

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			



**SPECIFICATION FOR
GPS Based Oscillation Monitoring System
(GPS-OMS)
(First Revision, February 2021)**

Specification No. –TM/SM/420, Version 1.1

**Track Machines & Monitoring Directorate
RESEARCH DESIGNS & STANDARDS ORGANISATION
LUCKNOW - 226011**

DTM	PED/TM	Page 1 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

TABLE OF CONTENTS

S N	Topic	Page nos.
1.0	Scope	3
2.0	Materials, processing and workmanship	3
3.0	Terminology & Abbreviations	4
4.0	General Requirements	4
5.0	Functional Requirements	5
6.0	System Requirement	5
7.0	Technical Requirements	10
8.0	Documentation	12
9.0	Spare parts and tools	12
10.0	Warranty & AMC	13
11.0	Tests & Verification	13
12.0	Marking and packing	14
13.0	Training and commissioning	15
Annexure		
A	Run Data in Time Mode	16
B	Run Data in GPS Mode	19
C	Ride Index	22
D	Executive Summary	23
E-I	Exception Report - Time Mode	25
E-II	Exception Report - GPS Mode	28
F	Time To Distance	31
G	Data File format for OMS in Time Mode	34
H	Data File format for OMS in GPS Mode	35
I	Description of record type for OMS data file format in GPS and Time mode.	36
J	List of Route Feature codes	38

DTM	PED/TM	Page 2 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

1.0 SCOPE

- 1.1 This document sets forth general, operational, technical and performance requirements for GPS based Oscillation Monitoring System.
- 1.2 Whenever this specification is referred by number only, without mentioning the year of issue, the latest issue of the specification is implied.
- 1.3 This specification is intended chiefly to cover the technical, material and functional requirements with testing details provisions only and does not cover the necessary provisions of a contract. In this specification GPS based Oscillation Monitoring System will be termed as "OMS".
- 1.4 Preference to make in India: compliance of the instruction contained in public procurement (preference to make in India) order -2017 "Make in India" shall be ensured.
- 1.5 All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-8.1-11 dated 12.09.2018 (titled Vendor–Changes in approved status"), subsequent versions / amendments thereof shall be binding, and applicable on the successful manufacturers/suppliers in the contracts floated by Railways to maintain quality of products supplied to Railways.
- 1.6 The OMS shall be capable of recording location referenced Vertical and Lateral accelerations of Railway Rolling Stock, running on the track.

2.0 MATERIALS, PROCESSING AND WORKMANSHIP:

- 2.1 OMS Unit shall be designated as a PWI's tool and thus it shall be portable, compact in size, light & of robust design. The weight of the unit, including battery, should be as less as possible & shall not be more than 19Kgs. except optional item. It shall be a portable unit which can be easily carried.
- 2.2 The Oscillation Monitoring System covered in this specification shall be of robust, rugged and compact construction and shall be easily portable with commercial grade Lap top/Tablet.
- 2.3 The OMS shall be of natural air cooled type and shall be suitable for use on Railway Rolling Stock.
- 2.4 The OMS covered under this specification shall work satisfactorily, meeting all prescribed parametric requirements, on in-built or external rechargeable battery, sufficient to work continuously for at least six (06) hours without charging.

DTM	PED/TM	Page 3 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

3.0 Terminology & Abbreviations:

Abbreviation	Full Form / Description
AC	Alternating Current
DC	Direct Current
GPS	Global Positioning System
LED	Light Emitting Diode
OMS	Oscillation Monitoring System
RI	Ride Index.
TP/KM Switch	Telegraph Pole / Kilometer Switch
MIPS	Multi Input Power Supply
SMPS	Switched Mode Power Supply.
KM	Kilometer
Route tape	RDPS Data File

4.0 GENERAL REQUIREMENTS

- 4.1 System shall be universally suitable for all types of sections of Indian Railways like single line, double line, twin single line, multiple lines etc.
- 4.2 System shall be suitable for all types of electric and diesel locomotives EMUs/ MEMUs/ DEMUs coaches, wagons, Guard van and any other self-propelled vehicle treated as train.
- 4.3 System shall be capable of working in all types of electrified as well as non-electrified territories.
- 4.4 System shall be suitable for train speeds up to 160 KMPH.
- 4.5 Each unit shall be shielded to prevent any Electromagnetic interference of any type. No false peaks should be observed if handheld walky-talky equipment used in Rlys. is operated beyond the vicinity of 4 meters. No false peaks should be observed in case of charging / operating from the coach supply during operation. A Voltage stabilizing device (Optional) if required to be provided for giving regulated input supply to OMS system.
- 4.6 The system shall be capable for working in non-air-conditioned environment. Ambient temperature range between $-10^{\circ}\text{C}\pm 3^{\circ}\text{C}$ to $55^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and Relative Humidity up to 95% +1%,-5% at 40°C for whole system except Laptop / Tablet.

DTM	PED/TM	Page 4 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

- 4.7 When system application is invoked, it will display Software Version & Software Checksum on the OMS monitor for a minimum period of 5 seconds. Subsequently the OMS System shall acquire GPS coordinates. The Internal Clock of Laptop / Tablet shall be synchronized to acquire GPS coordinates.
- 4.8 Signal bar indications shall be provided on the OMS Laptop/Tablet to indicate healthy communication status between OMS and GPS receiver (if GPS connected). Visual display button shall also be there on screen to indicate that the System is working in GPS or Time mode respectively

5.0 FUNCTIONAL REQUIREMENTS

5.1 OMS shall have following Functions:

- Calibration Check To calibrate the system in static mode and display a message after completion.
- Configuration To configure Train no., Coach No., Railway, Transducer Placement, Recording mode, Lower and Higher threshold values of Vertical and Lateral accelerations. All these configurations are to be displayed on the monitor.
- RUN During this function, vertical & lateral acceleration values, RI and RMS values shall be displayed and stored.
- Section Data Entry To enter all the data of the particular section such as Section No., Direction, Section: From and To, Start KM, End KM, Speed Limit, Run Speed, Electrified, TP (Odd/Even/Continuous).
- Diagnostic To check various hardware related diagnostic functions such as, event marker test, GPS Receiver test, Display and storage of static values of lateral and vertical transducers test.
- Utilities The System shall provide utilities for displaying the stored data, Executive Summary and Exception Report of a particular Run. In Executive summary the peaks per KM should be calculated as per the limits entered by the user for lateral & vertical peaks and RI.
- Exit To enable the user to close the program.

5.2 Error Messages –

The system should be capable of generating certain error messages with possible causes and indicate possible remedies to enable a user to rectify minor defects/errors.

6.0 SYSTEM REQUIREMENT:

- 6.1 Oscillation Monitoring System (OMS) will be a Lap Top or Tablet with accessories for monitoring the Parameters to be recorded & displayed during the Run in real time mode shall consist of the following:
- i. Block No. of a running kilometer in GPS Mode.
 - ii. Vertical and lateral RI of the block.

DTM	PED/TM	Page 5 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

- iii. Continuous display of the vertical /lateral acceleration. Grid lines for 0.15g & 0.20g should be shown on graph display in different colors. It should Identify and record /Display exceedances of vertical / lateral acceleration above a Lower threshold value.
 - iv. It shall also give distance in meters from any predetermined reference point (Generally a km post) in GPS Mode, when GPS mode is not selected then time of occurrence of exceedances shall be given.
 - v. Average Speed in time mode/Instantaneous speed in GPS Mode. System should show the speed of last 5 Kms. also on screen.
- 6.2 Speed, distance/time and location shall be computed from data taken directly either from the GPS Receiver in GPS mode or elapsed time from last km in Time mode.
- 6.3 Vertical and lateral accelerations, within a bandwidth of 0.3-10Hz shall be measured with the help suitable transducers/ accelerometers.
- 6.4 The system shall measure these acceleration value at least once in every 10 millisecond, display instantaneously peaks at the interval of one second continuously (even below Lower threshold value), compare with a predetermined value, find exceedances thereof and identify the location of occurrence by distance in GPS mode and elapsed time in Time mode.
- 6.5 These occurrences shall then be stored in the system for off line printing of both the acceleration values above lower threshold and distance from last km post in GPS mode or elapsed time in Time mode. The acceleration values above higher threshold shall be displayed/printed in BOLD.
- 6.6 All the peak values of vertical and lateral accelerations measured during every stretch of 200 meters run shall be taken to calculate the Ride Indices (R.I), using the Sperling Index formulae and Root mean square value of Lateral & vertical acceleration. This shall be displayed and stored.
- 6.7 At the end of the run, it shall be possible to take out an executive summary and exception report as well as copy of "ON LINE" running data report of the whole stretch tested, to get locations of all the spots where acceleration value recorded are more than any desired threshold value.
- 6.8 In off line mode, utility software shall be provided to convert data recorded in time mode to distance in meters as per Annexure 'F'.
- 6.9 Static calibration Facility at site to calibrate both vertical and lateral channels to be provided. The values obtained during calibration shall be stored and displayed on the monitor. The procedure and requirement of static calibration shall be elaborated in manuals based on the sensors used.

DTM	PED/TM	Page 6 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

6.10 Type of Input signals:

- **Digital Inputs :** Provision to accept at least 8 digital inputs for event marking such as for km post, bridge, level crossing, points and crossing, telegraph post, curve in, curve out and SEJ to signify various track features.
- **Analog Inputs:** There shall be two analog inputs from the accelerometer signal conditioner and one analog input from battery voltage for monitoring battery status if required.

6.11 GUI Based Data Acquisition and Analysis Software

Tailor Made Software for data acquisition and analysis is required for on line data acquisition and real time analysis. The software should operate under suitable software environment such as Windows, Linux, Android, etc.

The software should have graphic user interface. It should be possible to display data in the form of digital values & analog display in real time.

Application program should be provided with appropriate installation mechanism for the user interface system. A hard / soft copy of user manual should be provided with each system.

6.12 Data Acquisition and Application Software

The Data Acquisition and application Software shall have following:

i)	The software shall be industry standard and shall be compliant to the specifications of the user interface system used. The Application Software shall be uniquely identifiable by means of Checksum or version management.
ii)	It shall be possible to exchange data between this software and other associated office software (MS Office / equivalent package compatible with OS supplied.) for data management.
iii)	It should be possible to display real-time acceleration data in graphical format.
iv)	Software should be modular, menu driven and user interactive.
v)	Application Software shall be supplied by the firm on suitable media for installation, containing: a) Setup programme for installation. b) Associated drivers etc. c) Read me file with information on minimum hardware & Software requirements, release information etc.
vi)	Real-time acceleration data shall be displayed in graphical format.

Built in diagnostics and function routine for accelerometer calibration and other functions for checking the health of other hardware condition check should be provided in software. Battery condition check shall be provided either on the external battery or in built in diagnostic software.

DTM	PED/TM	Page 7 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

By default the unit will be in **GPS** mode. Following are initial parameter setting to be supplied by user at the start of run.

- Railway
- Train No.
- Coach No.
- GPS connected or not. (if connected)
 - Route Tape Y/N
If Yes
 - Route Code File Name
 - If GPS not connected
 - System should be switched over to Time mode.
- No. of sections. (maximum 5 sections can be provided)
Following details for each section to be provided:
 - Section Name
 - Section Speed
 - Run Speed
 - Direction
 - Start Km
 - End Km.
 - Electrified
 - TP Odd/Even/Continuous
- Transducer Placement: Leading/Trailing
- Lower and upper threshold values of accelerations

All the initial parameters should be stored as last entered which shall be user defined and can be changed by user as and when required for new configuration.

Following parameters are not user defined and should be taken from the system

- Machine number to identify its record.
- Offset and calibration values of vertical and lateral accelerometers with date and time.
- Run No. with date and time.

6.13 Each 10 m sec interrupt data for lateral & vertical accelerations will be collected and stored in a suitable buffer. The storage of acceleration peaks above lower threshold values, all Ride Index data shall be stored in comma delimited single file for further processing. The typical format of the file for GPS and Time Mode will be as per annexure 'G' & 'H' respectively. The description of record type for OMS data file format will be as per Annexure 'I'.

Vender shall not change the structure of this file without prior approval of RDSO.

6.14 Each sample will also be tested for peak. If sample is a peak it will be stored in a buffer for RI and RMS computation. In Time Mode, Ride Index and RMS of all blocks to be calculated after completion of a kilometer indicated by entering of Km,

DTM	PED/TM	Page 8 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

on the basis of elapsed time read, by dividing it in five blocks. In GPS Mode RI to be calculated for every block of 200m.

In case of GPS Mode number of blocks can be less than or more than 5, also depending upon the length of the kilometer. A KM may be more or less than 1000m if the last block is less than 250 m it will be the last block. However, in case of time mode it will be assumed that the km is of 1000m and the number of blocks will be 5. Method of zero crossing will be used for calculation of peaks.

In both cases RI of all the blocks to be displayed & stored after completion of each Kilometer.

All the peaks on a 200 meter length will be used for RI computation by using following formula:

$$R.I. = 0.896 \times 10^{\frac{1}{n} \sum_{i=1}^n \left\{ \frac{b_i^3}{f_i} \times F(f_i) \right\}}$$

Where n= no. of completed half waves (cycles)

b_i = Peak value of amplitude for the i^{th} half-wave

f_i = Frequency of the i^{th} half wave = $1/(2T_i)$; T_i = Time of i^{th} half cycle

$F(f_i)$ = Correction factor for the i^{th} half wave.

Correction factors for various frequency values are as follows:

For vertical mode	For lateral mode
0 for $f < 0.5$ Hz	0 for $f < 0.5$ Hz
$0.325 f^2$ for $0.5 \leq f < 5.4$ Hz	$0.8 f^2$ for $0.5 \leq f < 5.4$ Hz
$400/f^2$ for $5.4 \leq f \leq 20.0$ Hz	$650/f^2$ for $5.4 \leq f \leq 20.0$ Hz
1 for > 20 Hz	1 for > 20 Hz

- 6.15 In off line mode, utility software shall be provided to delete those Kms which have been recorded on less than desired speed and a memo indicating deleted Kms. displayed & stored in the report.
- 6.16 Format for output of run data in GPS mode and time shall be as shown in Annexure – B&A respectively.
- 6.17 Format of Ride Index and Executive summary shall be as shown in Annexure – C&D respectively.
- 6.18 The OMS shall work in GPS mode and in Time mode. In GPS mode working, the route information can also be fed through a route tape. In case the system hangs or shuts down due to power failure or due to any reason, when starting the system it should have the option to record data in the same run/ new run.

DTM	PED/TM	Page 9 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

- 6.19 In GPS mode if route tape of section is provided, the software shall read events from route Tape file in place of manual event marking. A method of synchronizing of route tape with Selected ground feature shall be provided in software.
- 6.20 All the track events such as Curve In, Curve Out, Point & Crossing, Bridge, Level Crossing etc. received from the event marker should be recorded against time/distance in the file as and when user presses the event key. Recording of TP in electrified section should be in odd/even No. as per the operator selection. For non-electrified, TP should be continuous in increasing order. TP/or feature like Br-in/Out, LC etc. should be displayed & recorded on the occurrence of peak.
- 6.21 Provision for generating the exception report should be available to user by defining the threshold of both acceleration and RI values. Format of the exception reports for Time Mode and GPS Mode is given in the Annexure-E-I, E-II respectively.
- 6.22 Option for PWI/ Section wise summary should be available.
- 6.23 Option to generate exception report from the recorded file as per the user Configuration of speed, Ver(TH), Lat(TH), Ver(RI) and Lat(RI).
- 6.24 Provision of Real time SMS/ e-mail alert to concerned sectional officials for peaks above configurable threshold value. Facility to change email id/mobile numbers of concerned officials should be there as and when required.
In case the GSM / GPRS connectivity is not available to send SMS/e-mail it shall be sent as soon as connectivity is achieved.
- 6.25 System shall be capable to read route tape file provided by Railways. Route tape file format will be as per annexure IV or VI or VIII or IX of RDPS document No.TM/SM/325 of RDSO. There shall not be allow any modification (format change) in route tape file by supplier/manufacturer.

7.0 Technical Requirements

Oscillation Monitoring System should be a Lap Top/ Tablet based system. The equipment should be portable and light weight as far as possible so as to facilitate carriage by single person. The system should consist two/Dual Axis acceleration sensors (lateral as well as vertical), a signal conditioner with suitable low pass filter, data acquisition system and GPS module. Suitable interfacing to be done to connect all these sub systems to get the desired parameters on Lap Top/Tablet, which shall be recorded, analyzed, displayed and stored for later analysis of the data. The OMS system shall be capable of recording up to the train speed of 160 Kmph.

7.1 Processing Unit Specification:

- CPU: Quad core or better, 1.4GHz or higher
- Storage: 64 GB extendable up to 128 GB or higher.
- Internal RAM: 2GB or higher
- External media: As suitable, such as USB drive, Flash disk, etc.
- Display: 9”or more with anti-glare screen

DTM	PED/TM	Page 10 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

- Laptop/Tablet should be protected with anti-dustcover.
- Operating system: Licensed
- Licensed MS office / equivalent package compatible with OS supplied.
- Antivirus software: Licensed, with at least two year subscription.
- Power Adapter Should be able to work with normal AC supply of 230volts, 50 Hz and supply available in Indian Railway coaches (110VAC/DC). Power cord of Min. 2 Mtr length, suitable for the same to be provided.
- Battery backup: 6 hours or better for which an external battery may be used.
- Carrying case

7.2 Data Acquisition system:

The desired Data Acquisition system should be of latest technology. This should be compatible with laptop/ Tablet supplied. System should be able to acquire all the field signals both analog as well as digital. Setup Program of the data acquisition system for installation on laptop/ Tablet should be provided in suitable media.

- **Sampling rate:** Minimum 1000 samples per channel per sec.
- **Sensor Range: 0.01g to $\pm 1.7g$.**
- **Interfacing Module:** Suitable interface should be provided to interconnect different modules & sensors. These connections may be wired or wireless.

7.3 Transducer, Signal conditioner cum Power pack unit:

Transducer & Signal Conditioner: The industrial grade acceleration sensor for system shall have adequate range of measurement of vertical and lateral accelerations. It should be mounted in true horizontal and vertical positions; the mounting arrangements of the acceleration sensor should be properly designed to produce true electrical output proportional to acceleration. The unit shall also have required amount of signal conditioning circuit with built in initial off set voltage adjustment of accelerometer to make it compatible to data acquisition system (DAQ). This unit should have provision of suitable low pass filter (10 Hz.).

The acceleration sensor should be housed in a metallic box, and it's mounting arrangement shall be such to avoid the self-vibration of the sensor unit during run. Operation of handheld Walky-Talky sets as used in Rlys, mobile sets etc. in the vicinity beyond 4 meters from the equipment should not result into false peaks being registered by equipment. No false peaks should be observed in case of charging/ operating from the coach supply during operation.

Power Supply:

Suitable power supply which can operate the system with internal/ external battery supply or coach supply ranging from 90-260V AC/DC shall be provided.

DTM	PED/TM	Page 11 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

Facility for charging the battery pack of adequate capacity by coach supply ranging from 90-260V AC/DC shall be provided. No false peaks should be observed in case of charging / operating from the coach supply during operation of the system.

The battery pack shall be of sealed maintenance free type of adequate capacity to provide working back up for at least 8 hours. Two LED indicators shall be provided to indicate the battery status. One for fully charged and the other for low battery.

7.4 **GPS Receiver Module:**

OMS System shall have a built-in GPS Receiver for getting GPS Coordinates (Longitude, Latitude) and Speed from Satellite System.

The desired **GPS Receiver** should be of Industrial grade. This should be compatible with laptop supplied. **GPS Receiver** unit shall comply the following requirements:

- Receiver Technology : GPS+ GLONASS or GPS+GAGAN
- Autonomous Positional Accuracy: 5 Meter or better
- Update Rate 5 Hz or better.
- Built-in non-volatile RTC
- Battery backup: 12 hours
- Hot Start Time: 3–5s
- Warm Start Time: 35s
- Cold Start Time: 60s

7.4.1 In case of failure of GPS receiver/Non connectivity of GPS the system should generate audio alarm/indication and automatically switch over to Time mode and again switch automatically back to GPS mode when GPS is available.

7.5 **Event Marker**

Provision of one External /Internal App based Event Marker to record various track features such as km post, bridge, level crossing, points and crossing, telegraph post, curve in, curve out and SEJ shall be a part of the system. For external event marker the length of cable should be minimum 2.5 meters.

In GPS/Time mode all the 24 track features as per Annexure 'J' shall be used through route tape, displayed and stored in data file.

8.0 **Documentation:**

Each unit shall be provided a user manual and a technical manual both for hardware and software.

Documents required from supplier

Manufacturer shall provide Operating and Maintenance manual consisting of following details:

- i) Brief description of the system and its sub-assemblies with suitable block diagram & connection diagram.
- ii) Technical Manual, Installation and maintenance guide (Hard copy and soft

DTM	PED/TM	Page 12 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

- copy).
- iii) Static calibration procedure, Diagnostic procedure, system commands including troubleshooting charts.
 - iv) User's Manual(hard copy and Soft copy) for operating the system & offline analysis of acquired data
 - v) In order to facilitate subsequent maintenance in service, the manufacturer/supplier shall supply detailed drawings of the OMS exhibiting clearly the materials and dimensions.

9.0 SPARE PARTS AND TOOLS:

9.1 Tools to be supplied

- a) Tool kit required for maintenance and operation.
- b) Spirit level table- One No.
- c) Other tools as recommended by OEM

9.2 Spares to be supplied

- a) For all leads/cords used in the system - 1 No. each
- b) Other spares as recommended by OEM

10.0 WARRANTY & AMC

All the material supplied should have a warranty for at least two year from the date of commissioning.

- 10.1** During procurement of the OMS, railways should go post-warranty AMC with the supplier for a pre-determined period as decided by the purchaser railway as per Comprehensive Guidelines on Procurement, Operation, Maintenance and Repair of Small Track Machine Repot no TM 227. This may be incorporated in the tender document as a condition of contract/Tender/Supply.

11.0 TESTS & VERIFICATION:

Type test shall be conducted on Prototypes at the time of initial approval. The manufacturer/supplier shall produce **two prototype samples** before inspecting officials for type tests.

The cost of type tests shall be borne by the manufacturer/supplier. All arrangement to conducts type tests shall be made by manufacturer/supplier.

DTM	PED/TM	Page 13 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

11.1 Dynamic Calibration/Test:

Dynamic calibration/ testing of sensors shall be done in any NABL accredited agency/RDSO for its performance.

The read values of the acceleration of 90% samples taken in the frequency range of 2Hz,3Hz,4Hz, 5Hz & 6Hz and acceleration range of 0.1g, 0.2g, 0.3g, 0.4g should be within limit of $\pm 10\%$ of the applied input acceleration.

11.2 Manufacturers test certificate for outsourced item:

- a) Dynamic calibration certificate/Test Report of sensors as per clause 11.1.
- b) License of Operating system
- c) License of related software if any.
- d) License of Antivirus software of reputed supplier with two years subscription
- e) Warranty of the Laptop/Tablet supplied.
- f) Technical Literature of GPS Receiver showing complete specification.

11.3 Test at the time of initial approval (Type test)

Following test shall be conducted at the time initial approval. The following shall constitute routine test and shall also be conducted by the manufacturer on every equipment/sub units and test results along with certificate shall be submitted during inspection.

- (i) Visual inspection as per clause 11.5
- (ii) System level functional test as per specification of OMS.

11.4 Test at the time of supply (Acceptance test)

Inspecting authority shall carry out acceptance tests on all the equipment/sub units. The following shall comprise Acceptance test:

- (i) Visual inspection as per clause 11.5.
- (ii) Test as per Acceptance test format approved by RDSO.

11.5 Visual Inspection:

The equipment shall be visually inspected to ensure followings–

- i. General workmanship.
- ii. Quality of soldering and component mounting.
- iii. Legend printing.
- iv. Green masking.
- v. Indications and displays.
- vi. Mounting, fitment and clamping of connectors.
- vii. Proper housing of cards.
- viii. Painting, labeling and marking as per clause 4.10.
- ix. Availability of stipulated documents and certificates.

DTM	PED/TM	Page 14 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

11.6 Field Trials:

Short stretch of field trials, as far as possible in hot condition, as practicable and in electrified section shall be done for the OMS under test to assess the working of the system in field conditions & in electrified section.

Interference due to use of Walky-Talky and switching of MIPS/charging needs to be seen during inspection field trial.

11.7 Testing/Inspection

The testing/Inspection of the OMS system shall be done by RDSO. The cost of inspection and testing shall be borne by the manufacturer/supplier. Minimum level of inspecting official shall be SSE/SSRE.

12.0 MARKING AND PACKING:

12.1 All sub units shall have names marked. All the markings / indications shall be easily legible and durable. Where the marking is by use of labels, the labels shall be metallic and shall be firmly fixed and shall not be easily removable by hand.

12.2 The word 'INDIAN RAILWAY PROPERTY' shall be indelibly etched /engraved /embossed/painted at a conspicuous position on the units. All units shall be aesthetically painted/ Powder Coated except the Lap Top/Tablet.

12.3 Each unit shall be supplied with a suitable carrying case which should be strong enough to handle, with provision of rollers for porting & carrying.

12.4 The system shall be so packed that it can withstand bumps and jerks encountered in a road/rail journey including handling during its transit.

12.5 The machine shall be legibly and indelibly marked with:

- i) Name, initials, contact no. and trade-marks of manufacturer.
- ii) Serial number of OMS.
- iii) Month & year of supply.

13.0 Training and commissioning:

The firm should provide training for operating the application software, installation of software and on various reports generation to the consignee.

DTM	PED/TM	Page 15 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

All annexures format are sample

RUN DATA IN TIME MODE

ANNEXURE-A

Machine No 123456
 Run No 543
 Run Date 31-03-2011
 Run Time 11:02:49
 Cal Date 31-03-2011
 Cal Time 10:59:08
 0g V/value -0.02
 0g L/value 0.00
 1g V/value 4.46
 1g L/value 4.49
 Railway NR
 Train No 12002
 Coach No ER12345
 L Ver (Th) 0.15
 L Lat (Th) 0.15
 H Ver (Th) 0.30
 H Lat (Th) 0.30
 Transducer Leading
 No of Sections 1

 Section Name LKO-CNB
 Direction UP
 Start Km 01
 End Km 80
 Section Speed 100
 Run Speed 100
 Electrified No
 TP Continuous

Time	Ver Peaks	Lat Peaks	Events

mm:ss:mss	SEC 1	LKO-CNB	
00:03:080	0.17		TP1
00:03:190	0.21		TP1
00:03:370	0.16		TP1
00:03:400		0.23	TP1
00:07:470		0.24	TP2
00:07:640		0.31	TP2
00:07:760		0.16	TP2
00:08:000		0.16	TP2
00:08:580		0.15	TP2
00:08:720		0.16	TP2

DTM	PED/TM	Page 16 of 37
Prepared By:	Issued By	

411545/2021/O/o PED/TMM/RDSO

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

00:08:990		0.19	TP2		
00:09:110		0.16	TP2		
00:09:250		0.16	TP2		
00:09:640	0.32		TP2		
00:09:650		0.15	TP2		
BLK	VER RI	LAT RI		VER RMS	LAT RMS
****	*****	*****		*****	*****
1.	2.89	4.42	0.7	0.8	
2.	3.26	3.65	0.6	0.6	
3.	2.82	3.94	0.8	0.9	
4.	3.60	3.78	0.6	0.7	
5.	2.27	4.13	0.5	0.8	
Km Avg RI	2.96	3.98	2 km, avg speed 60.19 KMPH		
00:03:490		0.24	TP1		
00:03:620		0.19	TP1		
00:03:740		0.19	TP1		
00:03:850	0.18		TP1		
00:03:980		0.25	TP1		
00:04:100		0.22	TP1		
00:04:220		0.17	TP1		
00:04:320		0.16	TP1		
00:04:450	0.19		TP1		
00:04:560		0.22	TP1		
00:04:680		0.19	TP1		
00:04:780		0.16	TP1		
00:04:900		0.18	TP1		
00:05:000		0.20	TP1		
00:05:130		0.19	TP1		
00:05:240		0.22	TP1		
00:07:360	0.18		TP2		
00:08:360	0.16		TP2		
00:08:590	0.19		TP2		
00:09:710	0.17		TP2		
00:11:430		0.19	TP2		
00:11:550		0.16	TP2		
00:16:440			BR		
00:16:660	0.23		TP3		
00:17:570			LX		
00:18:840			PC		
00:19:040		0.15	TP4		
00:19:580		0.18	TP4		
00:19:860			C-OUT		
00:20:100		0.17	TP4		
00:20:270		0.26	TP4		
00:20:430		0.30	TP4		
00:20:580		0.28	TP4		
00:20:730		0.24	TP4		

DTM	PED/TM	Page 17 of 37
Prepared By:	Issued By	

411545/2021/O/o PED/TMM/RDSO

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

00:20:870			LX
00:21:070	0.18		TP4
00:22:930	0.18		TP4
00:23:580	0.15		TP4
00:23:710	0.21		TP4
00:25:830		0.18	TP5
00:25:840	0.20		TP5
00:25:970	0.15		TP5
00:26:590	0.18		TP5
00:26:700	0.16		TP5
00:27:700	0.23		TP5
00:27:680		0.19	TP5
00:28:000		0.16	TP5
00:28:190		0.21	TP5
00:28:340		0.27	TP5
00:28:460		0.29	TP5
00:28:590		0.39	TP5
00:28:700		0.31	TP5
00:28:820		0.21	TP5
00:29:490		0.22	TP5

User stopped acquisition

DTM	PED/TM	Page 18 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

RUN DATA IN GPS MODE

ANNEXURE B

Machine No 12345
 Run No 550
 Date 31-03-2011
 Time 11:28:53
 Cal Date 31-03-2011
 Cal Time 10:59:08
 0g V/Value -0.02
 0g L/Value 0.00
 1g V/Value 4.46
 1g L/Value 4.49
 Railway NR
 Train No 14127
 Coach No ER12345
 GPS Yes
 Route Tape No
 L Ver (Th) 0.15
 L Lat (Th) 0.15
 H Ver (Th) 0.30
 H Lat (Th) 0.30
 Transducer Leading
 No of Sections 1

 Section Name LKO-CNB
 Direction UP
 Start Km 01
 End Km 80
 Section Speed 100
 Run Speed 60
 Electrified No
 TP Continuous

 Dist(meter) Ver Peaks Lat Peaks Spd Events

 SEC 1 LKO-CNB
 *****Dist = 0 m, km = 1 Spd = 59.796 Non Recording Mode is
 Starts Here *****
 *****Dist = 55.00m, km = 2 Spd = 61.340 Non Recording Mode is ends
 Here *****

55.60	0.18		61	TP1
55.93		0.20	61	[OHE Mast/ TP] 3/7
156.43	0.14		61	[OHE Mast/ TP] 3/7
258.08	0.23		61	[OHE Mast/ TP] 3/7
559.07	0.21		61	[OHE Mast/ TP] 3/7
660.39	0.19		61	[OHE Mast/ TP] 3/11

DTM	PED/TM	Page 19 of 37
Prepared By:	Issued By	

411545/2021/O/o PED/TMM/RDSO

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

BLK	VER RI	LAT RI	VER RMS	LAT RMS
1.	2.89	4.42	0.8	0.7
2.	3.26	3.65	0.7	0.8
3.	2.82	3.94	0.8	0.6
4.	3.60	3.78	0.7	0.6
5.	2.27	4.13	0.7	0.7
Km Avg RI	2.96	3.98	3 km, avg speed 60.19 KMPH	
490.21	0.17		64	[OHE Mast/ TP] 4/7
497.64	0.22		64	[OHE Mast/ TP] 4/7
501.10	0.22		64	[OHE Mast/ TP] 4/7
514.23			64	C-in
520.08		0.30	64	[OHE Mast/ TP] 4/13
522.39		0.32	64	[OHE Mast/ TP] 4/13
525.03		0.37	64	[OHE Mast/ TP] 4/13
540.21		0.36	64	[OHE Mast/ TP] 4/15
544.66	0.15		64	[OHE Mast/ TP] 4/15
545.82		0.22	64	TP6
545.82	0.32		64	TP6
548.13	0.24		64	TP6
547.96		0.21	64	TP6, PC
561.99	0.18		64	TP6
565.62	0.20		64	TP6
569.41	0.21		64	TP6
569.74		0.15	64	TP6
576.67	0.15		64	TP6
596.64		0.15	64	TP6
599.94		0.18	64	TP6
602.91		0.19	64	[Emergency Socket] 10
616.60	0.20		64	[Emergency Socket] 10
620.73	0.15		64	[Emergency Socket] 10
628.15	0.16		64	[OHE Mast/ TP] 4/17
651.42	0.15		64	[OHE Mast/ TP] 4/17
692.83		0.18	65	[OHE Mast/TP]8/17
694.48		0.29	65	[Level Crossing] 6C
697.29		0.32	65	[Level Crossing] 6C
699.27		0.32	65	[Level Crossing] 6C
702.24		0.30	65	TP8
704.22		0.26	65	TP8
756.85		0.21	65	TP8, PC
761.14	0.17		65	[Bridge (Minor)] DN ADVANCE S/L
761.31		0.16	64	[Bridge (Minor)] DN ADVANCE S/L
765.10	0.17		64	[Bridge (Minor)] DN ADVANCE S/L
768.73	0.18		64	[Bridge (Minor)] DN ADVANCE S/L

DTM	PED/TM	Page 20 of 37
Prepared By:	Issued By	

411545/2021/O/o PED/TMM/RDSO

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

```

784.57          0.16          64   [ Bridge (Minor) ] DN ADVANCE S/L
985.05          0.19          61   KM End
992.14          0.16          61   KM End
BLK            VER RI          LAT RI          VER RMS          LAT RMS
****          *          *****          *****          *****
1.             2.89           4.42           0.6             0.8
2.             3.26           3.65           0.5             0.6
3.             2.82           3.94           0.5             0.7
4.             3.60           3.78           0.7             0.8
5.             2.27           4.13           0.6             0.6
Km Avg RI     2.96           3.98   4 km, avg speed 62.37 KMPH
18.65         0.16           60   TP1
96.19         0.19           60   CIN
128.54        0.17           60   SIGNAL
132.49        0.17           60   USER 2
136.29        0.17           60   COUT
*****Dist = 535.26m, km = 4   Spd = 59.000 Non Recording Mode is Starts
Here *****
*****Dist = 705.54m, km = 4   Spd = 59.952 Non Recording Mode is ends
Here *****

```

DTM	PED/TM	Page 21 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

RIDE INDEX**ANNEXURE C**

Machine No 12345
 Run No 543
 Date 31-03-2011
 Time 11:02:49
 Railway NR
 Train No 14127
 Coach No ER12345
 GPS No

BLK	VER RI	LAT RI	
*****	*****	*****	
	SEC 1	LKO-CNB	
1.	3.12	2.43	
2.	3.27	4.38	
3.	2.56	2.66	
4.	2.77	2.67	
5.	2.62	2.74	
Average RI	2.86	2.97	2km,avg speed 61.01 KMPH
1.	2.89	3.42	
2.	3.26	3.65	
3.	2.82	3.94	
4.	3.60	3.78	
5.	2.27	4.13	
Average RI	2.96	3.78	3km,avg speed 60.19 KMPH
1.	2.43	2.68	
2.	2.63	2.52	
3.	3.07	2.93	
4.	2.78	2.15	
5.	3.21	3.09	
Average RI	2.82	2.68	4km,avg speed 60.54 KMPH
1.	3.79	3.82	
2.	2.56	2.40	
3.	3.30	2.95	
4.	3.22	3.28	
5.	2.56	3.25	
Average RI	3.08	3.14	5km,avg speed 61.55 KMPH

DTM	PED/TM	Page 22 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

EXECUTIVE SUMMARY

ANNEXURE D

RUN NO : 543
 DATE : 31-Mar-2011
 SECTION : SEC 1 LKO-CNB
 START KM : 1
 END KM : 5
 VER PEAK MIN : 0.15
 VER PEAK MAX : 0.50
 LAT PEAK MIN : 0.15
 LAT PEAK MAX : 0.50
 VER RI MIN : 2.50
 VER RI MAX : 5.00
 LAT RI MIN : 2.50
 LAT RI MAX: 5.00

 Acc limit No of Ver Peaks

>0.15 62
 >0.20 21
 >0.25 7
 >0.30 1
 >0.35 0
 >0.40 0
 >0.45 0

Vertical Average peak per Kilometer: 15.50

 Acc limit No of Lat Peaks

>0.15 55
 >0.20 24
 >0.25 10
 >0.30 2
 >0.35 1
 >0.40 0
 >0.45 0

Lateral Average peak per Kilometer: 13.75

 RI limit No of Ver RI Blocks

>2.50 16
 >2.75 14
 >3.00 9
 >3.25 5
 >3.50 2
 >3.75 1

DTM	PED/TM	Page 23 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

>4.00 0

>4.25 0

Vertical Average RI per Block : 3.03

 RI limit No of Lat RI Blocks

>2.50 14

>2.75 13

>3.00 10

>3.25 8

>3.50 7

>3.75 6

>4.00 3

>4.25 2

Lateral Average RI per Block: 3.28

DTM	PED/TM	Page 24 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

EXCEPTION REPORT TIMEMODE

Machine No 12345
Run No 543
Date 31-03-2011
Ver (Th) 0.20
Lat (Th) 0.20
Ver RI(Th) 2.50
Lat RI(Th) 2.50

ANNEXURE E-I

Section Name LKO-CNB
Start Km 1
End Km 3
Speed (Th) 60

TIME	Ver Peaks	Lat Peaks	Events
mm:ss:mss			
00:02:780		0.27	TP1
00:02:840		0.21	TP1
00:02:990		0.27	TP1
00:03:620		0.20	TP1
00:03:850		0.21	TP1
00:03:980		0.25	TP1
00:04:100		0.22	TP1
00:04:220		0.21	TP1
00:04:320		0.26	TP1
00:04:450		0.29	TP1
00:04:560		0.22	TP1
00:05:000		0.20	TP1
00:05:130		0.20	TP1
00:05:240		0.22	TP1
00:07:360	0.20		TP2
00:08:360	0.21		TP2
00:08:590	0.22		TP2
00:09:710	0.22		TP2
00:16:440			BR
00:16:660	0.23		TP3
00:17:570			LX
00:18:840			PC
00:19:580		0.22	TP3
00:19:860			COUT
00:20:100		0.21	TP3
00:20:270		0.26	TP3
00:20:430		0.30	TP3
00:20:580		0.28	TP3
00:20:730		0.24	TP3

DTM	PED/TM	Page 25 of 37
Prepared By:	Issued By	

411545/2021/O/o PED/TMM/RDSO

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

00:23:710	0.21		TP3
00:25:830		0.21	TP4
00:25:840	0.20		TP4
00:27:700	0.23		TP4
00:28:190		0.21	TP4
00:28:700		0.31	TP4
00:28:820		0.21	TP4
00:29:030		0.20	TP4
00:29:150		0.21	TP4
00:29:270		0.24	TP4
00:29:370		0.25	TP4
00:29:490		0.22	TP4
00:45:010	0.22		TP7

BLK	VER RI	LAT RI	VER RMS	LAT RMS	
****	*****	*****	*****	*****	*****
1.	2.89	4.42	0.6	0.8	
2.	3.26	3.65	0.7	0.7	
3.	2.82	3.94	0.6	0.7	
4.	3.60	3.78	0.7	0.8	
5.	2.27	4.13	0.6	0.8	
Km Avg RI	2.96	3.98	3km,avg speed 60.19 KMPH		

TIME	Ver Peaks	Lat Peaks	Events
------	-----------	-----------	--------

.....

mm:ss:mss

00:12:350		0.21	TP3
00:14:340		0.24	TP3
00:20:810		0.27	TP4
00:21:430	0.20		TP4
00:21:460		0.27	TP4
00:48:990		0.21	TP8
00:49:730		0.17	TP8
00:50:000	0.27		TP8
00:50:050		0.28	TP8
00:51:460		0.21	TP8
00:51:590	0.22		TP8
00:54:140		0.24	TP8
00:54:190		0.25	TP8

BLK	VER RI	LAT RI	VER RMS	LAT RMS
****	*****	*****	*****	*****
2.	2.63	2.52	0.5	0.5
3.	3.07	2.93	0.6	0.6
4.	2.78	2.15	0.6	0.5
Km Avg RI	2.82	2.53	4km,avg speed 60.54 KMPH	

DTM	PED/TM	Page 26 of 37
Prepared By:	Issued By	

411545/2021/O/o PED/TMM/RDSO

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

TIME	Ver Peaks	Lat Peaks	Events		
mm:ss:mss					
00:00:250	0.21		TP1		
00:03:530	0.21		TP1		
00:03:690	0.21		TP1		
00:04:850	0.23		TP1		
00:04:850		0.21	TP1		
00:05:550	0.26		TP1		
00:05:830	0.23		TP1		
00:06:390	0.22		TP2		
00:06:490	0.21		TP2		
00:06:680		0.21	TP2		
00:19:760		0.23	TP3		
00:20:800	0.22		TP3		
BLK	VER RI	LAT RI	VER RMS	LAT RMS	
****	*****	*****	*****	*****	
1.	3.79	3.82	0.6	0.7	
2.	2.56	2.40	0.5	0.6	
3.	3.30	2.95	0.6	0.8	
5.	3.22	3.28	0.6	0.7	
Km Avg RI	3.22	3.11			

DTM	PED/TM	Page 27 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

EXCEPTION REPORT GPS MODE**ANNEXURE E-II**

Machine No 12345
Run No 543
Date 31-03-2011
Ver (Th) 0.20
Lat (Th) 0.20
Ver RI(Th) 2.50
Lat RI(Th) 2.50

Section Name LKO-CNB
Start Km 1
End Km 5
Speed (Th) 60

Dist(mtr)	Ver Peaks	Lat Peaks	Spd (Kmph)	Events

5.26		0.27	65	TP1
5.45		0.21	65	TP/OHE Mast 3/19
5.79		0.27	65	Bridg(Important/major)nd3
7.45		0.20	65	Bridg(Important/major)nd3
8.56		0.21	65	Bridg(Important/major)nd3
8.99		0.25	65	Bridg(Important/major)nd3
9.02		0.22	65	Bridg(Important/major)nd32
9.26		0.21	65	TP/OHMast3/21
9.78		0.26	65	TP/OHMast3/21
10.45		0.29	65	TP/OHMast3/21
10.89		0.22	65	TP/OHMast3/21
11.96		0.20	65	TP/OHMast3/21
12.45		0.20	65	TP/OHMast3/21
12.89		0.22	65	TP/OHMast3/21
13.13	0.20		65	TP/OHMast3/21
13.56	0.21		65	TP/OHMast3/21
13.89	0.22		65	TP/OHMast3/21
14.23	0.22		65	TP/OHMast3/29
15.56			65	TP, BR
15.89	0.23		65	TP
16.02			65	TP, LX
16.45			65	TP,
16.52				PC
16.78		0.22	66	[Level Crossing] 6C
17.56			65	[Level Crossing] 6C
17.72				COUT
18.89		0.26	65	TP
19.23		0.30	65	TP
1956		0.28	65	TP

DTM	PED/TM	Page 28 of 37
Prepared By:	Issued By	

411545/2021/O/o PED/TMM/RDSO

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

19.96		0.24	65	TP/OHMast3/33
21.56	0.21		65	TP/OHMast3/33
21.89		0.18	65	TP/OHMast3/33
22.56	0.20		66	TP/OHMast3/33
23.45	0.23		65	TP1
24.96		0.21	65	TP1
26.65		0.31	65	TP1
28.24		0.21	65	TP1
29.87		0.24	65	TP1
30.45		0.25	65	TP1
30.68		0.22	65	TP1
31.86	0.22		65	TP1

BLK	VER RI	LAT RI	VER RMS	LAT RMS
****	*****	*****	*****	*****
1.	2.89	4.42	0.5	0.6
2.	3.26	3.65	0.4	0.7
3.	2.82	3.94	0.7	0.9
4.	3.60	3.78	0.7	0.8
5.	2.27	4.13	0.8	0.9
Km Avg RI	2.97	3.98	3km,avg speed 60.19 KMPH	

Dist(Mtr)	Ver Peaks	Lat Peaks	Spd(Kmph)	Events

12.22	0.21		65	[Bridge (Minor)] DN ADVANCE S/L
12.45	0.24		65	[Bridge (Minor)] DN ADVANCE S/L
14.03	0.27		65	[Bridge (Minor)] DN ADVANCE S/L
14.56	0.20		65	[Bridge (Minor)] DN ADVANCE S/L
14.98	0.27		65	TP2
17.45	0.21		65	TP2
17.56	0.17		65	TP2
18.02	0.27		65	TP2
18.56	0.28		65	TP2
18.99	0.21		65	[Level Crossing] 6C
19.12	0.22		65	[Level Crossing] 6C
19.56	0.24		65	[Level Crossing] 6C
20.12	0.25		65	[Level Crossing] 6C
BLK	VER RI	LAT RI	VER RMS	LAT RMS
****	*****	*****	*****	*****
2.	2.63	2.52	0.5	0.6
3.	3.07	2.93	0.7	0.8
4.	2.78	2.15	0.6	0.6
5..	3.21	3.09	0.7	0.8
Km Avg RI	2.92	2.67	4km,avg speed 60.54 KMPH	

DTM	PED/TM	Page 29 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

DIST(Mtr)	Ver Peaks	Lat Peaks	Spd(Kmph)	Events

5.12	0.21		65	TP3
6.98	0.21		65	TP3
7.45	0.21		65	TP3
7.99	0.23		65	CIN
8.12		0.18	65	SIGNAL
8.45	0.26		65	TP3
8.99	0.23		65	TP3
9.12	0.22		65	USER 2
9.56	0.21		65	COUT
9.99	0.21		65	TP4
13.45	0.23		65	TP4
13.96	0.22		65	TP4

BLK	VER RI	LAT RI	VER RMS	LAT RMS
****	*****	*****	*****	*****
1.	3.79	3.82	0.5	0.6
2.	2.56	2.40	0.4	0.7
3.	3.30	2.95	0.7	0.9
4.	3.20	2.88	0.7	0.8
5.	3.22	3.28	0.8	0.9
Km Avg RI	3.21	3.11		

DTM	PED/TM	Page 30 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

TIME TO DISTANCE**ANNEXURE F**

Machine No 12345
Run No 56
Date 31:03:2011
Time 11:02:49
Cal Date 31:03:2011
Cal Time 10:59:08
0g vval 0.00
0g lval 0.00
1g vval 4.50
1g lval 4.50
Railway NR
Train No 4127
Up/Dn Up
GPS No
Ver (Th) 0.15
Lat (Th) 0.15
Ver RI(Th) 2.50
Lat RI(Th) 2.50
Transducer Trailing
RI Blk/Km 5
No of Sections 1

Section Name LKO-CNB
Start Km 1
End Km 50
Speed Limit 100
Run Speed 100
Kilometer Increment
Electrified No

Dist V Pks L Pks EventSpeed

***** *****

SEC 1 LKO-CNB
294.2 0.17 TP3 72
301.9 0.16 TP4 72
305.6 0.23 TP4 71
713.5 0.24 TP8 73
729.7 0.29 TP8 72
764.1 0.16 TP8 71
858.6 0.19 TP9 72
883.5 0.16 TP9 71
920.7 0.19 TP10 73
921.7 0.15 TP10 73
1000.0

2km,avg speed 72.34 KMPH

DTM	PED/TM	Page 31 of 37
Prepared By:	Issued By	

411545/2021/O/o PED/TMM/RDSO

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

46.5	0.17	TP1	74
54.3	0.26	TP1	74
60.5	0.19	TP1	74
76.2	0.22	TP1	73
79.9	0.16	TP1	73
87.6	0.22	TP1	73
123.1	0.18	TP2	73
139.8	0.16	TP2	72
143.6	0.19	TP2	72
162.3	0.17	TP2	72
191.1	0.19	TP2	71
193.1	0.16	TP2	71
274.9		BR	
278.5	0.23	TP3	70
293.8		LX	
315.0		PC	
318.3	0.15	TP4	69
327.4	0.18	TP4	69
332.1			C-out
336.1	0.17	TP4	69
338.9	0.26	TP4	69
348.9		PC	
352.3	0.18	TP4	69
394.2	0.15	TP4	68
431.9	0.18	TP4	69
432.0	0.20	TP4	69
444.6	0.18	TP4	70
463.1	0.23	TP4	70
462.8	0.19	TP4	69
473.8	0.27	TP4	70
481.9	0.21	TP4	70
487.4	0.19	TP4	70
494.7	0.18	TP4	70
752.5	0.22	TP8	70
775.0	0.18	TP8	70
790.2	0.17	TP8	70
910.9	0.16	TP9	70
1000.0			3km,avg spd 70.1 Kmph
207.7	0.21	TP3	70
241.2	0.24	TP3	70
247.4	0.18	TP3	69
325.4	0.16	TP4	69
349.5	0.18	TP4	69
350.0	0.27	TP4	69
360.4	0.20	TP4	70

DTM	PED/TM	Page 32 of 37
Prepared By:	Issued By	

411545/2021/O/o PED/TMM/RDSO

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

360.9	0.27	TP4	70	
361.6	0.16	TP4	70	
369.3	0.16	TP4	70	
373.0	0.18	TP4	69	
823.1	0.19	TP9	69	
823.9	0.21	TP9	70	
835.9	0.15	TP9	70	
836.4	0.17	TP9	71	
840.9	0.27	TP9	71	
841.7	0.28	TP9	71	
865.5	0.18	TP9	71	
867.6	0.18	TP9	71	
910.5	0.16	TP10	71	
911.4	0.17	TP10	71	
1000.0				4km,avg spd 70.5 Kmph
8.4	0.21	TP1	70	
21.4	0.17	TP1	70	

DTM	PED/TM	Page 33 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

Annexure-G

Data File format for OMS in Time Mode

98,1243,
 96,2,
 95,543,
 94, 12:42:56,
 93,12,09,2011,
 99,12229,
 92, 1,
 90,2,
 80,1,
 81,2,2,
 72,ER12345,
 91, CNB-ALD,ALD-MGS,
 83,100,90,
 84,80,100,
 64,100,250,
 65,249,500,
 97,1,
 70,1,2,
 87, 12,09,2011,
 88, 12:42:56,
 89,-0.02,0.01,4.46,4.49,
 85,0.10,0.15,
 86,0.30,0.30,
 60,23,24,
 61,23,01:12:23,0.15,0.17,
 61,23,01:12:24,0.0,0.18,
 61,23,01:12:25,0.18,0.17,
 61,23,01:12:26,0.0,0.17,
 61,23,01:12:27,0.15,0.17,
 71,23, 01:12:24,26,
 71,23, 01:12:24,1,
 62,23,1,2.45,2.25,
 62,23,2,2.45,2.25,
 62,23,3,2.45,2.25,
 62,23,4,2.45,2.25,
 62,23,5,2.45,2.25,
 59,23,1,0.6,0.6,
 59,23,2,0.4,0.7,
 59,23,3,0.7,0.9,
 59,23,4,0.7,0.8,
 59,23,5,0.8,0.9,
 60,24,25,

DTM	PED/TM	Page 34 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

Annexure-H

Data File format for OMS in GPS Mode

98,1243,
 96,3,
 95,543,
 94, 12:42:56,
 93,12,09,2011,
 99,12229,
 92, 1,
 90,2,
 80,1,
 81,2,2,
 63,1234,
 72,ER12345,
 91, CNB-ALD,ALD-MGS,
 83,100,90,
 84,80,100,
 64,100,250,
 65,249,500,
 97,1,
 70,1,2,
 87, 12,09,2011,
 88, 12:42:56,
 89,-0.02,0.01,4.46,4.49,
 85,0.10,0.15,
 86,0.30,0.30,
 60,23,24,
 61,23,55.60,0.15,0.17,
 61, 23,55.93,0.0,0.18,
 61, 23,56.43,0.18,0.17,
 61, 23,58.08,0.0,0.17,
 61, 23,59.07,0.15,0.17,
 71,23,100.44,26,
 71,23, 1000.00,1,
 62,23,1,2.15,2.25,
 62,23,2,2.35,2.25,
 62,23,3,2.45,2.45,
 62,23,4,1.45,1.85,
 62,23,5,2.45,2.55,
 59,23,1,0.5,0.6,
 59,23,2,0.4,0.7,
 59,23,3,0.7,0.9,
 59,23,4,0.7,0.8,
 59,23,5,0.8,0.9,
 60,24,25,

DTM	PED/TM	Page 35 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

Description of record type for OMS data file format in GPS and Time mode

Record No	OMS Data	Drop Down Menu									
96	Recording Mode	1 -Tacho	2- Time	3- GPS							
92	Railway	0-CR	1-ER	2-WR	3-NR	4-SR	5-SC	6-NE	7-SE	8-NF	9-ECR
		10-NCR	11-WCR	12-NWR	13-SWR	14-SEC	15-ECO	16-KR	17-Others		
80	Transducer Placement	1- Leading	2- Trailing								
90	No. of Section	1	2	3	4	5					
81	Run Direction	1-UP	2-DN	3-SL	4-3 rd LINE		5-Others		(Entered for each section)		
70	Section electrified	1-Yes	2-No		(Entered for each section)						
97	TP Counting	1- Odd	2- Even	3- Continuous							
Taken from the System											
98	Machine No.	Machine No.									
95	Run no	Run no									
94	Run Time	hh:mm:ss									
93	Date of Run	Day	Month	Year							
87	Calibration Date	Day	Month	Year							
88	Calibration Time	hh:mm:ss									
89	Calibration Values	1- 0g V	2- 0g-L	3-1g V	4- 1gL						
Entered by the User											
99	Train No.	Train No.									
72	Coach No.	Coach No.									
82	Tacho Factor	Tacho Factor									
63	Route Code	Route Code									
91	Sections Name	Section1	Section2	Section 3	Section 4	Section 5	(No. of entries depends upon the no. of sections.)				
83	Section Speed	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	(No. of entries depends upon the no. of sections.)				
84	Run Speed	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	(No. of entries depends upon the no. of sections.)				
64	Section Start Km	Section1	Section2	Section 3	Section 4	Section 5	(No. of entries depends upon the no. of sections.)				
65	Section End Km	Section1	Section2	Section 3	Section 4	Section 5	(No. of entries depends upon the no. of sections.)				
85	Lower Theshold values for acceleration peaks	1- Vert	2- Lat								
86	Higher Theshold value for acceleration peaks	1- Vert	2- Lat								
Recorded Data											
61	Peak above threshold Details	1- KM	2- Time/Dist	3-Vert Peaks	4-Lat Peaks	(0.0 for no peak Vert/Lat above threshold)					
62	RI	1- Km	2-Block No.	3- Vert RI	4- Lat RI						
59	RMS	1- Km	2-Block No.	3- Vert RMS	4- Lat RMS						
71	Event	1-Km	2-Distance/time	3-Code							
60	KM	From	To								

DTM	PED/TM	Page 36 of 37
Prepared By:	Issued By	

ISO 9001-2015	Document No.: TM/SM/420	Version No.1.1	Date Issued :15/02/2021
Document Title: Specification for GPS Based Oscillation Monitoring System (GPS-OMS)			

Annexure-J

List of Route Feature codes

S.No	Route Feature	Route Code
1	Km post,	1
2	TP/OHE Mast,	2
3	Pt.& Crossing,	40
4	Level Crossing,	26
5	Switch Expansion Joint,	47
6	Buffer rails,	50
7	Road Over Bridge,	22
8	Bridge (Steel Girder) In,	20
9	Bridge (Steel Girder) Out,	21
10	Bridge (Others) In,	24
11	Bridge (Others) Out,	25
12	Curve In,	10
13	Curve Out,	11
14	Tunnel In,	68
15	Tunnel Out,	69
16	Cutting In,	60
17	Cutting Out,	61
18	Siding/loop In,	18
19	Siding/loop Out,	19
20	Speed Restriction In,	70
21	Speed Restriction Out,	71
22	Transponder	77

DTM	PED/TM	Page 37 of 37
Prepared By:	Issued By	