No.S42-85

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAY BOARD)

INDIAN RAILWAYS STANDARD SPECIFICATION

FOR

AXLE COUNTER EQUIPMENT (TENTATIVE)

SERIAL NO. S42-85

0. FOREWORD

0.1 This specification is issued under the fixed Serial No. S42-85 the final number indicates the year of original adoption as standard, or in the case of revision, the year of last revision.

ADOPTED,1970

0.2 This specification requires reference to the following Indian Railway Standard (IRS and Indian Standard (IS) specifications:

IRS S-23 Electrical Signalling and Interlocking equipment (Tentative)

IS 9000 (Part I,II, III,IV,V, VIII & XIV) Basic environmental testing procedures for electronic and electrical items.

Indian Railways Schedule of Dimensions

0.3 Wherever in this specification, any of the above mentioned specifications is referred to by number only without mentioning the year of issue, the latest issue of that specification is implied; otherwise, the particular issue referred to is meant.

0.4 This specification is intended chiefly to cover the technical provisions and the provisions relating to supply of the equipment and so does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This specification applies to Axle Counting equipment including the electronic type. It caters for single entry/exit and multiple entry/exit axle counting equipments with maximum four detection points.

1.2 This specification gives general operating and technical requirements and tests.

1.3 This specification does not cover the external wiring and protective devices used in conjunction with axle counting equipment in their installations.

2. TERMINOLOGY

2.1 The terminology referred to in the specification is covered by the definitions given in IRS Specification No.S-23 and IS Specification No.9000.

3. OPERATING REQUIREMENTS

3.1 The equipment shall be actuated only by the wheel flanges and not by any other part of the train (rail brakes, toilet pipes, suspended chains, etc.) and its operation shall be independent of:

a) type and condition of wheels such as diameter, design of wheel, wear and tear permitted vide Indian Railways Schedule of Dimension as well as lateral displacement of wheels on the rails,

b) type of rail sections and construction such as welded or non welded rails, and

c) type of traction such as DC as well as AC electric, diesel or steam as well as weight of the rolling stock.

3.2 The operation of the equipment shall be fully reliable at all train speeds in the range of 200 Km p.h. The equipment shall ensure that until all the axles that enter a section are completely counted out, the section concerned shall not be shown as clear.

3.3 The equipment shall count in or out the axles, the ends of the monitored section, depending on the direction of movement.

3.4 The equipment shall not be susceptible to operation by maintenance tools at or near the track equipment.

3.5 The equipment shall be capable of simultaneously counting-in and counting-out i.e, simultaneous counting in and counting-out impulses from the ends of the monitored

section shall not interfere with each other.

3.6 The error rate shall not exceed two errors for one million correctly counted axles,. Even this error shall not give rise to unsafe conditions.

3.7 Suitable arrangement shall be provided so that the wheels of insulated trolleys are not counted by the axle counters. Any devices required in this connection shall be provided by the purchaser.

3.8 The section where this equipment shall be installed may be provided with Automatic Warning System (AWS) equipment of the AC inductive type of IRS Specification RDSO/SPN/74/87. The axle counting equipment shall not be affected by the AWS fitted to the locomotive. Similarly, the axle counting equipment shall not affect the AWS equipment of the locomotives. The purchaser shall furnish the details of the AWS equipment of the locomotives to the Tenderer.

Also the axle counter should not get affected by Last Vehicle Check Device equipment and Audio/ High Frequency Track Circuit Equipment. Similarly the axle counting equipment shall not affect the last vehicle check device equipment and the Audio/High frequency track circuit equipment.

3.9 The equipment shall be so devised that it shall not be affected by magnetic type rail brakes if and when provided on the rolling stock.

4.GENERAL REQUIREMENTS

4.1 The equipment shall be robust in construction and shall work on the permanently energised principle. Any defect occurring in the equipment shall not result in a condition that will lead to unsafe working of the trains.An indication of failure shall be provided.It shall also not be affected by iron filings from brake shoes dropped during application of brakes.

.2 The equipment shall be self checking and shall have separate indications to show conditions of "clear" and "occupied". Any disturbance or failure in the equipment including power failure shall result in cancellation of the "clear" indication and appearance of "occupied" indication. Track clear indication shall only be given when "incount" and "out-count" are equal or the count is '0'.This implies that until all the axles that enter a section are completely counted out, the section concerned shall not be shown as "clear".

Resetting key/buttons (with sealing arrangement) permitting resetting of the counter to normal in case of disturbance

or failure shall be provided. Provision shall be made of recording by means of an electrical counter, each operation of resetting key/button.

4.4 The equipment shall be insensitive to extraneous magnetic or electrical fields (such as due to traction return currents on electrified sections, traction motor fields, vehicle magnets for inductive train control wheels with residual magnetism, etc., or due to any other source). The equipment shall also not be affected by operation of electrical switches raising or lowering of pantograph in electrified areas, switching in and out of diesel engines and switching on or off of the catenary in the electrified areas.

4.5 The equipment shall be insensitive to mechanical vibrations.

4.6 (a) The track-side equipment shall be insensitive to supply voltage fluctuations of +20% and -10% of rated voltage.

(b) The supply to the electronic counter shall be regulated to ensure proper functioning of the counter.

4.7 Power consumption, especially of track side equipment shall be low thus permitting operation from remote supply.

4.8 A voltage sensitive feature shall ensure that without the operation of resetting key, "clear" indication cannot be given in cases of -

(a) Power failure,

(b) Voltage fluctuations beyond upper and lower limits,and

(c) removal of printed circuit card if such cards are used.

4.9 The equipment shall be immune to adverse weather conditions like dust, heat, humidity, rain and thunder storms.

4.10 The equipment installed in the track shall preferably have no moving parts, and shall require little maintenance.

4.11 The installation of the equipment in the track shall be simple, preferably requiring no modifications to the track.

4.12 The equipment installed on the track shall not infringe the schedule of dimension of Indian Railways.

4.13 The equipment shall be so constructed as to prevent unauthorised/irregular access to the sub-assemblies of the system. Authorised persons should, however, have access to these sub-assemblies for purposes of installation and maintenance by unlocking the outer cover/breaking the seal provided on the outer cover.

4.14 The counting unit shall be provided with test points to facilitate adjustments required for proper functioning of the equipment and for facility of maintenance.

4.15 The equipment shall be fully solid state using carefully chosen components.

4.16 The equipment installed in the track shall be capable of withstanding flooding of the tracks and shall preferably be capable of functioning in partly or wholly submerged condition of the track.

4.17 Detecting equipment at the junction of two consecutive sections shall be able to control separate counters for each section.

4.18 The system shall provide for continuous supervision of transmission lines, i.e. in short circuit or open circuit the defect in transmission line shall be immediately detected.

4.19 The counter shall be capable of storing at least 1024 counts.

4.20 The Supplier shall indicate special maintenance instruments and tools, which may be necessary for proper adjustments and maintenance of the equipment and supply them, if so required by the purchaser.

5. ADDITIONAL REQUIREMENTS FOR ELECTRONIC EQUIPMENT

5.1 The equipment shall be subjected to and shall pass the tests specified in IS:9000. The details of the test to be complied with are given in clause 7.2.1.1(a).

5.2 The equipment shall also be subjected to electromagnetic test. The details of the test to be complied with are given in 7.2.1.1(b).

5.3 The functional integrity of the electronic counter shall preferably be visually indicated.

5.4 Card structure of both evaluator and junction box shall preferably be of modular construction.

5.5 A suitable design of mother board shall be used for back panel wiring.

5.6 There shall be an integrated 7 segments display system using good quality flat cable.

5.7 Suitable arrangements shall be made for providing electrical isolation between external relay circuit and internal circuit of the evaluator.

6. FINISH

6.1 The finish of the various parts of the equipment shall conform to IRS specification S-23.

7. INSPECTION AND TESTING

7.1 Inspection and test shall be carried out to ensure that all requirements of this specification and drawings supplied/approved, if any, by the purchaser are complied.

7.2 ACCEPTANCE TESTS

7.2.1 Type tests

7.2.1.1 (a) The equipment shall comply with climatic environmental tests as per IS:9000 to the severity conditions as per Appendix 'C' of this specification.

(b) The equipment shall pass the electro magnetic interference test caused by 25KV AC traction as per APPENDIX 'D' of this specification.

7.2.1.2 To obtain a Type Approval Certificate, the manufacturer or supplier shall submit to the Testing Authority sufficient number of samples for conducting all the tests mentioned. The samples shall be selected at random from regular production lots so as to be as representatives as possible of the type under consideration.

7.2.1.3 A type approval certificate once issued shall not be valid if a change in the design, construction, material used for manufacturing process is made subsequently, unless this change has the approval of the purchaser of nominee

7.2.1.4 A type approval Certificate shall be issued to the manufacturer if samples pass all the prescribed tests.

7.2.1.5 Maintenance of type Approval- At the end of the validity period of 3 years or earlier, if necessary, the Testing Authority may call for fresh samples for Type Testing for the purpose of maintenance of the Type Approval.

7.2.1.6 Rejection and Retesting-If the equipment fail in any test, the Testing Authority may consider the requirements of Type Approval as not having satisfied and any call for fresh samples not exceeding twice the original number for the purpose of retesting. In such

a case, a detailed report on the tests carried out shall be furnished to the Manufacturer after

incorporating in the equipment any modifications considered necessary. The specific test or tests to be carried out shall be at the discretion of the Testing Authority, who may wish to carry out all the related tests whether or not the earlier tests were satisfactory. In all cases, for the repeat tests to be carried out on the second set of samples, twice the number of samples originally used for the specific test in the first series shall be used. If in the second shall be considered to have passed the Type Tests.

7.2.2 Sub-system Functional Test.

All equipments of an axle counter system shall be checked for individual compliance with limits laid down in the track schedule as specified by the designer.

7.2.3 Performance Test-The equipment to be accepted shall be tested so as to comply with the operating requirements as specified in Clause 3.

7.2.3.1 Tests may also be carried out on actual installation to make sure that the equipment shall correctly perform the required functions.

7.2.4 The Inspecting Authority shall carry out routine and performance tests on 10.1 of the lot to be inspected.

7.2.5 The sampling plan for acceptance purposes shall be subject to agreement between the purchaser and supplier. In the absence of any such specific agreement, double sampling plan given in table I shall be adopted.

TABLE-I

Lot consisting of	First sample size (N1)	Second sample size (N2)	Combined sample size (N1+N2)	Acceptance number (C1)	Rejection number (C2)
Under 25	3	6	9	0	2
25 to 50	7	24	21	0	3
51 to 100	10	20	30	0	3
101 to 200	13	25	39	0	5
201 to 300	20	40	60	1	5
301 to 500	26	50	75	1	6
501 to 800	35	70	105	2	7
801 to 1300	50	100	150	3	10
1301 to 3200	75	150	225	5	12

8001 and above	150	300	450	9	24

7.2.6 The number of equipment(N1) as given in column 2 shall be first selected and subjected to the acceptance test. If in the first sample the number of defective equipment that is those failing in one or more acceptance test is less than or equal to the corresponding acceptance number (CI) given in Column 5 the lot shall be considered as conforming to the requirements of the acceptance tests.

If the number of defective equipment in the test sample lies between (C1) and (C2),a second sample of size (N2) as given in column 3 shall be selected and subjected to acceptance tests. If in the combined sample, the number of defective equipment is less than(C2),the lot shall be considered as conforming to the requirements of acceptance tests, otherwise not.

7.2.7 METHOD OF SELECTION

The equipment for acceptance tests shall be selected at random from at least 10% of the packages. For random selection of packages all the packages in the lot shall be arranged in a serial order and every r'th package shall be selected until the requisite number of packages is obtained 'r' being the integral part of

$$\frac{\text{Total No. of packages in the lot}}{\text{Total No. of packages to be selected}}$$

From each package, equal number of equipment shall, as far as possible, be drawn to make up the sample size required for the acceptance tests.

7.2.8 Test Report

A complete test report of all the tests conducted shall be submitted, giving the detailed observations made in every case and actual values recorded. Specific mention shall be made wherever the equipment has failed to comply with the requirements and also indicating as to how far it has failed to comply.

7.2.9 Disposal of Samples-Sample equipment which have been subjected to type tests mentioned in Clause 7.2 shall not form part of the supply.

8. REJECTION

8.1 The equipment or any part thereof that does not comply with any of the requirements of this specification and/or of the drawings as supplied/approved by the Purchaser may be rejected.

9. MARKING AND IDENTIFICATION

9.1 An engraved name plate giving Manufacturer's name and other data shall be attached on the outside of the different items of equipment in a conspicuous position.

10. PACKING

10.1 The equipment shall be so packed as to permit convenient handling and to protect equipment against pilferage or damage during transit or storage.

11. WARRANTY

11.1 The warranty of the equipment shall be in accordance with IRS Specification No.S-23

12. DATA TO BE FURNISHED

12.1 The tenderer shall finish the particulars as per Appendix 'B'.

APPENDIX 'A'

INFORMATION TO BE SUPPLIED BY THE PURCHASER

A-1 Number of detection point in track section.

A-2 Details of the traction system (clause 3.1)

A-3 Information regarding the gauge rails, sleepers and speeds on pertinent sections (clauses 3.1 and 3.2).

A-4 Details of AWS equipment (clause 3.8).

A-5 Number of axles per train running and expected in future (clause 4.19)

A-6 Details of proposed signalling including approximate location of the axle counting equipment.

APPENDIX 'B'

INFORMATION TO BE SUPPLIED BY THE TENDERER

B-1 Details of the axle counting equipment including the rated voltage and current of various units, overall dimensions of various units and manner of fixing the same relating to the track.

B-2 Limiting distance between the track unit and the counting unit, if any.

B-3 Sizes and specifications of cables required for working up to 5, 10 and 15 Km. lengths.

B-4 Extent of forward and backward movement of axle over the track unit which will ensure actuation of the counter.

B-5 Special maintenance instruments and tools (clause 4.20).

B-6 Details of any special wires or cables that are to be used for connections.

B-7 Complete circuit details and list of components used in the equipment.

B-8 Full description, values and tolerances of components used.

B-9 Type of wires, gauge, No. of turns etc. of coils chokes, transformers etc. used in circuitry.

APPENDIX 'C'

OUTLINE OF TESTS AND DEGREES OF SEVERITY FOR CLIMATIC TESTING OF EQUIPMENT CLAUSE 7.2.1.1.

S.No.	Test	Degree of severity
1.	Change of Temperature (temperature cycling) as per IS 9000 Pt.XIV	i)low temperature =0 deg.C+/-3deg.C ii)High temperature=60deg.C+/-2deg.C Rate of cooling and heating 1 deg.C per minute. iii)Duration of exposure at each temperature =3 hrs. iv)No. of cycles =3
2.	Damp heat test(cyclic) as per IS 9000 Pt.V	i)Upper temperature=40 deg.C ii)Duration of each cycle =24 hrs.

3.	Vibration test (Sinusoidal)as per IS 9000 Pt.VIII	i)Frequency range= 10 Hz. to 55 Hz. ii)Vibration Amplitude = 0.35mm. iii)Duration of one sweep 10 Hz.-55 Hz.-10Hz. iv)No.of sweep cycles=20 nos. v)No. of axis=3 Co-ordinate axis.
		vi)Duration of Resonant freq. =30 min.$\pm$ 1 min.

APPENDIX-D

A. 7KV STATIC DISCHARGE TEST

One prototype of the equipment shall be tested in the laboratory with 7 KV static discharge on its chassis. Methodology of the test is given below :

A capacitor of suitable capacity shall be charged to 7KV from a high voltage power supply through suitable transformer.After this the capacitor should be discharged through the tip of suitable pistol by touching it directly on the different points of chassis with 10 K.ohm resistance in series or by using Schaffner Interference simulator model HSG 222 orMini ESD simulator model MZ-15 of M/s Kdy Tek Instruments. This test should be repeated three/four times. In no case supervisory relay should be dropped or extra counts should be generated in the equipment. Equipment shall also be tested for its normal functioning after this test.

(b) PANTOGRAPH INTERFERENCE TEST

One prototype of the equipment shall be installed in the actual field condition in AC electrified area. An AC electric loco shall be placed in a position on the track such that distance between nearest face of the equipment and point of catenary where pantograph is touching, is 4.0 meters.

The equipment shall be tested for its normal working during raising and lowering of the pantograph in both the static and dynamic condition of the equipment i.e. when the track section is clear and when some counts are being generated because of the movement of the train in the section. The test shall be repeated for sufficient number of times in different position of equipment.

The equipment should also be tested for similar pantograph operation by electric loco when it is brought just on the track devices. In all the cases of the above

tests, neither supervisory reluy should be dropped nor the extra count should be generated and equipment should function satisfactorily after the above test.

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