

Peltier Element Thermal Vacuum Testing (PeTT) Space Chamber Equipment specifications

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1. Chamber specifications

No.	Item	Qty	Specification
1	Chamber	1	Dimensions : $\Phi 540 \times L480$ mm See Fig. 2 Pressure: 1×10^{-4} Pa
2	Shroud	1	Bottom plate: $L153 \times W128$ mm Shroud cover: $\Phi 270 \times L220 \times H230$ mm Inside: Black coating Outside: Covered with MLI (See Fig.2)
3	Rotary oil vacuum pump [Kashiyama, KRS 901]	1	Displacement: 900 l/min Power: 1.5 kW
4	Diffusion pump [SAN-EI RIKEN, DP-8S]	1	Oil capacity: 500 cc Pumping speed: 1950 l/s Power: 1.8 kW
5	Peltier modules [TARK THERMAL SOLUTIONS, MS2-192-14-20-11-18-22-W8]	4	2-stage thermoelectric device Max ratings: 14.8 V , 6.9 A , 90 K Operating temperature: -60°C - $+80^{\circ}\text{C}$
6	Peltier modules [Kryotherm, TB-4-(199-97-49-17)-1.5]	4	4-stage thermoelectric device Max ratings: 23 V, 6 A, 111 K Operating temperature: -50°C - $+80^{\circ}\text{C}$
7	Thermocouple feedthrough (Type K, female connector terminal)	9ch (15ch)	Number of channels that can be used for measurement: 9ch 6ch for chamber control 16ch can be added using USB

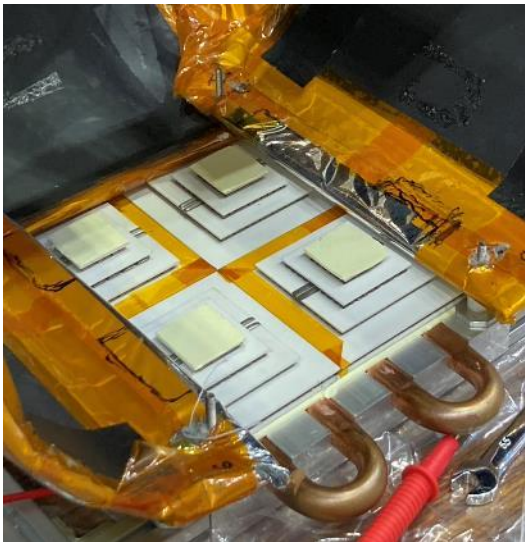
No.	Item	Qty	Specification
8	Powerline feedthrough	6 line	Internal terminal: Amon flat terminal (female type) Please prepare a male type terminal for connection. See Fig. 3 and Fig. 4 <i>NB: A pair means positive & negative OR live & neutral</i>
9	SMA feedthrough	2	Hermetically sealed female-female bulkhead adapter (up to 18 GHz) See Fig. 5
10	D-SUB feedthrough	2	25-pins (internal: female, external: male) 25-pins to 9-pins adapters available External cable is required separately. See Fig. 6
11	USB feedthrough	1	External USB extension available Cannot be used when 9 or more thermocouples are required by user USB 3.0 compatible, female type inside and outside See Fig. 7
12	LAN feedthrough	1	External LAN extension available

2. Measuring equipment

No.	Item	Qty	Specification
1	Thermocouple sensors	32	Type K, female connectors <u>Only 21 sensors available to user</u>
2	Pirani gauge [ULVAC, GP-1S]	1	ULVAC WIT-G1 Fig9
3	Ionization vacuum gauge [ULVAC]	1	Sensor [WIT] Monitor [GI-TL3RY] Fig. 9, Fig. 10
4	Monitoring & Control	-	Via LabVIEW program Fig. 11
5	Computer	1	OS: Windows 11 Pro LabView installation

3. Peltier elements

Kryotherm (Bottom)



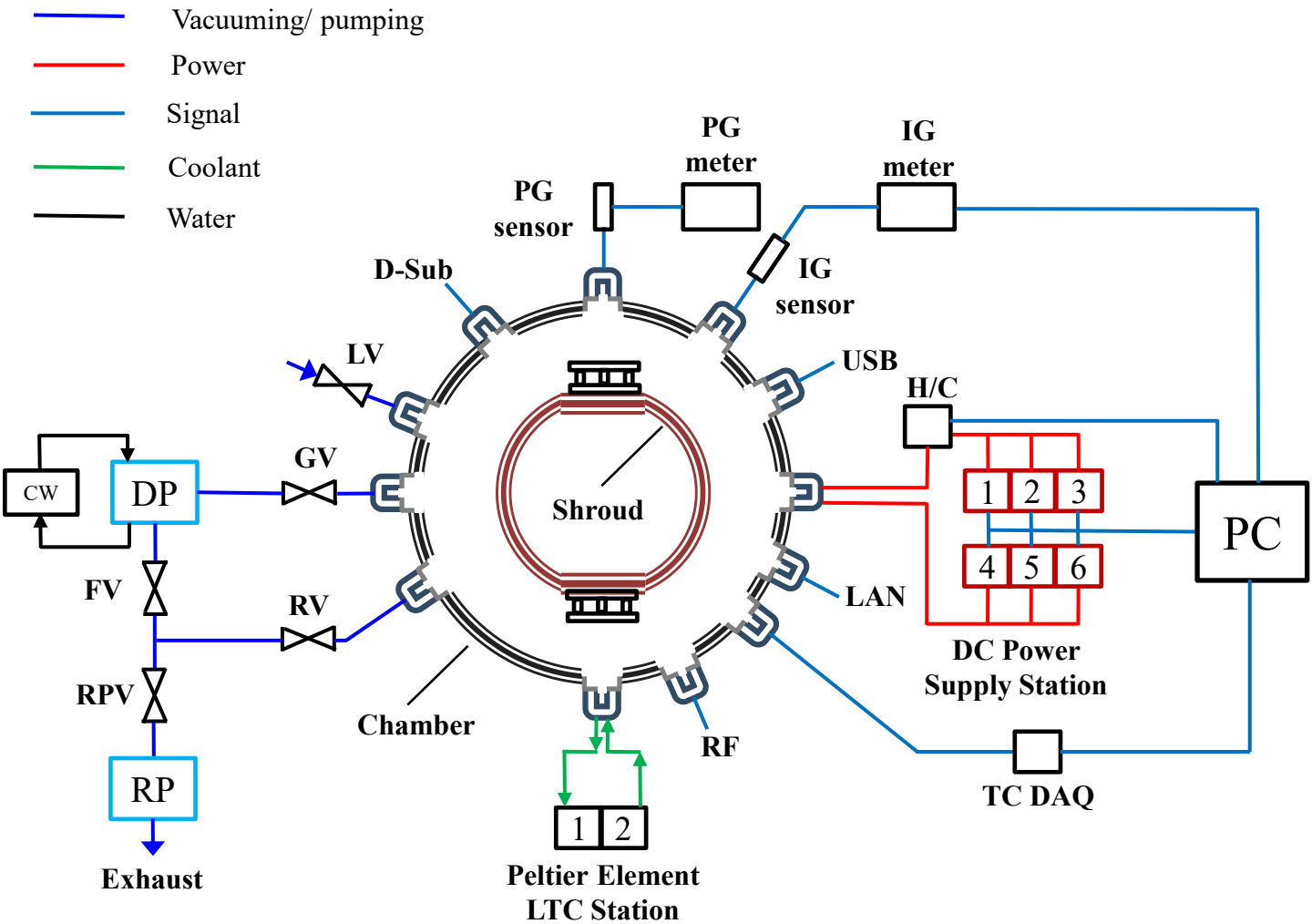
Laird Technologies (Top)



Total of 8 elements

Manufacturer	Kryotherm	Laird Tech
Stage number	4	2
Max cooling power, W	16.9	38
Maximum current, A	6.7	6.9
Maximum voltage, V	23.6	14.8
<u>Max temp. difference, °C (or K)</u>	<u>111</u>	<u>90</u>
AC resistance, Ω	3.42	2.14
Operating temperature, °C	-50 - +80	+80

4. PeTT chamber schematic



CW: cooling water

DAQ: data acquisition

DP: diffusion pump

FV: foreline valve

GV: gate valve

H/C: heating/ cooling controller

IG: ionization gauge

LTC: low-temperature circulator

LV: leak valve

PG: Pirani gauge

RF: radio frequency

RP: rotary pump

RPV: rotary pump valve

RV: roughing valve

TC: thermocouple



Feedthrough



Peltier element

5. Chamber pictures

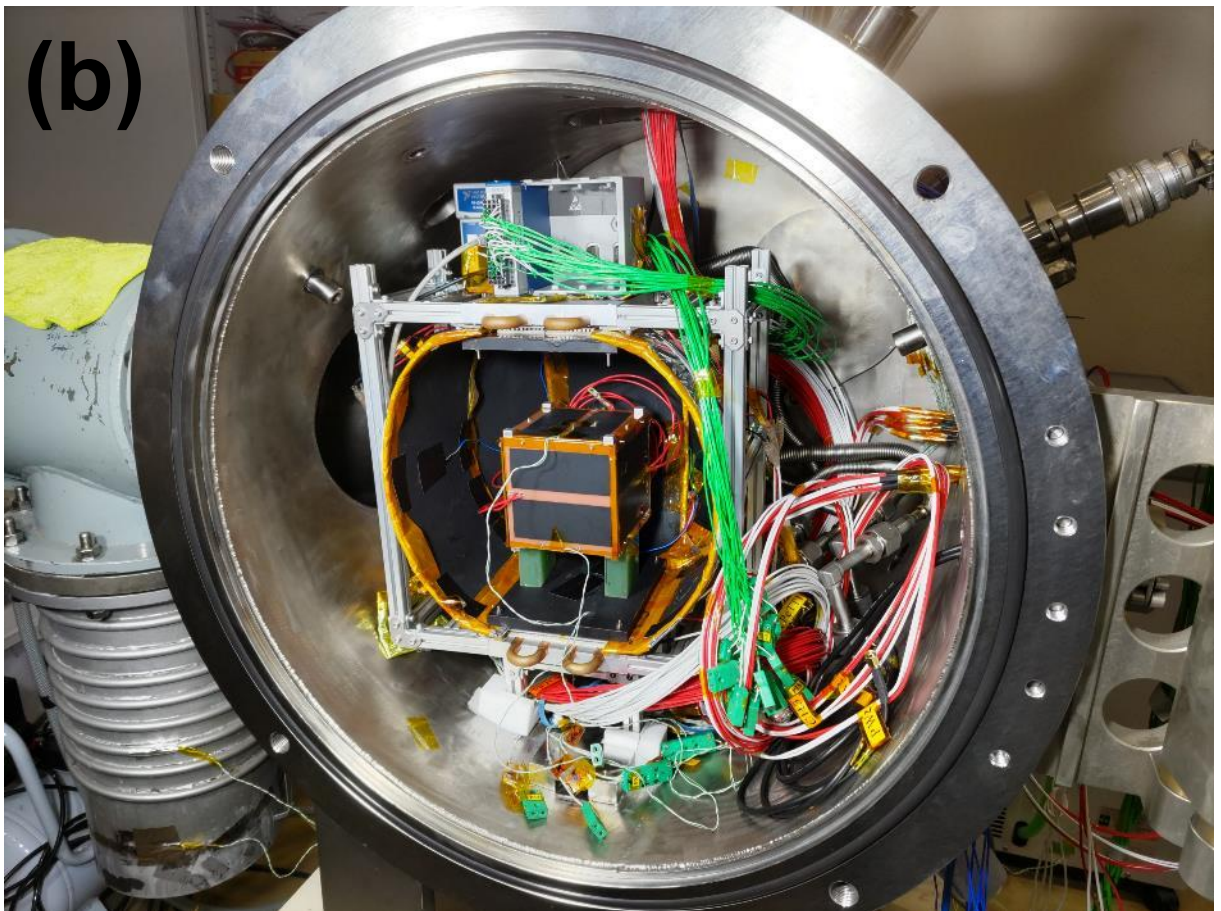
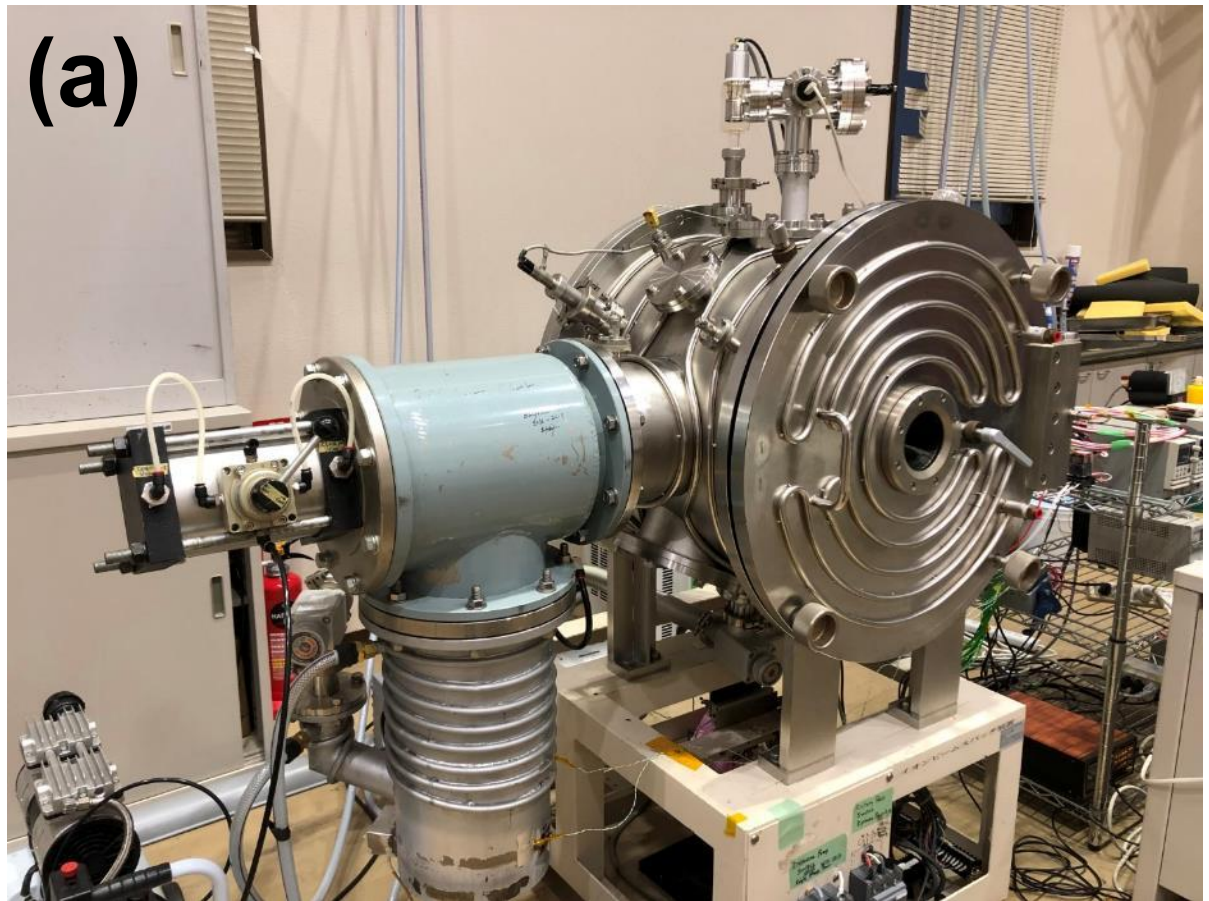


Fig. 1 (a) PeTT chamber, (b) dummy satellite inside shroud

5. Chamber pictures (feedthroughs)

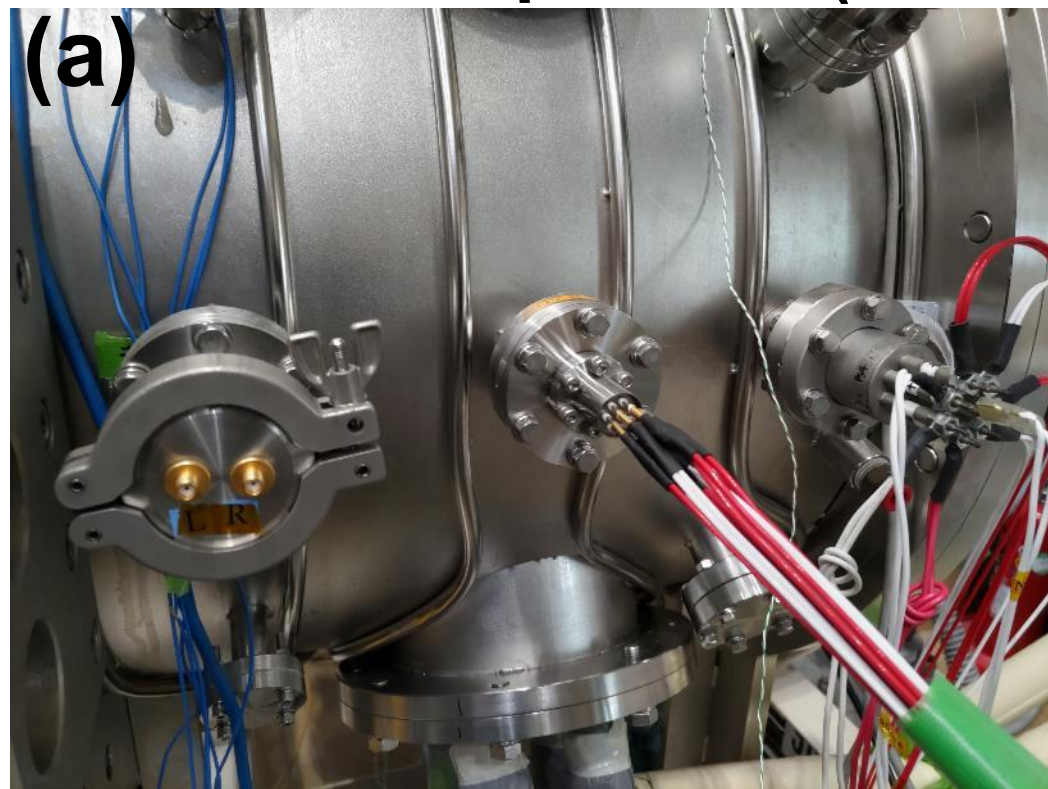


Fig. 2 (a)

- SMA
- Power

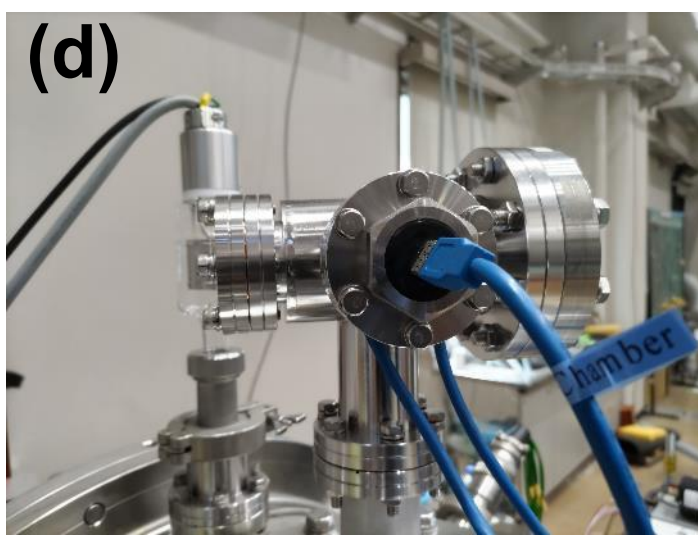
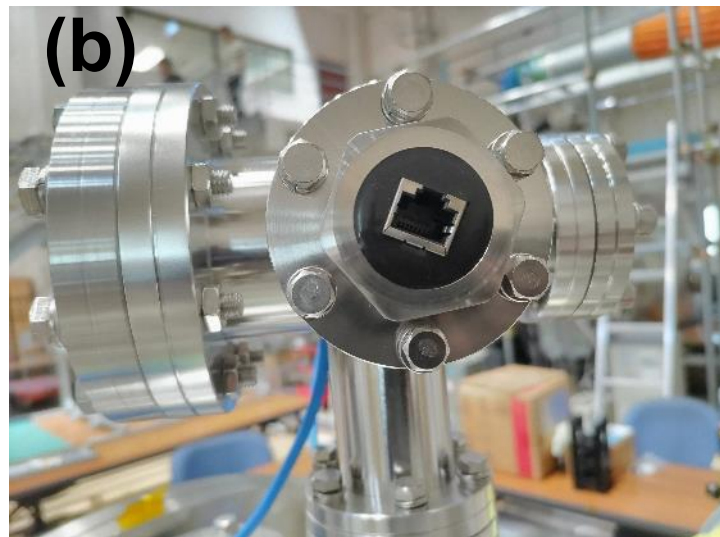


Fig. 2 (b), (c), (d)

- LAN
- D-Sub (2 X 25 pins)
- USB

5. Chamber pictures

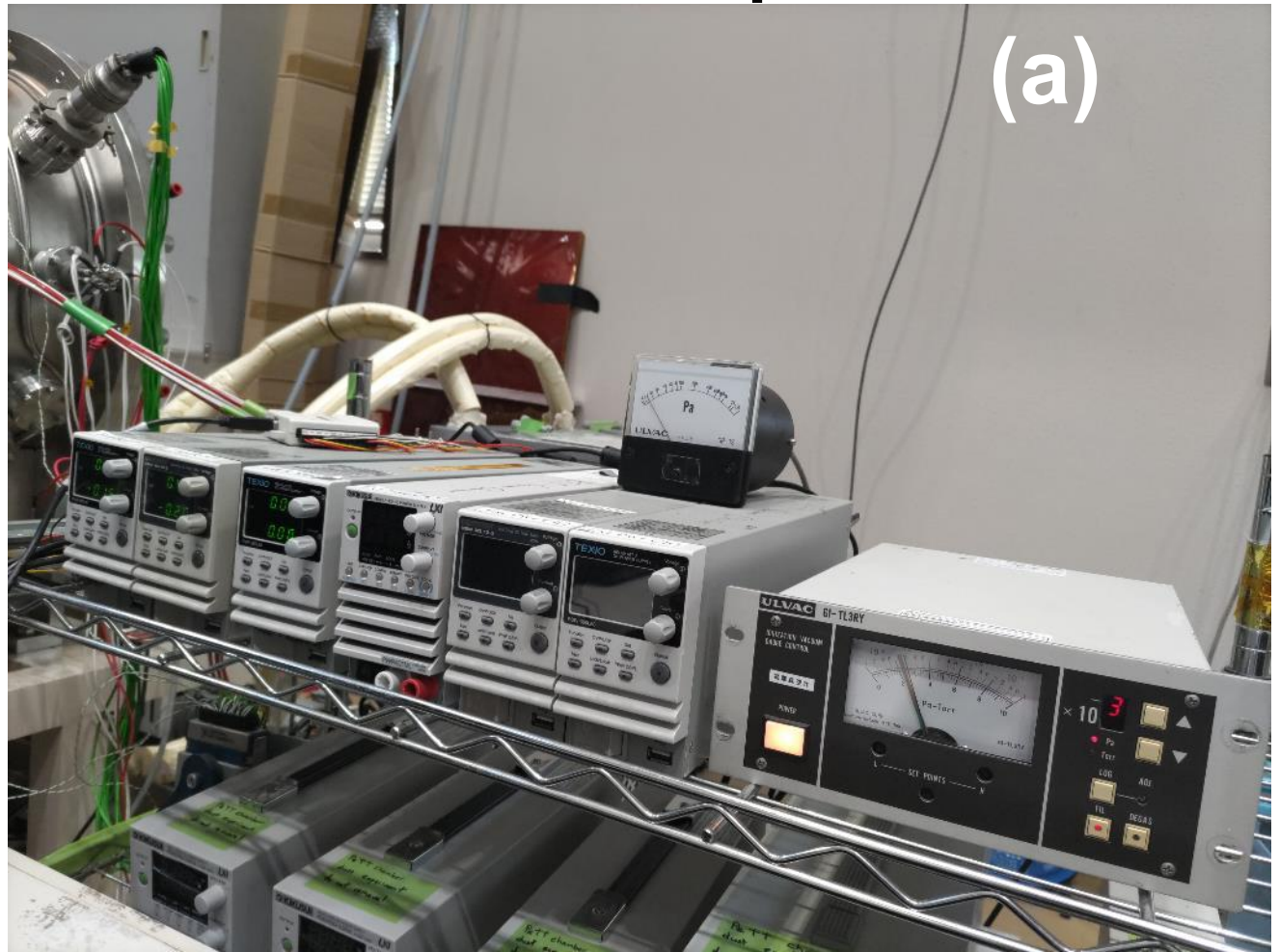


Fig. 3 (a) Power station and Ionization gauge meter,

(b) Ionization gauge sensor

5. Chamber pictures

(a)



Fig. 4 (a) Coolant circulator station,

(b) PC with LabVIEW program for data acquisition & control

(b)



6. Power cable terminals

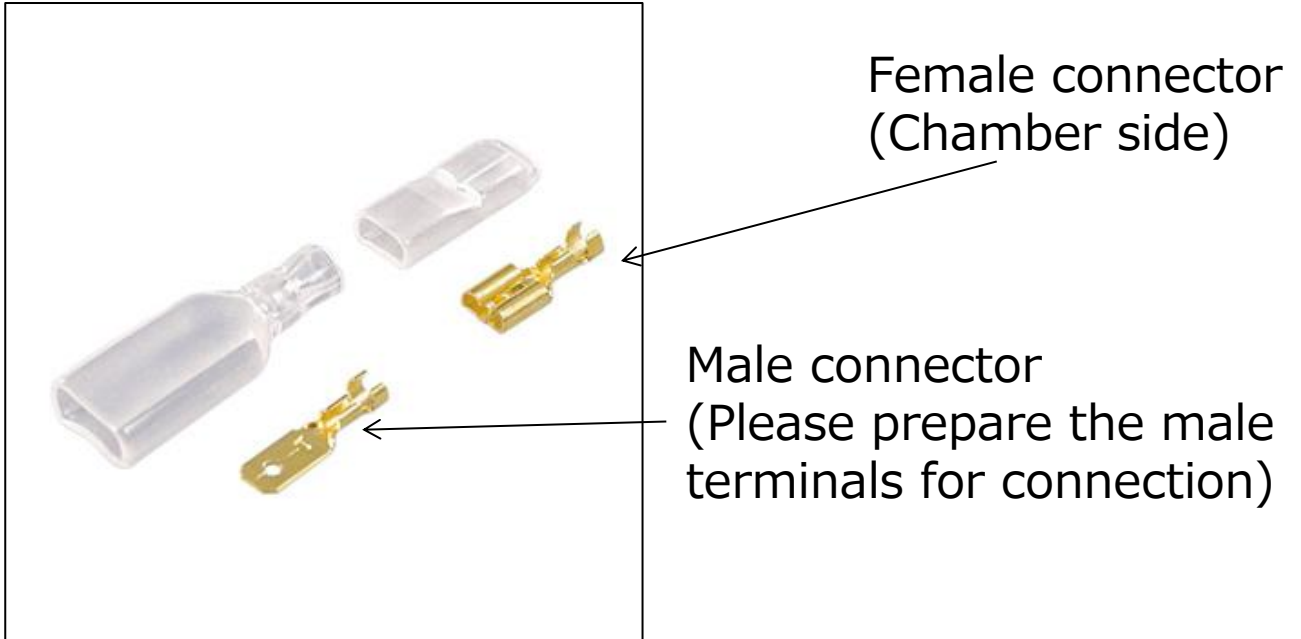


Fig 5 : Flat type terminal (Amon No1156)