

GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS



**SPECIFICATION  
FOR  
VIGILANCE CONTROL DEVICE  
TO BE USED IN  
25 kV AC TAP CHANGER LOCOMOTIVE**

SPECIFICATION No. RDSO/2008/EL/SPEC/0025/Rev.'6'(JUNE-2019)



Approved by	
PEDSE/ RDSO	<i>डॉ. म. प्रकाश</i> 10.6.19

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S.N.	Date of Revision	Page Nos.	Revision	Reasons for Revision
1.	23.06.03	All	1	Based on CR suggestions
2.	28.05.04	2,9,11 & 13	2	Inclusion of data logging and interfacing
3.	02.12.08	4,6,7,8,10,11,12 & 13	3	Inclusion of LCD display and amendment 1 & 2
4.	11.01.09	3,5 to 15,17,18 & 21 to 26	4	Standardisation as per VCD of three phase loco and to ensure inter changeability between different Makes.
5.	22.03.10	7,10,11,12,13, 14, 15, 16, 19, 22, 23, 24, 27, 28	5	Inclusion of Rly Bd comments.
6	10.06.19	3,8,9,13,14,15,17,20	6	Inclusion of Counter, MS0444 & MS0450



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## CHAPTER 1- GENERAL

### 1.0 SCOPE & OBJECT:

A vigilance feature to monitor the alertness of the Loco Pilot exists in three phase drive locomotive. AC tap changer locomotives were not provided with Vigilance Control device (VCD). The VCD is for monitoring alertness of the Loco Pilot through a system which gets reset by specified normal operational activities of the Loco Pilot, in addition to acknowledgement of the vigilance check by pressing a pedal/foot switch provided for Loco Pilot for this purpose. Absence of the normal driving functions or the acknowledgement at specified intervals shall activate vigilance control system to flash an indication. If after a specified duration, VCD is still not acknowledged then it shall cause audio warning. If audio warning is also not acknowledged after a specified period, it shall result in emergency brake application.

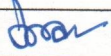
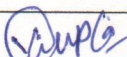
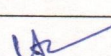
- 1.01 This specification is intended to define the technical requirements of Vigilance Control Device (VCD) to be used in existing tap changer locomotives and the interface requirements.
- 1.02 This revised specification supersedes the earlier technical specification No. RDSO/2008/EL/SPEC/0025/Rev.5(MAR'2010).

### 1.2 REFERENCE TO VARIOUS SPECIFICATIONS:

- 1.2.1 IEC-60571(1998-02) General requirements and tests for electronic equipment used on Rail vehicles. (Second Edition)
- 1.2.2 IEC-60077: Railway applications – electric equipment for rolling stock
- 1.2.3 IEC-61000 : Electromagnetic Compatibility (EMC)
- 1.2.4 IEC-60529 : Degrees of protection provided by enclosures (Code IP)
- 1.2.5 RDSO spec no ELRS/SPEC/SI/0015 for "Reliability of Electronics used in Rolling stock application"

**1.3 DOCUMENTATION:** The vendor shall submit the following information with the offer in printed form and digital format and compiled in a booklet. Offer with incomplete information may not be considered.

- Schematic Circuit
- Functional Description
- System design concept
- Data sheets for components/devices and other equipment proposed
- Mechanical interface diagram (Outline General Arrangement).
- Modifications needed in the present locomotive to accommodate the offered system.
- Clause by clause compliance

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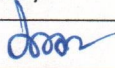
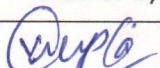
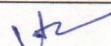


- List of spares List of special tools, jigs and fixtures needed for assembly, testing, commissioning, maintenance and repair.
- Mechanical drawings of complete cubicles as well as Major subassemblies/ Rack with details of dimensions, mounting arrangement and weight, which are required to be taken out for maintenance. Details of mounting accessories shall also be provided.
- Details of protection provided and their effectiveness/ proposed set values and range and working principle. Details of implementation i.e. through software and hardware shall be clearly spelt.
- Detail operation of panel and function of each switch, indications and fault diagnostic feature.

#### 1.4 INFRINGEMENT OF PATENT RIGHTS:

Indian Railway shall not be responsible for infringement of patent rights arising due to similarity in design, manufacturing process, components used in design, development and manufacturing of VCD and any other factor which may cause such dispute. The responsibility to settle any issue lies with the manufacturer.



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## CHAPTER 2- TECHNICAL FEATURES

### 2.1 Input Voltage:

VCD equipment shall be supplied power from locomotive battery at a nominal voltage of 110 volts DC. However, the battery voltage may vary from 78 V dc to 136 V dc.

### 2.2 Main Features:

2.2.1 Vigilance Control Unit shall be a microprocessor based resettable system. The VCD shall consist of one main unit and two cab units. It shall reset by operation of the specified control functions performed by the Loco Pilot as defined in this specification.

The system shall be designed to work on the Normally Energized principle and at any instance, cab unit of active cab shall only be active. There shall be time cycles that are described below.

#### 2.2.2 Vigilance cycle/Delay cycle:

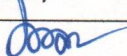
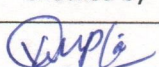
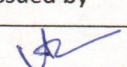
The cycle has a preset period normally set at  $60 \pm 2$  seconds. This cycle is automatically restarted whenever the vigilance unit detects one of the external inputs derived from some specified vehicle control functions under the Loco Pilot's control from the active cab, the presence of which automatically infers that the Loco pilot has taken some positive action and is therefore vigilant.

These control functions are :

1. Notch-up / Notch-down by the master controller (MP) or EEC;
2. Operation of the sander, Train Brake (A-9), Loco Brake (SA9), MPS-1;
3. Operation of the vigilance pedal (foot) switch available with Loco Pilot.

In normal circumstances, provided that the Loco Pilot is periodically performing some positive action, the cycle shall be continually reset and shall never run to completion. Only if the Loco Pilot fails to perform such an action within the cycle period, the cycle period shall be completed.

When such an event occurs, a second time cycle, i.e. action cycle shall be initiated and audible and visual warnings shall be given to the Loco Pilot.

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**2.2.3 Action cycle/Warning cycle:**

This cycle is initiated whenever the Vigilance/delay cycle runs to completion indicating that no positive Loco Pilot action has been detected for the length of the delay cycle period. During this cycle, VCD shall begin flashing a yellow warning light for a time period  $8 \pm 2$  seconds. If by end of this period, an acknowledgement by crew has not been actuated, an audible alarm for a time period  $8 \pm 2$  seconds shall begin in addition to yellow flashing light.

In order to maintain normal vehicle operation, the Loco Pilot shall operate the Vigilance foot switch or any other equipment, specified in clause 2.2.2, before the action cycle expires to prove positively that he has not become incapacitated.

Once reset in this manner, system operation reverts to the delay cycle and normal vehicle operation is maintained.

If for any reason, the action cycle expires without being acknowledge, the brake cycle is initiated to make an automatic brake application.

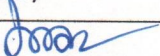
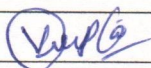
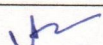
**2.2.4 Penalty brake Cycle:**

The brake cycle is initiated if the Loco Pilot fails to respond to the audible and visual warnings before the expiry of the action cycle. A brake application is immediately initiated. This ensures that the vehicle is brought to a complete standstill. Vigilance unit initiates penalty brake, which remain applied for a period  $32 \pm 2$  seconds and cannot be reset once applied during this period.

Only after the expiry of the brake cycle period and then only after the master controller has been set to the off position can the vigilance unit be reset using the reset push button provided at Loco Pilot desk. The brake application then gets released, the audible and visual warnings are cancelled and normal vehicle operation can be re-established.

**2.2.5 Main functions of the vigilance system include:**

- (a) Activating the system
- (b) Vigilance/delay cycle
- (c) Action cycle/warning
- (d) Audio-visual warning
- (e) Penalty brake cycle
- (f) Penalty brake release
- (g) Vigilance reset
- (h) Vigilance suppression
- (i) Data storage

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## 2.2.6 Fault Cycle

The operation of the vigilance unit is continuously monitored by its own test routines. If at any time, a condition is detected which could lead to unsafe system operation, a brake application shall be immediately initiated and a fault indication shall be displayed by flashing red LED. The fault cycle has a preset period normally set at 32 seconds during which period the brake application cannot be cancelled. Only after the expiry of the fault cycle can an attempt be made by the Loco Pilot to reset the fault condition using the vigilance reset push button and resume normal locomotive operation.

## 2.3 System Operation - Normal:

2.3.1 The time sequence of system operation mentioned above are summarised in the table below:

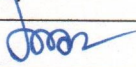
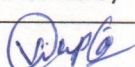

Operating cycles	Time periods (seconds)	Indications	Possibility to Reset
Vigilance cycle (To)	60±2	None	Yes
Warning cycle (T1) Level 1	8±2	Yellow flashing light	Yes
Warning cycle (T2) Level II	8±2	Yellow flashing light and alarm sound	Yes
Penalty brake (T3) Level I	32±2	Yellow flashing light	No
Penalty brake (T4) Level II	Until reset	None	Yes

2.3.2 A non resettable type counter with minimum count up to 999 shall be provided in each cab unit which shall increase by one unit in active cab whenever penalty brake application takes place. This counter shall be visible to the loco pilot so that reading can be noted whenever crew changes takes place.

## 2.4 System Operation – Other Conditions:

### 2.4.1 Vigilance Suppression:

There shall be a provision to suppress the operation of VCD when continuous proof of Loco Pilot's vigilance is not required. Such suppression shall be initiated by an external input to the system, derived from a vehicle speed sensor and from brake application. Brake application shall be sensed through operation of A9 or SA9 pressure. Vigilance suppression shall not

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function during the Brake or Fault cycles. The suppression of operation of the vigilance system shall be done in the following conditions:

- Vehicle is stationary / speed is very low
- Vehicle is used in slave mode
- Brake application
- Manual control of GR

A "speed low" signal shall be provided to the VCD system from an external source such as speedometer (not a part of the scope of supply of this specification). A potential free "speed low signal" is available from the speedometer which remain high (110 V) when speed remains less than 2 (two) Kmph. In case such external signal is not available, then vigilance suppression shall be done on the basis of logical deduction of low vehicle speed based on the position of master controller (MP), state of brake application etc.

#### 2.4.2 Multiple Unit Operation:

The VCD system shall be disabled on a slave locomotive in multiple operations.

#### 2.5 Fault mode operations and Diagnostics:

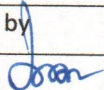
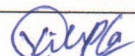
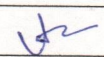
##### 2.5.1 Internal system Fault in VCD Unit and fail safe feature:

The operation of the vigilance unit is continuously monitored by its own in-built test routines. If at any time, a faulty condition is detected, a brake application is immediately initiated and a fault indication shall be given to Loco Pilot by flashing red LED suggesting Loco Pilot to bypass VCD through bypass arrangement. The test routine period shall normally be set at 32 seconds during which period the brake application cannot be cancelled. Only after the expiry of fault cycle, and provided the master controller handle has been set to off position, can an attempt be made by the Loco Pilot to reset the fault condition using the vigilance reset push button and resume normal locomotive operation. Such internal faults shall be recorded in inbuilt memory with date and time.

##### 2.5.2 Bypassing Arrangement:

A rotary program switch (HVCD) shall be provided through which it can be bypassed in case the device becomes defective/malfunctions. Red LED shall glow at cab unit indicating VCD bypass to the Loco Pilot.

##### 2.5.3 Mismanagement by Crew:

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VCD shall have built in logic based on trailing edge counter principle so that such inputs are not used for acknowledgement of control functions, in case vigilance foot switch remains in pressed position for more than 60+/-2 seconds continuously either by Loco Pilot or due to defect in foot switch. However such events shall be recorded in fault data.

#### 2.5.4 Cab Unit:

Following indications shall be provided on a separate unit known as cab unit:

- A green LED indication shall be provided to indicate that the device is in working order.
- A red LED indication (flashing) shall be provided to indicate faulty condition of VCD (ref. para 2.5.1 of this specification).
- A yellow LED indication (flashing) shall be provided to indicate warning cycle (ref. para 2.2.3 of this specification).
- A red LED indicating VCD bypass shall be provided to indicate that VCD is bypassed (refer para 2.5.2 of this specification).
- Buzzer with intermittent sound of 1170-3500 Hz with tolerance of  $\pm 15\%$  to indicate warning cycle with minimum sound level of 90 dB at 1(one) meter distance.
- A non resettable type counter with minimum count up to 999.

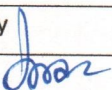
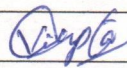

#### 2.5.5 LCD display:

There shall be LCD display (2x16 dot matrix) on the main unit to show the current status of VCD i.e. VCD bypassed, VCD in service and internal fault and other events which are to be recorded as an event with scroll buttons (up and down) for viewing messages stored in the memory. Backlit arrangement shall be provided for all time visibility.

Following are typical display messages which shall appear on LCD display exactly the same:

- (a) "POWER ON"/"POWER OFF"
- (b) "VIGILANCE CYCLE/WARNING CYCLE"
- (c) "FOOTSWITCH/A9/SA9/SANDER/MP OPERATED".
- (d) "IP PROBLEM"
- (e) "QVCD RELAY DEFECTIVE"
- (f) "VCD BYPASS BUT HEALTHY dd/mm/yy"
- (g) "VCD BYPASS AND FAULTY dd/mm/yy"
- (h) "VCD FAULTY"
- (i) "VCD REACTIVATED"
- (j) "VCD SUPPRESSED"

\*Power off shall be for recording purpose only in internal memory.

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2.5.6 A push button to reset VCD in case of penalty brake shall be provided on Loco Pilot desk.

**2.6 Sensing Arrangement:** Suitable sensors shall be provided for sensing of the control functions by the Loco Pilot as defined in para 2.2.2 of this specification. However, any malfunction of sensors shall not hamper normal locomotive operation.

**2.6.1 Brake position sensing:** Independent pressure switches to be provided for sensing of train brake (A-9) and independent loco brake (SA-9).

**2.6.2 Electrical Isolation:** For sensing of electrical signal from the loco circuit, optical isolation (6 kV opto-couplers) shall be preferred.

**2.6.3** A-9 sensing and BP pressure dropping sensing shall be taken separately on proper location, a pressure switch port shall be provided in outgoing pipeline of A-9 before Add.C-2 relay valve & for BP pressure dropping sensing, another pressure switch shall be provided in outgoing pipeline of Add. C-2 relay valve after A-8 cock (In BP pipe, the necessary sensing ports shall be provided by Railways). SA9 sensing shall be taken on proper location, a pressure switch port shall be provided between MU2B and double check valve (DCV) for this purpose. The setting of pressure switches shall be:

(i) A9 pressure switch	Cut in 4.5 Kg/cm <sup>2</sup> Cut out 4.8 kg/cm <sup>2</sup>
(ii) SA9 pressure switch	Cut in 1.5 Kg/cm <sup>2</sup> Cut out 1.0 kg/cm <sup>2</sup>
(iii) BP pressure switch	Cut in 4.5 Kg/cm <sup>2</sup> Cut out 4.8 kg/cm <sup>2</sup>

**2.6.4** In case of Penalty brake not coming through IP valve due to IP valve cock isolated or any other problem in locomotive, the system shall indicate "IP Problem".

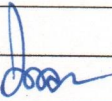
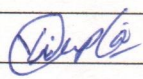

## **2.7 Construction:**

General:

**2.7.1** The VCD shall consist of one main unit and two cab units. The size and typical drawing of main unit, cab unit are shown in **annexure-1/1&1/2**.

The construction of VCD shall be so as to ensure complete interchangeability of the VCD set consisting of one main unit, two cab units of different makes.

**2.7.2** The main unit shall be protected against dust and water in accordance with IP50 and cab units shall be protected against dust and water in accordance with IP52.

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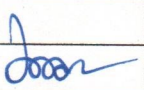
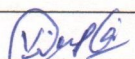

**2.7.3 Electronics:**

- 2.7.3.1 The electronics shall be suitable for rolling stock application in heavily EMI polluted environment.
- 2.7.3.2 The PCB cards used in main VCD unit shall have locking and removing arrangement.
- 2.7.3.3 VCD shall have proper filters and signal conditioning at all the sensing ports to prevent any mal functioning due to noise/distortion in DC control circuit of locomotive.
- 2.7.3.4 VCD shall be provided with two USB ports (Type A Jack-4 position for pen drive and Type B jack-4 position for Laptop) for down loading stored data for connecting commercially available pen drive and laptop. The USB ports shall be suitably covered and protected.

**2.8 Data logging and Interfacing:**

- 2.8.1 VCD shall have its own data logging facility in its in-built memory. All messages listed in clause 2.5.5 and internal faults of VCD shall be stored with date (in dd/mm/yy format) and time stamp (in 24 hour format). Such occurrences shall be kept stored for at least 60 days. VCD shall also record all displayed messages as per para 2.5.5 if it is bypassed but healthy. There shall be provision for downloading of data through any standard PC/Laptop and commercially available pen drive. The format for downloaded data shall be as shown in **annexure-2**. The downloaded data shall be of standard format for offline analysis and shall be compatible to Windows MS office (MS Excel, MS Word etc.). Suitable downloading and analysis software shall be provided for this purpose. The software shall also be made available on the official website of the supplier in the downloadable format.
- 2.8.2 VCD shall also have provision for interfacing with microprocessor based control and fault diagnostic system wherever fitted in the locomotive. Two (2) Nos. of 110 V volts potential free contact shall be provided: out of which one shall communicate activation of VCD while the other shall communicate healthiness of VCD. It shall be possible to log the VCD activation and failures in the Microprocessor based control and fault diagnostic system and generate suitable diagnostic messages.
- 2.8.3 The interface with brake system shall be provided on VCD through potential free contacts of normally energized relay for driving external relay (QVCD). During penalty brake application, the relay shall get de-energized. One number NO contact shall be provided for this purpose.

**2.9 Location of various equipments in locomotive:**

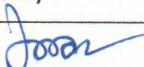
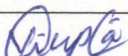

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S.No.		Locomotive		
		WAM-4/WAG-5	WAP1/4	WAG7
1.	VCD main Unit	Machine room on the wall behind Cab-1	Machine room on the wall behind Cab-1	Machine room on the wall behind Cab-1
2.	Cab units	Both cab near assistant Loco Pilot desk	Both cab near assistant Loco Pilot desk	Both cab near assistant Loco Pilot desk
3.	Vigilance foot switch	On right hand side of PVEF below master controller in both cabs	On right hand side of PVEF below master controller in both cabs	On right hand side of PVEF below master controller in both cabs
4.	VCD reset push button switch	Both cab , on Loco Pilot desk	Both cab, on Loco Pilot desk	Both cab, on Loco Pilot desk
5.	QVCD Relay	Cab-1 TPN Panel above baby compressor or Cab-2 Relay panel	Pneumatic Panel near CPs or Cab-2 Relay panel	Cab1 TPN Panel above baby compressor or Cab-2 Relay panel
6.	A-9 & SA-9 pressure switches	Cab-1 TPN Panel	Pneumatic panel near compressors	Pneumatic panel near compressors
7.	Bypass switch(HVCD)	Cab-2 switch board	Cab-2 switch board	Cab-2 switch board

## 2.10 Connectors:

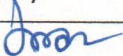
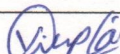

The cab units and main unit shall employ circular connectors of threaded type of Allied make only to ensure modularity and easy replacement. These connectors shall be complete with all required accessories. The connector types and pin allocation details are shown in annexure-4. The connector types and pin allocation should be exactly same so as to ensure interchange ability of VCD units of different makes. A 40 pin terminal strip of two way M5 type shall be provided near main unit to terminate inputs from 22 pin connector and 9 pin connector. The signal wires from this terminal strip shall be taken to respective devices. The connections at terminal strip shall be made from left to right first for 22 pin connector (A to X) and then for 9 pin connector (A to I).

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### CHAPTER 3- CLIMATIC AND ENVIRONMENTAL CONDITION

- 3.1 The Vigilance Control Unit shall be fitted in locomotive where the temperature shall be:
- a) Maximum temperature
    - Stabled Locomotive under sun : 70 deg. C
    - On board Working loco under sun : 55 deg. C
  - b) Minimum temperature : - 5 deg. C
  - c) Average temperature : 47 deg. C
- 3.2 Humidity: Upto 100% during rainy season.
- 3.3 Altitude: Upto 1200 m above mean sea level.
- 3.4 Rainfall: Very heavy in certain areas. The loco equipment shall be designed suitably.
- 3.5 Environment: Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6 mg/cub. In many iron ore and coalmine areas, the dust concentration is very high affecting the filter and air ventilation system of locomotive where the equipment shall be mounted.
- 3.6 Coastal area: The equipment shall be designed to work in coastal area in humidity and salt laden and corrosive atmosphere. The maximum values of the condition shall be as follows:
- a) Maximum pH value : 8.5
  - b) Sulphate : 7 mg per litre.
  - c) Max. concentration of chlorine : 6 mg per litre.
  - d) Maximum conductivity : 130 micro Siemens /CM
- 3.7 Vibration: The equipment shall be designed to withstand the vibrations and shock encountered in service satisfactorily as specified in IEC60077 and 60571.1(1998 - 2) (second edition) publication for the VCD and electronic equipments respectively and relevant IECs as applicable to other equipment.
- 3.8 Electromagnetic Pollution – High degree of electromagnetic pollution is anticipated in locomotive machine room, where the equipment shall be mounted. Necessary precaution shall be taken in this regard.

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## CHAPTER 4 - SCOPE OF SUPPLY

- 4.1 The scope of supply covers design, development and commissioning of complete set of Vigilance Control Unit for 25 kV ac locomotive as per technical requirement laid down in Chapter-2 of this specification.
- 4.2 The supplier shall supply sensors for sensing of items mentioned in this specification, one HVCD switch and one QVCD relay. The supplier shall procure these items from the CLW approved sources and as per CLW specification as mentioned in **annexure-3**. However, the supplier shall refer to latest approved sources of these items as published by CLW time to time on the official websites ([www.clw.indianrailways.gov.in](http://www.clw.indianrailways.gov.in) and [www.rdsso.indianrailways.gov.in](http://www.rdsso.indianrailways.gov.in)).
- 4.3 Necessary cabling in the loco.
- 4.4 The supplier shall supply suitable Single user license for the software tool for change of parameters.
- 4.5 Five days training for six persons per location is to be offered for Indian Railway personnel for training in the field of testing, maintenance and troubleshooting and repair.
- 4.6 Detailed operation and maintenance manual and spares catalogue.
- 4.7 Installation drawings.



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**CHAPTER 5 –TEST**

5.1 VCD shall be tested for functional and reliability performance as per details given below.


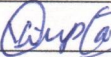

i) Functional test: Test programme shall be finalised at design approval stage between firm and RDSO.

ii) Reliability test: As per RDSO spec No. ELRS/SPEC/SI/0015

5.2 Following tests shall be carried out on the prototype unit as per relevant IEC specification or mutually agreed test program. Manufacturer shall bear the expenses of the tests.

SL NO	TEST	CLAUSE	TYPE	ROUT-INE
1.	Visual inspection	IEC 60571.1 clause 10.2.1	✓	✓
2.	Tolerance & Dimension		✓	✓
3.	Cooling	IEC 60571 clause 10.2.3	✓	
4.	Insulation Resistance	IEC 60571 clause 10.2.9	✓	✓
5.	Di Electric		✓	✓
6.	Vibration and shock	IEC 60571 clause 10.2.11	✓	
7.	Performance test by fault simulation	IEC 60571 clause 10.2.2	✓	✓
8.	Voltage Surge	IEC 60571.1 clause 10.2.6.2	✓	
9.	Electrostatic Discharge test	IEC 60571.1 clause 10.2.6.4	✓	
10.	Transient burst susceptibility test	IEC 60571.1 clause 10.2.7	✓	
11.	Radio interference test	IEC 60571.1 clause 10.2.8	✓	
12.	Salt mist test	IEC 60571.1 clause 10.2.10	✓	
13.	Damp heat	IEC 60571.1 clause 10.2.5	✓	
14.	Dry heat up to 80 degree C	IEC 60571.1 clause 10.2.4	✓	
15.	Burn – in	As per Burn-in cycle attached as Annexure-5	✓	*
16.	Functional Test	As per test program to be finalised during design approval stage	✓	✓
17.	Test for protection against dust and water	IEC 60529 clause 13 and 14	✓	
18.	Endurance Test	As per clause 5.2 (d) of this spec.	✓	

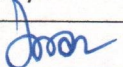
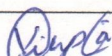

Note: Burn-in test shall be done on every 50<sup>th</sup> unit produced during routine test.

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The following clarifications are issued on the tests above.

- (a) Visual inspection and Tolerance & Dimension –The object of visual inspection is to check that the equipment is free from defects and the equipment are as per approved drawing. Bill of materials shall be submitted. The make, rating of equipments, subassemblies shall be checked with the details as per approved design. If a change is needed in make or rating of important equipments, sub-assemblies, it shall be intimated and shall have approval of RDSO. VCD equipment with modified subassemblies shall be given separate revision number. All the important dimensions shall be measured and shall be in permissible tolerance.
- (b) Insulation resistance and Dielectric test -- The insulation resistance with 1000 V megger shall not be less than 100 M ohms at 70 % RH for all the circuits. The dielectric test shall be carried out after earthing special cards if necessary before applying Dielectric voltage. The dielectric test to be carried out at a test voltage of 1500 kV<sub>rms</sub>. for 60 seconds. The leakage current to be less than 1 mA.
- (c) Burn in test -- The cards used on the equipment shall be subjected to burn- in as per the temperature cycle in **annexure-5**. The cards shall be kept energized during the test. Functional test of each card shall be carried out after the burn in test. This shall be part of internal test by manufacturer, whose results shall be submitted during routine test.
- (d) Endurance test -- The mechanical parts which need frequent operations like foot switch and vigilance reset button are to be subjected to endurance test for 1,00,000 cycles of operation. At the end of the above cycles, these mechanical parts shall be inspected for physical wear and tear. The contact resistance shall not increase more than 10% of the initial value. The springs used, if any, shall regain at least 50% of the operational height when released at the end of the endurance test cycles of 1,00,000 operations. Finally the device shall be checked for its satisfactory performance.

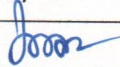
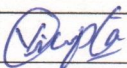
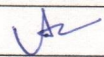
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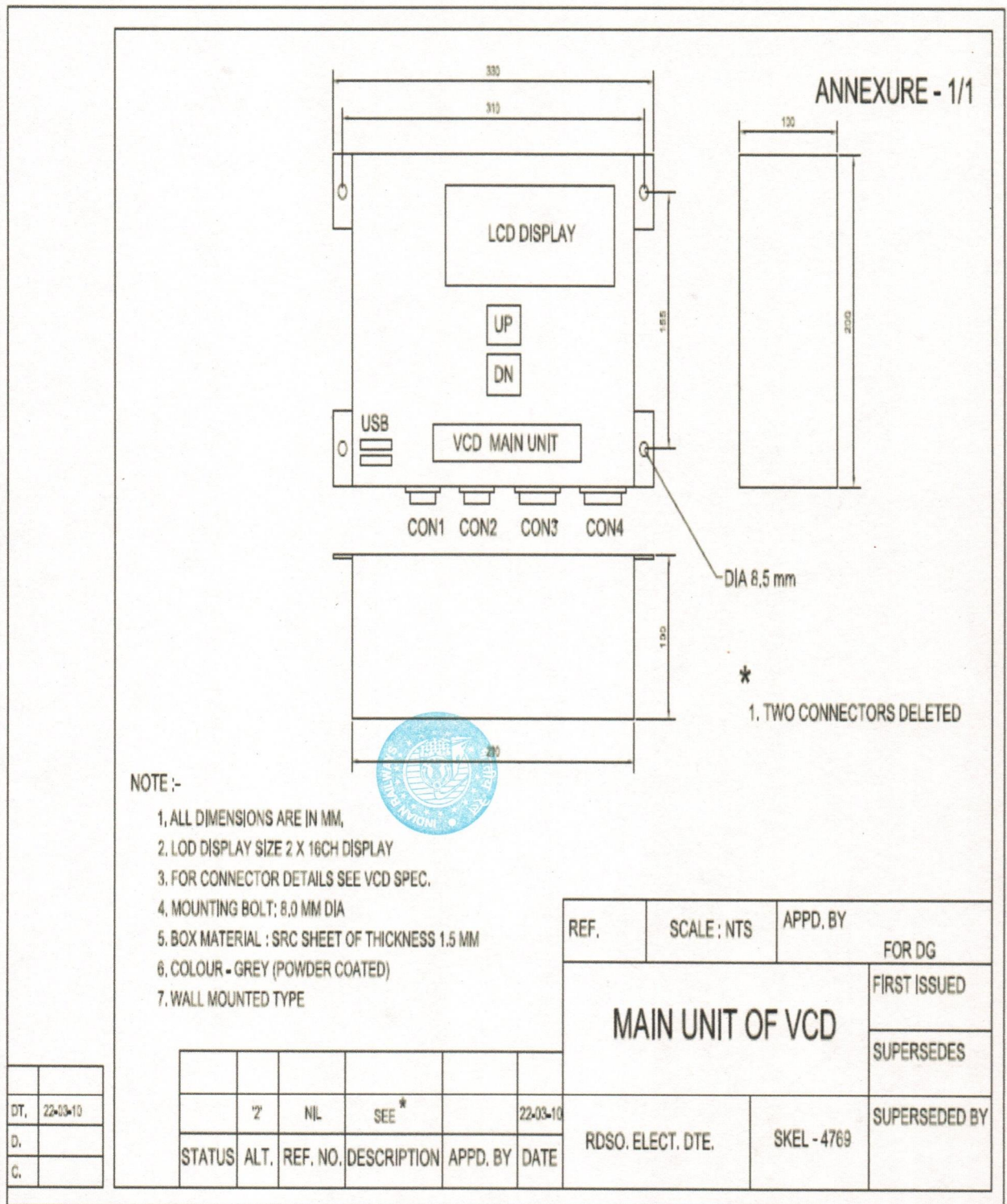
- 5.3 The prototype unit shall be inspected by the engineers of RDSO at the factory premises or at mutually agreed venue, where all the facilities shall be made available for carrying out the prototype test. The equipments shall be kept in field trials for a period of six months. The RDSO engineers shall associate and witness the tests in the locomotive also till they are successfully completed.
- 5.4 The individual equipments and sub-systems as may be necessary shall be type tested and routine tested in accordance with relevant IECs.
- 5.5 Type test shall be performed to verify that product meets the requirements specified and agreed upon between users & manufacturer. Subject to agreement between user and manufacturer, some or all the type tests shall be repeated once in two years by RDSO and purchaser on sample basis so as to confirm the quality of the product. Type test shall be repeated in following cases.
- Modification of equipment, which is likely to affect its function.
  - Failure or variations established during type or routine test.
  - Resumption of production after an interruption of more than two years.
  - At the time of indigenization, if the firm has supplied the product with foreign collaboration.

The type test shall be carried out for the equipment/sub-assembly indigenized. The type test on the full unit in the case of indigenisation shall be considered only if there is major design change."

- 5.6 Routine tests are to be carried out to verify that properties of the product corresponding to those measured during type tests. Routine test are to be done by the manufacturer on each equipments.

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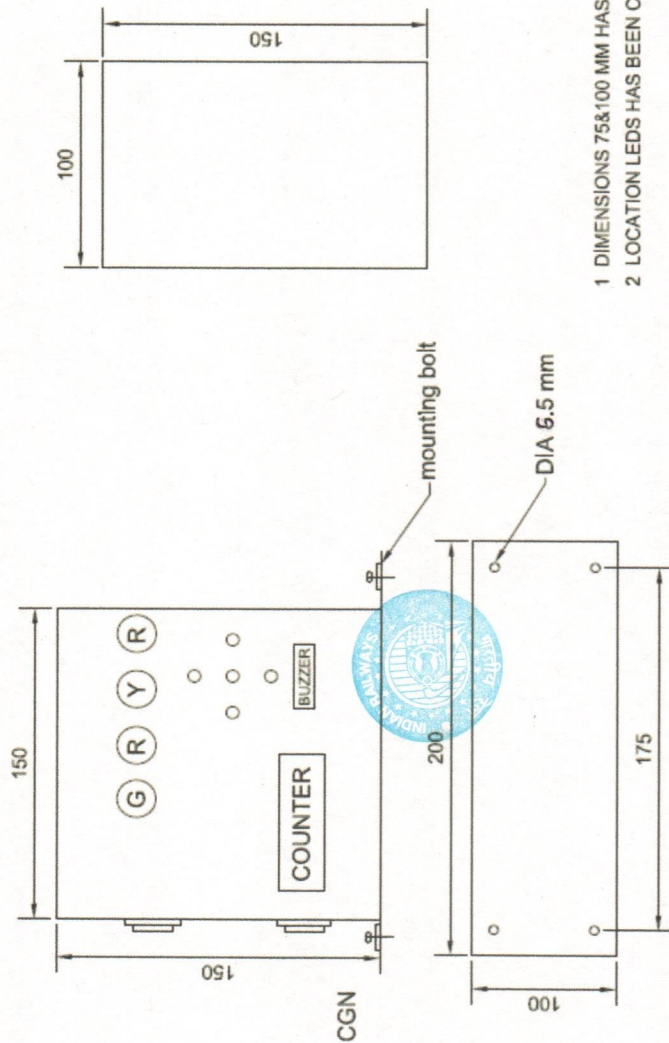




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## ANNEXURE-1/2



- 1 DIMENSIONS 75&100 MM HAS BEEN CHANGED.
- 2 LOCATION LEDS HAS BEEN CHANGED.

## NOTE:

1. ALL DIMENSIONS ARE IN MM.
2. FOR CONNECTOR DETAILS SEE VCD SPECIFICATION
3. MOUNTING BOLT: 6.0 MM DIA
4. BOX MATERIAL: CRV SHEET OF THICKNESS 1.5 MM
5. COLOUR - GRAY; POWDER COATED;
6. DESK MOUNTED TYPE

REF:-	SCALE. NTS	APPD. BY	FOR DG
CAB UNIT OF VCD			
		FIRST ISSUED	SUPERSEDES
RDSO.ELEC.DTE. SKEL - 4771		SUPERSEDED BY.	

27.3.10	DATE
APPD. BY	DATE
STATUS	ALT.
REF.NO	DESCRIPTION
1	N/L

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**Annexure – 2**

Sl No.	Date	Time	Message	Remarks



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**Annexure – 3**

S.No.	Equipment Name	CLW specification	Approved sources
1.	Vigilance foot switch	CLW/ES/3/0032/A	CLW: Spring AG Apparatefabric/SWZ, Hot line Switchgear, Chanda & Chanda Engg. Howrah, Woma Electronics Calcutta
2.	VCD acknowledgement/reset push button type switch	CLW/ES/3/0072/C	CLW: Schneider Electric France, Hotline Switchgear
3.	QVCD Relay	CLW/ES/R/27	RDSO: ABB Vododara (Type PC-8AHX), WOAMA Calcutta (Type WC-8)
4.	A-9 & SA-9 pressure switches	CLW/ES/S-24/I	CLW: Indfoss, Vasu Tech Ltd
5.	Bypass switch(HVCD)	CLW/ES/S-1/W	CLW: Siemens (Manufactured by Tecnofour Combines Pvt Ltd)
6.	LED indication lamp	CLW/ES/3/0072	CLW: Schneider Electric France, Hotline Switchgear

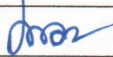
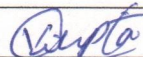



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**Annexure – 4****Connectors at Cab Unit:**

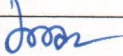
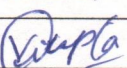

S. No.	Connector Type	Connector code	Pin No.	Signal name	Qty & use
1.	9- Pin Circular, threaded type- female and male	(MS 3106F-20-16S for female for cable) and (MS 3102R-20-16P male for cab unit)	A	Signal for buzzer from main unit	1 No. male connectors in cab at each cab unit and 1 No. female connectors at cable connecting main unit and cab unit at cab unit end
			B	COM for buzzer from main unit	
			C	Counter	
			D	COM for counter	
			E	Indication signal from cab unit to main unit for green LED	
			F	Indication signal from cab unit to main unit for red LED	
			G	Indication signal from cab unit to main unit for yellow LED (flashing)	
			H	Indication signal from cab unit to main unit for red LED (flashing)	
2.	2-Pin Circular, threaded type- female and male	(MS 3106F-12S-3S female for cable) and (MS 3102 R-12S-3P male for Cab unit)	I	Common	one No. male connector at each cab unit and 1 No. female connectors each at cable connecting battery supply to cab unit (for buzzer & PSU) and M5 lug on other end
			A	+110 VDC from SB	
			B	-110 VDC from SB	

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**Connectors at main unit:**

S.No.	Connector Type	Connector code	Pin No.	Signal name	Qty & use
1.	22- Pin Circular, threaded type female and male	(MS 3106F-28-11S female for Cable) and (MS 3102R-28-11P male for main unit)	A	Foot Switch -Cab1	1 No. male at Main unit and 1 No. female at cable connecting inputs to main unit
			B	Foot Switch -Cab2	
			C	Bypass switch	
			D	Brake Pipe Pressure Switch	
			E	MP 0	
			F	Sander	
			G	A9	
			H	SA9	
			I	Manual control of GR (input)	
			J	Spare	
			K	Spare	
			L	+110 VDC	
			M	-110 VDC	
			N	Notch UP by MP/EEC	
			P	Notch DN by MP/EEC	
			R	Low Speed	
			S	QVCD O/P(IP)	
			T	QVCD O/P(Regression)	
			U	BL Key Cab-1	
			V	BL Key Cab-2	
			W	MPS-1	
			X	SPARE	
2.	9- Pin Circular, threaded type-female and male	(MS 3106F-20-18S for female for cable) and (MS 3102R-20-18P male for Main unit)	A	QVCD COM	1 No. male at Main unit and 1 No. female at cable connecting outputs to main unit
			B	QVCD NO	
			C	FDCS COM	
			D	FDCS NO active	
			E	FDCS NO healthy	
			F	Reset push button signal from Reset push button to main unit Cab1	
			G	Reset push button signal from Reset push button to main unit Cab2	
			H	COM for Reset push button	
			I	SPARE	
3.	9- Pin Circular, threaded type-	(MS 3106F-20-16S for female for	A	Signal for buzzer from main unit	2 No. female connectors each at

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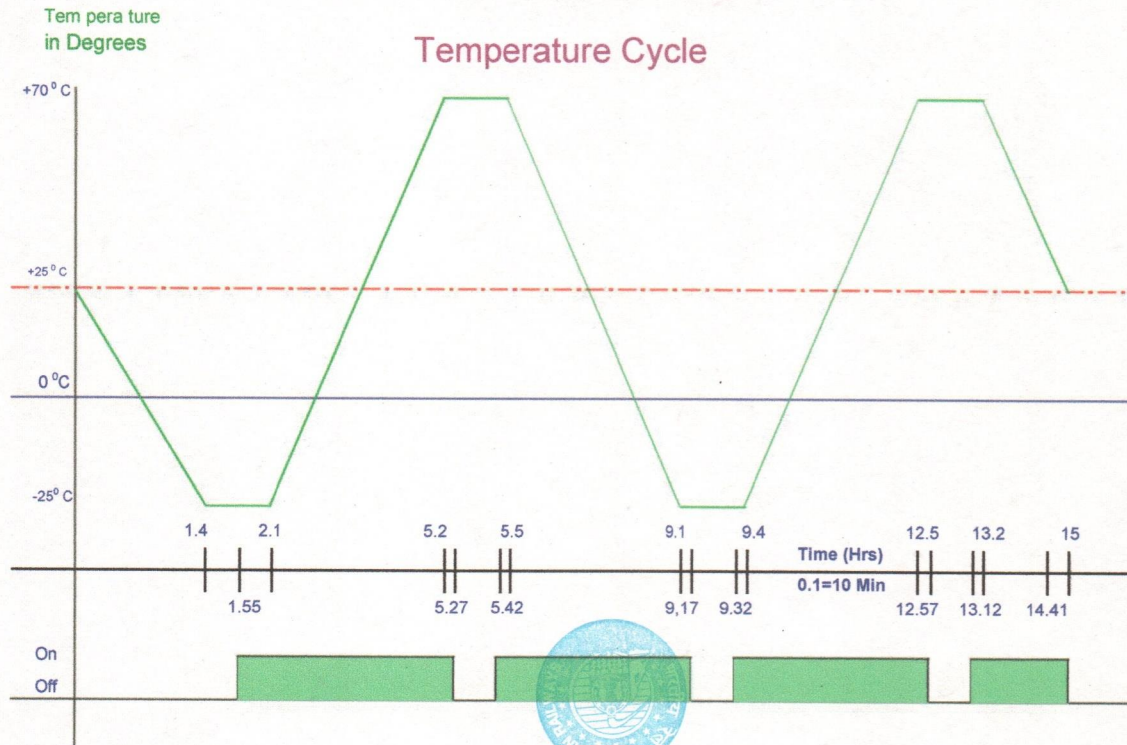
	female and male	cable) and (MS 3102R-20- 16P male for Main unit)	B	COM for buzzer from main unit	main unit and 2 No. male connectors at cable connecting main unit and cab unit at main unit end
			C	Counter	
			D	COM for counter	
			E	Indication signal from cab unit to main unit for green LED	
			F	Indication signal from cab unit to main unit for red LED	
			G	Indication signal from cab unit to main unit for yellow LED (flashing)	
			H	Indication signal from cab unit to main unit for red LED (flashing)	
			I	Common	



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## Annexure - 5

**BURN-IN TEST**

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