**GOVERNMENT OF INDIA**
**MINISTRY OF RAILWAYS**
**(RAILWAY BOARD)**

**Indian Railways**
**Standard Specification**

**For**

# Electric Lamp Filament Switching Unit for Colour Light Signals

## 1. SCOPE

This specification covers general requirements of electric lamp filament switching unit for triple pole lamps used in colour light signals.

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

IRS:S 23 : Electrical Signalling and Interlocking Equipment.
IRS:S 62 : Current Transformer for Lamp Proving.
IS: 9000 : Basic Environmental testing procedures for Electronic and Electrical items.

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

1.3 This specification is intended chiefly to cover the technical provisions and it does not include all the necessary provisions of a contract.

## 2. GENERAL REQUIREMENTS

2.1. The electric lamp filament-switching unit shall be manufactured as per drawing No. SA-24851 issued by RDSO.

2.2. The filament-switching unit shall be suitable for both 12V, 24W & 12V, 33W Triple pole lamps.

2.3. The layout of the components shall be such that it permits easy installation & repair of the filament-switching unit in the CLS unit.

2.4 It shall be possible to fix Electric Lamp Filament switching Unit in both CLS Unit as well as in location box provided near the signal post.

2.5 'H' type transformer shall in general conform to IRS: S62 with following modifications.

(i) Clause 3.1.1 : The overall dimensions of the transformer shall be as shown in drawing.
(ii) Clause 3.2.2(a) : Vac. 1 shall be less than 1.05V when a current of 2.75 Amp. A.C. 50 Hz is passed through the primary of the transformer.
(iii) Clause 3.2.2 (b) : With primary current of 1.8 Amp. in the transformer, D.C. voltage across resistive load of 185 ohm. shall not be less than 10V.
(iv) Clause 3.2.2(c): With primary current of 2.75 Amp. in transformer, D.C Voltage across resistive load of 185 ohm. shall not be greater than 15V.

2.6 All components used in the units shall be of approved type.

2.6.1 Silicon bridge rectifiers shall be used.

2.7 The switching unit shall be manufactured as per best engineering practice; the surfaces shall be finished and properly painted and small metal parts such as screws, nuts and washers shall be plated to protect against corrosion.

2.7.1 The wiring of filament switching unit shall be carried out as shown in fig.1. Multi strand copper wires of minimum 1.0 sq. mm size shall be used for wiring.

2.8 Contacts of the MECR Relay shall be wired and labeled on the terminal to provide LED indication for status monitoring of MECR Relay.

2.9 Relay shall be of PLA or O/E/N make to suit the following requirements:-

i) Working Voltage 12 V, Coil Resistance 185 ohms.
ii) Contacts - 4 C/O, Contact rating 7 Amp.
iii) Pickup Value (on full wave rectified AC) shall not be more than 8 Volts.

## 3 INSPECTION AND TESTING

**3.1 Type Test**: Following tests shall constitute type test and shall be conducted on 3 Nos. of the samples, as per sequence given below.

(a) Visual Inspection (Cl. 3.4)
(b) Performance Test (Cl. 3.5)
(c) Vibration Test (Cl. 3.6)
(d) Climatic Severity Test (Cl.3.7)
(e) Applied High Voltage Test (Cl.3.8)
(f) Insulation Resistance Test (Cl.3.9)
(g) Limited Life Cycle Test (Cl.3.10)

All the three samples must pass all the tests.

3.2 **Acceptance Test**: Following shall constitute acceptance tests and shall be carried out on the required No. of samples as given in Sampling Plan (Cl.4).

(a) Visual Inspection (Cl.3.4)
(b) Performance test (Cl.3.5)
(c) Applied High Voltage Test (Cl.3.8)
(d) Insulation Resistance Test (Cl.3.9)

3.3 **Routine Tests**: Following shall constitute Routine tests and shall be carried out by the manufacturer on 100% units and records shall be made available for perusal by the inspecting authority if required.

(a) Visual Inspection (Cl.3.4)
(b) Performance Test (Cl.3.5)
(c) Applied High Voltage (Cl.3.8)
(d) Insulation Resistance Test (Cl.3.9)

3.4 **Visual Inspection:** Visual inspection shall be carried out to verify the general requirements as given in clauses 2.1 to 2.9.

3.5 **Performance Test:** For conducting performance test, the circuit shall be arranged as shown in fig.2. 110V AC shall be applied across the signal transformer through a variac. A rheostat of 10 ohms, 10 Amp. will be connected across terminal 2 & 4 as shown in the figure.

(a) The rheostat shall be so adjusted that **IAC** is **2.75** amperes.

In this situation,

(i) **VACI** shall not be more than 1.05 V.
(ii) **VDC** shall not be more than 15V.

(b) The rheostat shall be so adjusted that **IAC** is 1.8 amps:

In this situation,

(i) **VDC** shall not be less than 10V.
(ii) Relay shall remain energized.
(iii) Contact resistance between terminals 5 & 6 and 7 & 8 shall not be more than 0.1 ohm.

(c) When disconnecting link of terminal 2 is loosened, the relay shall drop and continuity between terminal 5 & 6 and terminal 7 & 8 shall break.

**3.6 Vibration Test :**

Sample units shall be subjected to following vibration test.

After setting the sample unit on a vibration tester in the standard position as used in the field, a DC or AC voltage shall be applied. The AC test voltage shall be approximately sine-wave form and of any frequency between 50 and 60 Hz. The vibration shall then be performed for all three directions simultaneously for 30 minutes. Unit shall withstand the following test conditions.

| | | |
|---|---|---|
| i) | Frequency | : 25 to 100 Hz |
| ii) | Acceleration | : 0.5 g |
| iii) | Direction of Vibration | : X, Y & Z |
| iv) | Duration | : 30 minutes |
| v) | Test Voltage | : 12V AC |

If any resonance frequency is observed, the sample should be further put on vibration test at that particular frequency for half an hour.

3.7 **Climatic Severity Test:**

Unit shall be subjected to following climatic tests as per IS: 9000.

| S.No | Name of Test | Part & Section of IS:9000 | Recovery Period |
|---|---|---|---|
| (i) | Dry heat test at 70 deg.C ± 2 deg.C (One cycle of 16 hrs) | Part III Sec.3 of 1977 issue | 2 hrs. |
| (ii) | Cold test at -10 deg.C ± 3 deg.C (one cycle of 16 hrs) | Part II Section 3 of 1977 issue | 2 hrs. |
| (iii) | Damp heat cycle test (One cycle of 12+12 hrs upper temp. 55°C) | Part V Section 2 of 1981 issue | 2 hrs. |
| (iv) | Salt atmosphere test (Procedure 3) | Part XI of 1983 issue | 2 hrs. |
| (v) | Dust test at 40 Deg. C ± 3 Dg. C and RH not exceeding 50% for one hour | Part XII of 1981 issue | 2-4 hrs. |

**3.8 Applied High Voltage Test**:

(i) Complete unit excluding miniature relay shall withstand for one minute the application of 2000V r.m.s. at 50 Hz between (a) primary / secondary winding and the core or case and (b) primary and secondary windings.

(ii) Miniature relay shall withstand for one minute the application of 1000V r.m.s. at 50 Hz between (a) coil and body (b) coil and all contacts and (c) body and all contacts.

**3.9 Insulation Resistance Test**:

The insulation resistance of the filament switching unit shall be measured with a testing potential of 500V, D.C. between (a) primary / secondary winding of the transformer and the body and (b) Coil, body & contacts of the miniature relay. The insulation resistance value obtained shall not be less than 50 Mega ohms.

**3.10 Limited Life Cycle Test**:

The filament-switching unit shall be tested for a limited life cycle of 10,000 operations by switching ON/OFF 110V A.C. power supply to the CLS transformer at a rate of 8 to 10 switching per minute. A 33W Triple Pole lamp or equivalent load (**IAC**=2.75A) shall remain connected throughout the Life Cycle Test.

After the Life Cycle Test, there shall be no deterioration in any part of unit & unit shall successfully pass the performance test.

4 **Sampling Plan (for Acceptance test ):**

| S.No. | Lot Size | Sample Size | Acceptance Criteria |
|---|---|---|---|
| 1. | 1-200 | 20% | No Failure |
| 2. | 201-500 | 15% (Min 40) | 1 Failure (Max.) |
| 3. | 501-1000 | 10% (Min. 75) | 2 Failure (Max.) |

5. **MARKING**

Name of the manufacturer, year of manufacture, specification No. and wiring diagram as shown in Fig.1 shall be prominently marked on the unit. The markings should be of permanent nature.

6. **PACKING**

Electric lamp filament switching unit shall be so packed as to permit easy handling and to prevent damage during transit.

7. **WARRANTY**

The warranty of the product shall be in accordance with Clause 18 of IRS specification IRS:S 23.