM.

Set zero % to the MFC and close AV2 after purging.

MFC protection interlock is set as OFF at shipping.

6) MFC soft start

AV3 open after 0.5sec from AV3 OPEN signal, and MFC set signal changes from 0 to external input set signal still after 0.5sec.

7) Temperature Control

The internal PCB of this unit controls temperature.

- Controllable temperature of tank : Room Temp.+10 degrees ~ 82°C
- Controllable temperature of chamber : Room Temp.+10 degrees ~ 85°C
- Heating time to stand-by : Approx. 120min.

Temperature setting of chamber and tank are fixed.

8) Alarm Function

Checking the followings and if status signal becomes ON, external output will be ON.

- Temp. error (PT100) : Over heating of the heater
(thermal-register) : Over heating of heater (more than 110°C)
- Temp. ready : Temperature ready status signal(after 30 minutes from time over the setting temperature -5 degrees) Time constant is adjustable. See "Item 5.Name and function of each part No.9".

9) Tubing, Valves

All tubing and valves (for high temperature) are made of electrical polished stainless steel.

10) Mass Flow Controller

The metal sealed MFC (high temperature solenoid valve type) appropriate for this unit is employed and it has realized the operation of high response and repeatability. Inside of this Mass Flow Controller is finished by electrical polishing.

11) Liquid Material Tank

Inside of this tank is finished by electrical polishing.

- Capacity : 1.3 litre (charging up to 1.0 litre)
- Material : SUS 316L
- Applicable Maximum Pressure : 294KPa (G)

5 Name and function of each part

Refer to Fig. 1 to 3

Refer to Fig. 1 to 8

No.	Name	Function					
1	Gas IN/OUT	This is the connecting inlet for Gas IN/OUT.					
2	Solenoid Valve	Please supply the air to the manifold for solenoid valve.					
3	MFC	To control the mass flow controller. Refer to the specifications (page3).					
4	Connector	To connect between this unit and the Local Control Unit model AL50.(Option)					
5	Connector for external input/output	Connectors to interface between this unit and external equipment. For the details of the signal, refer to section 9 Wiring diagram for output (CN402) external input/output.					
6	Connector for external input (CN405)	Connect to power supply and ground. For the details of signal, refer to section 9 Wiring diagram for external input/output.					
7	Door	Remove the screw which are fastened in two places. MFC PCB part with zero adjusting POT and DIP switches are located inside of the door.					
8	MFC zero·adj. POT	Zero point adjustment of mass flow controller. This POT is adjusted after the sufficient time while the temperature of the chamber gets to the setting value and to the steady state. Be sure to purge through all of MFC line when the liquefaction occurred in MFC even if it is very small and the ZERO point of MFC may shift.					
9	DIP SW	These functions are set on the DIP SW.					
		SW No.	Function	Operation when the SW is ON	Set up at shipping		
		1	Heater ON/OFF	Heater ON	ON		
		2	Set up System	Never change	ON		
		3	MFC open interlock	MFC open when AV2 open	OFF		
		4	Charge interlock	Charge interlock ON	OFF		
		5~7	Temperature ready timer (Time from time over the setting temperature -5 degrees.)	5~7 ON			
		SW5		SW6	SW7	time(min)	
		OFF		OFF	OFF	2.5	
		OFF		OFF	ON	25.4	
		OFF		ON	OFF	5.1	
		OFF		ON	ON	7.6	
		ON		OFF	OFF	10.2	
ON	OFF	ON		12.7			
ON	ON	OFF		15.2			
ON	ON	ON	30.5				
8	not used			OFF			

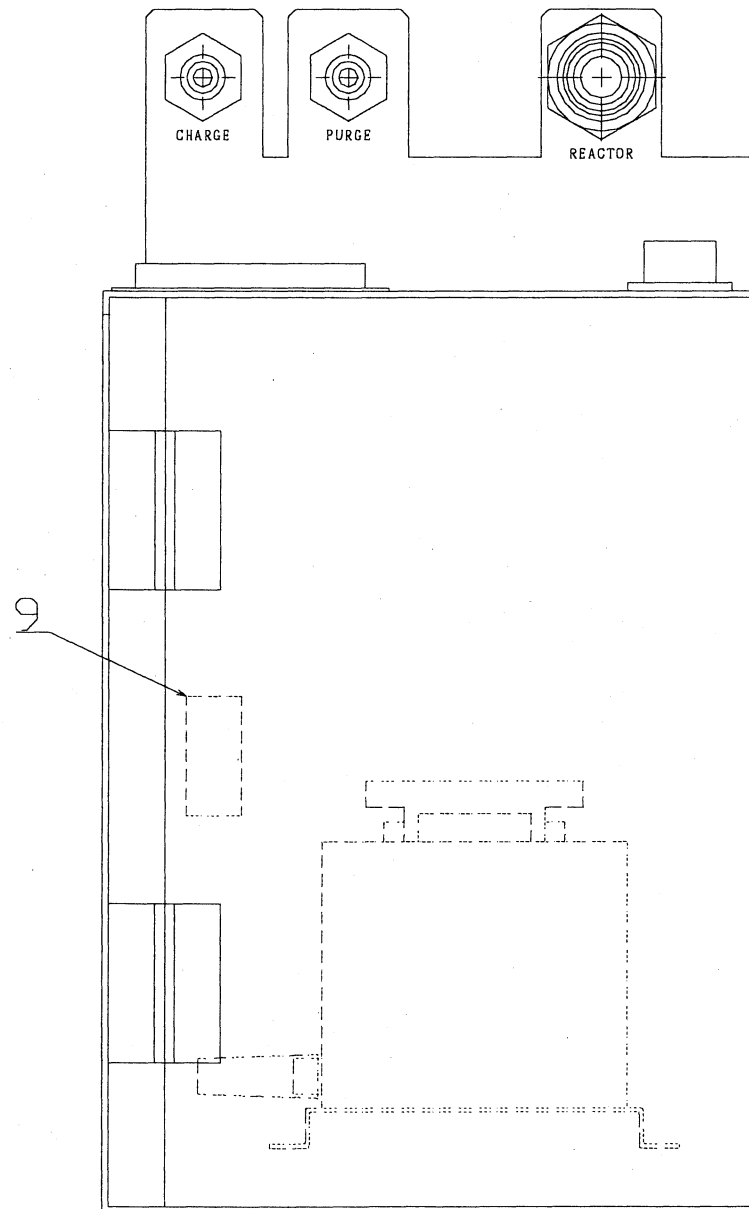


Fig.1

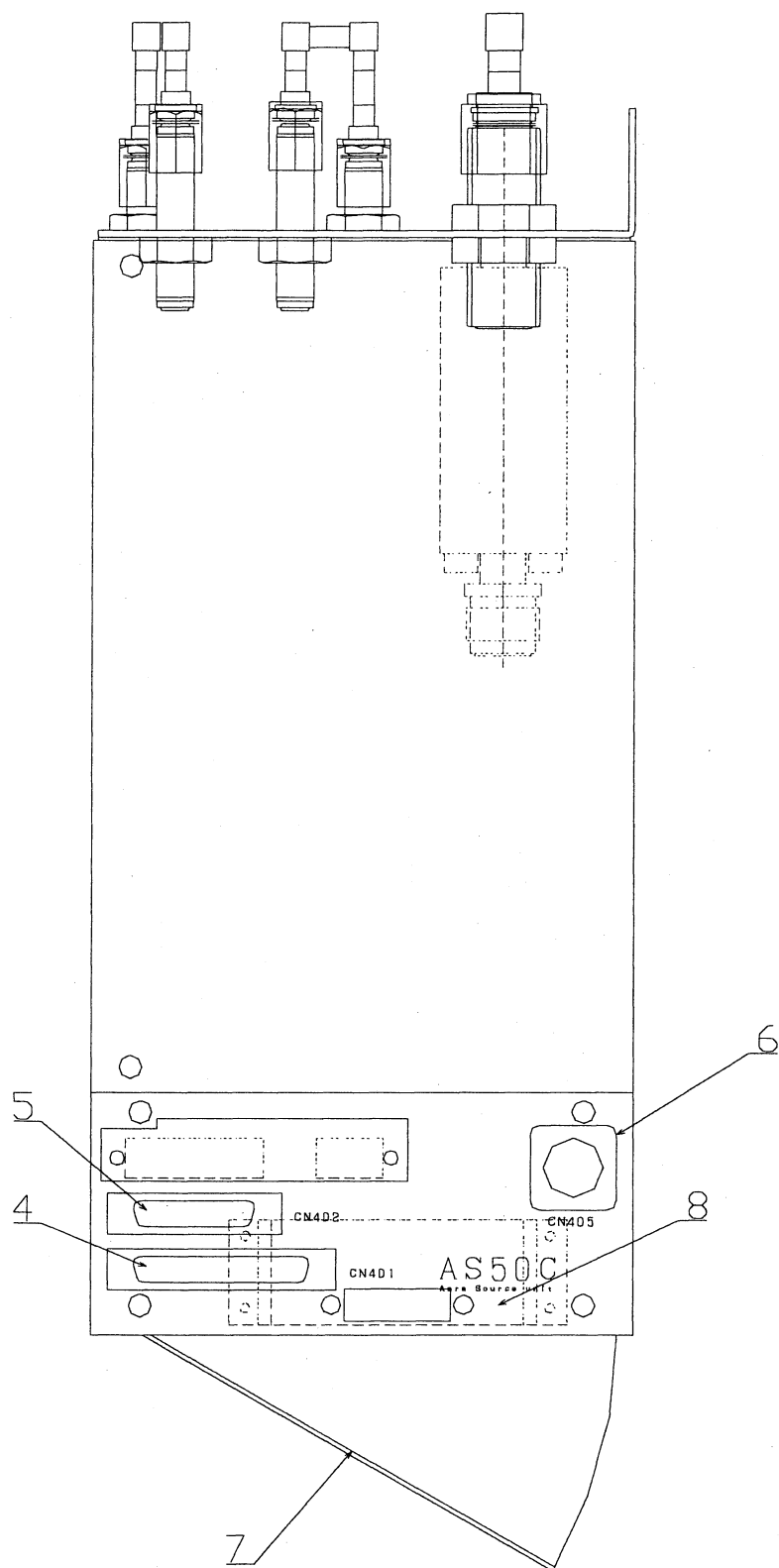


Fig.2

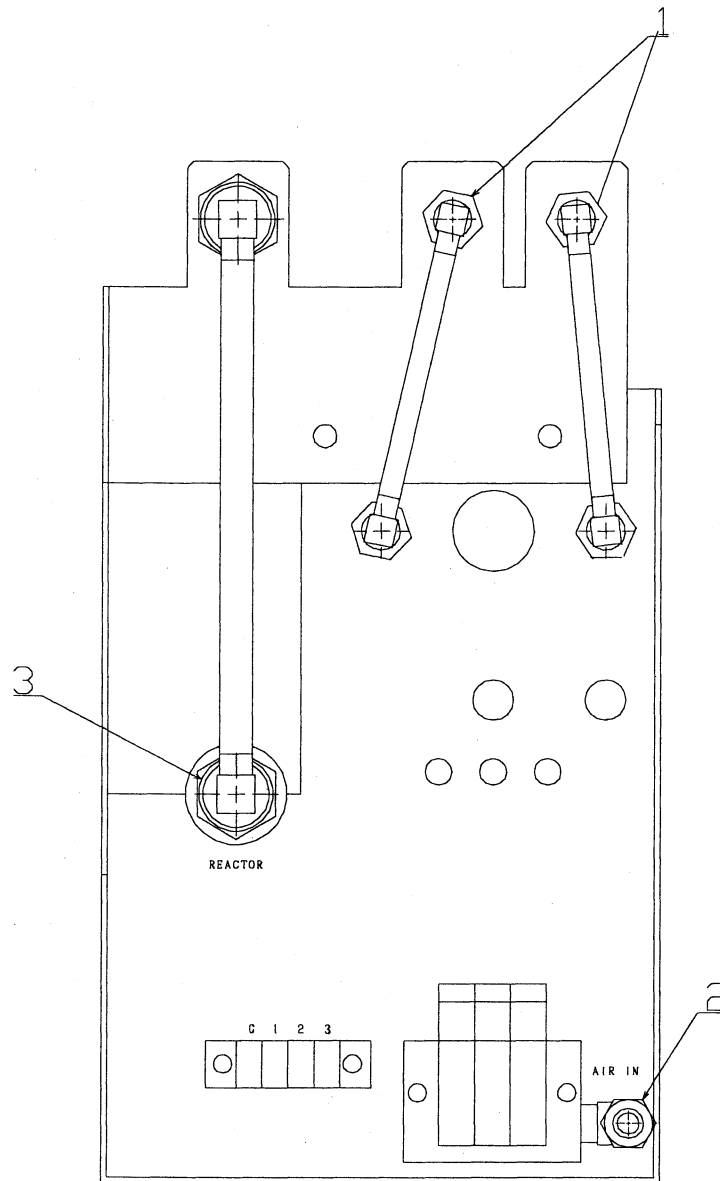


Fig.3

6 System Installation

6.1 Power Supply

:AC100V \pm 10% 50/60Hz 3A

6.2 Gas to be supplied

- Nitrogen (for purge) :0~98KPa(g)
- Air(for air valve drive) :343~441KPa(g)

6.3 Fittings for each port of gas in/out

In/out	Specification	Style	Material
PURGE IN	1/4" VCR type	BHU	SUS316
CHARGE IN	1/4" VCR type	BHU	SUS316
REACTOR OUT	3/8" VCR type	BHU	SUS316
AIR IN	6mm One touch joint	Elbow	

6.4 Installation environment

- Set up direction : Horizontal
- Humidity : Relative Humidity of 45%~85%.
- Temperature : 20~45 °C

6.5 Maintenance space

Be sure to mount at least 100mm away from right side and 150mm away from upper side for the maintenance space to open the cover and ventilation as shown in FIG.4. No sufficient space causes difficulty of trouble-shooting or repair.

MFC PCB and main control PCB is located inside of the front door and the door must be open at the maintenance. Keep the space for more than 150mm at the front side of the door. No sufficient space at the front side of the door causes no maintenance or repair.

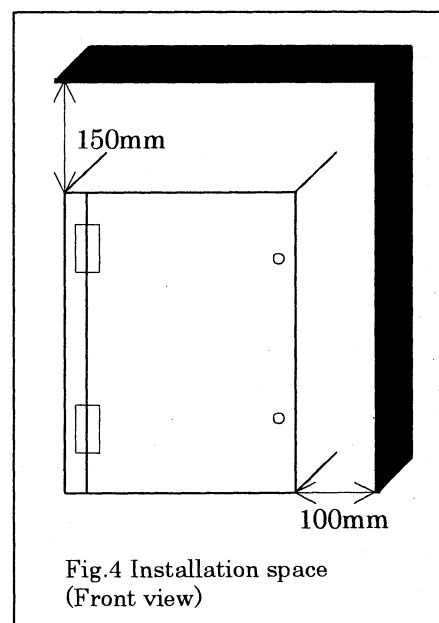


Fig.4 Installation space
(Front view)

7 Caution about setup

- 1) If the filter or small tubing is connected between this unit and the reactor, the pressure drop will increase and this unit may not supply the set flowrate under this pressure condition.
- 2) This unit has no heat exchanger in the purge gas line. Be sure to heat the external purge line by rubber heater and control the temperature of the gas to be the same temperature inside of the chamber. Close AV2 and wait enough time to recover the temperature of the purge gas line in the chamber after much gas flow in the purge line.
- 3) This unit has no drain valve under the tank, be sure to connect the drain valve in the charge line between this unit and refill system.
- 4) This unit has no over-current breaker and leakage-current breaker. Be sure to connect the over-current breaker and leakage-current breaker to power supply line.

8 Operation

8.1 Tubing

Steady the bulkhead-union with a back-up wrench when tightening the nut of the fitting. If you do without a back-up wrench when tightening the nut of the fitting, tubing in the chamber may rotate and leak.

8.2 Leakage check

Fittings may work loosen because of transport or connecting pipes, so it is necessary to check leakage after the connection. When you check by pressure, after heating the chamber and confirming that the temperature settles (more than 2 hours after power-on), check the pressure by a pressure sensor with pressuring and enclosing. No change after 12hours enclosing and pressuring in 294KPa(G) indicates standing test. And when you check by vacuum, enough vacuum test is necessary. Check charge lines as above.

8.3 Temperature control for the reactor line

- 1) Heat the external piping (REACTOR, VENT 1 & 2) with ribbon heaters. The temperature of external piping is to be generally set about 20~30 degrees higher than of the chamber.
- 2) After fixing the sensor to piping with heatproof tape, wind tape heater on it. Take care that the tape heater doesn't touch the sensor. If the tape heater touch the sensor directly, it will take a temperature of the tape heater not gas. So the actual temperature of gas is lower than indication of temperature controller.
- 3) The tape heater should wind tightly on to piping as possible. Winding unevenly will cause partial fall of temperature and liquefaction.
- 4) Wind heat insulator enough on to tape heater. When it is not enough to wind, or there is flow of wind in surroundings, it may not reach setting temperature.
- 5) If the temperature is not enough to heat the reactor piping, liquefaction troubles of MFC will happen and it cause unstable control of MFC, no gas flow, slow shut off, and occurrence of particles.
- 6) The temperature of bulkhead-union or valve in the reactor line between this unit and reactor easily drop, so intensify to heat at this part.

8.4 Purging

Open all valves in this unit and purge purging line, charging line and tank by 0.5slm for more than 1 day.

CAUTION

- Purge all lines inside of this unit after 2hours later of the power ON of this unit at the installation. If you purge all lines inside of this unit and the power ON of this unit at the same time, the empty tank may be overheated, so that temperature fuse may be cut in the worst case.
- Set 0V to the MFC setting voltage to protect the MFC after finishing the purge or vacuum in the MFC.

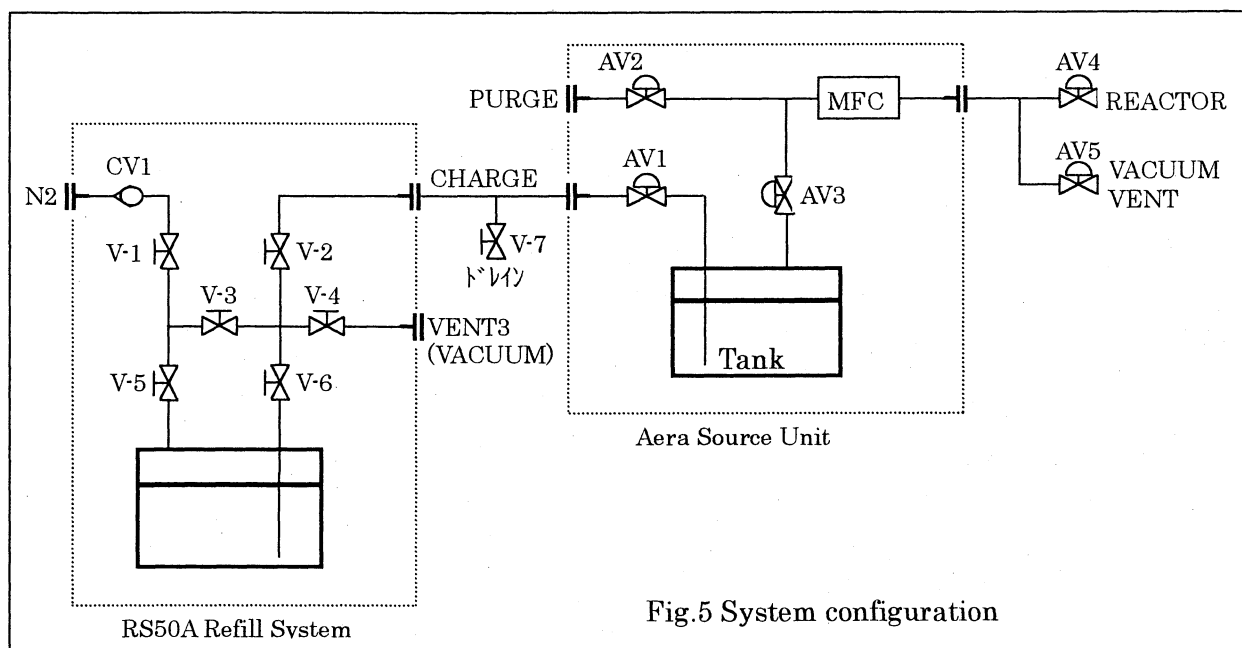


Fig.5 System configuration

8.5 Operation

8.5.1 Charging

Procedure 1. Close AV2.

Procedure 2. Check V-1, V-3, V-4, V-5, V-6 are closed. Open V-2, AV1, AV3, vacuum between charge line and tank.

Procedure 3. Close AV3.

Procedure 4. Close AV1.

Procedure 5. Pressurize 49~98Kpa(G) to refill tank by nitrogen.

Procedure 6. Open V-1 of refill system. : when RS-50A used

Procedure 7. Open the MV in order from V-5, V-6

Procedure 8. Open AV-1.

Procedure 9. When the tank is filled with material up to the M level, AV-1 will close automatically.

CAUTION

- Please ask us when normal pressure specification.
- AV1 may close if the charge interlock function or refill interlock function is set when purging all tubing at the installation, please reset charge interlock function and refill interlock function during the installation.
- We recommend to use Local Control Unit model AL50 (option) and check the indication of AV1~3 operation during the installation.

8.5.2 Start-up Formation

Procedure 1. Supply the power and keep purging in MFC for 2 hours with purging. Set the purge gas to 0.5SLM and wait until temperature ready output goes ON.

Procedure 2. Close all valves, open AV-3 and input the set flowrate to MFC.

Note 1. AV3 open after 0.5sec from AV3 OPEN signal by SOFT-START function and MFC set signal changes from 0 to external input set signal still after 0.5sec.

Note 2. The Full-scale of MFC is the calibration value and different from controllable range. Controllable range depends on the pressure of reactor line. In particular, If the filter (depend on its type, connecting diameter and connecting configuration) or small tubing is connected between this unit and reactor, pressure drop will increase and this unit may not supply the set flowrate under this pressure condition. In order to avoid such situation, regular replacement of filter and through purging will be very necessary.

8.6 Operation stop

Procedure 1. Close AV-3.

Procedure 2. Open AV-2. (Nitrogen purging)

8.7 Draining

Draining the liquid in the tank is necessary when removing this unit for the trouble or maintenance in order to the safety purpose.

Preparation 1. Set the refill system to operation stop mode.

Preparation 2. Reset the charge interlock function and refill interlock function. For AV1 may close if the charge interlock function or refill interlock function is set.

Procedure 1. Connect the tank for draining to V-7. (The tank for draining needs more than 2 litre.)

Procedure 2. Open V-7, V-4, V-2 and make vacuum in the tank.

Procedure 3. Close V-4, V-2.

Procedure 4. Close AV4, AV5 and open AV2, AV3, AV1. Liquid source flow into the tank for the draining.

CAUTION

- Be sure to check that AV1 opened or not. We recommend to use Local Control Unit model AL50 (option) and check the indication of AV1~3 operation during this operation or check the indication on top of the solenoid valve SV1 at the rear panel of this unit.
- AV1 never open when the liquid level reach to M or H. Push the orange button on top of the solenoid valve SV1 on this case and AV1 open mechanically.

Procedure 5. Close V-7, open V-4, V-2 to purge after the enough time of Procedure 4.

Procedure 6. Close V-4, V-2, AV1, AV2, open AV3, and AV5 and set the MFC to upper limit after the enough time of Procedure 5.

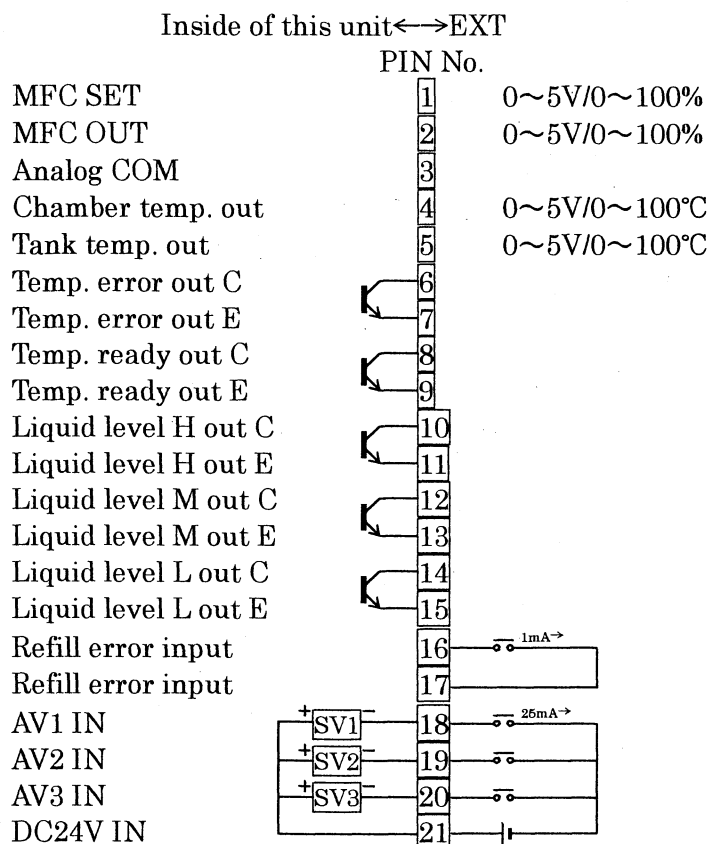
Procedure 7. Wait until the MFC output goes zero after the enough time of Procedure 6.


Procedure 8. Close AV3, AV5; remove this unit and tightening the cap to all fittings.

9 Connecting diagram of external in/out

9.1 CN402 External Connector

DB-25PF-N (JAE brand) D-sub 25PIN pin contact cable side



 shows photo-coupler.

- 1) Analog input impedance of equipment to be connected externally should be more than 5k Ω .
- 2) Analog input impedance of this system are more than 1M Ω .
- 3) Ratings of photo-coupler
 Collector-emitter voltage V_{ce0} : 40V max.
 Collector-emitter saturation voltage $V_{ce sat}$: 1V max.
 Collector current I_c : 10mA max.
- 4) When a temperature error occurs, the output will short-circuit between Collector-emitter
- 5) When a temperature ready occurs, the output will short-circuit between Collector-emitter.
- 6) The liquid level H output will short-circuit between Collector-emitter when the liquid level exceeds the set value of H level.
- 7) The liquid level M output will short-circuit between Collector-emitter when the liquid level exceeds the set value of M level.
- 8) The liquid level L output will short-circuit between Collector-emitter when the liquid level is lower than set value of L level.
- 9) Solenoid valve will open when 24V is connected.
- 10) Refill interlock input will close AV1 compulsorily when it receives data of changing cylinder or the lack of remains from the refill system. No connecting if it doesn't interlock by refill interlock input.
- 11) Connector DB-25PF-N, cramp cover DB-C8-J10-F4-1 for the cable side are attached.

9.2 CN405 External Connector

JMSP1303F (DDK brand) Round type 3PIN socket-contact cable side

Inside of this unit ↔ EXT

PIN No.

AC100V IN

AC100V IN

GND

1

2

3

1) Connector JMSP1303F for the cable side are attached.

10 Trouble shooting

Please check next items before contacting us when trouble happened.

Item	Cause	Sequence	Troubleshooting	Relation
Different from the set value to the flowrate of the MFC	<ul style="list-style-type: none"> ■ Set over the control range ■ Temperature error ■ Contamination ■ Faulty of the valve-span in the MFC ■ Pressure drop of the reactor line 		<ul style="list-style-type: none"> ■ Check the MFC set value. ■ Check the indication of the temperature. ■ Try purging ■ Do not adjust valve-span of MFC roughly by yourselves. Contact us for proper handling. ■ Check the control range ■ Check the reactor line 	2 8-5-2 7
Unstable control of the MFC	<ul style="list-style-type: none"> ■ Temperature error of the reactor line ■ Trouble of temperature controller in this unit. ■ Over charge because of the trouble of the level sensor. ■ Too much flow of purge gas. 		<ul style="list-style-type: none"> ■ Check the temperature of the reactor line. ■ Decrease the purge flow. 	8-3 4-2-5
Level sensor error	<ul style="list-style-type: none"> ■ AV1 is closed by charge interlock function. ■ AV1 is closed by refill interlock function. 		<ul style="list-style-type: none"> ■ Release the charge interlock function. ■ Release the refill interlock function. 	4-2-3 4-2-4
Temperature error	<ul style="list-style-type: none"> ■ The temperature of the chamber or the tank exceeds the set value for more than 5 degrees. ■ Thermal-resister works at 110°C. 	<ul style="list-style-type: none"> ■ Heater OFF(self-return) ■ Heater OFF(self-return) 	<ul style="list-style-type: none"> ■ Check whether the overshoot of the temperature had happened or not (Wait some minutes) ■ Check the voltage of power input 	4-2-5

11 Optional function

For this unit, optional Function is prepared as listed below :

- 1) Local Control Unit model AL50
- 2) Manual Refill System RS50A
- 3) Auto Refill System RS91B

■ Local Control Unit model AL50

The Local Control Unit model AL50 indicate the temperature, MFC flowrate, alarm, set the MFC, control each valve of this unit directly.

We recommend using as the testing tool for quick installation or trouble-shootings.

■ Manual type Refill System model RS50A

The Manual Refill System RS50A is designed for a cylinder of 7litre capacity and includes a remainder indicator of load-cell. Valves are manual diaphragm types. All fittings are high reliable VCR™ type. All piping and valves are electrically polished as standard specs. It can connect with any type of cylinder (refill cylinder is excluded).

■ Auto Refill System model RS91B

The Auto Refill System RS91B designed for a cylinder of 20 litre capacity, has automatic mode function for cylinder changing to decrease the mis-operation and includes level sensor by sub-tank and a remainder indicator of the load-cell.

All fittings are high reliable VCR™ type. All piping and valves are electrically polished as standard specs. It can connect with any type of cylinder (refill cylinder is excluded).

12 Warranty

The product is warranted against defects in material and workmanship for period of one year from date of shipment when used in accordance with specifications and not subjected to abuse or physical damage.

In case of a problem caused by user's improper handling or operation, fire, disaster, or by the repair or modification at user's site, or by contamination, the unit will be considered out of warranty, and the user will be charged according to the current repair rate schedule.

Note: Specifications or design of this system may be changed without notice for the purpose of total improvement.

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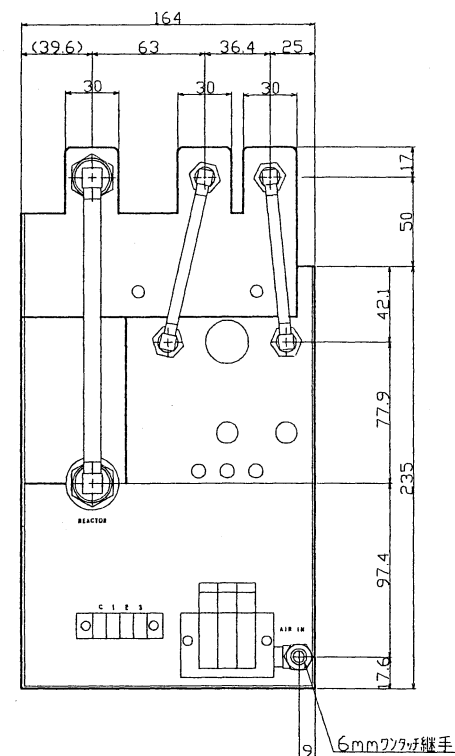
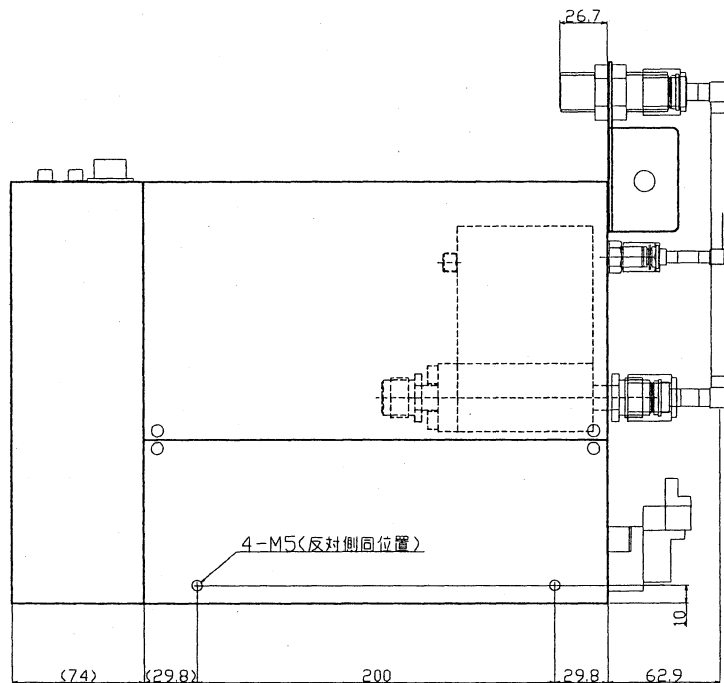
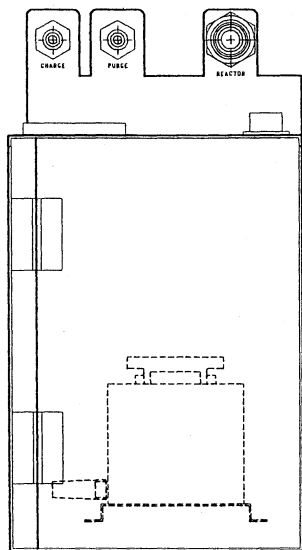
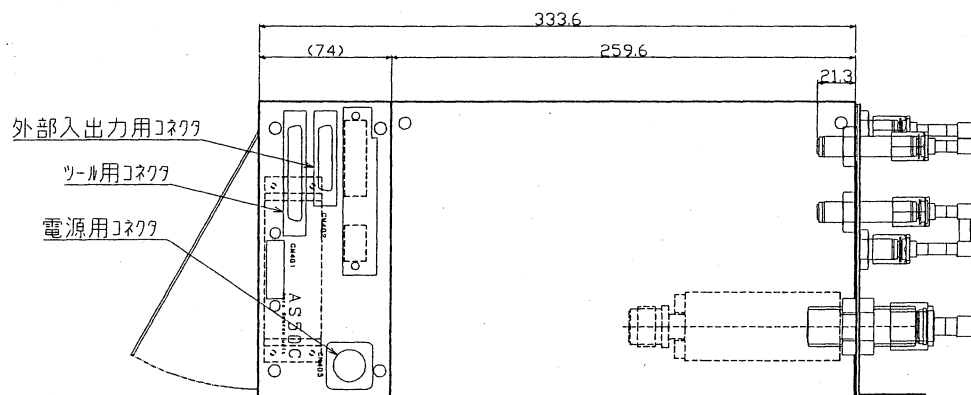
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Hermes-Epitek Corp. Ptc. Ltd.
20 Jalan Afifi #50-05 Cisco Centre Singapore
409179
TEL: (65) 841 4366 FAX: (65) 841

Specifications and appearance are subject to change without prior notice for improvement.

Printed in Japan

200-78118

No.	DESCRPT	SPECIFICATION	NOTE	Q
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<div> <div> <div>△</div> <div>△</div> <div>△</div> </div> <div> <div>DATE</div> <div>Q</div> <div>Q-X</div> <div>DRAW</div> </div> </div>				<div>MATERIAL</div> <div>FACE DISP</div> <div>TOLERANCE</div>		<div> <div> <div>Aera JAPAN LTD</div> <div>日本アエラ株式会社</div> </div> <div> <div>TITLE</div> <div>Aera Source Unit</div> </div> <div> <div>MODEL</div> <div>AS50CR</div> </div> </div>	
<div> <div>REVISION</div> <div>改訂</div> </div>				<div>DATE</div> <div>2000.5.11</div>		<div>外観図</div>	
<div> <div>APPD 承認</div> <div>佐々木</div> </div>		<div> <div>CHECK 検図</div> <div>佐々木</div> </div>		<div> <div>DESIGN 設計</div> <div>神保</div> </div>		<div> <div>DRAW 製図</div> <div>神保</div> </div>	
<div> <div>DWG No.</div> <div>81187-002</div> </div>				<div> <div>EDIT.</div> <div></div> </div>		<div> <div>SCALE</div> <div>1/3</div> </div>	

Rev.2

2144-002G

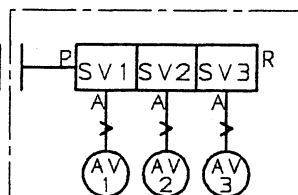
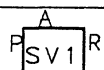
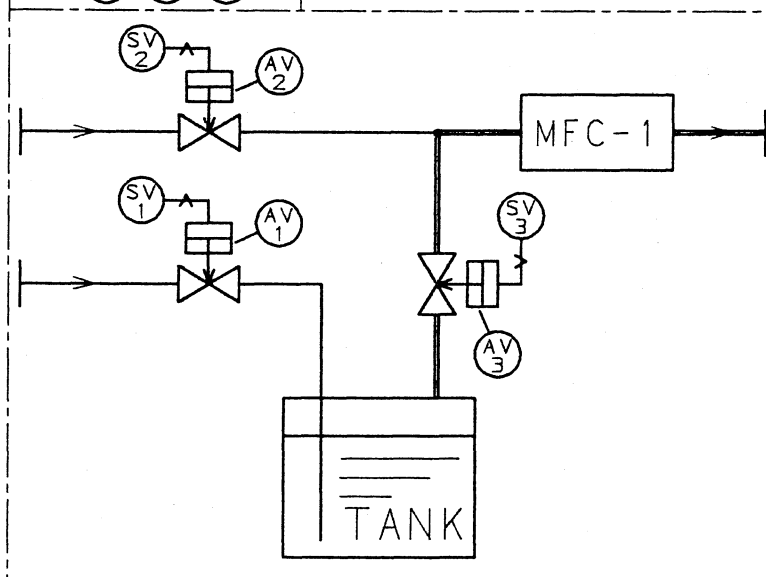
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DESCRIPT

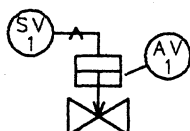
SPECIFICATION

MATERIAL OR NOTE

Q

AIR IN
1/4" SWAGelokNOTE. All tubing from SV1~3 to AV1~3
are 4mm in diameter.PURGE IN
1/4" VCRCHARGE IN
1/4" VCR

3PORT SOLENOID VALVE

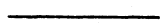
AIR OPERATE VALVE
NORMALLY CLOSE TYPE

MFC-1

MASS FLOW CONTROLLER



3/8" TUBING



1/4" TUBING

REVISION 改訂

NEXT ASSY

MATERIAL

NOTE

DATE

Q

REA

DRAW

MASTER

2144

FACE DISP

①

DATE

Q

REA

DRAW

ORIGINAL

SIZE

A4



AERA JAPAN LTD

Aera 日本アエラ株式会社

②

DATE

Q

REA

DRAW

TOLERANCE

TITLE

Aera Source Unit

MODEL

AS50C

③

DATE

Q

REA

DRAW

DATE,

96. 9. 17

総組立部

外観図

APPRV承認

CHECK検図

DESIG設計

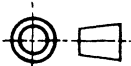
DRAW製図

佐々木

佐々木

神保

神保



DWG NO

2144-002G

EDT

SCALE

Rev. 0