Dated: 24.03.2025

### Sub: Commissioning inspection of Loco No. 38856 equipped with M/S Hind Rectifiers limited make prototype IGBT based 3-phase drive Propulsion Equipment

#### Ref:

- i. CLW PO No. 70211134D01496 dated 28.10.2021
- ii. CLW letter no. C-D&D/T/24(Part-IV)/Hirect dated 21.09.2024

### **Members Present:**

CLW Representatives	BLEE Shed Representatives	M/S HIRECT Representatives
Mr. Ankit Kumar Verma SSE/D&D/CLW	Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Mr. Kshaunish Kayal Manager/Hirect
Mr. Jitendra Singh JE/D&D/CLW	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Jitendra Singh Manager/Hirect

Vide reference to the above, Loco No. 38856 has been fitted with prototype Propulsion Equipment of M/S Hind Rectifiers Limited Make and same is under commissioning at CLW/CRJ.

The Locomotive functionality has been tested jointly with CLW/C-D&D, BLEE Shed representatives & firm representatives and all functionality tests report have been appended in attached annexures below:

### Annexures:

Annexure 1 : Analogue Signal Checking

Annexure 2 : Functional Test in Simulation Mode
Annexure 3 : Protective Functions in WAG9 locomotive

Annexure 4 : Performance Test

Irtendrasiny 24.03.25 Mr. Ankit Verma Mr. Ashish Mr. Jitendra Singh Mr. Kshaunish Mr. Pravin SSE/D&D/CLW/CRJ Singh Kumar Rathore Kayal Panchal JE/D&D/CLW/CRJ Manager/R&D SSE/TRS/BLEE Manager/R&D JE/TRS/BLEE Hind Rectifiers Hind Rectifiers Ltd. 1 td

# **Propulsion Unit in Loco 38856** Joint Inspection Test Report for Protection Test of HIRECT make IGBT Based Three Phase Drive

## Annexure: 1

Auxiliary Converter and VCU Format No. F60.305.01, Version:06) Analogue Signal Checking (Testing & Commissioning Format for 3-Phase Locomotive fitted with IGBT based Traction Converter,

with loco. Check for the following analogue signals with the help of DDU/firm's laptop and same to be Verified OK by the testing supervisor connected

Checked in both simulation and in Power mode  Checked in both simulation and in Power mode  In loco running condition at 596 node when A9 brake handle was at RUN position, 5 Kg/cm² BP was observed  Analog BP Gauge reading  (Also mapped with other values of BP pressure gauge reading)	ed value Requiremen Value displayed on Remark Photo
100% (= 5 Kg/cm2)	Prescribed value
Brake pipe pressure	Description

Mr. Ankit Verma Mr SSE/D&D/CLW/CRJ Mar Hin	A Per
Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	(E)
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	THE STATE OF THE S
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Con Contraction of the Contracti
Mr. Pravin Panchal JE/TRS/BLEE	n
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Theudrador) h

	<u> </u>		
	TE/BE at 'TE maximal'	TE/BE at '0' position from both cab	Actual BE electric
SSE/D&D/CLW/CRJ	Between 95% and 105% of Max kN	Between 0% and 10% of Max kN	100% (= 10V)
Mr. Jitendra Singh Manager/R&D Hind Rectifiers	TE Calculated by formula =	Observed values should be within prescribed range	value of BE on DDU should be changed according to Analog BE Gauge reading. BE Calculated by formula = (actual BE of both bogie x 100) /260kN
Wir. Ashish Kumar Rathore SSE/TRS/BLEE	100%	0%	Checked in simulation mode In this condition at 596 node when regenerative braking was taken by moving throttle in BE side  258.6 KN BE, (130 kN per bogie) was observed ( also mapped with other values of BE Gauge reading)
Mr. Kshaunish Kayai Manager/R&D Hind Rectifiers Ltd.	0<	0<	ed.
Mr. Pravin Panchal JE/TRS/BLEE	Verified OK	Verified OK	Verified
- 1		BOGIE 1	90 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Titen smakingh Mr. Jitendra Singh JE/D&D/CLW/CRJ		BOGIE 2	PE SU
		O DEM RM CONTROL OF THE PROPERTY OF THE PROPER	258.44CT KH (104.956 38956)

	TE/BE at 'TE minimal' position from both cab	position from both cab
AMT. Ankit Verma SSE/D&D/CLW/CRJ	Between 10% and 33% of Max kN	
Mr. Jændra Singh Manager/R&D Hind Rectifiers	***	(actual TE of both bogie x 100) /504kN
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	10.8% (54.9 kN observed in simulation mode)	(504kN value is observed in simulation mode.)
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	d. 5	simulation
Mr. Pravin Panchal JE/TRS/BLEE	Verified	
Titendra Singh  JE/D&D/CLW/CRJ	10 10 10 10 10 10 10 10 10 10 10 10 10 1	76 - 30 - 30 - 30 - 30 - 30 - 30 - 30 - 3
	54.9 ACT KN	486.9 ACT KN 98956 486.9 ACT KN 98956 480.9 ACT KN

		TE/BE at 'BE Minimal' position from both cab	TE/BE at 'BE' maximal' position from both cab
Mr. Ankit Verma SSE/D&D/CLW/CRJ	1	Between 10% and 33% of Max kN	Between 95% and 105% of Max kN
Mr. Jifendra Singh Manager/R&D Hind Rectifiers	The die	**	
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Card I	12.26% (31.9 KN observed in simulation mode)	99.5% (258.7 KN observed in simulation mode)
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	the state of the s	in in	/ed in
Mr. Pravin Panchal JE/TRS/BLEE	n	Verified %	Verified % 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Thendrakinyh	90 00 00 00 00 00 00 00 00 00 00 00 00 0	100 00 00 00 00 00 00 00 00 00 00 00 00
		TO SEE NEW THE COLUMN TO THE C	-258.6ACT NN

50 H 100 H

3

-90.6 ACT kN

TE/BE at '1/3 position' in TE and BE mode in both cab	
Between 33% and 50% of Max kN	
49	
36.38% of BE  (94.1 KN observed in simulation mode)  33.15%  (167 KN observed in Simulation mode)	
Verified OK	



Mr. Ankit Verma SSE/D&D/CLW/CRJ

Mr. Mendra Singh Manager/R&D Hind Rectifiers Ltd.

Kumar Rathore SSE/TRS/BLEE

Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.

		Both temperature sensor of TM1	TE/BE at '2/3 position' in TE and BE mode in both cab
Mr. Ankit Verma SSE/D&D/CLW/CRJ	A to the	Between 10% to 14.33% depending upon ambient	Between 51% and 75% of Max kN
Mr. Mendra Singh Manager/R&D Hind Rectifiers	Charles .	Observed values should be within	
Mr:Ashish Kumar Rathore SSE/TRS/BLEE	The state of the s	Checked in traction mode When loco was stand still at 570 node	75% of TE (381 KN observed in simulation mode) 71% of BE (184.3 KN observed in simulation mode)
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	E		ed in
Mr. Pravin Panchal JE/TRS/BLEE	n	Verified OK	O <sub>K</sub>
in Mr. Jitendra Singh I JE/D&D/CLW/CRJ EEE	Jitensonshingh		37777ACT HV
			BOCIE 1 BOCIE 1

Mr. Jitendra Singh JE/D&D/CLW/CRJ	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Mr. Jikendra Singh Manager/R&D Hind Rectifiers	Mr. Ankit Verma SSE/D&D/CLW/CRJ
Intentratingh	h	Con	May 1	THE RE	A Red

Both temperature sensor of TM2  Both temperature sensor of TM3	Between 10% to 14.33% depending upon ambient temperature 0°C to 50°C  Between 10% to 14.33% depending upon ambient temperature 0°C to 50°C  Between 10% to	range range Observed Values Should be within	23.57 °C @ 23 °C amb  Checked in traction mode When loco was stand still at 570 node  19.83 °C @ 23 °C amb Checked in traction mode When loco was stand still at 570 node 20.55 °C @ 23 °C amb Checked in traction mode	Verified OK
		values	20.55 C @ 25 C allip	
Both temperature sensor of TM4	Between 10% to 14.33% depending upon ambient temperature 0°C to 50°C	should be within prescribed range	Checked in traction mode When loco was stand still at 570 node	Verified OK
Both temperature	Between 10% to 14.33% depending upon ambient		Checked in traction mode	Verified OK

Mr. Jitendra Singh JE/D&D/CLW/CR.	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Wir. Ashish Kumar Rathore SSE/TRS/BLEE	Mr. Jitendra Singh ManagerR&D Hind Rectifiers	Mr. Ankit Verma SSE/D&D/CLW/CRJ
Titeutraningh	h	R	The state of the s	JANA SAL	Abut

Both temperature sensor of		sensor of TM5
Between 10% to 14.33% depending upon ambient temperature 0°C to		temperature 0°C to50°C
Checked in traction mode When loco was stand still at 570 node	21.55 °C @ 23 °C amb	When loco was stand still at 570 node
Verified OK		
	000	
	Retween 10% to  14.33% depending upon ambient temperature 0°C to  Checked in traction mode When loco was stand still at 570 node	Between 10% to 14.33% depending upon ambient temperature 0°C to

### Annexure: 2

# **Functional Test in Simulation Mode**

Conduct the following functional tests in simulation mode as per Para 5.5 of document no.3EHX 610 281 through the laptop/DDU:

		Emergency shutdown through emergency stop switch 244	Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	1	An Emergency braking operation can be initiated by actuation of the Emergency stop push button on A panel  VCB must open. Pantograph must lower. Flasher light should glow TE should be zero	Test Procedure/ Functional Requirement
Mr. Sitendra Singh Manager/R&D Hind Rectifiers	Credition.	Push Emergency Shutdown button located on A panel in both active and inactive CAB	Test Procedure Followed
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Bris .	ncy ton anel in d inactive	edure red
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Carl Carl	Checked for both in loco energized condition and in simulation mode  Push emergency stop button in loco running condition at 596 node  VCB opened Panto lowered Traction effort became zero BP pressure dropped BC applied In inactive CAB emergency stop button on A	Observation
Mr. Pravin Panchal JE/TRS/BLEE	Ru	5 Verified OK	Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Titendrashingla	Design of the second of the se	
		WARNING!  A PARTICULAR THE LOCAL SECTION OF THE PARTICULAR SECTION OF	Photo

	Shut Down through cab activation switch to "OFF" position		Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	Move BL key from drive position to off position  VCB must open.  Panto must lower.		Test Procedure/ Functional Requirement
Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	Moved BL key from drive position to off		Test Procedure Followed
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Checked for both in loco energized condition and in simulation mode  Moved BL key from D to Off position  VCB opened Pantograph lowered Final node reached to 612 Loco has gone in hold mode for 10 minute	panel was pressed in loco running condition at 596 node then emergency stop was not activated	Observation
Mr. Pravin Panchal PE/TRS/BLEE	Verified OK.	0 0	Result
Titenstrating/ Mr. Jitendra Singh JE/D&D/CLW/CRJ	In simulation mode	Management of the state of the	Photo

			Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	A. Par		Test Procedure/ Functional Requirement
Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	J. 1885		Test Procedure Followed
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	2		edure
	7	Movec to off p C and from C and re positio	0
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Cont	Moved BL key from D to off position and off to C and then moved from C to off position and removed at off position from A panel  VCB opened node reached to 550  Pantograph lowered node reached to 504  Main control electronics shut downed	Observation
Mr. Pravin Panchal JE/TRS/BLEE	hu	t 4 p	Res
	草		Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Titentration	The state of the s	
		Traction  PLG2: 1999 ESN : OFF  ALS2: 80 STHKEY: ON  BL  COndition	Photo

		Converter and filter contactor operation with both Power Converters during Start Up.		Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	Hay	FB contactor 8.41 is closed.  By moving reverser handle or node ≥ 570(in case of M/s Siemens):  Converter precharging contactor must close after few seconds.  Converter main contactor must close.		Test Procedure/ Functional Requirement
Mr. Affendra Nee Singh Kuma Manager/R&D SSE/I Hind Rectifiers	Check To	DDU/HMI/Laptop was connected with VCU Activate the CAB by moving BL key from 'O' to 'D'		Test Procedure Followed
McAshish Kumar Rathore SSE/TRS/BLEE Manager/R&D Hind Rectifiers Ltd.	THE PERIOD	Checked in simulation mode from both CAB and Verified OK the status of contactor on DDU has been verified as After self-test when node reached to 504 then discharging contactor 8.41 was closed  After closing VCB, when reverse/forward direction at 570 node		e Observation
Mr. Pravin M Panchal JI JE/TRS/BLEE	R	d. Verified OK		Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Trendrating	3 The transformations  3 The transformations  3 The transformations  4 The transformations  4 The transformations  4 The transformations  4 The transformations  5 The transformations  5 The transformations  5 The transformations  6 The transformation  7 Th	To the tion of the	Photo

		Converters during Shut Down.	Converter and filter contactor operation with				Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	1	<ul> <li>Converter main contactor must open.</li> <li>FB contactor 8.1 must open.</li> </ul>	Bring TE/BE to 'O' Bring the cab activation key to '0'.  • VCB must open.  • Panto must lower.		<ul> <li>FB contactor 8.41 must open.</li> <li>FB contactor 8.2 must close.</li> <li>FB contactor 8.1 must close.</li> </ul>	<ul> <li>Converter pre- charging contactor must open.</li> <li>By increasing TE/BE throttle:</li> </ul>	Test Procedure/ Functional Requirement
Michitendra Singh Manager/R&D Hind Rectifiers  Michitendra Kumar Rathore SSE/TRS/BLEE	Charles Prince	Move BL key from 'D' to 'O'	DDU/HMI/Laptop was connected with VCU	49			Test Procedure Followed
h Mr. Kshaunish nore Kayal LEE Manager/R&D Hind Rectifiers Ltd.	Y Cont	<ul> <li>VCB opened.</li> <li>Panto lowered.</li> </ul>	Checked in simulation mode from both CAB and Verified OK the status of contactor on DDU has been verified	After moving throttle node reached to 596 and FB contactor 8.41 was opened and 8.2 and 8.1 was closed	After few second converter main contactor 12.2 was closed and and Precharge contactor was opened	then Precharge contactor 12.1 was closed and DC link was charged	Observation
Mr. Pravin Panchal JE/TRS/BLEE	m		Verified OK			6	Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Tetentraling/h_		X		The control of the co	Section (2016)  County (2016)  Count	Photo

		Contactor filter adaptation by isolating any bogie		Test Function
*Mr. Ankit Verma SSE/D&D/CLW/CRJ	A	Isolate any one bogie through bogie cut out switch. Wait for self-test of the loco.  • Check that FB contactor 8.1 is open.  • Check that FB contactor 8.2 is open.  After raising panto, closing VCB, and setting TE/BE  • FB contactor 8.1 closes.	<ul> <li>FB contactors 8.41 must close.</li> <li>FB contactor 8.2 must remain closed.</li> </ul>	Test Procedure/ Functional Requirement
Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	Jredent.	DDU/HMI/Laptop was connected with VCU One by one bogie1 and 2 isolated through 154/SB1 bogie cut out switch I1		Test Procedure Followed
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	8:	op was VCU gie1 and ugh cut out		ed
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Y GE	Checked in simulation mode from both CABs and Verified OK the status of contactor on DDU has been verified When loco was in run condition at 596 node VCB was opened and one bogie was cut through 154 rotary switch  FB contactor 8.1 & 8.2 was opened	FB discharging contactor 8.41 is closed, Verified OK on DDU  FB main contactor 8.1 opened and 8.2 had closed, Verified OK on DDU	Observation
Mr. Pravin Panchal JE/TRS/BLEE	no	Verified OK		Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Titeustashingh	100	Parts 1  Parts 2  Consist of lead deviation  Part of lead of visits  Part of l	Photo

		Test earth fault detection battery circuit positive & negative		Test Function
Mr. Anklt Verma SSE/D&D/CLW/CRJ	李	wire 2050 to earth, create earth fault negative potential.  message for earth fault By connecting wire 2095 to earth, create earth fault positive potential. message for earth fault.	• FB contactor 8.2 remains open.	Test Procedure/ Functional Requirement
Mr. Jitendra Mr. Ashish Singh Kumar Rathore Manager/R&D SSE/TRS/BLEE Hind Rectifiers Ltd.	Tree Pro	Wire 2050 is earthed to the body for simulating negative earth fault Wire 2095 is earthed to the body for simulating positive earth fault	¢	Test Procedure Followed
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.		Earth fault battery circuit pop-up message appeared on DDU screen	After closing VCB and taking traction 8.1 contactor had closed and 8.2 remained open	Observation
Mr. Pravin Panchal JE/TRS/BLEE		Verified OK		Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Thewarasingh	Section of the sectio		
		WARNING!		Photo

	Angle Transmitter Failure Mode	Test fire system. Create a smoke in the machine room near the FDU. Watch for activation of alarm.	Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	Failure mode should work when difference between auxiliary contacts and the absolute value of angle transmitter became greater	When smoke sensor-1 gets activated then  • Alarm triggers and fault message priority 2 appears on screen.  When both smoke sensor 1+2 gets activated then  • A fault message priority 1 appears on screen and lamp LSF1 glow.  • Start/Running interlock occurs and TE/BE becomes to 0.	Test Procedure/ Functional Requirement
Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	Disconnect E/connector of angle transmitter from VCU	for simulating this test smoke was created by burning a paper in machine room after setting a loco speed through throttle	Test Procedure Followed
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	EA if angle om VCU	y this was was a thine atting a hirough	dure
h Mr. Kshaunish ore Kayal Manager/R&D Hind Rectifiers Ltd.	Checked in simulation and traction mode from Both CAB  Disconnected EA connector from VCU 1 when CAB 1 was	Checked in simulation mode from Both CAB Alarm triggered and warning smoke in machine room priority 1 fault message appeared on DDU screen. TE became zero	Observation
Mr. Pravin Panchal JE/TRS/BLEE	Verified OK	Verified OK	Result
1 tentrality h.  Mr. Jitendra Singh JE/D&D/CLW/CRJ	At 0< TE< 1/3TEmax	WARNING!  ***********************************	t Photo

			1 12	"	4																					Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	A-Per			and max. values	steps i.e 1/3, 2/3	must work at 3	Angle transmitter	Toko Troption	direction	forward/reverse	Move reverser in		152 to position '1'	the rotary switch	mode by moving	Activate failure	DDU	be appeared on	transmitter should	Fault in angle	Pop-Up message	master controller	of a defective	full range because	than 62% of the	Functional Requirement
Mr. Jitendra Singh Manager/R&D Hind Rectifiers	Charles Andrews													-	3											Test Procedure Followed
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	93							. 7	_		0	0)	-> (	1)	0) .	7 (7		/		0)	<	0.5		60	on.	edure ed
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	CE	increase in 1E	gradual	of throttle,	<ul> <li>With application</li> </ul>		values	moved at 3 steps i.e	Angle transmitter		CAB 2 is active)	active) & DDU 2(when	1 (when CAB 1 is	anneared on both DDI	angle transmitter was	message fault in	node was reached to	After taking traction		active	when CAB 2 was	connector from VCU 2	1	state	active at 504 node	Observation
Mr. Pravin Panchal JE/TRS/BLEE	Ru		1		on							ž		2	as							N			The second second	Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Titentrahigh										At 1/3TEmax< TE <2/3TEmax			138,30					Horse de	V				135.4	AND SERVICE STATE OF SERVICE STATE STATE STATE OF SERVICE STATE STA	
											TE <2/3TEmax			38.3DEM KN			Comin			CHARLS OF		9	<b>.</b>	T32 4 VCL KW		Photo

			Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	1		Test Procedure/ Functional Requirement
Mr. Titendra Singh Manager/R&D Hind Rectifiers Ltd.	Children Children		Test Procedure Followed
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	9		edure
	7	Regene working	0
Mr. Kshaunish Kayal Manager/R&D Managers Ltd.	Cold	has not observed  • Step change in values of TE/BE observed at position 1/3, 2/3, and maximum  • For TE minimal position from 0 to 1/3TEmax, TE observed is 138.3 KN  • For 1/3  TE_max up to 2/3 TE_max is 289.3 KN  • For 2/3TEmax up to 1/3 TE_max is 289.3 KN  • For 2/3TEmax is 289.2 KN  • For 2/3TEmax is 289.3 KN	Observation
Mr. Pravin Panchal JE/TRS/BLEE	hu		Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Titendrasingh	At TE>2/3TE	
		At TE>2/3TEmax or TEmax  388.6 ACT IN  388.6	Photo



		Bogie Cut Out Mode		Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	1	Single bogie isolation;		Test Procedure/ Functional Requirement
Mr. Jittendra Singh Manager/R&D Hind Rectifiers Ltd.  Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Single Pix	Firstly, VCB opened then one by one Bogie 1 & 2 isolated		Test Procedure Followed
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	C.	Checked in both traction and simulation mode from both CAB		Observation
Mr. Pravin N. Panchal J. JE/TRS/BLEE	m 3	Verified OK		Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Jiteant assiryh		BE>2/3BEmax or Full  104.956 38856 CAB1  104.956 38856 CAB2  -258.6ACT KN  200 200 300 400 200 500 600 0 -258.6DEM KN	Photo

				7							lil III											Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	1		up message of main power off.	isolated with pop	should be	at I+II position.	switch to be kept	isolation: Rotary	Both bogie		DDU .	pop up on the	message should	and then isolation	be I/II) position	position should	SR1/SR2	I/II/for isolation of	switch(154/SB1)	bogie by rotary	Isolate any one	Test Procedure/ Functional Requirement
Mr. Aftendra Singh Kumar Rathore Manager/R&D Hind Rectifiers Ltd.	Granding Bran			panel	127 11/2 in SB2	SR2 127 1/2 &	Tripped MCBs of	VCB opened then	through MCB, Firstly	For isolating SR2		panel	127.11/1 in SB1	SR1 127.1/1 &	control electronics of	Trinned MCBs of	VCB opened then	through MCR Firetty	)	rotary switch	through bogie cut out	Test Procedure Followed
h Mr. Kshaunish nore Kayal LEE Manager/R&D Hind Rectifiers Ltd.	Lest Cont			reset.	normal MCF was	To do the faulty SR		permanently glowed	and LSFI lamp	faulty SR got isolated	acknowledging BPFA	in all cases After	LSFI and BPFA glowed		0	DOLL	converter" appeared on	"Disturbance in	Priority 1 fault with	After taking traction		Observation
Mr. Pravin Panchal JE/TRS/BLEE	h				- U								<u> </u>				3					Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Irtendratingh						П			Deson			154 BOGIE CUT OUT				THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAM			DIE WESTER WITH THE PROPERTY OF THE PROPERTY O		t Photo

		Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ		Functional Requirement
Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.		Test Procedure Followed
M. Ashish Kumar Rathore SSE/TRS/BLEE	3	edure
Mr. Kshaunish Kayal E Manager/R&D Hind Rectifiers Ltd.	<b>†</b>	Observation
Mr. Pravin Panchal JE/TRS/BLEE		Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	RECON NORM  RECON PROFITE CUT OUT  THE PROFITE CUT	
	1+11   1-12	Photo

	Configuration Mode		Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ			Test Procedure/ Functional Requirement
Mr. Jifendra Singh Manager/R&D Hind Rectifiers Ltd.	Loco was stand still with applied SA9 brake		Test Procedure Followed
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	stand still d SA9		edure ved
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.			Observation
Mr. Pravin Panchal JE/TRS/BLEE	Verified OK		Result
Titerdanhingh. Mr. Jitendra Singh JE/D&D/CLW/CRJ		Power States Sta	
		BEACH STANA	

							- 1					Test Function
Mr. Ankit Verma SSE/D&D/CLW/CRJ	1			movement	appear during	"Loco in shunting	Pop up message	restricted to	Speed should be	at position 0	Rotary switch 160 to be moved	Test Procedure/ Functional Requirement
Mr. Ashish Singh Manager/R&D Hind Rectifiers Ltd.  Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Sieger Br			-50		normal to active	switch located in SB	When node was 504 then shunting mode	Pooling:	were in neutral	Throttle and reverser	Test Procedure Followed
h Mr. Kshaunish nore Kayal LEE Manager/R&D Hind Rectifiers Ltd.	The second	BPCS push button was pressed at 7.3 KMPH speed and loco speed became constant at 7.4 KMPH.	And Loco speed was restricted to 15 KMPH	Maximum loco speed was reached up to 14.9 KMPH	message is appeared.	shunting mode	After application of	was taken	At 590 node throttle	mode	Checked in both simulation and power	Observation
Mr. Pravin Panchal JE/TRS/BLEE	Ru	4 0	x									Result
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Titend, atringh								Loca in Shuntaing Maja.  MAX speed in Shuntaing lends to 15 Ningh Advisorage the Fault and Process	Fill Interest Value of the Control o	WARNING!	t Photo

		Vigilance Cut Out Mode			Test Function
Pop up message of vigilance emergency applied should appear	moved to original position '1' and check operation of VCD	minute VCD should not operate after 1 min Further rotary switch to be	Speed to be increased and apply BPCS above 5kmph, no action to be taken for 1	Rotary Switch 237 to be kept at 0 position	Test Procedure/ Functional Requirement
		Moved VCD switch 237 located in SB 1 panel to 0 position	When loco was in 504 node and SA9 was applied		Test Procedure Followed
After 76 second vigilance emergency brakes were applied with popup on DDU.	After 1-minute vigilance warning appeared.	When speed reached 11 KMPH BPCS push button was pressed and no action was taken for 1 minute.	At 590 node throttle was taken and node reached to 596. After 596 nodes, traction and speed appeared.	Checked in simulation mode from both CAB 1 and CAB 2	Observation
		Verified OK			Result
		Bird U.M. Frittill of protein late is Dissessed in the Di	WARNING! A		Photo

Mr. Ankit Verma SSE/D&D/CLW/CR-	1
Verma LW/CRJ	7/1
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Mr. Ashish Kumar Rathore SSE/TRS/BLEE	The state of the s
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Cont

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Annexure: 3

Protective Functions in WAG9 locomotive as per Document Vehicle Control System Software Specification F:3EHP 541 526

Description	Description Prescribed Value	Test Procedure Followed	Observation (Checked in Simulation/Traction Mode from Both CAB)	Remark	Photo
AC Primary Voltage (Cooling mode)	AC Primary       Trigger level 17,5       The trip setting was initiated by continuous off       The trip setting was initiated by initiated by operating the MVR       BL key was in relay.	The trip setting was initiated by operating the MVR relay.	BL key was in C position, MCE was off	Verified OK	NA

- 111	JE/TRS/BLEE	Manager/R&D Hind Rectifiers Ltd.	SSE/TRS/BLEE	Manager/R&D Hind Rectifiers	OOL/DOD/OLANOIS
Mr. Jitendra Singt	Mr. Pravin	Mr. Kshaunish	Mr. Ashish	Mr. Jitendra	Mr. Ankit Verma
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		AC Primary Voltage (Driving mode)				Description
KV	monitoring: U >= 30 kV(RMS): VCB off closing of VCB inhibited if U >= 29	closing of VCB inhibited if U <= 17.5 kV  2) Maximum-voltage	monitoring: U <= 17 kV(RMS): VCB off	Protective actions: 1) Minimum-voltage		Prescribed Value
	software tool and GUI.	signal was given to the controller of processor cards of the traction	parameters Simulated forced	for the upper and lower limit of locomotive	For testing the protective action	Test Procedure Followed
"Catenary voltage out of limit" Pop-Up message appeared on DDU	(Actual value is 25 KV Forced value is 24 KV. Default value will be 30kV)	17kV)  2) VCB tripped at	(Actual value is 25 KV, forced value is 26 KV,	1) VCB tripped for U<= 25	Values of OHE at which VCB tripped	Observation (Checked in Simulation/Traction Mode from Both CAB)
		Verified OK				Remark
	In opposition to the control of the	And the second of the second o		Collection from the collection of the collection	WARNING!	Photo

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Thentrakingh Mr. Jitendra Singh JE/D&D/CLW/CRJ

AC Primary Current (Hardware Function)	Description
Protective actions: 1)Trigger level 990 Apeak (+ 0 A / - 100 A): VCB off 2) Maximum-current monitoring during normal operation: Trigger level 360 ARMS (+ 0 A / - 20 A): VCB off	Prescribed Value
	Test Procedure Followed
In cooling mode, MCE stays off due to which AC over current protection cannot be simulated through software logic  Ac over current protection in cooling mode is actuated by over current relay	Observation (Checked in Simulation/Traction Mode from Both CAB)
Verified OK	Remark
AC over current protection in cooling mode is actuated by over current relay.	Photo

Mr. Ankit Verma Mr. 3 SSE/D&D/CLW/CRJ S Manaa Hind F	A Set Just
Mr. fitendra Singh Aanager/R&D lind Rectifiers	The state of the s
Mc Ashish Kumar Rathore SSE/TRS/BLEE	Pur
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	E
Mr. Pravin Panchal JE/TRS/BLEE	R
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Titendrashingh

					AC Primary Return Current				Description
ML Ankit Verma SSE/D&D/CLW/CRJ N	dat.		normal operation: I >= 330 A(RMS) : VCB off	2) Maximum-current monitoring during	(inrush current of transformer): I >= 800 A(RMS) : VCB off	Maximum-current monitoring within 1,25 sec after switch-on of VCB	Protective actions:	V.	Prescribed Value
Mr. Jitendra Singh Manager/R&D Hind Rectifiers  Mr. Ashish Kumar Rathore SSE/TRS/BLEE	P.			GUI.	processor cards of the traction converter through	parameters Simulated forced signal was given to	lower limit of	For testing the protective action	Test Procedure Followed
ish Mr. Kshaunish tthore Kayal BLEE Manager/R&D Hind Rectifiers Ltd.	P CE	"Primary overcurrent" Pop-Up message appeared on DDU.	(Actual value –10A Forced value- 5A Default value – 338A)	2) VCB tripped for l≥338A	(Actual value – 10A Forced value- 8A Default value – 810A	To simulate the condition, the level has been changed in forced value.	1) VCB tripped for I≥810A	Values of AC Primary Return Current at which VCB tripped	Observation (Checked in Simulation/Traction Mode from Both CAB)
Mr. Pravin Mr. Jit Panchal JE/D& JE/TRS/BLEE	Pr Titan			3A	Verified OK	, , , , , , , , , , , , , , , , , , ,	)A		n Remark B)
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Titania ningh			Annual Property Control of the Contr	A second content of the data above of content of the content of th			WARNING	Photo

		Harmonic Filter Current						Description
	2) Maximum-current monitoring during normal operation: I >= 410 A(RMS): VCB off, contactor harmonic filter off	of harmonic-filter: I >= 600 A(RMS): VCB off, contactor harmonic filter off	monitoring within 1 sec after switch-on	Protective actions:  1) Maximum-current				Prescribed Value
	GUI.	processor cards of the traction converter through	signal was given to	parameters Simulated forced	for the upper and lower limit of	protective action	For tosting the	Test Procedure Followed
Harmonic filter current too high Pop-Up message appeared on DDU.	2) VCB tripped for I≥410A (Actual value – 190A Forced value- 130A Default value – 410A)	(Actual value – 168A Forced value- 150A Default value – 600A)	1) VCB tripped for I≥600A	the level has been changed in forced value.	To simulate the condition,	tripped	Values of Harmonic Filter	Observation (Checked in Simulation/Traction Mode from Both CAB)
		Verified OK.						Remark
71		The control of the co	The state of the s		HONOR TIPE CHARGE TO HER.  THE EXTENSION WE FOR INSING PRIVATE SERVICE AND THE CHARGES AND THE		WARNING!	Photo

Mr. Ankit Verma SSE/D&D/CLW/CRJ	A SEA
Mr. Mendra Singh Manager/R&D Hind Rectifiers Ltd.	Choop W
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Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	E
Mr. Pravin Panchal JE/TRS/BLEE	In

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JE/D&D/CLW/CRJ

Auxiliary	Description
Protective actions: 1) Maximum-current monitoring: 1 >= 400 A(RMS) : VCB off	Prescribed Value
For testing the protective action for the upper and lower limit of locomotive parameters Simulated forced signal was given to the controller of processor cards of the traction converter through software tool and GUI.	Test Procedure Followed
Values of Auxiliary Current at which VCB tripped  To simulate the condition, the level has been changed in forced value.  VCB tripped at I≥402A (Actual value – 117A Forced value – 100A Default value – 400A)  Auxiliary winding overcurrent Pop up message appeared on DDU	Observation (Checked in Simulation/Traction Mode from Both CAB)
Verified OK.	Remark
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		Motor Speed	Vehicle Speed				Description
IGBT-pulsing inhibited	2) v > 112 km/h:	100 % to 0 % in VCU	reduction from	KMPH TE linear	1) 100 <v <="110&lt;/th"><th>Protective actions:</th><th>Prescribed Value</th></v>	Protective actions:	Prescribed Value
							Test Procedure Followed
When speed v>113 km/h motor pulsing stopped.	% to 0 % in VCU.	reducing TE demand with a linear reduction from 100	activated, VCU start	KMPH, buzzer alarm	speed exceeded to 100	In simulation mode, when	Observation (Checked in Simulation/Traction Mode from Both CAB)
			Volume Co	Varified OK			Remark
							Photo

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	Traction Motor		Description
inhibited: 230°C	Protective actions: 1) IGBT-pulsing		Prescribed Value
software tool and GUI.	signal was given to the controller of processor cards of the traction	For testing the protective action for the upper and lower limit of locomotive parameters Simulated forced	Test Procedure Followed
"Traction motor temperature too high" Pop-Up message appeared on DDU  The motor got isolated.	(Actual value – 21.8 °C Forced value- 20 °C Default value – 230 °C)	VCB tripped for motor temperature T >= 230 °C	Observation (Checked in Simulation/Traction Mode from Both CAB)
	Verified OK		Remark
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Mr. Pravin Panchal JE/TRS/BLEE

Mr. Jitendra Singh JE/D&D/CLW/CRJ Thewardingh

,			Oil Pressure						Description
		(2.5 bar) : VCB off	(0.75 bar): VCB off or signal > 14 mA	Protective actions:		×			Prescribed Value
			converter through software tool and GUI	the controller of processor cards of the traction	Simulated forced signal was given to	locomotive	for the upper and lower limit of	For testing the	Test Procedure Followed
Converter got isolated Main power isolated.	Transformer oil temperature or pressure not ok Pop-Up message appeared on DDU	Forced value- 1 bar Default value - 2.5 bar)	2) VCB tripped at TOP>2.6 Bar (Actual value – 1.5 bar	Forced value - 1.6 bar Default value - 0.75 bar)	TOP<0.75 Bar (Actual value – 1.5bar	1) VCB tripped at	exceeds the following values	When transformer oil	Observation (Checked in Simulation/Traction Mode from Both CAB)
			Verilled ON						Remark
A property of the state of the		Annie   Anni	The appropriate the section of the s		The second secon	SSC1 Main River  THEORY OF HE THE POINT CAN THE POINT CAN  THEORY DIVINE THE CONTROL CANNETS C	WARNING!		Photo

Mr. Jitendra Sing JE/D&D/CLW/CF	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Mr. Jfendra Singh Manager/R&D Hind Rectifiers	Mr. Ankit Verma SSE/D&D/CLW/CRJ
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	Transformer Temperature	Description
Mr. Ankit Verma SSE/D&D/CLW/CRJ	Protective actions: 1) VCB Off: T 84°C longer than 10 sec	Prescribed Value
Mr. Aftendra Singh Manager/R&D Hind Rectifiers Ltd.	For testing the protective action for the upper and lower limit of locomotive parameters Simulated forced signal was given to the controller of processor cards of the traction converter through software tool and GUI.	Test Procedure Followed
nish Mr. Kshaunish kayal Manager/R&D Hind Rectifiers Ltd.	When transformer oil temperature exceeds the following values  VCB tripped at T≥84 °C (Actual value – 31.58°C Forced value – 25°C Default value – 84°C)  Transformer oil temperature or pressure not ok Pop-Up message appeared on DDU and VCB will be tripped and after two iterations Main power will be isolated.	Observation (Checked in Simulation/Traction Mode from Both CAB)
Mr. Pravin Panchal JE/TRS/BLEE	verified Verified	n Remark
Titentagingh Mr. Jitendra Singh JE/D&D/CLW/CRJ	WARNING!  The broad point of the broad between t	ark Photo

	Converter Oil Pressure	Description
Mr. Ankit Verma SSE/D&D/CLW/CRJ	Protective actions: 1) Oil-pressure monitoring: Converter oil temperature > 50°C pressure < 1.5 bar : VCB off	Prescribed Value
Mr. Jitendra Singh Manager/R&D Mr. SSE/TRS/BLEE Hind Rectifiers Ltd.	For testing the protective action for the upper and lower limit of locomotive parameters Simulated forced signal was given to the controller of processor cards of the traction converter through software tool and GUI.	Test Procedure Followed
ish Mr. Kshaunish thore Kayal Manager/R&D Hind Rectifiers Ltd.	When converter oil pressure dropped below the following value  VCB tripped at P<1.45 Bar, actual value is 1.45 Set value is 1 Bar after two iterations that converter & bogie got isolated.  Converter oil pressure not ok pop-Up message appeared on DDU	Observation (Checked in Simulation/Traction Mode from Both CAB)
Mr. Pravin Mr. Pranchal JE/TRS/BLEE	Verified OK	n Remark
The strain of th	SEZ Petro Bayl  SEZ Petro Bayl	Photo

		Converter Oil Temperature	Description
Mr. Ankit Verma SSE/D&D/CLW/CRJ N	A THE	Protective actions: 1) VCB Off: T 80°C longer than 10 sec	Prescribed Value
Mr. Sitendra Mr. Ashish Singh Kumar Rathore Manager/R&D SSE/TRS/BLEE Hind Rectifiers	多	For testing the protective action for the upper and lower limit of locomotive parameters Simulated forced signal was given to the controller of processor cards of the traction converter through software tool and GUI.	Test Procedure Followed
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	文定	When converter oil temperature exceeded the following results.  VCB tripped at T≥81 °C.  Actual temp was 29.45 °C.  After One iteration particular bogie got isolated.  "Converter oil temperature too high"  Pop-Up message appeared on DDU.	Observation (Checked in Simulation/Traction Mode from Both CAB)
Mr. Pravin N Panchal J JE/TRS/BLEE	In 1	C, Verified	n Remark B)
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Teteratedolyk	WARNING!  SECON Institute dispens  COMMITTED 11 CL. Extraction flows  COMMITTED 11 CL. Extraction flows  COMMITTED 11 CL. Extraction flows  First \$10 to 60 sh V3 O Other of much in the discourage because the committed of the Other commands for decoding because the another property of the complete of the Other commands flows and the committed of the Other commands flows and the committed of the Other commands flows and the committed of the Other committed flows and the committed of the Committed	rk Photo

	Converter	DC Link Voltage Main		Description
	Udc > 3200 V : DC Link Over Voltage	Protective actions: Udc < 2500 V : DC-		Prescribed Value
	converter through software tool and GUI.	Simulated forced signal was given to the controller of processor cards of the traction	For testing the protective action for the upper and lower limit of locomotive	Test Procedure Followed
Disturbance in Converter, Line Converter-1 Bogie-1 Isolated Pop-Up message appeared on DDU	2) VCB tripped at V≥3199V, limit change 1500 volt, actual value is 1950 volt.	VCB tripped at V≤2450V. limit change 2500-volt actual value is 2000 volt.	When DC link voltage dropped below and exceeded above the following values	Observation (Checked in Simulation/Traction Mode from Both CAB)
		Verified OK		Remark
		Proper Nove  SEA Partie Bale 1 Lie (presp) displa blackel  Asked Tadishbary Search Road Consists	* WARNING!	Photo

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Mr. Æhish Kumar Rathore SSE/TRS/BLEE

Mily Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.

Mr. Pravin Panchal JE/TRS/BLEE

Mr. Jitendra Singh
JE/D&D/CLW/CRJ

		Earth Fault Battery Circuit	Earth Fault Detection Main Converter	Description
Mr. Ankit Verma SSE/D&D/CLW/CRJ N	1 hut	Protective actions: Binary signal 0: normal operation Binary signal 1: diagnostic data set (DDS) 'earth fault battery circuit'	'Earth fault in converter 1/2' le > 1A: DDS 'Earth fault in converter 1/2' (le: Earth fault leakage current)	Prescribed Value
Mr. Jffendra Mr. Ashish Singh Kumar Rathore Manager/R&D SSE/TRS/BLEE Hind Rectifiers	Great De	To simulated the battery Earth fault, at PCLH connector +ve and -ve terminal of the D panel is connected to the loco body individually.	For testing the protective action for the upper and lower limit of locomotive parameters Simulated forced signal was given to the controller of processor cards of the traction converter through software tool and GUI.	Test Procedure Followed
Mr.\kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	8	Earth Fault Battery Circuit Pop-Up message appeared on DDU.  As per shed, the E/F indication need to be incorporated in DDU.	Earth fault in Traction Converter Pop-Up message appeared on DDU As we have used the current based Earth fault sensing logic	Observation (Checked in Simulation/Traction Mode from Both CAB)
Mr. Pravin Mr. Ji Panchal JE/D8 JE/TRS/BLEE	In Siter	Verified OK	Verified OK	Remark
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Titentralingh	WARNING!	WARNING:  WARNIN	Photo

		Earth Fault Filter Circuit	Earth Fault 415V/110V Circuit	Earth Fault Auxiliary Circuit	Description
Mr. Ankit Verma SSE/D&D/CLW/CRJ	ART	Protective actions: Binary signal 0: normal operation Binary signal 1: diagnostic data set (DDS) 'earth fault filter circuit'	Protective actions: Binary signal 0: normal operation Binary signal 1: diagnostic data set (DDS) 'earth fault 415V/110V circuit'	Protective actions: Binary signal 0: normal operation Binary signal 1: diagnostic data set (DDS) 'earth fault auxiliary circuit'	Prescribed Value
Mr. Jitendra Singh Kanager/R&D Manager/R&D Hind Rectifiers Ltd.	SK.	To simulate this, in FB Cubicle, relay 89.6 A & B points are shorted.	To simulate this, in HB1 panel, relay 89.5 A & B points are shorted.	To simulate this, HB2 panel relay 89.2 A & B are shorted.	Test Procedure Followed
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	3	3	5	y in	
Mr. Kshaunish re Kayal EE Manager/R&D Hind Rectifiers Ltd.		Earth fault harmonic filter circuit Pop-Up message appeared on DDU.  As per shed, the E/F indication need to be incorporated in DDU.	Earth Fault 415V/110V Circuit Pop-Up message appeared on DDU. As per shed, the E/F indication need to be incorporated in DDU.	Earth Fault Auxiliary Circuit Pop-Up message appeared on DDU.  As per shed, the E/F indication need to be incorporated in DDU.	Observation (Checked in Simulation/Traction Mode from Both CAB)
Mr. Pravin Panchal JE/TRS/BLEE	n	Verified	Je Verified	verified	
Mr. Jitendra Singh JE/D&D/CLW/CR.	The wordingh	d OK	d OK	OX OX	Remark
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Annexure: 4

Performance Testing & Commissioning Format For 3-Phase Locomotive fitted with IGBT based Traction Converter, Auxiliary Converter and VCU Format No. F60.305.01, Version:06

Description	Process followed to simulate the test	Observations	Result
Emergency stop in cooling mode	Raise panto in cooling mode. Put the brake controller into RUN position. Close the VCB. Push emergency stop button 244.	VCB got open Panto was lowered Emergency brake was applied	Verified OK
Emergency stop in driving mode	Raise panto in driving mode in. Put the brake controller into RUN position. Close the VCB. Push emergency stop button 244.	VCB got open Panto was lowered Emergency brake was applied	Verified OK
Shut down in cooling mode	Raise panto in cooling mode. Close the VCB. Bring the BL-key in 'O' position.	VCB got open Panto was lowered	Verified OK
Shutdown in driving mode	Raise panto in driving mode. Close the VCB. Bring the BL-key in 'O' position.	VCB got open Panto was lowered	Verified OK
Interlocking pantograph-VCB in cooling mode	Raise panto in cooling mode. Close the VCB. Lower the pantograph by ZPT	VCB got open	Verified OK
Interlocking pantograph-VCB in driving mode	Raise panto in driving mode. Close the VCB. Lower the pantograph by ZPT	VCB got open	Verified OK

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Trtendrahingh	M	E	Barry .	K	A.

Description	Process followed to simulate the test	Observations	Result
Measurement of protective shutdown by Converter 1 electronics	Start up the loco with both the converter. Raise panto. Close VCB. Move Reverser handle to forward or reverse. Remove one of the fiber optic/EMD/ESD/Communication media feedback cable from converter 1 Check that converter 1 electronics produces a protective shut down.  • VCB goes off • Priority 1 fault msg. on DDU appears  "Disturbance in Converter 1"	After removing the MVB cable from the Traction Converter 1 VCB goes OFF and fault msg popped up on DDU screen "Life sign from Line Converter 1 is missing"	Verified OK
Measurement of protective shutdown by Converter 2 electronics	Start up the loco with both the converter. Raise panto. Close VCB. Move Reverser handle to forward or reverse. Remove one of the fiber optic/EMD/ESD/Communication media feedback cable from converter 2. Check that converter 2 electronics produces a protective shut down.  • VCB goes off • Priority 1 fault msg. on diagnostic display appears "Disturbance in Converter 2"	After removing the MVB cable from the Traction Converter 1 VCB was OFF and fault msg popped up on DDU screen "Life sign from Line Converter 2 is missing"	Verified OK
Cab activation in driving mode	No fault message should appear on the DDU of the loco.	No fault msg appeared on DDU screen	Verified OK
Check regenerative braking	Bring the TE/BE throttle to BE side. Loco speed should start reducing	Regenerative braking was checked during loco running in trial and found working satisfactory	Verified OK
Check for BUR redundancy test at ventilation level 1 & 3 of loco operation	In the event of failure of one BUR, rest of the two BURs can take the load of all the auxiliaries. For this switch off one BUR. Auxiliaries should be catered by rest of two BURs.  Switch off the 2 BURs: loco should trip in this case.	BUR redundancy test was conducted with isolation of 1, 2 & 3 BUR individually.  When 2 BURs were got isolated, main power SS01 also got isolated.	Verified OK
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Mr. Jitendra JE/D&D/CL\	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Mr. Jitendra Singh Manager/R&D Hind Rectifiers	Mr. Ankit Verma SSE/D&D/CLW/CRJ
Treendre	M	E C	Post	Control of the second	Addition

Description	Process followed to simulate the test	Observations	Result
		"Disturbance in BUR Processor 1/2/3" pop-up message appeared.	
Check the power converter	Create disturbance in power converter by switching off the electronics. VCB should open and converter should get isolated and traction is possible with another power	Power Supply of Traction Converter was isolated from SB1 & SB2 and VCB turned OFF	Verified OK
isolation test	converter.	Bogie 1 isolated only half traction available.	
		Moved BL key from off to drive position	
Loco charging.	Loco to be charged and all auxiliaries should run. No fault message to appear on the diagnostic panel of the loco. Raise MR pressure to 10 Kg/cm², BP to 5 Kg/cm², FP to 6 Kg/cm².	After self-test node reached to 504, after raising panto node reached to 550, and after closing VCB node reached to 570 all auxiliaries start working	Verified OK
		MR, BP and FP are charged accordingly.	
	BLCP off mode     Manual mode	1-BLCP off mode verified compressor not operate.      2-Auto & Manual verified	
Check operation of compressors in "AUTO"	<ul> <li>Auto mode</li> <li>At the starting of compressors un-loader valve should operate.</li> </ul>	3-Un-loader value operated during ON of compressor	Verified OK
Mode.	<ul> <li>If MR pressure is less than 8 Kg/cm² both compressor will run till MR pressure reaches at 10 Kg/cm².</li> </ul>	4-When MR pressure drops below 8 Kg/cm² both compressor runs till MR pressure reached at 10 Kg/cm².	

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Check function of emergency push stop.  Beyond 5 kmph, press BPCS, the speed of loco should be constant.  Check function of BPCS.  BPCS action should be cancelled by moving TE/BE throttle, by dropping BP below 4.75 Kg/cm², by pressing BPCS again.  Check train parting operation of the locomotive.  Mr. Ankit Verma Mr. Jitendra Mr. Ashish Mr. Titendra  Mr. Ashish Mr. Mit.	Description
	Check function
ain nction ve.	pusn stop.
nction ain of the ve.	
<u> </u>	Check function of BPCS.
- L	
	Check train parting operation of the locomotive.
+	
- Z = -	

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Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	To the second
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	T.
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Carl Carl
Mr. Pravin Panchal JE/TRS/BLEE	Ru
Mr. Jitendra Sing JE/D&D/CLW/CR	Thetentration

Check vigilance operation of the locomotive.  Set the speed more than 1.5 kmph and ensure that brakes are released For 60 seconds do not press vigilance foot switch or Buzzer should start buzzing.  LSVW should glow continuously.  At low pressure of MR (< 5.6 kg/cm²).  With direct loco brake applied.  With automatic train brake applied (BP < 4.75 kg/cm²).  With emergency cook (BP < 4.75 kg/cm²).  With eractive/braking effort should ramp down, and BP reduces rapidly.  Switch off the brake electronics MCB 127.7 in SB2. After MCB reduces rapidly.  Check traction  Test  As per she logging has software by MS needs  Buzzer sou LSVW glov LSVW glov Check switch or LSVW glov Check start/run in kg/cm²).  Switch off the brake electronics MCB 127.7 in SB2. TE/BE & Brake Blending  During the Regeneration failure the loco brakes will be intentionall throttle in E	Set the speed more than 1.5 kmph and ensure that brakes are released For 60 seconds do not press vigilance foot switch or sanding foots switch or TE/BE throttle then Buzzer should start buzzing.  LSVW should start buzzing.  LSVW should glow continuously.  At low pressure of MR (< 5.6 kg/cm²).  With direct loco brake applied.  With automatic train brake applied (BP < 4.75 kg/cm²).  With emergency cock (BP < 4.75 kg/cm²).  With emergency cock (BP < 4.75 kg/cm²).  Switch off the brake electronics MCB 127.7 in SB2.  The tractive/braking effort should ramp down, and BP reduces rapidly.  During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode  Mr. Ashish  SSE/D&D/CLW/CRJ  Manager/R&D  SSE/TRS/BI FE  Manager  Manager/R&D  SSE/TRS/BI FE  Manager  Manager/R&D  SSE/TRS/BI FE  Manager  Manager/R&D  SSE/TRS/BI FE  Manager  Manager  Manager/R&D  SSE/TRS/BI FE  Manager  Manager	Description	Process followed to simulate the test	Observations  Alarm Chain Pulling was appeared on
Set the speed more than 1.5 kmph and ensure that brakes are released For 60 seconds do not press vigilance foot switch or sanding foots switch or TE/BE throttle then Buzzer should start buzzing.  LSVW should glow continuously.  At low pressure of MR (< 5.6 kg/cm²).  With direct loco brake applied.  With automatic train brake applied (BP < 4.75 kg/cm²).  With emergency cock (BP < 4.75 kg/cm²).  Switch off the brake electronics MCB 127.7 in SB2. The tractive/braking effort should ramp down, and BP reduces rapidly.  Buring the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode	Set the speed more than 1.5 kmph and ensure that brakes are released For 60 seconds do not press vigilance foot switch or sanding foots switch or TE/BE throttle then Buzzer should start buzzing.  LSVW should start buzzing.  LSVW should glow continuously.  At low pressure of MR (< 5.6 kg/cm²).  With direct loco brake applied.  With automatic train brake applied (BP < 4.75 kg/cm²).  With emergency cock (BP < 4.75 kg/cm²).  Switch off the brake electronics MCB 127.7 in SB2.  The tractive/braking effort should ramp down, and BP reduces rapidly.  During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode  Mr. Ashish  SSE/D&D/CLW/CRJ  MSSE/D&D/CLW/CRJ  MSSE/TRS/BI FE  Manager  M			Alarm Chain Pu DDU.
Set the speed more than 1.5 kmph and ensure that brakes are released For 60 seconds do not press vigilance foot switch or sanding foots switch or TE/BE throttle then Buzzer should start buzzing. LSVW should glow continuously.  At low pressure of MR (< 5.6 kg/cm²). With direct loco brake applied. With automatic train brake applied (BP < 4.75 kg/cm²).  With emergency cock (BP < 4.75 Kg/cm²). Switch off the brake electronics MCB 127.7 in SB2. The tractive/braking effort should ramp down, and BP reduces rapidly.  During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode	Set the speed more than 1.5 kmph and ensure that brakes are released For 60 seconds do not press vigilance foot switch or sanding foots switch or TE/BE throttle then Buzzer should start buzzing.  LSVW should glow continuously.  At low pressure of MR (< 5.6 kg/cm²).  With direct loco brake applied.  With automatic train brake applied (BP < 4.75 kg/cm²).  With emergency cock (BP < 4.75 kg/cm²).  Switch off the brake electronics MCB 127.7 in SB2.  The tractive/braking effort should ramp down, and BP reduces rapidly.  Buring the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode  Mr. Ashish  SSE/D&D/CLW/CRJ  Manager/R&D  SSE/D&D/CLW/CRJ  Manager/R&D  SSE/TRS/RI EF  Manager/R&D  Manager/R&D  SSE/TRS/RI EF  Manager/R&D  Manager/R&D  SSE/TRS/RI EF  Manager/R&D  Manager/R&D			As per shed remark, AFL logic with logging has been implemented in the software but the necessary wiring as pert MS needs to be done by CLW.
At low pressure of MR (< 5.6 kg/cm²).  With direct loco brake applied.  With automatic train brake applied (BP < 4.75 kg/cm²).  With emergency cock (BP < 4.75 Kg/cm²).  Switch off the brake electronics MCB 127.7 in SB2.  The tractive/braking effort should ramp down, and BP reduces rapidly.  During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode	At low pressure of MR (< 5.6 kg/cm²).  With direct loco brake applied.  With automatic train brake applied (BP < 4.75 kg/cm²).  With emergency cock (BP < 4.75 Kg/cm²).  Switch off the brake electronics MCB 127.7 in SB2.  The tractive/braking effort should ramp down, and BP reduces rapidly.  During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode  MARANKIT Verma Singh SSE/D&D/CLW/CRJ Manager/R&D SSE/TRS/BI FF Manager/R&D SSE/TRS/	Check vigilance operation of the locomotive.	Set the speed more than 1.5 kmph and ensure the speed more than 1.5 kmph and ensure the scale are released for 60 seconds do not press vigilance foot switch anding foots switch or TE/BE throttle then Buzzer should start buzzing.  LSVW should glow continuously.	Buzzer sounds after 1 minute
Switch off the brake electronics MCB 127.7 in SB2. The tractive/braking effort should ramp down, and BP reduces rapidly.  e Blending  During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode	Switch off the brake electronics MCB 127.7 in SB2. The tractive/braking effort should ramp down, and BP reduces rapidly.  Blending During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode applied in proportion to throttle position in BE mode with the second state of the se	Check start/run interlock	At low pressure of MR (< 5.6 kg/cm²).  With direct loco brake applied.  With automatic train brake applied (BP < 4. kg/cm²).  With emergency cock (BP < 4.75 Kg/cm²).	Start/run interlock was simulated with all the four combinations
e Blending  During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode	During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode  WHANKIT Verma Singh Kumar Rathbre Kingar Rath	Check traction interlock	Switch off the brake electronics MCB 127.7 in SE The tractive/braking effort should ramp down, and teduces rapidly.	. After MCB 127.7 in SB2 was switched off TE/BE & BP reduced to zero
applied in proportion to throttle position in BE mode	During the Regeneration failure the loco brakes will be applied in proportion to throttle position in BE mode  Mr. Singh SSE/D&D/CLW/CRJ Manager/R&D SSE/TRS/RI EF Manager/R&D			Checked in simulation and
	Mr. Sitendra Singh Kumar Rathore Manager/R&D SSETTRS/BI FF	Brake Blending Test	During the Regeneration failure the loco brakes will applied in proportion to throttle position in BE mode	To simulate the test condition VCB was intentionally opened after taking the throttle in BE in loco running condition.

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Verified OK	VCB Tripped, "Traction motor temperature too high" Pop-Up message appeared on DDU and respective motor got isolated.  When all temperature sensor connectors of SR1/SR2 were disconnected from MCU processor card then that bogie got isolated.	Remove 1,2,3 temperature sensor cable from TC1/TC2 and check whether that motor is isolated. Again, in case of three motor the Bogie gets isolated.	Motor Temperature Sensor Failure Test
Verified OK	Transformer temperature sensor cable (210.5A) was disconnected from amplifier  "Transformer oil temperature is not ok" Pop-Up message appeared on DDU and VCB tripped	Remove the sensor to detect the failure message on DDU screen. VCB turns OFF	Transformer Oil Temperature Sensor Failure Test
Verified OK	Transformer oil pressure sensor cable (214.C/1) was disconnected from amplifier  "Transformer oil temperature is not ok" Pop-Up message appeared on DDU and VCB tripped	Remove the sensor to detect the failure message on DDU screen. VCB turns OFF	Transformer Oil Pressure Sensor Failure Test
Verified OK	loco brake was automatically applied without application of SA 9 brake. Checked in simulation mode at 596 node, after taking traction TE not exceeded to 298 KN	TE should be limited to 300kN after applying the brakes (applicable only to WAG-9H)	ZTEL to be switched on at 596 node
Result	Observations	Process followed to simulate the test	Description

Mr. Ankit Verma Mr. Jitendra SSE/D&D/CLW/CRJ Singh Manager/R&D	AND JOHN
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Pir.
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	( Cal
Mr. Pravin Panchal JE/TRS/BLEE	Ru
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Ittentraligh

SS.		Traction R Converter D Coolant Oil		Motor Speed the Sensor Failure a	ū	Inching mode S	<b>X</b>	<b>U</b> 1 (	VCU Reset	ס	Description
Mr. Ankit Verma SSE/D&D/CLW/CRJ	fait	Remove the sensor to detect the failure message on DDU screen. VCB turns OFF	got isolated.	Speed sensor connectors of Bogie 1 & 2 was disconnected from motor sensor units (MSUs processor cards) from TC1/TC2 and checked whether that motor is isolated. When 3 speed sensors of Bogie 1 and Bogie 2 was isolated one by one then that Bogie	Press ZTEL switch.	Inching mode to be selected from DDU. Speed limit to be set at 0.5-1.5kmph	Reverser to be kent at forward/reverse mode	504 node should be reached.	drop more than 4.65kg/cm2.	Press the VCII reset switch at 504 node RD should not	Process fo
Mr. Jitendra Singh Manager/R&D S	Contract of the contract of th	or to detect the turns OFF		sensor connectors of Bogie 1 & ected from motor sensor units sor cards) from TC1/TC2 and checked tor is isolated. When 3 speed sensors ogie 2 was isolated one by one then the	>	e selected from let at 0.5-1.5kmp	at at forward/revi	be reached.	55kg/cm2.	et switch at 504	Process followed to simulate the test
Mr. Ashish Kumar Rathore SSE/TRS/BLEE Manager/R&D	Pin 1	failure message		logie 1 & 2 was sor units (MSUs nd checked whether d sensors of Bogie1) are then that Bogie		DDU.	erse mode		restart	node RP should	late the test
Mr. Kshaunish Kayal Manager/R&D	E				ZTEL ope	After mov	Checked after cont	MCE rese	BP does not drop		
Mr. Pravin Panchal JE/TRS/BLEE	hu	TC Coolant MCB was turne panel to simulate the result	When 3 speed sensors of Bogie1 and Bogie 2 was isolated one by one then that Bogie got isolated.	After disconnecting motor speed sens connectors, "Fault in speed sensor" pop-up message was appeared with VCB tripped, BPFA and LSFI glowed, after acknowledging BPFA that motor isolated.	ZTEL operation got deactivated	ring ZTEL switc	Checked in forward reverse after configuring through D	MCE reset occurred	not drop	VCU reset push button was pressed	Observations
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Trentrasingh	TC Coolant MCB was turned off from HB panel to simulate the result	of Bogie1 and e by one then	After disconnecting motor speed sensor connectors, "Fault in speed sensor" pop-up message was appeared with VCB tripped, BPFA and LSFI glowed, after acknowledging BPFA that motor got isolated.	ctivated		on position			vas pressed	ons
		Verified OK		Verified OK		Verified OK			Verified OK		Result

Mr. Ankit Verma SSE/D&D/CLW/CRJ	And
Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	Contract of the contract of th
Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Pin
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	E
Mr. Pravin Panchal JE/TRS/BLEE	hu
Mr. Jitendra Singl JE/D&D/CLW/CR	Trentrasingh

2	Banking mode operation	Speed restricted to 100 KMPH when harmonic filter got isolated	Pressure Sensor Failure Test	Description
Mr. Ankif Verma SSE/D&D/CLW/CRJ Manager/R&D Hind Rectifiers Hind F	The brake pipe of rolling stock will not be charged by the banking loco, but it will be possible for the banking	Cas-1 In simulation mode, harmonic filter isolation has created by simulating the condition of harmonic filter over current by giving the forced command to the controller of processor card through software tool and HMI.  Case-2 Harmonic filter isolated fault was created by harmonic filter contactor stuck off fault. By releasing pressure of EPC contactor (8.1 & 8.2) through FB cock on pneumatic panel		Process followed to simulate the test
Mr. Kshaunish Mr. Pravin Mr. Jitendra Singh Kayal Panchal JE/D&D/CLW/CRJ Hind Rectifiers Ltd.	Banking mode was tested in power mode. Throttle was applied to check the TE demand	In simulation mode, for the first case, VCB was tripped and "Harmonic filter current too high" pop-up message appeared. After closing the VCB and taking traction speed was restricted to 100 kmph  In second case, harmonic filter was isolated, again VCB closed and when traction taken speed restricted to 100 kmph.		Observations
~ [ 원	ne Verified OK	Verified OK		Result

李		Check sanding 1-Revers operation. activated	Auxiliary load - 1-trip isolation test 2-trip	Performance of BURs during energy saving mode  7.  2.  4.	AD-BLDJ Rais	BPFA operation Fault	VCB Stuck ON VCB	loco case Thro	Description	
Wr Ankit Verma	14	ated.	oped any one (	To check the operation of Ene following steps to be followed:  1. First keep the BL in 'D' switch on VCB.  2. Ensured all BUR are in applied and loco speed is applied and loco speed is 3. Ensured Temperature converter coolant and trace deg.C  4. Wait for 5 min, if all the alloco should go to energy is BUR-2 converter.  5. By moving TE/BE throttle deactivated.	e panto in drivi	t should acknow	Stuck OFF/0	loco's driver to apply tr case of emergency. Throttle can be applied	Process	
Mr Mitendra	Jana Sant	1-Reversal in forward 1,3, sanding valves should be activated.	1-tripped any one Compressor MCB 2-tripped any one Scavenge Blower	To check the operation of Energy saving mode, the following steps to be followed:  1. First keep the BL in 'D' position, raise the paswitch on VCB.  2. Ensured all BUR are in service, TE/BE is applied and loco speed is zero.  3. Ensured Temperature of Transformer oil, converter coolant and traction motor is less deg.C  4. Wait for 5 min, if all the above condition prevaleco should go to energy saving mode by switch BUR-2 converter.  5. By moving TE/BE throttle, Energy saving mode deactivated.	ing mode. Close	wledge by pressir	ON by continua	pply train brake: כץ. oplied	Process followed to simulate the test	
Mr. Ashish	Piy	/alves should be		o check the operation of Energy saving mode, the billowing steps to be followed:  1. First keep the BL in 'D' position, raise the panto and switch on VCB.  2. Ensured all BUR are in service, TE/BE is zero, BC applied and loco speed is zero.  3. Ensured Temperature of Transformer oil, Traction converter coolant and traction motor is less than 55 deg.C  4. Wait for 5 min, if all the above condition prevails, then loco should go to energy saving mode by switching OFF BUR-2 converter.  5. By moving TE/BE throttle, Energy saving mode will be deactivated.	Raise panto in driving mode. Close the VCB by AD-BLDJ	Fault should acknowledge by pressing BPFA in any fault pop	VCB Stuck OFF/ON by continually ON/OFF of BLDJ	loco's driver to apply train brakes from banking loco in case of emergency. Throttle can be applied	ulate the test	
Mr. Kshaunish	E	Operated 1-Reversa activated.	Performed and only performar					co in		
Mr. Pravin	hu	Operated from CAB-2 found 1-Reversal in forward 1,3, sactivated.	Performed by tripping MCB form HB-2 and only popup message observed no performance issue was observed.	Energy saving mode getting activated & deactivated. As per described condition.	VCB got open/close by AD-BLDJ switch	acknowledge by	No VCB stuck ON/OFF mobserved		Observation	
Mr. Jitendra Singh	artentration	nd sanding valves is	B form HB-2 panel observed no served.	ng activated & bed condition.	)-BLDJ switch	Fault get acknowledge by pressuring BPFA switch.	message		ions	
	J	Verified OK	Verified OK	Verified OK	Verified OK	Verified OK	Verified OK		Result	

JE/D&D/CLW/CF	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Ksnaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Kumar Rathore SSE/TRS/BLEE	Mr. Sitendra Singh Manager/R&D Hind Rectifiers	Mr. Ankt Verma SSE/D&D/CLW/CRJ
Trans.	h	E C	Piy	Jie Ber	the t

Check Harmonic current	VCU redundancy test	PVEF Operation		Description
By removing AFE-2 gate pulse optical cable.	Removed VCU main processor card	Break pressure should release fast.	2-Reversal in reverse 2,4 sanding valves should be activated.	Process followed to simulate the test
Reduction of 1/4 th of AFE & checked 190 Amps harmonic current.  WARNING!  A MARNING!  A M	VCU-1 main processor removed in control and verified FLG-1 status high and system working ok.	PVEF pressed and break get release fast	2-Reversal in reverse 2,4 sanding valves is activated.	Observations
Verified OK	Verified OK	Verified OK		Result

Mr. Jitendra Singl JE/D&D/CLW/CR	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	Mr. Ankit Verma SSE/D&D/CLW/CRJ
Titendra Ringh	hu		Pi	The state of the s	1

				Constant Speed	Inching Mode	Description
Mr. Ankit Verma SSE/D&D/CLW/CRJ	ART			Speed should maintain constant speed by pressing BPCS at above 5 KMPH	In inching mode speed of locomotive verified at 0.5 KMPH to 1.5 KMPH.	Process
Mr. Jitendra Singh Manager/R&D Hind Rectifiers	Jan Jan		ю	itain constant spe	eed of locomotive	Process followed to simulate the test
Mu-Ashish Kumar Rathore SSE/TRS/BLEE	Pris !			ed by pressing BF	e verified at 0.5 KN	Ingle the test
Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	E,					
Mr. Pravin Panchal JE/TRS/BLEE	R			BPCS pressed at 5KMPH. speed maintain 5 KMPH.	mode at 0.5 KMPH ok	Observations
Mr. Jitendra Singh JE/D&D/CLW/CRJ	Thendralingh			BPCS pressed at 5KMPH speed & observed speed maintain 5 KMPH.	MPH & 1.5KMPH	OHS
				Verified ok	Verified ok	Kesuit

## Joint Note

In compliance to CLW letter no. C-D&D/T/24(Part-IV)/Hirect, dated 21.09.2024 functionality and performance testing was done on 19.03.2025 and the observations are as follows:

1. The snapshot of software version which has been uploaded in the loco no. 38856 is as follow and the versions are -

Description		Software version
SR 1 software version	:	1006
SR 2 software version	1	2006
BUR1 software version	1:	103
BUR2 software version	:	203
BUR3 software version	1:	303
VCU 1 software version	1:	1036
VCU 2 software version	1:	2036
DDU1 software version	:	DDU_CAB11703.11
DDU2 software version	1:	DDU_CAB11703.11



Shut	literation	Din-	- Col	fer	Teterstratingh
Mr. Ankit Verma SSE/D&D/CLW/CRJ	Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	Mr. Ashish Kumar Rathore SSE/TRS/BLEE	Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Jitendra Singh JE/D&D/CLW/CRJ

Graphical user interface (GUI) to monitor the healthiness of each motor has been implemented in DDU and same has been verified. Also Screen shot of same is attached below for reference



- 3. Recordings of 43 critical signals as per RDSO letter no. EL/3.1.35/17 dated 28.04.2023 has been implemented. The storing is being done for 72 hours and it is being downloaded through Ethernet cable and the data displayed in Excel format which is provided as Annexure-AA. Further it is to be noted that there are 62 parameters altogether which is being recorded.
- 4. Logic for energy-saving scheme, based on RDSO Modification Sheet no. 0482, rev 1, has been provided. Further whenever energy saving mode gets activated, in pixy window of DDU the status of the ESM will be ON indicating "ESM (Energy Saving mode): ON" showing a pop up message of "Energy Saving Mode Activated".



Intendralingh Mr. Jitendra Mr. Pravin Mr. Jitendra Singh Mr. Ankit Verma Mr. Ashish Mr. Kshaunish Kayal Manager/R&D JE/D&D/CLW/CRJ SSE/D&D/CLW/CRJ Kumar Rathore Panchal Singh Manager/R&D JE/TRS/BLEE SSE/TRS/BLEE Hind Rectifiers Ltd. Hind Rectifiers Ltd.



- Against implementation of DPWCS ICD firm confirmed that they have MVB ports ready for integration. However, due to unavailability of DPWCS in the locomotive the logic can't be verified.
- 6. Against implementation of WTB ICD firm mentioned that they are using standard WTB gateway unit of M/S HaslerRail which is already been used by other propulsion manufacturer. Same has been verified in loco. It can't be verified because similar propulsion system of M/S Hind Rectifiers Limited propulsion is not available.
- 7. Firm has provided Trouble shooting and Maintenance manual with Fault diagnostic list and mentioned that Compliance with the protection scheme is in already include in the manual and design documents. Thus, firm intimated to refer the same. Also firm has provided a joint test report which has been witnessed by CLW.
- On 19.03.2025, a testing was conducted with two locomotives placed back-to-back in regeneration mode. The trail was done in both up and down gradient available inside CLW. In the testing following was observed
  - a. On the day of testing it was fair and sunny and no rain was there.
  - b. In the up gradient the maximum tractive effort which was reached was 508kN and the maximum speed was 9.2kmph. Wheel Slip appeared sometime but no tripping of Traction converter had been observed.

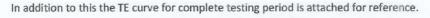
Istensiahing 4 Mr. Pravin Mr. Jitendra Singh Mr. Ankit Verma Mr. Jitendra r. Ashish Mr. Kshaunish Kayal SSE/D&D/CLW/CRJ JE/D&D/CLW/CRJ Singh Kumar Rathore Manager/R&D Panchal Manager/R&D JE/TRS/BLEE SSE/TRS/BLEE Hind Rectifiers Ltd. Hind Rectifiers Ltd.

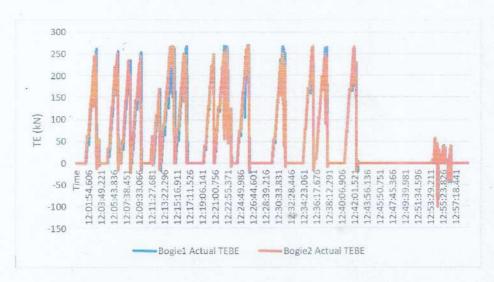


c. In down gradient the maximum tractive effort which was reached was 520 KN and the maximum speed observed was 12 kmph. Wheel slip in down gradient was not observed and snapshot for the same is attached for reference.



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Mr. Ankit Verma SSE/D&D/CLW/CRJ	Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	Mf. Ashish Kumar Rathore SSE/TRS/BLEE	Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Jitendra Singh JE/D&D/CLW/CRJ





In view of above of it can be observed that slip slide control has been found satisfactory. Currently, the test is being conducted with two locomotives connected back-to-back in regeneration mode, with the loads being simulated. However, more precise tuning may be required to match actual service conditions during field trials.

Additionally, it is to be noted that due to speed and track limitations at CLW, the complete performance could not be assessed at higher speeds. Therefore, firm may be advised to conduct foot plating of the locomotive when it is dispatched from CLW. Furthermore, ELS/Shop-19/CLW may be instructed to carry out pre-dispatch tests as per the testing and commissioning format along with the modifications with the necessary MS issued by RDSO.

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Mr. Ankit Verma SSE/D&D/CLW/CRJ	Mr. Jitendra Singh Manager/R&D Hind Rectifiers Ltd.	Ashish Kumar Rathore SSE/TRS/BLEE	Mr. Kshaunish Kayal Manager/R&D Hind Rectifiers Ltd.	Mr. Pravin Panchal JE/TRS/BLEE	Mr. Jitendra Singh JE/D&D/CLW/CRJ