



BHARAT HEAVY ELECTRICALS LIMITED

HEEP HARIDWAR INDIA-PIN 249403

FAX NO: 0091 1334 226462

PHONE NO: 0091 1334 284142

Open Tender No.: D/6580/17/5309D1 DUE ON 17.05.18

The Heavy Electricals Equipment Plant (HEEP) located in Haridwar, India is one of the major manufacturing plants of Bharat Heavy Electricals Ltd. The core business of HEEP includes design and manufacture of large steam and gas turbines, turbo generators, Defense Items and so on.

Sealed tenders with the Tender No. and opening date clearly super scribed on the cover are invited from the manufacturers (registered as well as unregistered) for the supply of the Rotary Converter. Details of items are as per **Annexure Item details**.

The tender documents can be downloaded from our web site www.bhel.com or www.bhelhwr.co.in or www.tenders.gov.in.

After downloading the tender documents from web site, while submitting the tender as detailed in "Instruction to Bidders", intending vendors must remit the requisite **EMD Rs 2,00,000/-** (Rupees Two lacs only) in the form of Cash (as permissible under Income Tax Act) / Pay Order / Demand draft (drawn in favour of 'BHEL HARIDWAR'). Cash is to be deposited in cash section in BHEL Haridwar and receipt of the same is to be enclosed with offer. In case of foreign bidders e-payment may also be accepted as EMD.

If documents (in hard copies) are required from BHEL, then intending vendors must also remit tender fee of Rs. 2,000.00 for indigenous vendors (or equivalent amount in foreign currency for foreign vendors). However, if no hard copy of any tender document is required from BHEL, no Tender Fee is required to be submitted.

Please submit **separate drafts** for EMD and tender fee in an envelope super-scribed with bold letters "EMD & Tender Fee" to be submitted with Part-I.

As per notification reference no. NSIC/HO/GP/15(4)/2013-14 dated 07.07.2013 Micro & Small Enterprises (MSEs) are not required to submit EMD & tender fees.

As per GOI (Ministry of Finance) Office Memorandum dated 28th Feb-2018 it is mandatory from 01-04-2018 to register the Udyog Adhar Memorandum (UAM) of all MSME vendors on Central Public Procurement Portal (CPPP), failing which such MSME bidders shall not be able to avail the benefits available to MSEs as contained in Public Procurement Policy for MSEs Order-2012. All the MSME Vendors are advised to comply the same and confirmation for this should be mentioned in their offer / bids mandatorily.

Following vendor registered with BHEL-HEEP, Haridwar in PMD (Product Material Directory) DF125 are exempted from submission of EMD:

1. Vendor code M40439
2. Vendor code M23131

Amendments/Corrigendum, if any, will be hosted on our web site only. Other terms and conditions will be as per tender documents.

BHEL will forfeit the EMD if, the successful bidder / vendor refuses to honor the order after award of the same on him and / or withdraws his bid and / or unilaterally changes the offer and / or any of its terms & conditions within the validity period.

Tenders will be received in Tender Box kept in Tender Room and should be addressed to:

**THE HEAD OF MATERIAL MANAGEMENT,
Heavy Electrical Equipment Plant,
Bharat Heavy Electricals Limited,
HARIDWAR-249403 (Uttarakhand), INDIA.**

The date for opening of tender shall be 17.05.2018. Tenders will be received up to **1.45 P.M.** on **17.05.2018** and opened on the same day at 2.00 P.M. in the Tender Room. **Please note that tender received after due date & time (1.45 PM on 17.05.2018) will not be REPEAT will not be opened.** BHEL will not be responsible for any type of postal / courier delay.

The total quantity may undergo change at the time of ordering.

Documents submitted with the offer / bid shall be signed and stamped in each page by authorized representative of the bidder.

Any vendor who is under hold (for the item)/ delisted/ banned with BHEL on date of opening of Part – 1 will not be allowed to quote for this tender. In case their offer is received, it may be out rightly rejected.

BIDS shall be opened at 2.00 PM on the due date in the presence of authorized representative of the bidders who may like to be present. The authorized representative should bring authority letter from their parent company (Manufacturer) for the specific tender no. attending the bid opening.

Unregistered vendors may please visit our site **www.bhel.com** for filing up the Supplier Registration Form. Copy of filled Supplier Registration Form may be submitted along with the offer.

IN CASE YOU ARE NOT MAKING AN OFFER AGAINST THIS ENQUIRY, THEN PLEASE ARRANGE TO SEND A LETTER OF REGRET.

KINDLY READ “INSTRUCTIONS TO BIDDERS.” QUOTATION NOT IN ACCORDANCE WITH THE INSTRUCTIONS ARE LIABLE TO BE DISQUALIFIED AND IGNORED.

INSTRUCTIONS TO BIDDERS FOR OPEN TENDER

DEFINITION

Registered Vendors - Are those who are registered with BHEL, Haridwar for Megawatt rating/ Size/ Weight of tendered items in respective material grade or machining of such items.

Un-registered Vendors - Are those who are not registered with BHEL, Haridwar for Megawatt rating/ Size/ Weight of tendered items in respective material grade or machining of such items.

TECHNICAL QUALIFICATION

Annexure-1 (P.Q.R, Pre-Qualifying Requirements/Conditions) is to be submitted with Techno-commercial bid. It is the mandatory requirement. Offer of vendors not meeting these requirements may not be considered.

ESSENTIAL INSTRUCTIONS

* Un-registered vendors may be approved by BHEL, if found suitable, on the basis of data furnished by them in Supplier Registration Form (SRF) for Foreign Vendors or Indigenous Vendors (as applicable).

* BHEL team may visit the vendor (s) works for verification of capability and capacity claimed in tender documents/offer (s).

* The tenders shall be submitted in two parts in separate sub-envelopes clearly super scribing type of bid, tender no., due date and the name of vendor with full contact details.

❖ **Part I –**

- a. **EMD & Tender fee** (tender fee required if hard copy insisted from BHEL)
- b. **Pre Qualification Requirement (Annexure-1)**
- c. **Techno- Commercial Bid** - it should be replica of price bid (copy of price bid without price part).

❖ **Part II – Price Bid.**

All the sub-envelopes (Part-I & Part- II) to be put in a single covering envelope indicating tender no., due date and the name of vendor, e-mail id, with full contact details. Offer should be complete in all respect (i.e. Part-I & Part-II).

REFERENCES:

1. Annexure Item details
2. Annexure-CONV/60KVA/OBS
3. Annexure Specification: RCS/60KVA
4. Annexure GISTC (General Instructions and Standard Terms & Conditions)
5. Annexure-1 (PQRs: Pre-Qualifying Requirements)

Annexure- ITEM DETAILS

Item Description	Quantity	Unit	Lot	Quantity	Lot Date
1 W97053604012 60 KVA,380/440V, 50/60HZ, 3 PHASE,600 RPM ROTARY CONVERTER WITH CONTROL PANEL ALONG WITH ON-BOARD SPARES AND DOCUMENTS AS PER ANNEXURE- CONV/60KVA/OBS SIZE: - DIM.: -	3	NO	1	3	30/09/18
2 W97053604020 AUTOMATIC VOLTAGE REGULATOR FOR CONTROL PANEL OF 60 KVA, 380/ 440V, 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -	6	NO	1	6	30/09/18
3 W97053604039 REVOLVING DIODE DISC COMPLETE WITH DIODES FOR 60KVA,380/440V , 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -	6	NO	1	6	30/09/18
4 W97053604047 DIODES FOR REVOLVING DIODE DISC (ANODE/CATHODE STUD) FOR 60 KVA, 380/440V, 50/60HZ,3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -	42	NO	1	42	30/09/18
5 W97053604055 ROLLER BEARINGS (DE) FOR 60KVA	6	NO	1	6	30/09/18

SL	MATERIAL CODE	QUANTITY	UNIT	LOTNO	LOT DELIVERY QTY SCHEDULE
	,380/ 440V, 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -				
6	W97053604144 ROLLER BEARINGS (NDE) FOR 60KVA , 380/ 440V, 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: -	6	NO	1	6 30/09/18
7	W97053604063 HRC FUSE LINKS OF MOTOR FOR CONTROL PANEL OF 60 KVA, 380/ 440V, 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -	18	NO	1	18 30/09/18
8	W97053604071 HRC FUSE LINKS FOR GENERATOR OF CONTROL PANEL OF 60 KVA, 380/ 440V, 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -	18	NO	1	18 30/09/18
9	W97053604080 INDICATING LAMPS FOR CONTROL PANEL OF 60 KVA,380/ 440V, 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -	30	NO	1	30 30/09/18
10	W97053604098 MAIN CONTACTOR KIT FOR MOTOR OF CONTROL PANEL OF 60 KVA, 380/ 440V, 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -	12	NO	1	12 30/09/18
11	W97053604110	6	NO	1	6 30/09/18

SL	MATERIAL CODE	QUANTITY	UNIT	LOTNO	LOT DELIVERY QTY SCHEDULE
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OVER LOAD RELAY FOR GENERATOR
OF CONTROL PANEL OF 60 KVA,
380/ 440V, 50/60HZ, 3 PHASE
ROTARY CONVERTER SYSTEM
SIZE: -
DIM.: -

12	W97053604187	3	NO	1	3 30/09/18
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OUTPUT SIDE AMMETER APPLICABLE
FOR 60 KVA,380/ 440V, 50/60
HZ, 3 PHASE ROTARY CONVERTER
SYSTEM
SIZE: -

13	W97053604209	6	NO	1	6 30/09/18
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VOLTMETER FUSE FOR 60 KVA,
380/ 440V, 50/60HZ, 3 PHASE
ROTARY CONVERTER SYSTEM
SIZE: -

14	W97053604152	3	NO	1	3 30/09/18
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SOFT STARTER FOR 60 KVA, 380
/440V, 50/60HZ, 3 PHASE ROTARY
CONVERTER SYSTEM
SIZE: -

15	W97053604160	3	NO	1	3 30/09/18
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OUTPUT SIDE VOLTMETER
APPLICABLE FOR 60 KVA,
380/ 440V, 50/60HZ, 3 PHASE
ROTARY CONVERTER SYSTEM

16	W97053604179	3	NO	1	3 30/09/18
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OUTPUT SIDE FREQUENCY METER
APPLICABLE FOR 60 KVA,
380/ 440V, 50/60HZ, 3 PHASE
ROTARY CONVERTER SYSTEM
SIZE: -

17	W97053604195	18	NO	1	18 30/09/18
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CONTROL FUSE FOR 60 KVA,380
/440V, 50/60HZ, 3 PHASE ROTARY
CONVERTER SYSTEM
SIZE: -

SL	MATERIAL CODE	QUANTITY	UNIT	LOTNO	LOT DELIVERY QTY SCHEDULE
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18	W97053604128	6	NO	1	6 30/09/18
PROTECTION RELAY CARD FOR CONTROL PANEL OF 60 KVA, 380/ 440V, 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -					

19	W97053604101	12	NO	1	12 30/09/18
MAIN CONTACTOR KIT FOR GENERATOR OF CONTROL PANEL OF 60 KVA, 380/ 440V, 50/60HZ, 3 PHASE ROTARY CONVERTER SYSTEM SIZE: - DIM.: -					

** IMPORTANT: This enquiry is 2 part tender. Techno-Commercial bid (Part-1) & Price Bids (Part-2) should be submitted in separate envelopes. These two envelopes should be submitted in a common sealed envelope. Techno-Commercial Bid shall contain detailed Technical Specification, Drawings Technical documents, Catalogues, taxes & duties, payment terms, delivery period, Validity of offer, Replica of Price Bid (Copy of price bid without price part) etc. The confirmation to the special terms & conditions must be submitted alongwith Techno-Commercial bid.

Special Instructions:

- VENDOR HAS TO GET THE ROTARY CONVERTERS SYSTEM AND SPARES TESTED , INSPECTED AND CLEARED FROM BHEL / NAVY BEFORE DESPATCH.
- ROTARY CONVERTER SYSTEM AND SPARES IS TO BE DIRECTLY DESPATCHED FROM SUPPLIER TO WED MANKHURD, MUMBAI 400 088.
- ONE SET OF ON-BOARD SPARES AS PER ANNEXURE CONV/60KVA/OBS IS PART OF ITEM NO. 1 AND TO BE SUPPLIED WITH EACH ROTARY CONVERTER.
- OTHER DOCUMENTS TO BE SUPPLIED AS PER ANNEXURE CONV/60KVA/OBS.
- ONE SET OF MANUAL CONTAINING INSTALLATION, MAINTENANCE AND OPERATION INSTRUCTION IN SOFT COPY TO BE PROVIDED WITH EACH ROTARY CONVERTER.
- BIDDER TO QUOTE FOR ITEM 1 GIVING
 - COST OF EQUIPMENT
 - CHARGES FOR ERECTION AND COMMISSIONING .
- PAYMENT TERMS:100% PAYMENT OF ITEMS 2-19 WITH DESPATCH OF ITEMS 2-19 FROM VENDOR WORKS.
80% PAYMENT OF ITEM 1 WITH DESPATCH OF ITEM 1 FROM VENDOR WORKS.
20% PAYMENT OF ITEM 1 AGAINST CERTIFICATE BY BHEL REGARDING COMPLETION OF ERECTION AND COMMISSIONING BY VENDOR.
- ALL ITEMS OF THE ENQUIRY ARE TO BE PROCURED FROM ONE BIDDER TO ENSURE

SL	MATERIAL CODE	QUANTITY	UNIT	LOTNO	LOT DELIVERY QTY SCHEDULE
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COMPATIBILITY. THUS EVALUATION OF OFFER WILL BE DONE WITH ALL ITEMS OF ENQUIRY TAKEN TOGETHER.

9. ITEMS 2 TO 19 (B&D SPARES) OF EACH UNIT ARE TO BE DESPATCHED IN ONE LOT ALONG WITH EACH UNIT.

10. LD @ 0.5% PER WEEK OF DELAY OR PART THEREOF SUBJECT TO

A MAXIMUM OF 10% ON UNEXECUTED PORTION SHALL BE APPLICABLE. IF YOU DO NOT CONFIRM THIS IN YOUR OFFER, THEN IT SHALL BE PRESUMED TO BE ACCEPTABLE.

11.VENDORS TO QUOTE BEST POSSIBLE DELIVERY SCHEDULE. DELIVERY IS NOT SACROSANCT.

12. EARLIER DELIVERY IS ACCEPTABLE.

13. WARRANTY CERTIFICATE REQUIRED FOR 30 MONTHS FROM THE DATE OF DELIVERY.

14. For foreign vendors, custom duty on merit shall be paid by BHEL to statutory authority & later it will be reimbursed at actuals from BHEL customer. Loading on foreign vendors shall be done on account of interest on custom duty for the period held up with customer. Loading period is 5 months & interest rate is Base Rate of SBI + 6% (Per annum). The base rate of SBI shall be considered as applicable on 31st March of preceding year from tender due date.

15. VENDOR TO SUBMIT QUALITY PLAN FOR BHEL APPROVAL.

INSPECTION SHALL BE DONE BY BHEL NOMINATED INSPECTION AGENCY

BVIL IN CASE OF INDIAN VENDORS & BY THIRD PARTY INSPECTION AGENCY

(LRS/TUV/BVIL) IN CASE OF FOREIGN VENDOR.

16. Foreign vendors to either quote third party inspection charges (LRS/BV/TUV) separately in their offer or vendor to mention that third party inspection charges are included in the quoted prices of the offer. If vendor do not quote third party inspection charges or do not mention that third party inspection charges are included in quoted prices, then it shall be presumed that third party inspection charges are included in the quoted prices of the offer. No further clarification shall be asked in this regard after opening of techno-commercial bid part-1.

17. For Indian bidders, Inspection charges would be on BHEL's account. Loading of inspection charges shall be done as per GISTC.

General Instructions:

Please visit our site www.bhelhwr.co.in for General Instructions and Standard Terms & Conditions (GISTC) for Tender Enquiries. All the bidders/vendors must ensure compliance of these GISTC (VERSION: JUNE -2017, REV. 01).

Terms & Conditions printed overleaf of this Standard Tender Enquiry Format is null & void.

GISTC (VERSION: JUNE -2017, REV. 01) can also be referred by login to B2B Portal for Vendors.

As per GOI (Ministry of Finance) Office Memorandum dated 28th Feb-2018 it is mandatory from 01-04-2018 to register the Udyog Adhar Memorandum (UAM) of all MSME vendors on Central Public Procurement Portal (CPPP), failing which such MSME bidders shall not be able to avail the benefits available to MSEs as

SL	MATERIAL CODE	QUANTITY	UNIT	LOTNO	LOT DELIVERY QTY SCHEDULE
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contained in Public Procurement Policy for MSEs Order-2012. All the MSME Vendors are advised to comply the same and confirmation for this should be mentioned in their offer / bids mandatorily.

QUALIFYING CONDITIONS for 60 KVA ROTARY CONVERTER SYSTEM

Sl. no.	PQR Requirement	Vendor Response
1.	Only those manufacturers or authorized dealer/distributor of Original Equipment manufacturers, should quote: i) who have manufactured / supplied: 60 KVA, 440V, 60HZ, 3 PHASE ROTARY CONVERTER WITH CONTROL PANEL. ii) who have supplied 1 or more quantity of same rating or higher in the last 5 years. iii) are capable to manufacture & supply the Converter as per attached specification RCS/60KVA . iv) Can provide Printed Catalogue/Brochure with clear dimensions, pictures and other details of the offered product.	Vendor / Dealer to confirm
	Authorization certificate from Original Equipment Manufacturer to be furnished by the authorized dealer/distributor with the offer.	Dealer to submit
2.	Vendor should have supplied Spares and done Service After Sales for above referred item.	Vendor to confirm
3.	Vendors is required to send the information as per table given below with the offer:	Vendor to inform
a.	Name & address of the customer company / Defence Establishments where these have been supplied.	
b.	Year of supply	
c.	Phone, e-mail address of the customer company / Defence Establishments	
4.	Vendors are required to submit with the offer the proof of supply of same rating or higher to customer company / Defence Establishments. (copy of PO / copy of performance certificate issued by customer company etc.. to be provided.)	Vendor to submit
5.	BHEL reserves the right to verify information submitted by vendor. In case the information is found to be false/ incorrect, the offer shall be rejected. Vendor to accept & confirm.	Vendor to confirm

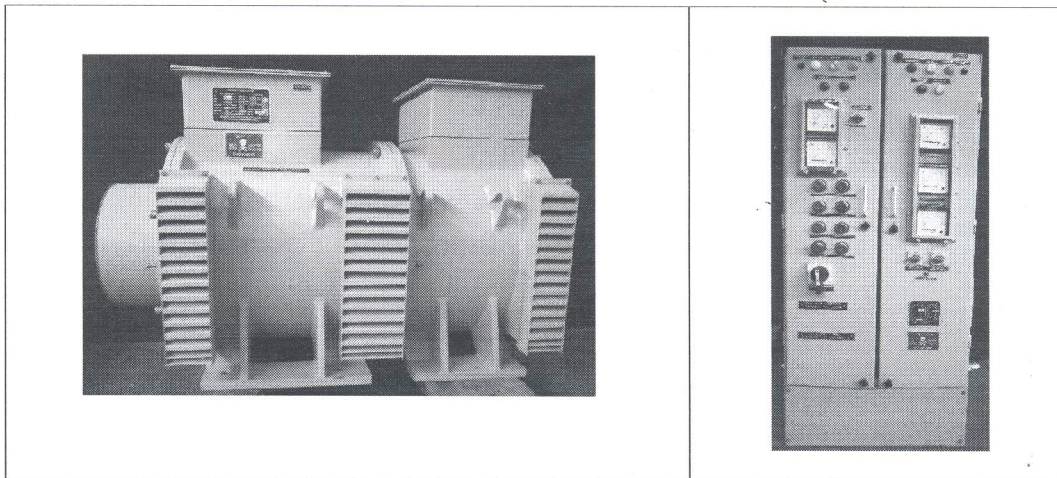

 (DPE)
 (Umesh Dutt)
 AGM (DABG-DPE)

60 KVA, 380V, 50HZ, 3 PHASE ROTARY CONVERTER SYSTEM (RCS)

A. TECHNICAL SPECIFICATION OF 60 KVA, 50 / 60 Hz ROTARY CONVERTER

1. GENERAL DESCRIPTION:

The Rotary Converter is comprised of an Induction Motor of suitable capacity which drives a synchronous brushless generator with a solid-state automatic voltage regulator. The motor and generator are of monoblock construction with a common drive shaft. The generator is designed to give the output specified.



Rotary Converter is rated "Continuous". The insulation is class 'H'. Thermistors are provided in Motor & Generator windings for protection. Anti-condensation heaters are fitted in the Rotary Converter for both Motor and Generator. Cable Glands are fitted on Gland plates of the terminal box of the Rotary Converter.

Control Panel is of sheet steel fabricated construction and incorporates necessary microprocessor based controls, instruments, terminal connectors, and relays for operation and protection of the Rotary Converter. Necessary Indicating meters and lamps are provided on the front side of the Control Panel to indicate the status of input, output and fault conditions. Suitable cable glands are provided on a gland plate at the bottom of the control panel for the entry of incoming and outgoing cables.

Supply to the motor is given through the control panel which houses fuses, soft starter, contactors and relays. Indicating lamps are provided in the control panel to indicate the presence of input to the panel and 'motor on' conditions respectively.

The synchronous brushless AC generator generates the outputs specified. Supply is taken out from the stator of the AC generator through the control panel to load terminals. Meters to

Specification: RCS/60KVA

monitor voltage, current, frequency of the supply are located in the control panel. An overload protection relay is also provided in the panel for over load protection of the generator. Indicating lamps are provided for indicating the presence of generator supply and 'load on' condition respectively.

The rotating field of the brushless Alternator is fed by means of a brushless exciter with a revolving diode disc. Exciter generates necessary AC voltage, which after rectification through revolving diodes is fed to the main generator field (Rotor). Exciter field current is regulated by means of an AVR (Automatic Voltage Regulator), which maintains the terminal voltages of the main generator within limits under all load conditions.

The Automatic Voltage regulator employs static components such as thyristor diodes, transistors, resistances and capacitors. The voltage regulator is also interfaced with a Hand Voltage Adjuster.

The Hand Voltage Adjuster is provided on the front of the panel to set the generator voltage at a desired value. It provides for a +/- 5% variation of the generator terminal voltage as required by the user.

2. GENERAL SPECIFICATIONS:

a) Rating	: 60 KVA Continuous (Output), 0.8 p.f lagging)
b) Type of Motor	: 3 Ph, Induction Motor (600 rpm)
c) Type of Alternator	: 3 Ph, Brushless type with solid-state Automatic Voltage Regulator.
d) Type of Construction	: Mono-block type.
e) Efficiency	: 82% (At rated load)
f) Degree of protection for Converter	: IP-23 (SPDP) or as required by customer.
g) Degree of protection for Control Panel	: IP-55
h) Mounting of Converter	: Horizontal foot mounting
i) Mounting of Control Panel	: Floor and Bulkhead Mounted
j) Class of Insulation	: Class 'H'
k) Cooling	: Fan cooled by shaft mounted fan.
l) Cable Details	: All Electrical cables will be LFH / FRS type certificate of Conformity
m) Cable Entry Gland	: Cable entry glands will conform to DGS/EED/VI/1535/R6 Specification.
n) Shaft Material	: EN – 57 / AISI 431
o) Earthing Terminals	: External earthing terminals of brass or stainless steel will be provided for Converter and Control Panel.

Specification: RCS/60KVA

- p) Lifting Arrangement : Eyebolts will be provided for lifting the equipment.
- q) Tally and Diagram Plates : All tallies and diagram plates will be provided for Converter and Control Panel.
- r) Painting : Conforming to DGS-251.
- s) Shock standard as per NSS-II Shock Curve 'B' as per user requirements.
- t) Converter and Control Panel will be supplied with suitable shock mounts.
- u) Rotary Converter will meet Navy standards (EED-Q-267) / IRS standards, Shock Grade NSS-II and will be Vibration resistant as per JSS-55555 (533 Hz).

3. INPUT AND OUTPUT DETAILS:**3.1. INPUT SUPPLY: 380 V, 50 Hz, 3 Ph, 3 Wire.**

a) Input Supply characteristics:

CHARACTERISTIC	DESCRIPTION	VALUE
Voltage	(i) Normal Voltage	380 V
	(ii) Load range tolerance	
	Line to line	+/-5%
	Constant Load tolerance	1%
	Single phase of 3 Phase system	+/-6%
	(iii) Maximum Unbalance	2%
	(iv) Maximum Modulation	2%
	(v) Transients (Excluding Spikes)	
	Frequent Transients	-10% to +6%
	Recovery time	0.5 Sec
	Infrequent Transients	-16% to +10%
	Recovery time	1 Sec
Wave Form	(i) Maximum Individual Harmonic	3%
	(ii) Maximum Total Harmonic	5%
Frequency	(i) Nominal Frequency	50 Hz
	(ii) Load range Tolerance	+/-2.5 %
	(iii) Constant Load Tolerance	+/-0.5 %
	(iv) Modulation	0.25 %
	(v) Infrequent Transients	+/-3.75%
	(vi) Recovery time	2 Sec

3.2. OUTPUT SUPPLY : 440 V, 60 Hz, 3 Ph, 3/4 Wire.

a) Output Supply characteristics:

Specification: RCS/60KVA

CHARACTERISTIC	DESCRIPTION	VALUE
Voltage	(i) Normal Voltage	440 V
	(ii) Load range tolerance	+/- 2%
	(iii) Maximum Modulation	2%
	(iv) Transients (Excluding Spikes)	+/-10%
	(v) Recovery time	1 Sec
Wave Form	(i) Maximum Individual Harmonic	3%
	(ii) Maximum Total Harmonic	5%
Frequency	(i) Nominal Frequency	60 Hz
	(ii) Load range Tolerance	+/-3 %
	(iii) Constant Load Tolerance	+/-0.5 %
	(iv) Modulation	+/-0.25 %
	(v) Infrequent Transients	+/-6.25%
	(vi) Recovery time	2 Sec

4. REMOTE OPERATION:

A provision for remote START/STOP, status indication and voltage adjustment can be provided in the control panel if required by the customer. Additionally a remote control unit may also be provided, which can be mounted on a remote console as per user requirements.

5. FAULT CAPACITY:

Immediate tripping at generator-end terminal short circuit. Short.circuit current not less than 300% of rated current, maintainable for at least 3 seconds.

6. CONSTRUCTION:

Rotary Converter will be mono-block with a Induction motor as the prime mover. Anti-vibration mounts will be provided.

The Converters and Control Panels will be designed to withstand shock as per Naval Shock Grade 'B' / NSS-II

7. AMBIENT CONDITION:

Ambient Temperature : 0 Deg. C to 55 Deg. C.

Relative Humidity : 30% to 100% @ 40 Deg C

8. PERMISSIBLE TEMPERATURE RISE:

Motor and Generator: 105 Deg. C with Class 'H' insulation.

9. RATED OUTPUT:

- i) The Rotary Converter will be capable of supplying continuously either the rated full load output, or any other specified load cycle output (up to the rated full load output) over the specified steady state input voltage tolerance in the maximum normal ambient conditions. Equipment will be able to operate at rated or higher power factor.
- ii) Overload capacity: 10% for 1 hour in any 12 hour period.
50% KVA for 30 Seconds for 0-0.4 p.f lagging.
- iii) Converter will be fully short circuit protected and be capable of withstanding short circuit without damage until the protective devices are able to clear the output breakers.
- iv) The output voltage will be maintained and within specified limits for all permissible values of input voltage and frequency.
- v) Output voltage unbalance (for 3 Ph systems) will be within specified limits.

10. LIMITING DIMENSIONS & WEIGHT:

FOR 60 KVA (Excluding with Shock Mounts):

I) For Converter : 1544 (L) x 861 (W) x 919 (H) [Dimension are in mm]

Weight : 1860 Kg (approx.)

II) For Control Panel : 1600 (H) x 600 (D) x 800 (W) [Dimension are in mm]

Weight : 250 Kgs (approx.)

11. EMI/EMC, Shock and Noise:

EMI/EMC : MIL-STD-461 E/F

Shock Grade : NSS-II

Sound Pressure Level : 90 dBA (At 1 m distance)

12. CONTROL AND PROTECTION:

The control unit will be microprocessor controlled and will incorporate the protections as required by Indian Navy Specification and as per our equipment standards.

12.1. Voltage control and Protection:

- i) Over voltage and under voltage protections will be provided.
- ii) Manual voltage adjustment (trimming) will be provided for the Automatic Voltage Regulator as required by the user.

12.2. Frequency Control & Protection:

- i) Over frequency and under frequency protections will be provided.
- ii) Compensation for variations under varying ambient conditions, voltages and loads will be automatic.

12.3. Short circuit and Overload Protection:

- i) The converter will be designed so that it can withstand, without damage, a short circuit at output terminals at any permissible input and output conditions.
- ii) Overload protection setting will be at 125% of full load current and it will be adjustable up to 150%.

12.4. High Temperature Protection:

PTC.T's will be provided and over temperature shut down will be provided.

12.5. Indication lamps: The following indications will be provided

- a. Equipment ON
- b. Equipment supply available
- c. Overheating (winding & bearing)
- d. Anti-condensation heaters ON/OFF
- e. Output ON, meters to indicate output voltage and frequency, output power.
- f. Other indications as per manufacturer's standards.

13. CUBICLE CONSTRUCTION:

- i) All Control Panel components and assemblies will be located in a cubicle constructed of sheet steel of 14 gauge.
- ii) Construction of cubicle will be such that they are easily accessible and various components /sub-units can be checked without difficulty.
- iii) Hinged doors will be fitted to provide carry access to controls, fuses or other components where occasional attention is required to be provided, while maintaining the enclosure rating of the control panel.
- iv) Eyebolts will be provided for lifting the equipment.

14. LIST OF ONBOARD SPARES:

The following recommended Onboard Spares for 60 KVA Rotary Converter and Control Panel for 2 years operation will be supplied along with Converter.

SL	Description	Unit	Qty
1.	Automatic Voltage Regulator for Control Panel	NO	1
2.	Revolving Diode DISC complete with Diodes	NO	1
3.	Diodes for Revolving Diode Disc (Anode Stud)	NO	7
4.	Diodes for Revolving Diode Disc (Cathode Stud)	NO	7
5.	Roller Bearing (DE)	NO	1
6.	Roller Bearing (NDE)	NO	1
7.	HRC Fuse Links for Motor side of Control Panel	NO	3
8.	HRC Fuse Links for Generator side of Control Panel	NO	3
9.	Indicating Lamps for Control Panel	NO	5
10.	Main Contactor Kit for Motor of Control Panel	NO	2
11.	Main Contactor Kit for Generator of Control Panel	NO	2
12.	Over Load Relay for Generator of Control Panel	NO	1
13.	Protection Relay Card of Control Panel	NO	1

15. LIST OF B & D SPARES:

The following recommended Base & Depot Spares for 60 KVA Rotary Converter and Control Panel for 5 years operation will be supplied along with Converter.

SL	Description	Unit	Qty
1.	Automatic Voltage Regulator for Control Panel	NO	2
2.	Revolving Diode DISC complete with Diodes	NO	2
3.	Diodes for Revolving Diode Disc (Anode Stud)	NO	7
4.	Diodes for Revolving Diode Disc (Cathode Stud)	NO	7
5.	Roller Bearing (DE)	NO	2
6.	Roller Bearing (NDE)	NO	2
7.	HRC Fuse Links for Motor side of Control Panel	NO	6
8.	HRC Fuse Links for Generator side of Control Panel	NO	6
9.	Indicating Lamps for Control Panel	NO	10
10.	Main Contactor Kit for Motor of Control Panel	NO	4
11.	Main Contactor Kit for Generator of Control Panel	NO	4
12.	Over Load Relay for Generator of Control Panel	NO	2
13.	Protection Relay Card of Control Panel	NO	2
14.	Soft Starter	NO	1

SL	Description	Unit	Qty
15.	Output Side Voltmeter	NO	1
16.	Output Side Frequency Meter	NO	1
17.	Output Side Ammeter	NO	1
18.	Control Fuses	NO	6
19.	Voltmeter Fuses	NO	2

16. Inspection and testing:

All routine tests will be conducted on Rotary Converter and Control Panel as per NES 629 / EED-Q-267 at manufacturer's works. All type tests as required by the Navy will be conducted at manufacturer's facility or an accredited test facility.

17. Applicable Standards / Specifications :

- i) NES-536, NES-537 & NES-538
- ii) NES-634 - Requirements for Motor Generators and associated Control gears
- iii) NES-501 - General requirement for the design of Electro-technical equipment.
- iv) NES-627 - Requirements for general application to rotating electrical machinery
- v) NES – 629 - Testing of Rotating Machinery.
- vi) NES-632 - Requirements for A.C. & D.C. Motors.
- vii) NES - 723 - Tally plates.
- viii) JSS-55555 - Environmental test methods for Electrical and Electronics equipment.
- ix) JSS-0251-01 & EED-S-048 - Documentation.
- x) NES-581 - Guide to electronic components and practice.
- xi) EEDS-806 (R1) - Requirement of ship – borne frequency converter.
- xii) EED-Q-071 (R3) - Requirement of AC Motor and Starters.
- xiii) EED-Q-242 (R2) - Requirements of AC generators
- xiv) IS-2147 - Starter enclosure.
- xv) BS-5424, Part 1 - Control Gear Voltages up to and including 1000 VAC for Contactors.
- xvi) NES-514 AND DGS/EED/VI/1535/R6 - Cable Glands.
- xvii) DGS -251 - Painting.
- xviii) EED-Q-267 - Pertaining to the frequency converter chapters only
- xix) MIL-STD-461 E/F - Electromagnetic Compatibility.
- xx) IS 12063 - Degree of protection provided by enclosure for rotating electrical machinery
- xxi) IS 12075 - Self-generated vibration
- xxii) ISO 1940/1 - Rotor dynamic balancing

Reference: Indent No. 20175309 dt. 17-02-2018

ANNEXURE-CONV/60KVA/OBS

ONBOARD SPARES FOR 60 KVA ROTARY CONVERTER:

Sl No.	Description of Item	Qty. (Nos.)
Rotary Converter		
1	ROLLER BEARINGS (DE)	1
2	ROLLER BEARINGS(NDE)	1
3	DIODES FOR REVOLVNG DIODE DISC- ANODE STUD	7
4	DIODES FOR REVOLVNG DIODE DISC- CATHODE STUD	7
5	REVOLVING DIODE DISC COMPLETE WITH DIODES	1
Control Panel:		
1	AUTOMATIC VOLTAGE REGULATOR	1
2	PROTECTION RELAY CARD	1
3	HRC FUSE LINKS FOR MOTOR	3
4	HRC FUSE LINKS FOR GENERATOR	3
5	OVER LOAD RELAY FOR OUTPUT	1
6	MAIN CONTACTOR KIT FOR MOTOR	2
7	MAIN CONTACTOR KIT FOR GENERATOR	2
8	INDICATING LAMPS (ASSORTED COLORS)	5

DOCUMENTATION:

Sl No.	Description of Item	Qty. (Sets)
01.	Hand books / Manuals containing Installation, Operation and Maintenance Instructions	05
02.	Shop Trial / Test Reports	05