Date 22/04/17

Addendum no:- 4181-19-01022, Rev00.

for Specification no TG60582, Rev 02.

Against cl no 02.3.- Field Junction Box requirements will be as follows:-

Field Junction Box (FJB) should be of 'high quality polycarbonate, glass fiber reinforced or Mild steel with Power coated with protection class IP 54 or better rated. Supplied be supplied along with suitable cable glands, wall / channel mounting accessories. FJB should be suitable for mounting 12 no charge amplifiers. One screw less terminal strip for connecting charge amplifier output (with 20% spare terminal) should be mounted inside the FJB suitably.

Against cl no 02.4- Charge amplifiers requirements will be as follows:-

In addition to specification, charge amplifier should meet following requirements

1) Sensitivity :- 1mv/PC (minimum)
2) Input over range :- +/- 3 V
3) Frequency range :- 5 Hz to 30kHz
4) Temp range:- -40 to 120 deg C.
5) Excitation voltage:- 18 to 28 VDC
6) Electrical connections (input):- 10-32 micro dot connector.

Note :- Vendor to supply charge amplifier suitably mounted inside the Junction Box and output of Charge amplifier should be connected to screw-less terminal strip suitably.

Against Cl no 11.0:-

a) **Installation**:- The supplier shall arrange, after getting message from ENGG., required expertize and manpower to carry out satisfactory installation of supplied equipment –Instrumentation Cabinet, Field Junction box, Cables, Charge-Amplifier cabinet etc. Further, as a preliminary step, the whole system is to be checked by injecting simulated external signal.

b) **Commissioning**:- The supplier shall arrange satisfactory commissioning of system in following condition:-

i) Machine should be on load (at least 50% of rated load)

ii) All the readings recorded during operation of the generator, at specified filtered frequencies- 100Hz and 50 Hz- should match with the calibrated

BHEL measurement system within 5 to 7% range. This document would be part of MOM which is to be signed by End customer, BHEL Site and BHEL Haridwar engineer.

iii) In the same visit, comprehensive training like , all the software / hardware settings would be thoroughly explained to the End customer and BHEL site engineer by the Vendor for resolving any future operational problems for smooth function of the monitoring system.

iv) The performance of the system shall be kept under observation for a period of one year from the date of successful commissioning. Within this period, if any part of monitoring system- hardware or software- does not perform satisfactorily, same would be replaced/ rectified by the Vendor without incurring any cost to BHEL.

Against Cl no 15.0:-

Gurantee / Warrantee:- Generally, each equipment of the monitoring system shall be guaranteed for a minimum period of 24 months from date of supply or 12 months of successful commissioning as per clause(b).

However, in view of the site conditions, successful commissioning date shall be over-riding factor.

Rest will be as per specification no TG60582, rev02.

Generated By:-

Pallu Singh

Pallu Singh
Dy. Manager/CIE

Approved By:-

Satish

Shri Satish Kumar
DGM /CIE

GEN END WINDING VIBRATION MONITORING EQUIPMENT FOR TURBOGENERATORS

1.0 GENERAL:

This specification covers the requirement of vibration monitoring equipment for generator end winding overhang zone. The accelerometer sensors mounted at different locations on generator overhang winding on both ends, are connected by special low noise cable and terminated at inner side of lead-in-plates with 10-32 microdot connectors.

The scope of vendor starts from external side of lead in plate having male 10-32 UNF microdot connection. There are two lead in plate, one at turbine end and one at exciter end. From both Lead in plates, signals (which is in form of charge) will be taken to field JB having charge amplifier by very low noise individually double screened special cable. The signal will be amplified and integrated by the charge amplifier. Then signal will be taken to vibration monitoring modules through safety barrier by very low noise individually screened special cables to ensure minimum corruption in signal. Refer figure-1 for more clarity.

The control cabinet shall be of Rittal / Pyrotech (or other reputed make subject to BHEL's approval). The degree of protection shall be IP-32 or as specified in enquiry / order. This cabinet will be placed in air conditioned room in the power station. The equipment will generally be used to monitor 2X (97Hz-103Hz) vibrations in displacement mode. However, there will also be the facility to monitor 1X (47Hz-53Hz) and Sigma values. The corresponding 4-20mA outputs for 2X /1X / sigma values will be made available for external use in the client's DCS.

The piezoelectric accelerometers and very low noise cables from piezoelectric accelerometers to lead-in plate (within Generator) are in scope of BHEL and do not form part of the scope under these specifications. However, the offered system should be API 670 compatible to ensure compatibility of the accelerometers. The make and type of the accelerometers will be intimated by BHEL while approving the documents submitted by the vendor during detailed engineering. The typical accelerometer will be type 4383V (B&K)/ 357B21 (PCB Piezoelectronic).

				NAME	SIGNATURE & DATE
GRI	20/11/10	RAM SEWAK	अनुवादक TRANSLATED BY		
TSX	Lalit Kumar	Lalit Kumar	निर्मापक WORKED BY	SAURABH PURI	20/11/10
QAX	S K Chauhan	20.11.10	जाचक CHECKED BY	SATISH KUMAR	20/11/10
सहमत विभाग AGREED DEPTT	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षक SUPERVISED BY	KB BATRA	

(Supersedes)

स्वीकृति APPROVED : AGM (CIE)

GR. No 8.10

REV NO. 02			निर्माण PREPARED : CIE	जारी ISSUED : TSX	दिनांक DATE : 02/03/07
Dt 20.11.10					

INVENTORY NO. P-62833

SUPERSEDES INVENTORY NO

2.0 **SCOPE OF SUPPLY**: The system will comprise of the followings:

1. Twelve channel vibration monitoring modules (maximum 4 channels per module) along with associated power supply units and accessories mounted in a free standing cabinet of dimensions 600(W)x800(D)x 2200(H) along with inbuilt Software based band pass filters for individual channels to filter out 1X /2X components. The vendor shall supply the microprocessor based, fully programmable modules to provide continuous bar graph & digital value display (alternately vendor to provide display panel) of vibrations of all channels, indicating stator end winding vibrations in terms of displacement (0-400 microns Pk-to-Pk), while the machine is in operation. The 4-20mA hard wired outputs from the vibration monitoring modules will be made available for use in client's DDCMIS. The system shall be suitable for redundant 230 VAC +-10%, 50Hz power supply (unless specified otherwise in the enquiry / order). Paint shade of the cabinet / field JB shall be informed after placement of order as per end customer requirement. The paint thickness will be approximately 100 Microns. The painting requirements, if specified otherwise in the enquiry / order shall be met.

2. Twelve number safety barriers mounted in above cabinet to ensure intrinsic safety as sensors are mounted in Hydrogen area (potentially explosive media).

3. Field Junction Box (IP54 Protection) along with termination accessories for microdot connectors / TBs etc.

4. Twelve number charge amplifiers to be mounted in above field JB. The charge amplifiers shall be very low noise type and will provide amplification of signal. So as to minimise distortion of signals during their transmission to monitoring modules located away in control equipment room. The charge amplifiers shall meet at least following requirements:
   i. Input signal :- 10-50 pc/g.
   ii. Frequency range: 20Hz - 1.5 kHz.
   iii. Inbuilt integration for converting acceleration signal to velocity signal.

5. Very low noise individually double screened cables with termination accessories for making connections in between lead in plate & charge amplifiers which are mounted in field JB. Microdot connectors at both end shall be suitable for the offered double screened cable.

6. Very low noise individually ingle screened cables with termination accessories for making connections in between charge amplifier & safety barriers, which are mounted in system cabinet.

7. Mandatory spares comprising 10% of the installed modules / charge amplifiers rounded off to next higher number. These should be quoted separately.

8. **Any other accessory / item which may be considered essential by the vendor for proper commissioning /measurement /monitoring of the vibration signals.**

3.0 ACCURACY:
The supplier shall indicate accuracies and linearity of individual important items like charge amplifiers, display modules, 4 - 20 mA output & overall system as such.

4.0 ROUTINE TESTING: The equipment shall be subjected to following tests at supplier's works.

4.1 Dimensional details/visual checking as per the approved general arrangement drawing to ascertain that model no. offered is as per purchase order and mounting / cutout dimensions are as per catalogues furnished with the offer.

4.2 IR value of terminal blocks to be measured with 500V megger. The value shall not be less than 20 M ohms.

4.3 Checking of scope / technical particulars covered under clauses 2.0.

4.4 HV test at 2KV (rms) for one sec. between live and earth parts as per relevant IS (excluding electronics components/modules). The equipment will pass the test without failure.

4.5 Burn in test for 48 hrs at elevated temp (>=55 Degree C). The verification of in-house tests carried out for this will be done

4.6 Functional checking of the equipment as per approved schematics before dispatch. Vendor to mention "List of all tests" which should be carried out on the components/module/overall system at his works to ensure system performance at site. The procedure for the tests and acceptance norms shall be submitted for approval to BHEL

5.0 TYPE TESTING : The type test certificates of similar equipment for the following climatic tests (which shall not be older than 5 years) as per IEC60068 / IS9000 (relevant parts) will be furnished along with the offer. If these are not available, the party will carry out these type tests from reputed test house and furnish the test certificates to BHEL for acceptance

5.1 Dry heat test
5.2 Temperature cycle test
5.3 Damp heat test
5.4 Surge withstand test as per ANSI 37.90a or other relevant standards.

6.0 ACCEPTANCE NORMS:-

6.1 Compliance to clause 5.0

6.2 Carrying out of routine tests as per clause 4.0

Calibration data / curves (Acceleration Vs mV output upto 15g of acceleration) / data sheet for charge amplifiers, display modules and 4 - 20 mA output value shall also be submitted for approval.

Before dispatch test results as per above and in compliance of above shall be send to BHEL for approval. Dispatch of the equipment shall be subject to approval of these test results.

7.0 TEST AND GUARANTEE CERTIFICATES: Three copies of test certificates for routine & type tests and guarantee certificates in English shall be furnished

8.0 RECOMMENDED SPARES: The list of recommended spares required for 5 years operation with prices of individual items will be furnished for BHEL's reference. BHEL reserves the right to order these components at pre vailing rates within 6 months of the placement of the main order.

9.0 PACKING: The equipment shall be packed in such a way that no damage occurs to any of its components during transit & storage.

10.0 MARKINGS: Each package shall be marked with the following:

1. BHEL order number
2. Designation of component/assembly
3. Suppliers name & reference
4. Net weight / gross weight

11.0 INSTALLATION & COMMISSIONING:

The supplier shall arrange for satisfactory installation & commissioning of supplied equipment at site. The offer for the same will be included in main offer. The erection of cabinet and laying of the 12 no cables will be done by BHEL at site. However, all terminations, installation of modules, balance activities and commissioning of the system shall be done by the vendor. **The vendor shall also provide training to customer site engineers during visit for better understanding and operation of the system at site.**

12.0 DOCUMENTS FOR APPROVAL :

The vendor will furnish GA /Schematic drawings of the offered system including data sheets for the offered charge amplifiers / vibration modules / power supply modules, procedure for the tests and acceptance norms etc. for BHEL/s approval

13.0 O&M MANUALS:

The O&M manuals comprising of installation & commissioning instructions, operation & maintenance procedure, service procedure, technical / circuit details and data sheets of the used instruments will be furnished in number of copies as mentioned in Purchase Order.

14.0 INSPECTION:

BHEL reserves the right to depute their / customer's representative during final testing at supplier works. The supplier will arrange this inspection without any additional cost.

15.0 GUARANTEE/ WARRANTEE:

Each equipment shall be guaranteed for a minimum period of 18 months from the date of supply or 12 months from the date of commissioning whichever is earlier.

16.0 CROSS REFERRED STANDARDS

IS 13947, IS9000, IEC60068, ANSI 37.90a,

REV.NO. 02 DATE 20/11/10		निर्माणकर्ता WORKED BY	SAURABH PURI		20/11/10
		जाचलता CHECKED BY	SATISH KUMAR		20/11/10

INVENTORY P-4283 | 25/1/11 | SUPERSEDES INVENTORY NO | SIGN & DATE

R1 V.NO.02 DATE 26/11/10

SCOPE & TERMINAL POINTS FOR GENERATOR END WINDING VIBRATION MONITORING SYSTEM

Note:-- * BHEL scope upto lead in plate
- ** Vendor scope start from other side of Lead in plate to Generator End Winding Vibration Cabinet

CHECKED BY SATISH KUMAR | WORKED BY SAURABH PURI

उत्पाद मानक (हीप - हरिद्वार)
PRODUCT STANDARD (HEEP - HARDWAR)
TG60582
पृष्ठ Page 5 Of 5