

REQUEST FOR QUOTATION

	BHARAT HEAVY ELECTRICALS LIMITED Electronics Division PB No. 2606, Mysore Road Bangalore - 560026 INDIA	RFQ NUMBER: VMK0000020 RFQ DATE : 11.05.2018	Due Date/Day: 06.06.2018 WED Time : 13:00 HRS Tender Box : Reception Area Opening Venue: NEW ENGG. BLDG
MMI:PU:RF:003			
(address for communication) :		(for all correspondence) Purchase Executive : V M Kalyani Phone : 080 25146167 Fax : E-mail: kalyani@bheledn.co.in	

1. Please drop your offer before due date & time in the tender at the reception of BHEL-ESD, Electronic city, Bangalore.
2. Offers by e-mail are also accepted. The offers by Email shall be sent to Email ID "defnesdmm@bhel.in"
3. Items to be delivered to:
 PLOT NO 98,
 ELEGTRONIC CITY PHASE 1,
 HOSUR ROAD,
 BANGALORE-560100,
 KARNATAKA
4. Overall L1 is taken for evaluation purpose.
5. Following documents are attached along with RFQ:
 - " RFQ Special instructions
 - " Commercial clarifications sheet
 - " Pre-Qualification criteria (PQ-460-003)
 - " Purchase specification (PS-460-0156)

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	DS0830005335 DC/DC 5KW MIL Grade Power Supply * HSN/SAC : 9032 Test Certificate DC/DC 5KW MIL Grade Power Supply as per Purchase Specification Document no: PS-460-0156	3	NO	3	18.07.2018
2	DS0830005343 AC/DC 5KW MIL Grade Power Supply * HSN/SAC : 9032 Test Certificate AC/DC 5KW MIL Grade Power Supply as per Purchase Specification Document no: PS-460-0156	3	NO	3	18.07.2018

Total Number of Items - 2

- 1.
- 2.

TWO PART BID - SUBMIT TECHNICAL AND PRICE BID IN SEPARATE SEALED COVERS

NOTES :

- 1.This RFQ is Governed by :
 - a)INSTRUCTIONS TO BIDDERS/SELLERS(Doc No :BHEL:EDN:ITB-SHOP) available at **www.bheledn.com (RFQ-PO Terms & Conditions)**
 - b)GENERAL CONDITIONS OF CONTRACT FOR PURCHASE(Doc no :BHEL:EDN:GCC-SHOP) available at **www.bheledn.com (RFQ-PO Terms & Conditions)**
 - c)Any other specific Terms and Conditions mentioned.
 2. Bidders / Representatives who would like to be present during opening of offers are required to furnish authorization letter for the same .
- * The HSN/SAC no mentioned against the line items in the RFQ are indicative only.

For and On behalf of BHEL.

V M Kalyani
 Contrl Eqpmnt - ESD

1 OF 1

RFQ - VMK00000020 - SPECIAL INSTRUCTIONS:

1. Separate offer in English language addressed to the Purchase Executive shall be made for this RFQ in three parts.
Three Part Bid : Offer shall be made in three parts as detailed below:
"Pre-Qualification Bid (Part I Bid)" : Documents related to PQC to be placed in a sealed cover super scribed with RFQ No., Due Date and "Pre-qualification Bid (Part I Bid)".
"Techno-commercial Bid (Part II Bid)" : Techno-commercial Bid to be placed in a separate envelope super scribed with RFQ No., Due Date and "Techno-commercial Bid (Part II Bid)". This bid should contain all commercial terms i.e. delivery terms, payment terms, applicable taxes/duties etc.
"Price Bid (Part III Bid)" : Price of the offered item to be placed in a separate sealed envelope super scribed with RFQ No & Due Date.
All the three sealed envelopes shall be placed in another sealed envelope super scribed with RFQ No & Due Date.
Pre-qualification bid will be opened on due date. Techno-commercial bid (part II) will be opened for the vendors who are qualified in the pre-qualification bid.
2. Offers by e-mail are also accepted. Offers by email should contain separate files for Part-I, Part-II and Part-III. The offers by Email shall be sent to Email ID defnesdmm@bhel.in specified in the RFQ with the subject VMK00000020_06.06.2018_Wednesday_5 kW Power supply
3. Reference Documents: PQ-460-004 Rev00, PS-460-003 Rev00, PS-460-161, PS-460-0156 Rev 00 is to be completely read, understood and should be acceptable to bidder.
4. Terms & Conditions shall be as per Doc Ref Doc no: BHEL: EDN: GCC - SHOP: Rev00, Instructions to bidders as per Doc no: BHEL: EDN: ITB - SHOP: Rev02, and Annexures. The same can be downloaded from the website provided in the RFQ.
5. Price basis shall be firm; Price Variation Clause is NOT acceptable.
6. Tender opening Time is 01:30 PM on the tender due date, Place: Tender opening room @ BHEL-ESD, Electronic city, Bangalore.
7. Please drop your offer before due date & time in the tender box named "Wednesday" kept at the reception of BHEL-ESD, Electronic city, Bangalore.
8. Items should be delivered to

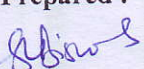
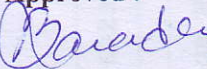
BHEL-ESD,
PLOT NO 98,
ELEGTRONIC CITY PHASE 1,
HOSUR ROAD,
BANGALORE-560100,
KARNATAKA.
9. Items to be delivered within 15 Weeks from the date of Purchase order
10. Warranty shall be as per purchase specification PS-460-0156 Rev00
11. Pre-Shipment inspection (PSI) to be done at vendor's premises. One week advance intimation to be given to BHEL for PSI.
12. Clause wise compliance to BHEL Purchase specifications to be provided.

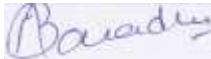
NOTE:

1. Please fill commercial terms sheet along with your offer.
2. Items shall be evaluated based on overall L1.

Commercial Terms Discussion For VMK0000020 (5 kW Power supply for Naval applications)

Sl. No.	BHEL Terms	Complied (Yes/No)	Remarks
1	Payment Terms (100% within 45 days after receipt and acceptance of material)		
2	Penalty (0.5% per week on the basic value of the undelivered quantity max upto 10%)		
4	Delivery time 15 weeks from the date of Purchase order		
5	Price Firm (PVC not acceptable- Prices should be firm till execution of order)		
6	Packing And Forwarding By Supplier		
7	Free Door Delivery at BHEL ESD		
8	Offer Validity (90 days from the tender opening)		
9	Taxes & duties to be mentioned in offer		
10	Warranty 36 months from the date of supply as per Cl. 12 of PS-460-0156		
11	Pre-Shipment inspection (PSI) Pre-shipment inspection shall be done at Vendor works. 1 week advance intimation to be provided by the vendor.		
12	Documents to be submitted along with the offer Cl. 11 (a) as per PS-460-0156 (Pg 12 of 14)		
13	Documents to be submitted along with the equipment Cl. 11 (b) as per PS-460-0156 (Pg 12 of 14)		
14	Clause wise compliance to BHEL Specifications Purchase specification - PS-460-0162		
15	Applicable taxes GST % HSN code of all materials		

		PRE QUALIFICATION CRITERIA DEFENCE ENGINEERING		PQ-460-003 Rev No. 00 Page 01 of 01		
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company. PQC for 5KW Power Supplies 1. Pre-qualification criteria (PQC): 1.1 The Bidder shall be an Original Equipment Manufacturer (OEM) or an authorized dealer representing an OEM and the OEM shall have capabilities with respect to manufacturing and routine testing facilities for MIL Grade power supplies preferably with similar or higher rating. 1.2 The purchase specification document PS-460-0156 Rev00, is to be completely read, understood and should be acceptable to bidder. Compliance to same shall be provided 1.3 The bidder must have supplied similar MIL GRADE power supplies for defence applications complying to MIL-STD-461E/F preferably with similar or higher rating. 1.4 The bidder should furnish Overall General Arrangement (OGA) Drawings for verifying limiting dimensions of power supplies. 1.5 The average annual financial turnover of the bidder in the preceding three financial years as on March 31st 2017 shall be at least INR 5 crores. In case of dealer, OEM's turnover to be considered for pre-qualification criteria. 2. Document submission : 2.1 The bidder shall submit supporting documents to comply with Sl. No 1.1 regarding manufacturing and routine testing capabilities of said power supplies. If necessary, BHEL may visit the works. 2.2 Compliance to PS-460-0156 Rev 00 purchase specification at Sl. No 1.2 shall be provided. 2.3 Document to support the supply in compliance to Sl. No 1.3 to be provided. 2.4 OGA shall be furnished to verify that limiting dimensions will be met as mentioned in Sl. No 1.4. 2.5 Self-certified document in respect of financial turnover in compliance of Sl. No 1.5 above. Offers without above necessary documents shall be liable for rejection.						
Ref. Doc	Revisions : 0 Refer to record of revisions :			Prepared :  G.L. Biswas	Approved :  P Baradhi	Date: 27-12-2017

			PURCHASE SPECIFICATION		PS-460-0156	
					Rev 00	
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COPY RIGHT AND CONFIDENTIAL THIS INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY		PURCHASE SPECIFICATION OF MIL Grade AC/DC & DC/DC Power Supply for NAVAL Applications				
		REVISION 00		APPROVED		
						
				PREPARED	ISSUED	DATE
						20-12-17



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REVISION HISTORY SHEET FOR PURCHASE SPECIFICATION

REV NO	DATE	NATURE OF CHANGE	REASON FOR CHANGE	PREPARED BY	APPROVED BY
00	20/12/2017	First Issue	--	GLB	PB

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AUTHOR'S ABSTRACT:

The purpose of this document is to define the features, functionalities and requirements of the MIL Grade AC/DC & DC/DC Power Supply to be supplied to BHEL.

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1. INTENT OF SPECIFICATION

- 1.1 This specification covers the features, functionalities and requirements of the MIL Grade AC/DC & DC/DC Power Supply, to be supplied for Naval underwater application.
- 1.2 It is not the intent to specify completely herein all the details of design and construction of equipment. However, the equipment shall be complete in all respects conforming to high standards of components which may not have been specifically mentioned, but are essential for satisfactory and trouble free operation/maintenance of the equipment.
- 1.3 The supplier while quoting shall go through the specifications in detail and all the attachments thereof and furnish all documentation as indicated elsewhere in the specification. Deviations from specifications, if any, should be clearly specified. Compliance shall be assumed if not mentioned otherwise.

2. GENERAL TERMS

- 2.1 The supplier must clearly quote for unit price as well as lot price for deliverables including accessories and cables for indisputable calculations of lot prices in case of revised quantities later.
- 2.2 Any deviations with respect to the above specification should be brought out in the offer otherwise offer may be rejected.
- 2.3 Offer shall be submitted in two parts: Part A: Techno-commercial Bid(without pricing) : Unpriced bid to be enclosed in the technical bid. Part B: Price bid

3. SCOPE OF SUPPLY

- 3.1 The scope of supply per panel i.e one set will include the following deliverables:
 - a) MIL Grade AC/DC 5.0KW, 220 VDC O/P Power Sup. (DS0830005343) – 2 Nos
 - b) MIL Grade DC/DC 5.0KW, 220 VDC O/P Power Sup. (DS0830005335) – 2 Nos
 - c) DS0830005343 – 1 No (Spare) & DS0830005335 – 1 No (Spare)

The items has to be of reputed make meeting all the MIL grade requirements as specified in this document. Supplier to provide mating connectors and the length of the cables will be finalized during the detail design.

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4. EXCLUSIONS

--- Nil -----

5. FREE SUPPLY OF ITEMS BY BHEL

--- Nil -----

6. APPLICABLE TEST & CERTIFICATIONS

The MIL Grade Power Supplies to be supplied shall meet the applicable standards & test conditions indicated below. Bidder to furnish the Certificates along with the Technical Offer for below listed standards & tests.

i. Temperature: Operating : 0 - 55 Deg C , Storage 0 – 60 Deg C as per JSS 55555:2000 or equivalent MIL Standard.

ii. Humidity:

Relative Humidity: 98% for temperature range 0 to 40degC

Period: Continuous Condensing as per JSS 55555:2000 or equivalent MIL Standard.

iii. Vibration Resistance: The equipment should be able to withstand vibration levels as specified below,

a. 01Hz to 05Hz – Acceleration of 0.1g

b. 05Hz to 50Hz – Acceleration of 2.0g

iv. Vibration Levels: The equipment should withstand vibration levels in 1/3 Octave band frequency range from 25Hz to 8 KHz with a reference to 1×10^{-5} m/sec² and the maximum vibration levels shall not exceed the straight line joining the values as specified : -

a. At 5 Hz -- 48 dB

b. At 8 KHz -- 80 dB

Equipment to be in ON condition during the test.

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v. Shock: Shock requirements to be met by the power supply is given below,

1. In X Direction, 30g, 37msec full sinewave.
2. In Y Direction, 30g, 37msec full sinewave.
3. In Z Direction, 30g, 37msec full sinewave.

vi. EMI/EMC: MIL-STD-461E as per the tests given below,

S.No	Requirement	Type of test	Description	Frequency range
(1)	CE-101	Cond. Emissions	Power Leads	25 Hz – 10 KHz
(2)	CE-102	Cond. Emissions	Power Leads	10 KHz – 10 MHz
(3)	CS-101	Cond. Susceptability	Power Leads	25 Hz – 150 KHz
(4)	CS-114	Cond. Susceptability	Bulk Cable Injection	10 KHz– 200MHz
(5)	CS-115	Cond. Susceptability	Ground - Bulk Cable Injection	Impulse Excitation
(6)	RE101	Rad. Emissions	Magnetic Field (Cables & equipt)	25 Hz – 100 KHz
(7)	RE102	Rad. Emissions	Electric Field	10 KHz – 18 GHz
(8)	RS-101	Rad. Susceptability	AC Magnetic Field	25 Hz – 100 KHz
(9)	RS-103	Rad. Susceptability	Electric Field	2 MHz – 40 GHz
(10)	RS-06	Rad. Susceptability	DC Magnetic Field	1200 A/m

- vii. Acoustic Noise: Average level of sound pressure measured in the test bed in accordance with ISO 3744 on conformed surface at a measuring distance of one meter, in dB (A) with respect to reference threshold level of 2×10^{-5} N/m² should not exceed 60dBA.
- viii. Ingress Protection(IP) Rating: Minimum protection required is IP20 as per IEC-60529.
- ix. Mould growth & Salt corrosion tests: The modules/PCBs are to be conformal coated to avoid any corrosions and supplier to ensure that all the components chosen are of marine grade with ability to sustain in marine environment.



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Note:

1. For all parameters under clause 6, Certificate of Compliance has to be provided by supplier stating proper analysis/justification for the basis of compliance.
2. For clause 6(iii), 6(iv) & 6(v), supplier has to carry out transient structural analysis for the shock & vibration levels as per the requirement given in clause 6 for the proposed power supplies. The reports to be submitted within 3 weeks after the placement of PO.
3. In case of any failure observed during Type testing of Local Control Panel due to power supply and its components, supplier has to support BHEL to resolve the same, free of cost. This includes even any design changes/replacement/modifications for qualifying the type tests as listed in this specification.

7. ENVIRONMENTAL STRESS SCREENING (ESS) TESTS

- a. ESS is the tailored application of electrical and environmental stresses, to electronics parts modules and units to identify and eliminate defective abnormal or marginal parts and manufacturing defects. Production screen is normally conducted on 100% of the manufactured items. The intent of ESS is to simulate infant mortality failures via accelerated aging without causing damage or inducing wear out to the product under development manufacture.
- b. As mentioned, ESS is required to be conducted on electronic components/units/sub-assemblies and as such hardware incorporating purely mechanical system/elements including wire strapped backplanes are exempted. Further electronic unit/sub-assemblies which are susceptible to failure during ESS such as LCD panels, hard disk drives etc. due to their fragile nature or possible deformation due to thermal stresses should not be subjected to ESS. Therefore, due care to be taken by the supplier to determine the list of items which are to be exempted from ESS.
- c. Supplier to provide ESS test certificate or perform the ESS tests as mentioned below in clause (d).
- d. The complete panel shall be tested for ESS at approved ETDC laboratories, equipped with facilities to undertake these tests as given below,



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The ESS tests consists of:-

(aa) Thermal shock:

i.)The minimum & maximum temperature range of the components selected by the supplier to be used as an input to establish the overall range. However the range should be at least more than or equal to the operating temperature as given in this specification. The maximum safe range and the fastest rate of change of temperature provides the best screening.

ii) The minimum rate of change of temperature of 10degC/min is desirable.

iii) A minimum of 10 thermal cycle should be performed in order to eliminate most latent workmanship defects in electronic equipment.

iv) Dwell time at the upper and lower temperature range limits should be long enough to reach thermal stability and time required for performance testing.

(bb) Random Vibration (20 Hz to 2000 Hz)

In random vibration stress screening (RVSS), the UUT is normally vibrated from 20Hz to 2000Hz. It can expose mechanical fatigue or failure, loose solder joints, improper bonding or chip level mechanical flaws. As a starting point for input stimulus i.e a power spectral density of $0.04 \text{ g}^2 / \text{Hz}$ from 20 to 2000Hz with a 3dB/Octave roll-off from 350 to 2000Hz shall be used as reference. A roll-off of 3dB/octave between 20Hz to 80Hz with starting power spectral density of $0.01 \text{ g}^2 / \text{Hz}$ may also be used if the screening facility or the equipment to be screened is not tolerant of low frequency vibration stimulus. The input stimulus shall be either random or quasi-random. If quasi-random stimulus is used, a $\pm 10 \text{ dB}$ tolerance shall be maintained. Other random stimuli shall maintain a $\pm 3 \text{ dB}$ tolerance. The test is to be subjected to all the three axis and time duration should be minimum of 10 minutes in each axis. The performance monitoring is needed when done at module/system level and the same is not required if test is done at PCB level.

8. Power Supply Functional Requirements

1. AC/DC 5.0KW, 220 VDC O/P Power Supply – A :
 - a. Rated continuous output : 5.0KW @ 220 VDC
 - b. Input to power supply : 430 VAC, 3 Phase, 3 Wire, 50Hz

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- c. Input Variation : 270 to 451 VAC. Power supply should switch off when voltage goes below 270V and above 451 V.
- d. Output Voltage : 220V DC (Adjustable from 200V to 240V)
- e. Input/Output Isolation to be provided
- f. Limiting Dimensions & Size requirements : Two power supply will be put adjacent to each other inside the panel. The overall dimension of one power supply should not exceed 250 mm (Length) by 650mm (width) by 150mm (height) as shown in below figure. The power supplies shall be panel mounted inside the system panel

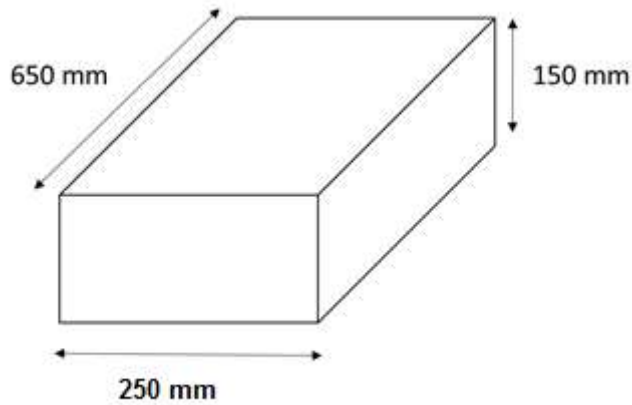


Figure 1: AC/DC Power Supply Limiting Dimensions

2. DC/DC 5.0KW, 220 VDC O/P Power Supply - B :

- a. Rated continuous output : 5.0KW @ 220 VDC
- b. Input to power supply : 175 to 320 VDC.
- c. Input Variation : Power supply should switch off when the input voltage goes below 175V and above 320 V.
- d. Output Voltage : 220V DC (Adjustable from 200V to 240V)
- e. Input/Output Isolation to be provided
- f. Limiting Dimensions & Size requirements : Two power supply will be put adjacent to each other inside the panel. The overall dimension of one power supply should not exceed 250 mm (Length) by 650mm (width) by 150mm (height) as shown in below figure. The power supplies shall be panel mounted inside the system panel.

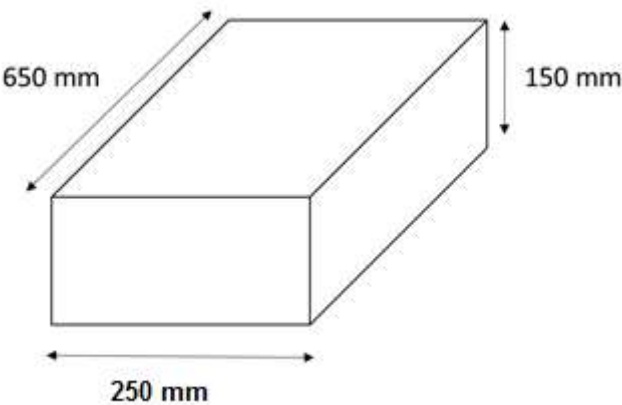


Figure 2: DC/DC Power Supply Limiting Dimensions

3. Arrangement of Power Supplies in redundant configurations:

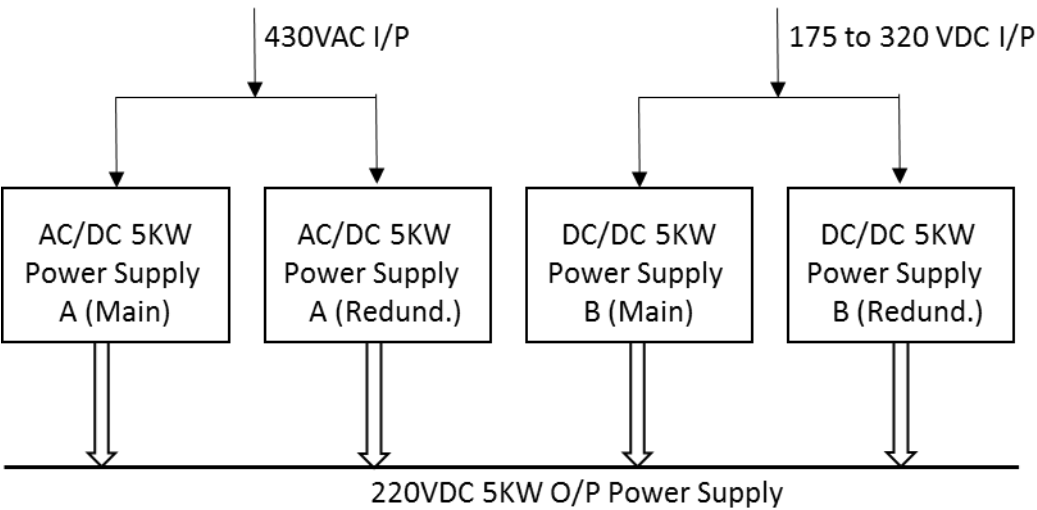


Figure 3: Arrangement of Power Supplies in Redundant Configuration

9. Power Supply General Requirements

1. Parallel/Redundant Operation:

- a. Power supply – A and Power Supply – B as mentioned in clause 8.1 & 8.2 will be connected in parallel with two numbers each of A & B as shown in figure 3. Although system is designed so that single unit will be able to cater load requirement, four power supplies i.e two numbers each of A & B will be connected in parallel for redundancy. Provision should be there for active current sharing including decoupling diode. Also there may be instances where one of the power supply may not have input power, in that case the redundant power supply operation should not get affected (up to rated load only) and load voltage should

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remain unaffected. Similarly failure of one of the power supply should not affect the redundant power supply (upto rated load only) and load voltage should remain unaffected.

2. Protections :

Power Supply shall have the following protections given below,

- a. Overload protection
- b. Over voltage protection
- c. Short circuit protection

3. Cooling :

- a. Cooling shall be by natural convection. Fans can be avoided. Heat sink, if any, will be part of power supply module. No external heat sink shall be mounted.
- b. No derating should be there upto +55 degree Celsius.

4. Contacts/Indications :

- a. Suitable indications for Input OK, Fault/trip (Overload, Overvoltage etc), DC output ok shall be provided.
- b. Potential free contact for DC output OK shall be provided.

5. Design/Constructions :

Product should be of MIL grade, compact, robust design, suitable for naval applications.

6. Output Ripple :

Expected value less than 1% and noise should be minimal. Actual values to be provided with the offer.

7. Regulation :

- a. Line Regulation(+/- 10%) : Less than 0.5%.
 - b. Load Regulation (10-90%) : Less than 0.5%.
- Actual values to be provided with the offer.

8. Efficiency :

The efficiency of the power supply shall be greater than 80%.



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10. Reliability & Availability

Each component and system offered by the Bidder shall be of established reliability. The minimum target reliability of each piece of equipment like each electronic module/card, Power supply, peripherals, etc. shall be established by the Bidder, considering its failure rate / mean time between failures (MTBF). MTBF should be greater 50,000 Hrs (Minimum).

The bidder shall furnish their MTBF conformance in the technical offer for proposed Power Supplies.

In order to ensure the target reliability, the Bidder shall ensure selection of proper materials, control manufacturing process, use quality controlled components and parts, take adequate design margins & derating of electronic components and parts and carry out necessary tests, etc

The equipment shall employ latest state of the art technology to guard against obsolescence. In case, it is felt by the Bidder that certain equipment/component is likely to become obsolete the bidder shall clearly bring out the same in his offer and indicate steps proposed to deal with such obsolescence.

11. SUPPLIER DOCUMENTATIONS

a. Documents to be submitted along with Offer

1. Technical data sheet.
2. Technical literature / catalog /Datasheets of each component.
3. Efficiency Losses, Power consumption & Dimension/weight details to be furnished.
4. Compliance with justification as given in clause 6.
5. Single point contact detail to be furnished for after sales service support under Warranty.
6. Clause wise compliance/deviations confirmation as given in Annexure A.

NOTE: Offers without Technical datasheet and Duly Filled in Compliance list is liable to be REJECTED.

b. Documents to be given along with the equipment

1. Manuals.
2. Technical Datasheets.
3. Certificate of compliance as given in clause 6.
4. Warranty/Guarantee certificates.
5. ESS Test certificate
6. Country of origin certificate (if applicable).

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c. Test Certificate:

Supplier has to provide routine test certificate for all the items supplied including the tests as mentioned below,

a. General Tests:

1. Dimension & Weight Checks.
2. Functional Test.
3. Insulation Resistance Test (cold and hot)
4. Temperature Rise Test.
5. High Voltage withstand ability Test
6. Self Generated Noise Test

& power supply specific routine tests as given below,

a. Power Supply Routine Tests:

1. Output Ripple
2. Line Regulation
3. Load regulation
4. Holdup time
5. In-rush current
6. Startup time
7. Efficiency
8. Power consumption (No load and Rated load)
9. Parallel/Rundancy Test for power supply –A & power Supply – B in parallel.

12. WARRANTY

The supplier has to provide warranty for the product for a period of 36 months from the date of supply. The warranty includes the repair/replacement of the defective parts/items. The cost of logistics for movement of parts/ items for repair/ replacement to be borne by the supplier

13. Tally Plate

Tally plate to be provided in every equipment with following details:

BHEL P/N:

PSpec No:

Date of Manufacture:

Input/Output Power & voltage Ratings:

Weight:



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Annexure - A

Clause wise compliance/deviation matrix format as given below to be submitted along with technical offer,

S.No	Clause No	Bidder Acceptance/Deviation Remarks
1	1	---
2	2	---
3	3	---
4	4	---
-	-	---
-	-	---
-	-	---

Clause wise compliance matrix is mandatory is mandatory to be submitted along with technical offer otherwise the offer is liable to be rejected.

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