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# 1E_C&C_V04 DESCRIPTION

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# 1. GENERAL

- **Cabinets Dimensions:**

  Height: 1.8 meters
  Width: 1,2 meters (two times 0,6 meters)
  Depth: 0,6 meters
  Weight: approximately 400 Kg

# 2. SAFETY INSTRUCTION

Electrical experts and technicians familiar with electrical risks can only perform maintenance and repair of the equipment.

**Before operating the unit**

Make sure you have read and understood the instruction manual.

**Inputs**

Input signals are driven through connectors and cables supplied with the equipment.

**Outputs**

Output signals are driven through connectors and cables supplied with the equipment.

**Ground:**

A safety ground is available on the unit. For protection, this terminal must be connected to the main non-fused earth.

**Opening of the unit**

Make sure that the main input power is unplugged before opening.
The unit can only be opened by technicians and experts in electrical.

# 3. PRESENTATION

The Command & Control Cabinet is designed to operate equipment relative to the ECR source SILHI and relative to beam transport and measurements.

As well as the power supply for the source potential and focus potential, the C&C cabinet provides all the necessary signals to control the ion source, and  a Water-cooled Faraday Cup.

It is mainly based on I/O Crio modules that provide analogue and digital signals for the control and monitoring of all the parameters.

For the safety use of the ion source, the use of the RF power and of all the supply is protected by interlocking chains.

# 4. DESCRIPTION

## *4.1. COMMAND & CONTROL FRONT:*

*Illustration 1: C&C front global view*

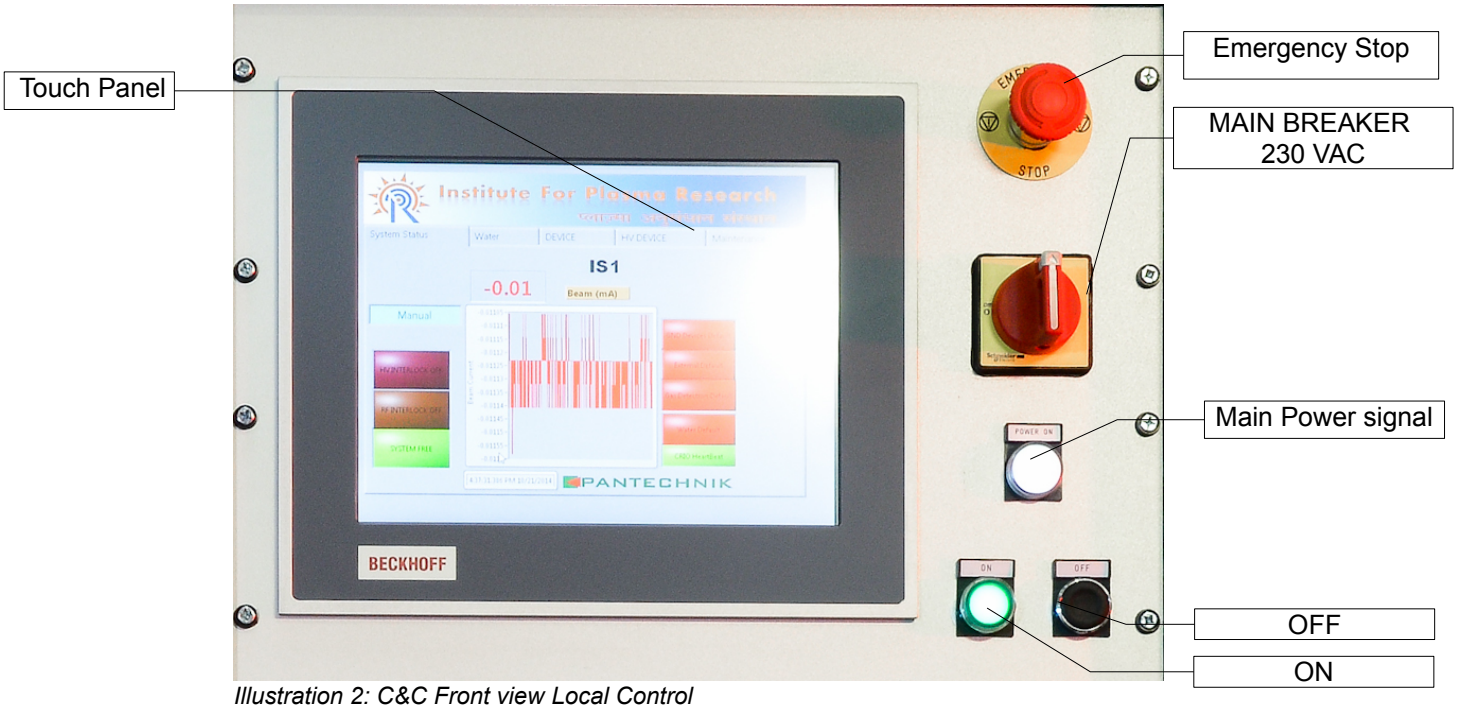



*Illustration 2: C&C Front view Local Control*

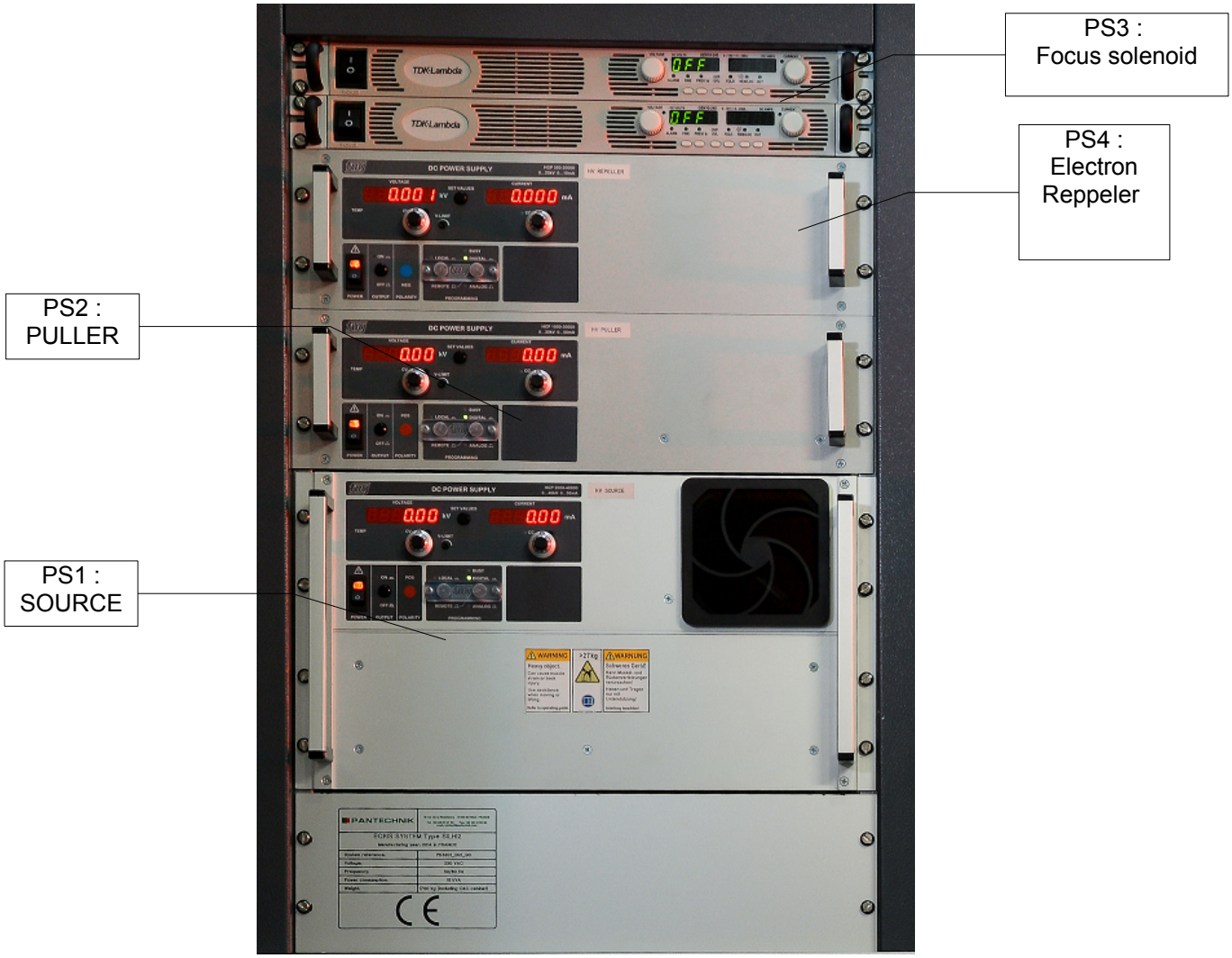



*Illustration 3: C&C front view Power supply*

## *4.2. DESCRIPTION OF THE INTERLOCKING CHAIN*

### 4.2.1. HIGH VOLTAGE INTERLOCK

Following parameters are taken into account to be able to control high voltage power supplies.

- Extraction pressure
- Ground stick
- HV door of cabinet
- Screen of the source bench
- Grounding system
- HV validation from operator
- External interlock (customer)

### 4.2.2. RF INTERLOCK

Following parameters are taken into account to be able to control the RF amplifier:

- HV INTERLOCK (refer to 4.2.1)
- Ion source Water-Flow
- Ion source Water Temperature
- Faraday Cup Water-Flow
- Faraday Cup Temperature
- DC-Breaker Water temperature
- RF validation from operator.

See electrical drawing for more information (ref : 5E_C&C_V04)

# 5. EQUIPMENT

## 5.1. HV POWER SUPPLY

Located on the C & C Cabinet.

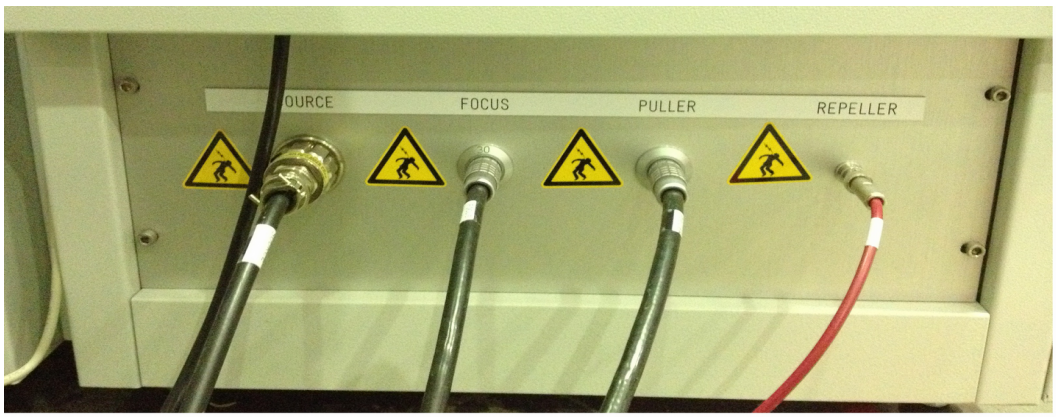



*Illustration 4: HV GLAND*

Four power supplies are used and will be integrated in the C&C Cabinet.

- **PS1: Source Potential Power Supply**
  - Type FUG HCP 2000-40000 P
  - HT output 40kV / 50mA
  - AC power requirement: 230VAC, 1350VA
  - Gland at the back side of the C & C Cabinet
  - HV wire type RG11
  - Plug type:  S150

- **PS2: Puller Potential Power Supply**
  - Type FUG HCP 1500-30000 P
  - HT output 30kV / 50mA
  - AC power requirement: 230VAC, 140VA
  - Gland at the back side of the C & C Cabinet
  - HV wire type RG11
  - Plug type:  F3430

- **PS3: Focus Potential Power Supply *2**
  - Type TDK GEN10240
  - HT output 10V / 240A
  - AC power requirement: 230VAC, 350VA
  - Gland at the back side of the C & C Cabinet

- **PS4: Electron Repeller Power Supply**
  - Type FUG HCP 350-2000 N
  - HT output 20kV / 15mA
  - AC power requirement: 230VAC, 35VA
  - Gland at the back side of the C & C Cabinet
  - HV wire type RG58
  - Plug type:  SHV

for wiring refer to : http://www.fug-elektronik.de/webdir/3/cable_mounting.htm

# 6. DESCRIPTION OF THE GROUNDING SYSTEM

The grounding system has been designed for the security of the persons and equipments.

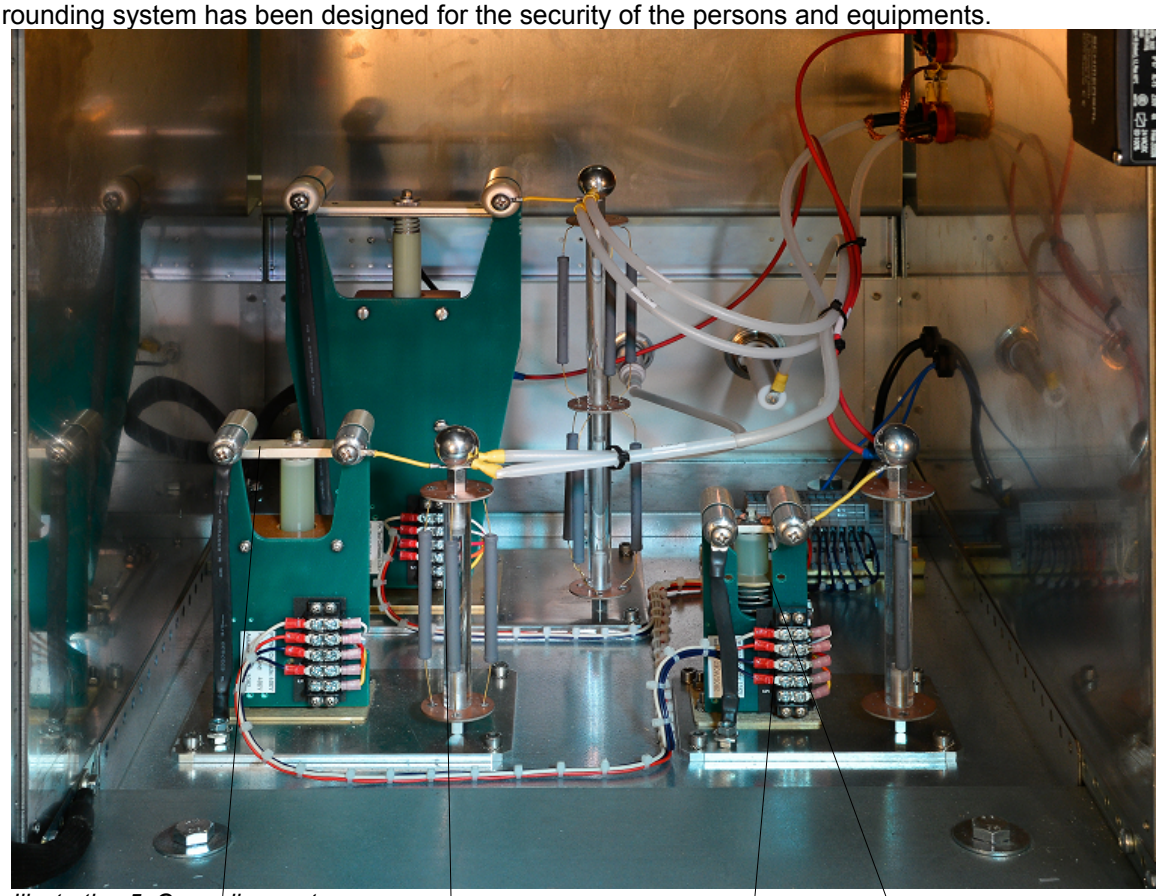


*Illustration 5: Grounding system*

Ground Plate

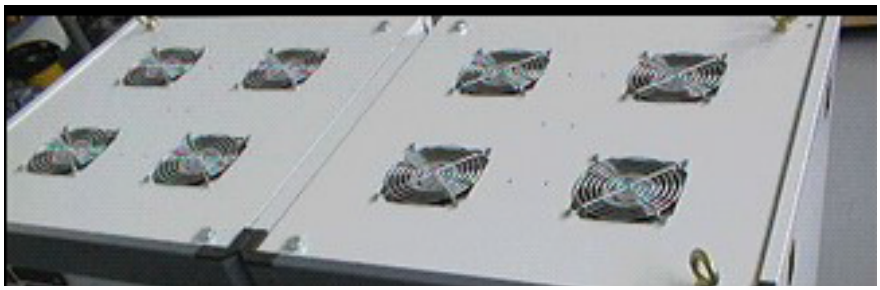
Switch position

Bleeder resistor

Actuator

- Each of the high voltage power supplies has a bleeder resistor mounted in parallel. The power supply is then working in more stable conditions by forcing the minimum output current. It also helps to discharge polarized components while decreasing the potential.
- The operator activates the ground plate through a digital output relay of the I/O modules.
- The position switch GND for the ground plate is part of the HV interlock chain and HV power supplies outputs have to be grounded in case of the system needs to be opened.

# 7. MECHANICAL ASPECT



The top of the cabinet is equipped with 8 fans for the air-cooling of the inside equipments.
At least, 50 cm of free space has to be kept to ensure a good air circulation.

## *7.1. DOORS OPENING*

For the front side as well as for the rear side, from 10 cm from the floor, 80 cm of free space has to be kept in order to allow the opening of the doors.

# 8. PROTECTION

The 230 VAC circuit is protected with a general breaker and split by Pantechnik.

- The 230 VAC for the Power Supply cabinet itself is protected with a 30 mA differential breaker.

breakers will allow to isolate 230VAC circuits as follow:

| description | identification | protection |
|---|---|---|
| Main supply | Q1 | 63A 30mA |
| Protection U1&U2 | Q2 | 4A |
| Power extension rack | Q3 | 20A |
| Grounding device | Q4 | 2A |
| Maintenancy spare plug | Q5 | 4A |
| FAN from cabinet | Q6 | 2A |
| PS1 | Q7 | 16A |
| PS2 & 4 | Q8 | 20A |
| PS3 | Q9 | 25A |
| U1 24V PS | Q10 | 2A |
| U2 24V PS | Q11 | 2A |

# 9. LIST OF SIGNAL CABLE

## 9.1. RF STUB COMMUNICATION

- Cable reference : SubD9 connection for the control cable (3 wire + shileding)
- length 10m
- qty : 1

## 9.2. VACCUM GAUGE COMMUNICATION

- Cable reference : PFEIFFER  PT448253-T  Sensor cable 15m for vacuum gauge
- length 15m
- qty : 3

## 9.3. MASSFLOW FIBER OPTIC

- Fiber optic OM1 ST/ST
- length 10m
- qty : 1

## 9.4. RF AMPLIFIER FIBER OPTIC

- Fiber optic OM1 ST/ST
- length 10m
- qty : 1

## 9.5. POWER SUPPLY CABLE :

- Cable reference :3RG2,5
- length 10m
- qty : 3

## 9.6. PRIMARY PUMP POWER SUPPLY CABLE

- Cable reference :4RG2,5
- length 10m
- qty : 1

## 9.7. ACTUATOR FARADAYCUP SIGNAL

- Cable reference : 6point + shielding
- length 10m
- qty : 1

## 9.8. FARDAYCUP SIGNAL

- BNC 50 ohms
- length 10m
- qty : 1

## 9.9. EXTERNAL DISTRIBUTION BOX

- Cable reference : RKU 19-242/15M  M23 connection for the control cable
- length 15m
- qty : 2

| Channel_pin | description | terminal in the bay |
|---|---|---|
| | *BOX N°1* | |
| 1_4 | GND stick status | XRP1_3 |
| 1_2 | FC setpoint | XRP1_4 |
| 2_4 | FC status IN | XRP1_5 |
| 2_2 | FC status OUT | XRP1_6 |
| 3_4 | Plasma chamber temperature status | XRP1_7 |
| 3_2 | Plasma chamber water flow status | XRP1_8 |
| 4_4 | FC Temperature status | XRP1_9 |
| 4_2 | FC water flow status | XRP1_10 |
| 5_4 | Extraction Temperature status | XRP1_11 |
| 5_2 | Extraction water  Flow status | XRP1_12 |
| 6_4 | DC-Breaker Temperature status | XRP1_13 |
| 6_2 | DC-Breaker water  Flow status | XRP1_14 |
| 7_4 | RF Interlock amplifier (dry contact) | XRP1_15 |
| 7_2 | RF Interlock amplifier (dry contact) | XRP1_16 |
| 8_4 | Solenoid Temperature status | XRP1_17 |
| 8_2 | Solenoid water  Flow status | XRP1_18 |
| | *BOX N°2* | |
| 1_4 | Pressure controller 1 | XRP2_3 |
| 1_2 | Pressure controller 2 | XRP2_4 |
| 2_4 | Pressure controller 3 | XRP2_5 |
| 2_2 | Pressure controller 4 | XRP2_6 |
| 3_4 | Pressure controller 5 | XRP2_7 |
| 3_2 | Pressure controller 6 | XRP2_8 |

| | | |
|---|---|---|
| 4_4 | Diaphram | XRP2_9 |
| 4_2 | Solenoid chamber | XRP2_10 |
| 5_4 | Light column red | XRP2_11 |
| 5_2 | Light column orange | XRP2_12 |
| 6_4 | Light column green | XRP2_13 |
| 6_2 | SAFETY ACCESS A | XRP2_14 |
| 7_4 | SAFETY ACCESS 13 | XRP2_15 |
| 7_2 | SAFETY ACCESS 14 | XRP2_16 |
| 8_4 | Spare | XRP2_15 |
| 8_2 | Spare | XRP2_16 |

### *9.10. HV CABLE*

Refer to 5.1

## 10. PREVENTIVE MAINTENANCE

The air intake filter from the grounding system and HV side of the cabinet is the only element that requires periodic service.
The frequency of the service depends on the environment where the cabinet is installed and is in fact determined by inspection.
If dust is accumulated, the filter has to be washed with soap and water and can be dry with compressed air.
In case of the filter has to be cleaned, the inside of the cabinet has to be inspected and cleaned accordingly.

## 11. TROUBLE SHOOTING

This section is to help the operator to troubleshoot problems that could occur while operating the C&C cabinet.
In case of the problem is not from your competences, it is also possible to contact Pantechnik and ask for technical support. We will do our possible to provide you technical assistance.
Tel: +33.2.31.51.27.60
Fax: +33.2.31.21.96.33
contact@pantechnik.com
www.pantechnik.com

## 12. ELECTRICAL DRAWINGS

Please refer to 5E_C&V_V04 documentation