

ISO 9001-2015	Document No.TM/SM/CTSL/334 (Rev.02 of 2022)	Version:01	Date effective: 20/06/2023
Document Title: Specification of Cordless Train Speed Logger			



## **SPECIFICATION OF CORDLESS TRAIN SPEED LOGGER**

**No. TM/SM/ 334 dated:31/08/2012**

**( Rev. 02 of 2022)**

**Track Machines & Monitoring Directorate**  
**RESEARCH DESIGNS AND STANDARDS ORGANISATION**  
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## 1.0 Scope

- 1.1** This specification covers the functional and material requirements with testing criteria of Cordless Train Speed Logger, which is a device for measurement of speed of the passing train.
- 1.2** Preference to make in India: Compliance of the instructions contained in Public procurement (Preference to Make in India) order-2017 shall be ensured.
- 1.3** Manufacturers/suppliers shall be responsible to maintain quality of products supplied to Railways.”

## 2.0 References

Following codes/specifications have been referred to in this specification. Updated copy of latest version with correction slip/amendments of these codes/ specifications shall be followed and available with the firm.

i)	IS:104- 2017	Ready mixed paint, brushing, zinc chrome, priming
ii)	IS 2074 (Part 1) : 2015	Ready mixed paint, air drying, red oxide, zinc chrome, priming-Specification
iii)	IS 2932 (Part 1) : 2013 (Re-affirmed 2018)	Enamel, Synthetic, Exterior : (a) Undercoating (b) Finishing - Specification

## 3.0 Materials, Processing and Workmanship

- 3.1** All the components used in the device shall be free from manufacturing defect and of good quality of reputed make.
- 3.2** All metal surfaces shall be properly finished and rough/sharp edges shall be removed.
- 3.3** The device shall be made of good and durable light weight weather resistant material. All surfaces of the metal box shall be powder coated with anticorrosive coating or shall be painted with one coat of zinc chromate primer to IS:104- 2017 followed by one coat of red oxide/zinc chromate primer to IS 2074 (Part 1) : 2015 and two coats of synthetic enamel IS 2932 (Part 1) : 2013 or other approved painting system.
- 3.4** Cordless Train Speed Logger and its fixing arrangement shall be portable, simple and light in weight. The track transducer (sensor) should suit all rail sections used on Indian Rail and of reputed make. The rail fixtures shall not be affected by weather.
- 3.5** Power Source: Durable and good quality re-chargeable battery of reputed make e.g. Eveready, Panasonic etc. shall be used as power source. After one full charging the battery shall be able to sustain recording of speeds for at least two days continuously for section having around 100 trains/day. Standby time shall be 1 week. Overall life of battery shall not be less than 2 years.

## 4.0 Functional Requirements

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The instrument can be preset at any desired speed up to 200 kmph and the recording will mark all speeds above the preset speed as 'excess speed'.

#### **4.1 Display Unit**

This unit shall have menu based user friendly man machine dialogue by using key board and 16 characters, 2 line alphanumeric LCD display with backlit which sets Sensor unit parameters:

- Setting of date and time
- Setting of name of Railway, Division, from Station & to Station upto 4 alphabets each.
- Setting of Kilometer post upto 4 numeric maximum.
- Setting of Line name upto 5 alphanumeric maximum.
- Setting of from TP to TP upto 2 numeric maximum each.
- Setting of Speed limit.
- There shall be provision to display the following Data on LCD display directly by Scrolling
  - i. Maximum speed for the given stipulated period.
  - ii. Over speed for the given stipulated period
  - iii. All logged data for the given stipulated period.

The size of this unit shall not be more than 15cm x 9cm x 4cm (approx.) to make it easy to handle and operate. No separate batteries are to be used for this unit as it will draw power from Sensor unit when in use.

#### **4.2 Sensor Unit**

This unit shall be fitted on track for recording the speed. This unit shall be compact and consists all the parts i.e. Sensors, Electronic circuitry for recording the speeds, batteries etc. This Unit shall have the following features:-

- Non-volatile memory which shall be capable to record speeds for at least 500 nos. of trains.
- It will have rechargeable battery pack of two days backup (without Display unit) and while replacing/removing the battery, there shall be no loss of stored data.
- The unit should easily be installed with not more than one semi-skilled workman within five minute.
- Sensor Unit shall have following Visual indications:
  - (i) Visual indication at power ON/Low Battery.
  - (ii) Visual indication at Over speed.
  - (iii) Visual indication at the time of transferring data to Data Transfer Module.

The size of this unit shall not be more than 26cm x 12cm x 7cm (approx) and weight shall not be more than 1.5 Kg to make it easy to handle and install.

#### **4.3 Data Transfer Module**

This module is used for transferring data from Sensor Unit to Personal Computer (PC) through USB Port of PC. Data transferred in Computer should create a file in ASCII format compatible to TMS software as given below:-

#### **Location Record Format**

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I	,	R	R	R	R	,	D	D	D	D	,	S	S	S	S	-	S	S	S	S
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

I	-	Record identifier : 1 for location record.
RRRR	-	Name of Railway in 4 Alphanumeric characters.
DDDD	-	Name of Division in 4 Alphanumeric characters.
SSSS- SSSS	-	Name of Section in 9 Alphanumeric characters.

#### **Kilometer record format**

I	,	K	K	K	K	,	T	P	,	T	P	,	L	L	L	L	L
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

I	-	Record identifier : 2 for Kilometer record.
KKKK	-	Kilometer post reading in 4 Numeric characters.
TP, TP	-	Name of the two Telephone poles in 2 Numeric characters each.
LLLLL	-	Name of the line in 5 Alphanumeric characters.

#### **Train speed record format**

I	,	D	D	/	M	M	/	Y	Y	,	H	H	:	M	M	,	S	S	S	,	M	M	M	,	1	,	U	P
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

I	-	Record identifier : 3 for Train speed record.
DD/MM/YY	-	Date, Month & Year.
HH:MM	-	Time in hours and minutes
SSS	-	Set train speed limit in 3 Numeric characters.
MMM	-	Maximum recorded speed of train in 3 Numeric characters.
1or 0	-	0 for normal speed and 1 for over speed in 1 Numeric character.
UP or DN	-	UP or DN is direction of train in two Alphanumeric characters.

This data can also be further accessed in EXCEL files.

- (i) EXCEL file for the trains exceeding preset speed limit
- (ii) EXCEL file for maximum speed of all trains along with all 25 speed samples with proper color coding.

The supplier shall provide a software on CD (compact disc) for both the functions. This module shall be designed in such a way that it can be fitted easily in Sensor Unit and does not contain any power source or battery. Dimensions of this module should be approximately 7.0 cm X 6.0 cm X 2.6 cm.

## **5.0 Technical Features**

i)	Range of Speed	01 to 200 kmph
ii)	Traffic condition	Bi-directional
iii)	Mode of speed measurement	Repetitive speed measurement on passage of at least every fourth wheel set. (Up to 25 sets/train)

iv)	Tolerance of speed measurement	$\pm 01\%$ of full scale for all speeds
v)	Calendar and time recorder	High stability crystal based real time clock to drive calendar & time shall be provided.
vi)	Installation	The unit should easily be installed with not more than one semi-skilled workmen within 5 minutes
vii)	Weight of the instrument	Maximum 3 kg (Approx.) including Display unit, Sensor unit, Data Transfer Module, Battery charger, cable etc.

## 6.0 **Tests:**

### 6.1 **Visual& Dimensional check:**

The device shall be checked visually and dimensionally. The device shall be free from all visual defects in material, construction and fabrication.

### 6.2 **Operation Test:**

The operations like functioning of transducers, train simulation, transferring of logged data on computer, working of calendar and clock and other features described in clause 4.1 etc. shall be checked.

### 6.3 **Field Test:**

- a) The Cordless Train Speed Logger shall be tested in field in main line/yard line. Recording shall be done in two sets for two trains each. The first set will record speed up to 50 KMPH and the second shall record speed more than 50KMPH.
- b) After conducting the above test, the speed recorded by the Logger shall be checked with the speedometer of the engine of the train in driver's cabin. Not more than 5% reading shall fail the criteria mentioned in clause 5.0 above.

### 6.4 **Performance Test**

A train simulator as per Annexure –I is to be arranged by supplier/manufacture on which Cordless Train Speed Logger shall be mounted for comparing at least five different speeds with actual speed of the simulator.

## 7.0 **Tests at the time of supply (Acceptance Test)**

7.1 Following tests shall be done as acceptance test in sequence for all the samples randomly collected as per clause 7.2:

- i) Visual test as per clause no. 6.1
- ii) Operation test as per clause no. 6.2
- iii) Performance test as per clause no. 6.4
- iv) Field test as per clause no.6.3

7.2 100% sample shall be tested as per clause 7.1 (i) and (ii). 05% or min. 2 nos. of the device (whichever is more) per lot/PO (randomly selected) shall be inspected for its performance as mentioned in the clause no. 7.1(iii). If only one device is procured, the same shall be tested as per clause 7.1 (iii). At least one device per lot shall be inspected for field test as per clause no.7.1(iv).

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- 7.3 If the samples satisfy the entire test prescribed as per acceptance criteria, the lot is accepted, otherwise lot is rejected.
- 7.4 In case of any dispute between inspecting officers and manufacturer/supplier, the decision of inspecting team shall be final and binding.

## **8.0 Warranty & AMC**

- 8.1 Any part of the device failing or proving unsatisfactory in service due to defective design, material or workmanship within 12 months from the date of commissioning shall be replaced by the supplier/ manufacturer at his own expenses.
- 8.2 During procurement of the device railways should go post-warranty AMC with the supplier for a pre-determined period as decided by the purchaser railway. This shall be incorporated in the tender document as a condition of contract/Tender/Supply.

## **9.0 Service Facility and Spare Parts (including tools)**

- 9.1 The supplier/manufacturer shall provide service of competent service engineers free of cost during commissioning and warranty period. The service engineer shall guide the operating and maintenance staff during commissioning and warranty period of the device for proper operation and handling.
- 9.2 The manufacturers/supplier shall have good service network throughout the country for quick and easy access to the users. A prompt response to the call of the customers is expected in case of any problem experienced in field.
- 9.3 Each device shall be supplied with a complete set battery charger with cables, connection cable to USB port and other necessary attachment as prescribed by the manufacturer/supplier for trouble free operation of the device.
- 9.4 The manufacturer/supplier shall be responsible for subsequent availability of the spare parts/components/chips etc. to ensure trouble free service for the normal life (5-8 Years) of the device.

## **10.0 Documentations:**

- 10.1 Copies of maker's test certificate guaranteeing the performance of the device shall be supplied in duplicate along with delivery of each device.
- 10.2 In order to facilitate trouble-free operation, the manufacturer/ supplier shall supply operating and maintenance manual including trouble shooting details. These shall exhibit clearly the details of the various components.

## **11.0 Training and Commissioning:**

Adequate training in operation and maintenance of the device shall be imparted to railway operators by the manufacturer either at manufacturer's premises or at railway premises,as

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per the convenience of the purchaser/mutually agreed between the purchaser and the supplier, at the rate of two operators per device which shall be treated as part of commissioning.

## **12.0 Marking and Packaging:**

12.1 Each device shall be legibly and indelibly marked/stickered with the following details:

- (i) Name and trade mark/brand of the manufacturer.
- (ii) Contact details of Manufacturer/supplier.
- (ii) Serial no. of the device.
- (iii) Month & year of supply.

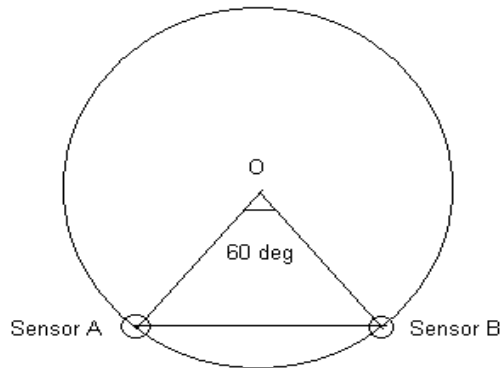
12.2 The device shall be packed in suitcase after covering with good quality plastic sheets as per best trade practice.

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## ANNEXURE – I

In speed simulator a non metallic arm having a small metal piece fitted at a distance of **d** metre from its axis (equal to the distance between two sensors) is rotated at **N** RPM so that its metal piece triggers Sensor 'A' & Sensor 'B' for every revolution. This phenomenon may be simulated as train wheels are passing from Sensor 'A' to Sensor 'B' continuously and a formula for converting RPM of simulator (Measured by Pre - calibrated Digital RPM meter) into train speed in Kmph can be derived as given below:



Radius of simulator Arm = OA = OB = Distance of sensors A & B = AB = d metre

Radius of simulator Arm = Distance of Sensors A & B = **d** metre

Let simulator Arm speed = **N** RPM

Time taken for one revolution i.e.  $360^\circ = 60/N$  seconds

Hence time taken for travelling distance **d** between sensors A & B i.e.  $60^\circ = 60/N \times 60^\circ/360^\circ$   
 $= 10/N$  seconds

Speed measured by Cordless Train Speed Logger  

$$= \frac{\text{Distance between two sensors}}{\text{Time gap for triggering the two sensors}}$$

$$= \frac{d}{10/N} = \frac{dxN}{10} \text{ m/sec}$$

$$= \frac{d \times N \times 3600}{10 \times 1000} \text{ kmph}$$

$$= 0.36 d \times N \text{ Kmph}$$

In this case distance between two sensors is taken equal to 0.139 metre

Hence speed measured by Cordless Train Speed Logger =  $0.36 \times 0.139 \times N$  Kmph  
 $= 0.05004 \times N$  Kmph

Or we can say that 20 RPM of simulator is equal to 1 Kmph of train speed.

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