

# Annexure 1

## High voltage power supplies (HVPS) Ratings and Quantity

Item No.	High voltage power supply			Polarity with respect to chassis Ground	Qty. (No.)
	Voltage rating	Current rating	Maximum output power		
1	0 to $\geq 40$ kV DC adjustable, (Maximum 65kV is acceptable)	0 to $\geq 30$ mA DC adjustable, (Maximum 40mA is acceptable)	2600W	Negative(-)	1
2	0 to $\geq 30$ kV DC adjustable, (Maximum 35kV is Acceptable)	0 to $\geq 40$ mA DC adjustable, (Maximum 45mA is acceptable)	1575W	Negative(-)	1
3	0 to $\geq 10$ kV DC adjustable, (Maximum 12.5kV is acceptable)	0 to $\geq 300$ mA DC adjustable, (Maximum 400mA is acceptable)	5000W	Positive (+)	1

### Common Specifications of power supplies (Item No. 1 to 2)

- 1) **Input Voltage:** 220V AC  $\pm$  10%, 1-phase, 50 Hz **OR** 415V AC  $\pm$  10%, 3-phase, 50 Hz.
- 2) **Features:** CV/CC mode of operation.
- 3) **Protections:**
  - (i) Over-voltage, over-current, over-temperature etc. and at least one potential free contact for external interlock.
  - (ii) Power supply shall have an arc intervention/ protection feature to prevent power supply damage from continuous long term arcing.
- 4) **Local Front Panel Controls:** Voltage and current setting are continuously adjustable by ten-turn potentiometers with lockable counting dials /key-pad/ LCD touch screen. Power ON/OFF circuit breaker with indication and High voltage ON/OFF switch with indication.
- 5) **Status Indicators on front panel:** Voltage and Current Control Mode, Interlocks, over- current, over-voltage and over-temperature.
- 6) **Voltage Regulation:**  
Load and line regulation:  $\leq 0.01$  % of rated voltage.
- 7) **Current Regulation:**  
Load and Line regulation:  $\leq 0.01$ % of rated current.

- 8) **Ripple:**  $\leq 0.2\%$  p-p of output voltage.
- 9) **Efficiency:**  $\geq 85\%$  at full load.
- 10) **Environmental Condition:**
  - a) Operating temperature range: 0 to 40°C minimum.
  - b) Humidity: 10 to 90% relative humidity, non-condensing.
- 11) **Stability:**  $\leq 100$  ppm, after 1/2 hour warm-up for both voltage and current.
- 12) **Metering:** Front panel voltage and current meters, equivalent to 3 and 1/2 digit or better, accuracy up to minimum one place after decimal.
- 13) **High Voltage Output Cable:** Minimum 3 meter length, shielded high voltage cable, removable type from rear panel with each power supplies units.
- 14) **Dimensions:** 19 Inch Rack Mountable, Height 4U maximum.
- 15) **Remote control Interface:** RS-232 and ETHERNET (Documentation for detailed communication protocol to be supplied during delivery along with the each power supplies).
- 16) **Cooling:** Air cooled.
- 17) **Warranty:** Minimum one year from date of acceptance.

### **Specifications of power supply (Item No.3)**

- 1) **Input Voltage:** 415V AC  $\pm 10\%$ , 3-phase, 50 Hz.
- 2) **Features:** CV/CC mode of control.
- 3) **Protections:**
  - (i) Over-voltage, over-current, over-temperature etc. and at least one potential free contact for external interlock.
  - (ii) Power supply shall have an arc intervention/ protection feature to prevent power supply damage from continuous long term arcing.
- 4) **Local Front Panel Controls:** Voltage and current setting are continuously adjustable by ten-turn potentiometers with lockable counting dials /key-pad/ LCD touch screen. Power ON/OFF circuit breaker with indication and High voltage ON/OFF switch with indication.
- 5) **Status Indicators on front panel:** Voltage and Current Control Mode, Interlock, over-current, over-voltage and over-temperature.
- 6) **Voltage Regulation:** Load & Line regulation  $\leq 0.05\%$  of rated voltage.
- 7) **Current Regulation:** Load & Line regulation  $\leq 0.05\%$  of rated current.
- 8) **Ripple:**  $\leq 0.2\%$  p-p of output voltage.
- 9) **Efficiency:**  $\geq 85\%$  at full load.
- 10) **Environmental condition:**

- a) Operating temperature range: 0 to 40°C minimum.
  - b) Humidity: 10% to 90% relative humidity, non-condensing.
- 11) **Stability:**  $\leq 200$  ppm, after 1/2 hour warm-up for both voltage and current.
  - 12) **Metering:** Front panel voltage and current meters, equivalent to 3 and 1/2 digit or better, accuracy up to minimum one place after decimal.
  - 13) **High voltage output cable:** Minimum 3 meter length, shielded high voltage cable, removable from rear panel with the power supply unit.
  - 14) **Dimensions:** 19 Inch Rack Mountable, Height 6U maximum.
  - 15) **Remote control Interface:** RS-232 and ETHERNET. (Documentation for detailed communication protocol to be supplied during delivery along with the power supply).
  - 16) **Cooling:** Air cooled.
  - 17) **Warranty:** Minimum one year from date of acceptance.

### **Important Terms & Conditions:**

- a) For proper inventory management and uniform control architecture, all the power supplies may be procured from same make and single vendor **on overall lowest basis**.
- b) The quotation should include a compliance sheet for each of the power supplies showing the comparison of the tender specifications and offered specifications, clearly mentioning the make and model number of the quoted power supply. Datasheet should also be provided along with the offer.
- c) Conformity in respect of EMC/EMI and high voltage safety should be mentioned.
- d) Vendor should send the list of users from any Government Organizations/ Research laboratories/ Academic Institutions in India where similar type of high voltage DC power supplies were supplied.
- e) The manufacturer should **agree to supply** well documented operation and service manual (written in English) along with the detailed circuit diagrams, troubleshooting; programming etc (soft copy in pdf. format preferably along with hard copy).

### **Acceptance criteria:**

- a) Factory test reports (Output voltage, Output Current, Output ripple, load and line regulations, stability and efficiency) in respect of all the power supplies must be provided for approval before dispatch to VECC Stores.
- b) Certificate of Conformity (COC) from OEM must be supplied along with the power supplies at the time of delivery.
- c) The manufacturer should supply well documented operation and service manual (written in English) along with the detailed circuit diagrams, troubleshooting, programming, protocol for remote operation etc. (soft copy in pdf. format preferably along with hard copy) along with the power supplies.
- d) Front panel control and protection features, CC and CV mode operation in respect of rated output voltage and current of the power supplies, will be checked with dummy / actual load at VECC by VECC Engineers.

## COMPLIANCE STATEMENT TO BE FILLED BY BIDDER

### High Voltage Power Supply (Item No. 1 to 2) as per below specification:

SN	Item	Tender Specification	Offered Specifications
1	<b>Power supply Item No. 1</b>	Output voltage : 0 to $\geq 40$ kV DC adjustable, (Maximum 65kV is acceptable)	
		Output current; 0 to $\geq 30$ mA DC adjustable, (Maximum 40mA is acceptable)	
		Polarity: Negative(-)	
		Make /Model number	
2	<b>Power supply Item No. 2</b>	Output voltage : 0 to $\geq 30$ kV DC adjustable, (Maximum 35kV is Acceptable)	
		Output current: 0 to $\geq 40$ mA DC adjustable, (Maximum 45mA is acceptable)	
		Polarity: Negative(-)	
		Make /Model number	
		Polarity: Positive (+)	
		Make /Model number	
3	<b>Input</b>	220V AC $\pm$ 10%, 1-phase, 50 Hz <b>OR</b> 415V AC $\pm$ 10%, 3-phase, 50 Hz	
4	<b>Features</b>	CV/CC mode of operation.	
5	<b>Protection</b>	(i) Over voltage, over-current, over-temperature etc. and at least one potential free contact for external interlock. (ii) Power supply shall have an arc intervention/ protection feature to prevent power supply damage from continuous long term arcing.	
6	<b>Local Front Panel Controls</b>	Voltage and current setting are continuously adjustable by ten-turn potentiometers with lockable counting dials /key- pad/ LCD touch screen. Power ON/OFF circuit breaker with indication and High voltage ON/OFF switch with indication.	
7	<b>Status Indicators on front panel</b>	Voltage and Current Control Mode, Interlocks, over-current, over-voltage, Arcing and over-temperature.	
8	<b>Voltage Regulation</b>	Load and line regulation: $\leq 0.01$ % of rated voltage.	
9	<b>Current Regulation</b>	Load and Line regulation: $\leq 0.01$ % of rated current.	
10	<b>Ripple</b>	$\leq 0.2$ % p-p of output voltage.	
11	<b>Efficiency</b>	$\geq 85$ % at full load.	
12	<b>Environmental</b>	a) Operating temperature range: 0 to 40°C minimum. b) Humidity: 10 to 90% relative humidity, non-condensing..	
13	<b>Stability</b>	$\leq 100$ ppm, after 1/2 hour warm-up for both voltage and current.	
14	<b>Metering</b>	Front panel voltage and current meters, equivalent to 3 and 1/2 digit or better, accuracy up to minimum one place after decimal.	
15	<b>HV Output Cable</b>	Minimum 3 meter length, shielded high voltage cable, removable type from rear panel with each power supplies units.	
16	<b>Dimensions</b>	19 Inch Rack Mountable, Height 4U maximum.	
17	<b>Remote control Interface</b>	RS-232 and ETHERNET (Documentation for detailed communication protocol to be supplied along with the each power supplies).	
18	<b>Cooling</b>	Air cooled.	
19	<b>Warranty</b>	Minimum one year from date of acceptance.	
20	<b>Operation service and programming manual</b>	The manufacturer should agree to supply well documented operation and service manual (written in English) along with the detailed circuit diagrams, troubleshooting; programming protocol etc (soft copy in pdf. format preferably along with hard copy).	

## COMPLIANCE STATEMENT TO BE FILLED BY BIDDER

### High Voltage Power Supply (Item No.3) as per below specification:

SN	Item	Tender Specification	Offered Specifications
1	Power supply Item No. 3	Output voltage : 0 to $\geq 10$ kV DC adjustable, (Maximum 12.5kV is acceptable)	
		Output current: 0 to $\geq 300$ mA DC adjustable, (Maximum 400mA is acceptable)	
		Polarity: Positive (+)	
		Make/Model number	
2	Input	415V AC $\pm$ 10%, 3-phase, 50 Hz.	
3	Features	CV/CC mode of operation.	
4	Protection	(i) Over-voltage, over-current, over- temperature etc. and at least one potential free contact for external interlock. (ii) Power supply shall have an arc intervention/ protection feature to prevent power supply damage from continuous long term arcing.	
5	Local Front Panel Controls	Voltage and current setting are continuously adjustable by ten-turn potentiometers with lockable counting dials /key- pad/ LCD touch screen. Power ON/OFF circuit breaker with indication and High voltage ON/OFF switch with indication.	
6	Status Indicators on front panel	Voltage and Current Control Mode, Interlocks, Over current, Overvoltage, Arcing and Over temperature.	
7	Voltage Regulation	Load & Line regulation $\leq 0.05\%$ of rated voltage.	
8	Current Regulation	Load & Line regulation $\leq 0.05\%$ of rated current.	
9	Ripple	$\leq 0.2\%$ p-p of output voltage.	
10	Efficiency	$\geq 85\%$ at full load.	
11	Environmental	a) Operating temperature range: 0 to 40°C minimum. b) Humidity: 10% to 90% relative humidity, non-condensing.	
12	Stability	$\leq 200$ ppm, after 1/2 hour warm-up for both voltage and current.	
13	Metering	Front panel voltage and current meters, equivalent to 3 and 1/2 digit or better, accuracy up to minimum one place after decimal.	
14	HV Output Cable	Minimum 3 meter length, shielded high voltage cable, removable type from rear panel with the power supply unit.	
15	Dimensions:	19 Inch Rack Mountable, Height 6U maximum.	
16	Remote control Interface	RS-232 and ETHERNET (Documentation for detailed communication protocol to be supplied along with the power supply).	
17	Cooling	Air cooled.	
18	Warranty	Minimum one year from date of acceptance	
19	Operation service and programming manual	The manufacturer should agree to supply well documented operation and service manual (written in English) along with the detailed circuit diagrams, troubleshooting; programming protocol etc (soft copy in pdf. format preferably along with hard copy).	