# REQUEST FOR QUOTATION - ONLINE BIDDING

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER: AKSE000607

RFQ DATE : 21.02.2022

Due Date/Day: 04.03.2022 FRI
Time : 13:00 HRS

Please submit your lowest quotation subject to our terms and conditions attached for the material mentioned below. "Quotation to be submitted in E Procurement portal only"

(for all correspondence)
Purchase Executive : ABHISHEK
Phone : 26998102
Fax : 00918026989215
E-mail: singh.abhishek@bhel.in

| Sl No. | Description | Qty | Unit | Delivery qty | Delivery Date |
|---|---|---|---|---|---|
| 1 | TI0668128313 Remote Monitoring System-EMU application<br>* HSN/SAC : 9032<br>Test Certificate<br>Remote Monitoring System as per Purchase Spec. PS/445/2748, Rev. 00 | 5 | NO | 5 | 15.04.2022 |

Total Number of Items - 1

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1.
2.

NOTES:

1. This RFQ is governed by:

a) INSTRUCTIONS TO BIDDERS/SELLERS and GENERAL CONDITIONS OF CONTRACT FOR PURCHASE available at **http://edn.bhel.com (RFQ-PO Terms & Conditions)**

b) Any other specific Terms and Conditions mentioned. of offers are required to furnish authorization letter for the same.

2. Tender Result can be viewed in the website.

* The HSN/SAC no mentioned against the line items in the RFQ are indicative only.

For and On behalf of BHEL.

ABHISHEK
Control Equipment

## 1. Pre-qualification Criteria

1.1 The Bidder should be manufacturer/supplier of Remote Monitoring System (RMS) for use in rolling stock application (locomotive/EMU/Metro) in India or abroad.

1.2 The bidder should have supplied for rolling stock application & should have prototype clearance from Indian Railway (RDSO/CLW/ICF etc.). Bidder/BHEL will approach and submit credentials/details furnished to its customer and await customer's approval for a maximum of one month from the date of tender opening. If approval is not received within this period, BHEL shall treat the offer as "*Not meeting Pre-qualification criteria*" and offer shall be rejected. No extension for whatsoever reason, beyond one month will be given.

1.3 It is preferred that the bidder is the manufacturer of this item. If the bidder is importing some or all portions of the item, then minimum value addition in India shall be 20%. Bidder to confirm this in the offer. Value addition less than 20% is not acceptable, and such offers shall be rejected.

1.4 Bidder should possess valid type test report for the item, not older than five years, conducted at an accredited laboratory as per standards mentioned in the specification at the time of bid submission.

## 2. Documents to be submitted:

2.1 Proof of manufacture/supply of Remote Monitoring System for rolling stock application (Locomotive/EMU/Metro) in India or abroad directly or through any agency.

2.2 Copy of Prototype Clearance letter from Indian Railway (RDSO/CLW/ICF ect.)

2.3 Copy of type test report.

2.4 Clause by clause compliance to purchase specification as mentioned in clause no. 3.1.

## 3. Reference documents:

3.1 BHEL Purchase Specification No PS/445/2748, Rev. No. 01 : Remote Monitoring Unit for Railway Application.

| | | | | | |
|---|---|---|---|---|---|
| | Rev.00 | | Approved by: Venkateshalu K 19/02/2022 | | |
| | | | Prepared by: Dayananda Kumar P | Department: Traction Engg. | Date: 19.02.2021 |

| | PURCHASE SPECIFICATION<br>BHEL-ELECTRONICS DIVISION<br>TRACTION ENGINEERING | P. S. No.: PS/445/2748<br>Rev. No.: 01<br>Page 1 of 12 |
|---|---|---|



**Material Code No.: TI0668128313**

# Technical Specification

# REMOTE MONITORING SYSTEM FOR RAILWAY APPLICATION

| | | | | |
|---|---|---|---|---|
| | Rev. 00 Dated 09.09.2021 | **APPROVED**<br>**K Venkateshalu** | | |
| | Issued By:<br>Traction Engg. Dept.,<br>BHEL-EDN | **PREPARED**<br>**Aditya Kumar, Manager** | **ISSUED**<br>Traction Engg. | **DATE**<br>19-02-2022 |

# Table of Contents

# SECTION – 1

# SCOPE, QUANTITIES & ELIGIBILITY

## 1.1 Scope

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of **Remote Monitoring System.**

The equipment is required for the following project.

| | |
|---|---|
| **Name of the customer** | BHEL/Indian railways |
| **Name of the Project** | Design, development, manufacture, supply, installation, testing & commissioning of 25kV IGBT based three phase electrics (on board mounted) for AC EMU |

The scope shall also include the followings:

a. The supply of complete documentation for approval of design, relevant drawings and training to the satisfaction of purchaser and RDSO and support documentation associated with the operation and maintenance of the equipment supplied.

b. Commissioning shall be in the scope of supplier.

c. The supplier shall submit list of equipment and facilities required for maintenance and overhaul of equipment offered.

## 1.2 Bill of Material

| Sl. No. | Description | Qty. per Train Set (12 Coach Train ) | Remarks |
|---|---|---|---|
| 1. | Remote Monitoring System (RMS) with suitable two SIM's for each RMS | 01 No. | |
| 2. | GSM and GPS antenna with minimum of 10 mtrs. of cable length | 01 No. | |
| 3. | M5X16MM SS Allen cap screw with M5 SS plane and spring washer (Screws for RMS fixing on bracket) | 4 Nos. | |
| 4. | RMS fixing bracket | 01 No. | |
| 5. | Power supply mating connector female with dust cover | 01 No. | |
| 6. | MVB mating connector male with dust cover | 01 No. | |
| 7. | MVB mating connector female with dust cover | 01 No. | |
| 8. | M12 termination connector for ethernet | 01 No. | |
| 9. | Remote Monitoring Software | 01 No. | |
| 10. | Any other accessories required not covered above | As reqd. | |

## 1.3 Clause by Clause Compliance

Vendor to submit clause-by-clause compliance to complete technical specification along with the technical bid.

# SECTION – 2

# TECHNICAL SPECIFICATION

## 2.1 Functional Description of Remote Monitoring System

The Remote Monitoring System (RMS) in each train allow remote access to diagnostic data of the train. One nos. of Remote Monitoring System shall be mounted in Driving Trailer Coach (DTC).

## 2.2 Technical details:

1. The Remote Monitoring Systems (RMS) in each train (in DTC or any other suitable coach) shall allow remote access to diagnostic data.
2. Remote access to RMS has to be realized via GSM/GPRS radio communication. Therefore, an antenna to be mounted on the roof of the DTC shall be required. Also, a cellular SIM and its suitable interface, for prototype, shall be provided by the supplier and ensured for satisfactory operation during the entire warranty period.
3. RMS shall automatically collect and upload diagnostic event data from all Propulsion and TCMS devices holding a diagnostic database in a cyclic pattern.
4. The RMS shall be based on GPS and GSM/GSM-R technologies. This equipment shall perform the function of tracking of the Train and also communicate with the Train diagnostic system, and pass on this information to the central server (application server of RMS's web portal maintained by IR/CRIS). It shall be possible to remotely send and obtain the information stored in the diagnostic memory of the computer system, depending on availability of communication channel, for troubleshooting diagnosis with the aim of facilitating and speeding up the maintenance process of the train. Exception reports shall be generated by the TCMS and downloaded remotely in the Maintenance Depot for planning the corrective action. Access to central server shall be provided for data download and analysis, the cost of which shall be borne by IR beyond warranty period. However, configuring the server and cost of access as needed during warranty shall be in the scope of supplier.
5. The time needed to transfer the data to the wayside depends on the availability of GPRS/GSM connection and its bandwidth. The RMS shall keep the collected data in the upload queue until successfully transferred.
6. When the RMS data is not transmitted to the server in time (e.g. in case of GPRS connection loss) the oldest data received by the RMS from the network will be overwritten and will therefore be lost.
7. When RMS is active, the diagnostic event data from the complete train is uploaded every hour.
8. The communication between RMS and TCMS shall be through MVB as well as Ethernet protocol. Only one protocol will be used at a time.
9. The event data collected by the RMS are downloaded via any of this protocol ie. UDP, TCP or FTP.

10. If any of the TCMS devices is not reachable at the scheduled moment (for example due to a reduced train configuration), the RMSs skip the respective device after three failed attempts.
11. The transfer of diagnostic data from train to ground is triggered each time a cab is un-occupied.
12. Data size of each event shall be in the range **of 5-10Kb.** Every day minimum of **500** events or more may be considered for estimation of memory.
13. RMS shall determine the GPS data based on the position of the connected GPS antenna and sends the GPS data to TCMS according to the train via communication protocol.
14. There shall be provision to download the diagnostic data collected by the RMSs from any place by accessing the host server as and when required via suitable ethernet protocol.
15. IR shall provide a server for hosting of the transmitted data as per pattern mentioned above. Necessary software and its interface shall be provided by the supplier of this RMS system.
16. Following conditions shall be fulfilled by Remote Monitoring System supplied-

| Sl. No | Description | Notes |
|---|---|---|
| 1. | Cooling | *Natural cooling* |
| 2. | Shock and vibration | *The vibration levels at some intermittent points on the track may be higher than those specified by the relevant IEC publication (IEC 61373).* |
| 3. | IEC-60571 standard | *Shall confirm to latest version and Testing should be complied to this standard. Other relevant International/IS/Railway standards/ specification shall be applicable.* |
| 4. | Maintenance | *Easily accessible* |
| 5. | Enclosure & Safety | *Equipment should be provided with suitable enclosure so as to provide adequate protection to working personnel.* |

### 2.2.1 Mounting arrangement :

The supplier shall design the mounting arrangements suitable for coaches to be manufactured by IR. Mounting and cable termination arrangement shall be finalized with ICF/RDSO. The accessories for mounting the equipment shall be in the scope of supply. The hardware for mounting, the termination hardware also will be in the scope of supply of equipment.

## 2.3 Equipment Testing:

Approved type test report, within last 5 years, is to be submitted for the RMS along with offer, if the equipment is already type tested. If any test, not covered in the above approval, but insisted by Indian Railway, then those tests are to be conducted by the supplier at their own cost.

## 2.4 Cables:

The cables shall be conforming to international standards for fire retardant, fire survival characteristics suitable for EMU services. Cables shall also be tested for ensuring its fire retardant, fire survival characteristics.

## 2.5 Design Requirements to Be Provided by Supplier:

| | |
|---|---|
| a) Write-up/ description of the proposed System | To be provided along with offer. |
| b) Circuit diagram, connection & wiring diagram, System drawing with mounting details, weights, etc. and any other relevant drawings. | To be provided along with offer. |
| c) Datasheets of the proposed System | To be provided along with offer |
| d) Type test protocol & procedure/ Type test reports | Refer section 2.3.<br>Type test reports and Indian Railway (RDSO / CLW / ICF etc.) approved letter along with offer. |
| e) Routine test procedure | To be provided after placement of Purchase order. |
| f) QAP | To be provided along with offer. |
| g) Complete Bill of Material | To be provided along with offer. |
| h) Performance statement | To be provided along with offer. |
| i) Performance certificate | To be provided along with offer. |
| j) Indian Railway (RDSO /CLW/ICF etc.) Approval letter (conforming to the latest RDSO spec as applicable) | To be provided along with the offer |
| k) Project specific AUTO CAD drawing-2D and 3D model | To be provided after placement of purchase order |
| l) Project Specific Drawings in A3 size OGA of clause 1.2:(1), (2) & (4) | To be provided along with the offer. |
| m) Technical Manual | To be provided after placement of order. |
| n) Installation, Operational and Maintenance Manual | To be provided along with material supply. |

# SECTION – 3

## PROJECT DETAILS AND GENERAL SPECIFICATIONS

### 3 General

This section stipulates the General Technical Requirements under the contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipment and services covered under other sections and are not exclusive.

However, in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall hold good.

### 3.1 Instruction to bidders

The bidders shall submit the technical requirements, data and information as per the technical specification, provided in Section-2.

### 3.2 General Design Requirements

EMUs are currently running in NR, NER, ER, ECR, SECR, SCR, SWR, SR and NCR etc. These EMUs/MEMUs are operating at 25 kV AC OHE voltage fed through pantograph and vacuum circuit breaker mounted on the roof of the motor coach. The incoming power supply is fed to the primary of the main transformer and stepped down to a lower voltage, converted into AC voltage through IGBT based Converter and inverters and fed to four (04) parallel connected 3 phase traction motors.

For AC EMU, the configuration of the coaches shall be of either 9/12/15/18
Indicative train formation for 9 and 12 car is as shown below:

**9 car Formation:**

**DTC-MC-TC-NDTC-MC-TC-TC-MC-DTC**

**12 Car Formation:**

**DTC-MC-TC-NDTC-MC-TC-NDTC-MC-TC-TC-MC-DTC**

DTC: Driving Trailer Coach
MC: Motor Coach
NDTC: Non-Driving Trailer Coach
TC: Trailer Coach

i) The entire equipment shall be designed to ensure satisfactory and safe operation under the running conditions specified. The design shall also facilitate erection, inspection, maintenance and replacement of the various Systems comprising the equipment.

ii) All working parts of the control and auxiliary circuit specifically electronics and PCBs, shall be suitably covered in cubicles with essential interlocks/keys to keep them free from moisture and dust. As a minimum, equipment shall be sealed to the standard below:

a. Roof Mounted equipment IP65.
The protection level (IP level) shall be furnished by the supplier during design approval.

iii) All the electrical equipment's shall comply with the latest edition of IEC specifications unless otherwise specified.

iv) All equipment's shall be adequately earthed, insulated, screened or enclosed. They shall be provided with essential interlocks and keys as may be adequate to ensure the protection of the equipment and the safety of those concerned with its operation and maintenance.

v) The design of the equipment shall be based on sound, proven and reliable engineering practices. The equipment used in different sub systems shall be of proven technology and design. The supplier shall submit the supportive document for each of the assembly/sub-assembly for its proven performance under the environmental conditions prevalent in India.

vi) The supplier shall design the mounting arrangements suitable for coaches to be manufactured by IR. The accessories for mounting the equipment shall be in the scope of supply. The hardware for mounting the termination hardware also will be in the scope of supply all equipment.

vii) Notwithstanding the contents of this specification, the supplier shall ensure that the equipment supplied by them is complete in all respect to enable the desired operation of the EMU fitted with their equipment.

## 3.3 Ambient conditions / operating conditions

The equipment shall be designed to work satisfactorily under following environmental conditions: -

| | |
|---|---|
| Relative Humidity | Up to 98% saturation during rainy season which may be as long as five (5) months. |
| Ambient temperature. | Max. 50º C<br>Min. 0ºC |
| Average annual ambient temperature | 35°C. |
| Maximum temperature inside HT compartment of motor coach | Max. 55º C. |
| Stationary rake temperature | The temperature of stationary rake may go as high as 70-75 ºC. The equipment shall not be adversely affected in any way due to exposure to such high temperatures. Supplier shall furnish the precautions taken in equipment/component selection in order to conform to this requirement. |

| | |
|---|---|
| Altitude | At any altitude between 0 and 1200 m above mean sea level. |
| Rainfall | Very heavy and continuous (up to 2500mm during rainy season) All underslung equipment shall be designed suitably to ensure its normal working even in adverse conditions as above. |
| Atmosphere during hot weather | Extremely dusty, humid and salty.<br>The EMU shall be working primarily in coastal area and thus shall be continuously exposed to highly corrosive, salty atmosphere along with industrial pollutants.<br>Special care shall be taken to ensure no damage to equipment due to deposition of atmospheric salts and industrial pollutants. Supplier shall enclose details of specific measures adopted to ensure the satisfactory working of equipment against the deposition of salts & industrial pollution. |
| Vibrations | The vibration levels at some intermittent points on the track may be higher than those specified by the relevant IEC publication (IEC 61373). The suspension system and the mounting arrangements shall be so designed that the equipment's performance is not adversely affected due to such high vibrations and shocks. |

## 3.4 Standards

The equipment covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.

The equipment to be furnished under this specification shall conform to latest issue (with all amendments) of specified standards. In addition to meeting the specific requirement called for in Sections 2 of the Technical Specification, the equipment shall also conform to the general requirement of the applicable standards, which shall form an integral part of the specification. The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to complement each other. When the specific requirements stipulated in the specifications exceed or differ from those required by the applicable standards, the stipulation of the specification shall take precedence.

Other internationally accepted standards, which ensure equivalent or better performance than that specified in the standards referred, shall also be accepted. The bidder shall submit copies of such standards.

## 3.5 Services to be performed by the Equipment Being Furnished

All equipment shall also perform satisfactorily under various other electrical, electromechanical and meteorological conditions of the site of installation. All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like wind load, temperature variation, ice & snow, (wherever applicable) short circuit etc. for the equipment.

## 3.6 Engineering data

### 3.6.1 DRAWINGS

The title block of drawings shall contain the following information incorporated in all contract drawings

| |
|---|
| **1. Customer :** BHEL /Indian Railways |
| **2. Project:** DESIGN, DEVELOPMENT, MANUFACTURE, SUPPLY, INSTALLATION, TESTING & COMMISSIONING OF 25kV IGBT BASED THREE PHASE ELECTRICS (ON BOARD MOUNTED) FOR AC EMUs. |
| **3. Contract No./LOA No. : P.O no.** 08/18/1418/2425/F dated 20/10/2018 |
| **4. Main Contractor : Bharat Heavy Electricals Limited** |
| **5. BHEL Order No. & Date :** |

#### 3.6.1.1 Size of Drawings

The drawings of the following parts shall be to the sizes indicated below

I. Equipment details – full size or half size

The dimensions, weight, capacity, etc. shall be in SI Systems. All drawings shall be submitted on CDs along with complete setup with software for reading and taking prints through desk top PC and suitable printer. In case the format is not compatible with AUTOCAD necessary customized hardware and software shall be submitted.

#### 3.6.1.2 Method of Filing of Drawings

To facilitate filing of drawings, it is essential that each drawing submitted for approval is marked so that it can be identified. The supplier is, therefore, required to ensure that all prints are marked legibly at the right hand bottom corner. The following information is required in respect of each drawing:

I. Supplier’s drawing number.
II. Supplier's name and date of submission.
III. Contract no. given by the purchaser.
IV. Description of drawings.
V. Relevant Specifications

## 3.7 Marking of equipment & rating plate

All equipment/cubicles shall contain rating plates of anodized aluminium with embossed letters. The rating plate will give detailed rating specification and identification of equipment. The details of rating plate of each of the equipment shall be as approved by RDSO.

## 3.8 Infringement of patent rights

BHEL and Indian Railway shall not be responsible for infringement of patent rights arising due to similarity in design, manufacturing process, components used in design, development and manufacturing of propulsion system & other equipment and any other factor which may be a cause such dispute. The responsibility to settle any issue lies with the manufacturer.

## 3.9 Quality assurance programme

To ensure that the equipment and services under the scope of this Contract, whether manufactured or performed within the Manufacturer's Works or at his Sub-manufacturer's premises or at the Purchaser's site or at any other place of Work, are in accordance with the specifications, the Manufacturer shall adopt a suitable quality assurance program to control such activities at all points, as necessary. Such program shall be outlined by the Manufacturer and shall be finally accepted by the Purchaser after discussions before the award of Contract

## 3.10 Type and routine testing & inspection

1) The supplied equipment shall be Type tested from any Govt. accredited laboratory and type test reports conducted within previous 5 years shall be submitted to BHEL for review and evaluation.
2) Routine Test reports along with Routine Test procedure shall be submitted for BHEL review and acceptance at the time of inspection.
3) Routine Test inspection shall be carried out at vendor works by BHEL.

## 3.11 Materials and Workmanship

Equipment materials and components shall be new, of high grade and good quality and be to the latest engineering practice. The material and workmanship throughout shall be in accordance with the purpose for which they are intended. Each component shall be designed to be consistent with its duty.

All the information concerning materials or components to be used in manufacturing, machinery, equipment, materials and components supplied, installed or used shall be submitted for approval. Without such approval the supplier shall run risk of subsequent rejection. The cost as well as time delay associated with such rejection shall be borne by the supplier.

## 3.12 Packing and Storage

All the equipment’s shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at site till the time of erection. On request of the purchaser, the manufacturer shall also submit packing details/ associated drawing for any equipment/ material at a later date, in case the need arises.

Supplier shall ensure that equipment shall be properly packed, blocked, padded, coated and protected so that it is not damaged due to possible mishandling. Storage requirements shall be clearly defined by the supplier. Packing shall be such that if required, long time storage at site should not deteriorate the performance of the equipment.

## 3.13 Fire prevention

i) The equipment’s shall be designed to minimize the risk of any fire.
ii) Materials used in the manufacture of equipment’s shall be selected to reduce the heat load, rate of heat release, propensity to ignite, rate of flame spread, smoke emission and toxicity of combustion gases.

iii) The Supplier shall comply with specification NF F 16-101: (Railway Rolling Stock Fire behavior “Choice of Material”), NF F 16-102: (Railway Rolling Stock Fire behavior “Material choosing, application for electric system” category A2), BS 6853 – 1999 Category II or DIN 5510, EN 45545 (for rolling stock design) CET. HL-2 or any other equivalent/superior international standard for fire safety plan in respect of their equipment. Whichever standard is selected for meeting the fire safety, the standard shall be declared and a copy shall be furnished to BHEL/RDSO.

iv) Materials which are not fire retardant shall not be used.

### 3.14 Maintenance Manual, Spare Parts Catalogue & Material Specification

The detailed maintenance and service manual (including the trouble shooting directory shall be prepared for the various equipment’s and 3 sets of hard copies & soft copy of the same shall be supplied free of charge.

### 3.15 Reliability

In addition to meeting the performance requirements, the equipment, shall incorporate high standards of reliability to ensure that operating cost and operation performance are optimized.

The supplier shall provide the achieved quantitative reliability data of major subsystem/equipment, expressed in Mean Time between Failures (MTBF) and/or Mean distance between Failure (MDBF), based on operations of proven coaches fitted with similar equipment for a minimum of 3 years and 450,000 kilometres per coach in revenue service, for purchaser’s and IR’s evaluation. The definition of MTBF & MDBF for this purpose may be considered as: MTBF = No. of equipment (Population) x Period (Time)/Total number of failures during that period. MDBF = No. of equipment (Population) x Kilometre run (Distance)/Total number of failures during that distance.
The values for the temperature expected inside the HT compartment as per the Supplier’s calculation shall be submitted at design approval stage.

### 3.16 Warranty

The supplier shall warrant that RMS supplied is free from defects and faults in design, material, workmanship and shall be of highest grade and consistent with established and generally accepted standards for goods of the type mentioned in this specification and in-full conformity with the specification. Comprehensive warranty of 36 months from the date of delivery or 24 months from the date of commissioning of the RMS whichever is earlier.
The supplier shall immediately on receipt notice of defect, depute his engineer to start action for rectification of defects under warranty.