ANNEXURE:
DRG. NO. CLW/ES/3/SK-1/0652/D

TECHNICAL SPECIFICATION FOR

CUBICLE F

FOR 3-PHASE ELECTRIC LOCOMOTIVES.

Specification No : CLW/ES/3/0652/~~D~~ E

ISSUE DATE : 29/04/2010

ISSUED BY :

DY.CHIEF ELECTRICAL ENGINEER/D-II
CHITTARANJAN LOCOMOTIVE WORKS
P.O.CHITTARANJAN – 713331
DIST.BARDHAMAN (WEST), WEST BENGAL (INDIA)

PREPARED BY	CHECKED BY	APPROVED BY
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ALTERATION RECORD SHEET

Amendment no.	Date of Amendment	Alteration	Reason	Initial
1.	17-06-2010	A	Auto Flasher Circuit has been included in the Details of Sub-components in sheet no. 6 &CLW/ES/3/SK-1/0652 Clause no.10.1 of Page no. 9 has been added.	S/d-
2.	20-02-2013	B	Sources of Bare Panel are modified at sheet 5.	S/d-
3.	25.05.2018	C	OEM/Part-I source is replaced by CLW Approved source (the term only)	S/d-
4	26-09-2019	D	Clause no. 18 (Page no. 11) has been added for modifications required in Push Pull operation of WAP- 5 & WAP-7	S/d-
5		E	i) Manufacturer name for list of electrical components should be as per CLW approved Vendor Directory on UVAM. ii) Complete Continuity test as per cable cutting chart to be done 100 % during routine test. iii) Remark added for Crimping test marked as *. iv) The references are for guidance only. Final Cable cutting chart enclosed as Annexure-II.	

Note: The Specification has been digitized and all the alteration have been incorporated.

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SPECIFICATION FOR CUBICLE F

TABLE OF CONTENTS

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1. CLIMATIC AND ENVIRONMENTAL CONDITION OF LOCO

Sl. no.	Climate and Environment conditions	Range
a.	Maximum atmospheric temperatures	Under Sun : + 70°C In Shade : + 50°C
b.	Humidity	100% saturation during rainy season.
	Reference site conditions	1) Ambient temp. max. 55 ºC min. 0ºC 2) The contractor will indicate the expected temperature rise in the machine room under reference site conditions. 3) Humidity 60 % 4) Altitude 160 m above sea level
c.	Rainfall	Very heavy in certain areas. The locomotive will be designed to permit its running at 10 Km/h in flood water level of 102 mm above rain level.
d.	Atmosphere during hot weather	Extremely dusty and desert terrain in certain areas.
e.	Coastal areas	Locomotive and equipment will be designed to work in coastal areas in humid and salty laden atmosphere.
f.	Vibration	The equipment , sub-system and their mounting arrangement will be designed to withstand vibrations and shocks encountered in service as specified in IEC 77 unless otherwise prescribed.

2. LIST OF ELECTRICAL COMPONENTS

The following electrical components which are mounted in the cubicle F shall be supplied by the panel supplier. ~~Only the OEM of components are also mentioned~~ ***Only the makes specified in CLW approved vendor directory shall be accepted***. The detailed CLW specification of each of these items would be passed on to the

successful tenderers.

Annexure-I (Cubicle-F)

3. DETAILS OF SUB-COMPONENTS:

Sl. No.	Description	Sch. Pos.	Spec. No.	ABB Identification No.	Qty./ Panel	CLW Approved sources
a)	Bare Panel	----	CLW/MS/3/045 Alt. 3 or latest 1209-11.244-024 Alt. 4 or latest 1209-11.144-025 Alt. 6 or latest	IA081-00171	02 nos.	Sources are to be followed as per latest CLW approved vendor list published on UVAM.
b)	Transformer Module Primary Voltage	224.2	CLW/ES/3/0083/B or latest	3EHP590547R0001	02 nos.	-do -
c)	Resistor Head Light	332.3	CLW/ES/3/0014/H or latest	NBT300210P0041	02 nos.	-do -
d)	Connector	150.A 293.A 435.B	CLW/ES/3/0124/O or latest	HBTB315205 R0111 HBTB316240 R0009	02 nos. 02 nos. 02 nos.	-do -
e)	Wago Type Terminal Block	----	CLW/ES/3/0644/F or latest		----	-do -
f)	Cable	----	CLW/ES/3/0458/E or latest CLW/ES/3/0459/C or latest	3EHP431307	----	-do -
g)	Hardwares for fixation and standard hardwares	----	CLW/MS/3/040 ALT. 14 or latest CLW/MS/3/085 ALT. 8 or latest CLW/ES/3/187 ALT. N or latest	As per document no. 3EHP130221 R0002	----	-do -
h)	Auto Flasher Circuit	----	CLW/ES/3/0481		----	-do -

4. STANDARDS

IEC 60077	Electrical traction equipment
NF.F16.101	Rolling stock Fire behaviour; Materials choosing
NF.F16.102	Rolling stock Fire behaviour; Efforts on electrical equipment
3EHN600359	Insulation co- ordination
3EHN600385	Min. Insulation distance for basis insulation within air.

5. WIRING AND CABLING

i) The cable for wire in the locomotives and equipments will use high grade electrolytic copper stranded conductors tinned as used in WAG-9 loco.

ii) The cable will of approved quality and grade of insulation and sheath. They will be fire retarding type. In locations where high temperatures likely to be met ,special cables may be employed.

iii) All connection will be terminated on terminal bars of approved design, provided for the purpose. The terminals and wire cable ends will be marked to facilitate correct connections.

iv) Plugs and sockets and connectors will be used to connect pre-assembled units and to facilitate maintenance and ensure a better layout. The details of which will be passed on subsequently to the successful tenderer/s.

v) No cable having a conductor size of less than 2.5 sq.mm will ordinarily be used.

vi) Smaller size cables for internal wiring panels, control cubicles, signal wiring, consistent with the mechanical and electrical requirements, may be adopted.

vii) The layout of the cable should be such that contamination by oils is avoided.

viii) Loading of power cables will not be more than 75 % of its capacity.

ix) Cables for terminal connections will have only crimped joints with good make crimping tool and proper tightening torque.

x) The documents related to cabling of the panel would be passed on subsequently to the successful tenderer/s. All wiring and cabling should be as per CLW specification.

xi) Please add the necessary modifications as advised by CLW/RDSO/Rly.Board or TOT partners through Part-I source of sub items of panel have to be incorporated by the firm in consultation with CLW at their own cost.

6. SHEET METAL STRUCTURE

The Cubicle is of detachable type and shall comply with the dimensions and tolerances specified. In relevant part drawings. The complete cubicle shall consist of a no. of panels secured to each other by Hex. Bolts/screws, nuts, washers etc. made of stainless steel.

The cubicle should be of sturdy construction so as not to vibrate loosely or excessively when mounted in the machine room. The dimensions and weight of the complete cubicle shall not be exceeded.

7. ENVIRONMENTAL AND OPERATIONAL CONDITIONS

The Cubicle F shall be used under the following condition:

7.1 Environmental Conditions:

Environmental Condition within the machine room

Air Circulation : weak forced cooling
Operational temperature : 0....+ 65 ºC
Environmental air : Salt, Dusty
Air Humidity : Condensation possible

7.2 Operational Conditions:

Operational time:

Daily approx : 16 hours (approx 330 days per year)
Yearly approx : 5,280 hours
Within 30 years approx :158,400 hours

Environmental Conditions:

Rated value for environmental temperature and humidity according to clause 7.1 “condition within the machine room”.

7.3 Reliability

Operation condition	:	according to 7.2
Availability rate	:	98 %
Lifetime of loco	:	min. 30 years (Maintenance, spare, parts, lifetime)

8. TEST CONDITIONS

8.1 Type Testing:

(a) Material certificate for materials used from an approved test /house supplier has to be produced during inspection and along with supplier. (from NABL approved reputed labs)

(b) Certificate for Fasteners used and their material to be produced and supplied along with suppliers.

(c) Welding to be checked properly as per an approved test plan which has to be submitted to Dy.CEE/Design (it should comply with standard welding instructions as per TOT)

(d) Panel should be electrically tested after wiring as per relevant standards. The components be tested as per CLW's stipulation to be passed on to the successful tenderer.

(e) All electrical equipments procured shall be tested at assemble stages. Test certificate shall be produced for OEM components. Any change will have to be taken prior approval of DY.CEE/Design. and it will involve complete type test

(f) All test on prototype that cannot be carried in-house have to be carried out from NABL approved reputed labs.

8.2. ROUTINE TESTING :

The cubicle will be tested for the following routine tests:

i. Integrity and completeness.

ii. Testing of inter connections and functionality of the different sub assemblies within the panels .

iii. Suitable checking fixtures are to be made for checking the dimensions of the complete assembled panels.

iv. Certificate for raw materials and fasteners to be provided.

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v. Complete cubicle and electrical items will be tested as per relevant IS.

8.3 Details of Type and Routine Tests are indicated at clause no. 14

9. STANDARD /UNITS

IS/ IEC -Standards will be accepted. Internally used BBC/ABB/Adtranz-Standard if any should be mentioned together with corresponding IEC- standard. Only SI Unit will be accepted.

10. SCOPE OF SUPPLY

One Cubicle F fully assembled with the equipments as given in clause 3 and dully tested as per clause 8 of this document.

10.1 All individual components of panel should be procured as per annexure – I

11. INSPECTION

i) Type test will be carried out by authorized representative of DY CEE/Design, Routine inspection to be carried out by the respective zonal inspection cells of CLW.

ii) Stage inspection or at the premises of the sub venders during inspection of component Of Cubicle F.

iii) Details of Type &: Routine tests are given at clause. 8. Purchaser reserve the right to carry out stage inspection during assemble of Cubicle F.

12. SUPPLY OF DOCUMENTS (In addition to those indicated in bid documents of CLW)

i) Technical details composition and characteristics of the material including fasteners to be used for manufacture of cubicles.
ii) Sources(s) of raw materials and hardwares
iii) Manufacturing process
iv) Type test plan including checks for vibration and welding
v) Routine test plan

vi) Details for similar items supplied for locomotive, if any.
vii) Source of the components being offered including cables.

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13. SUBMISSION OF TENDER QUATAT1ON:

13.1 The tenderer shall give sufficient information to prove that his factory has adequate facilities and capacity to manufacture the complete panel to meet fully the technical requirements of the specification and quality of material and workmanship while filling up Proforma-A sent by CLW to the firm.

13.2 Quotation shall not be considered complete unless all information is furnished and are therefore liable to be rejected and after completion of successful capacity-cum-capability assessment by the competent authority.

14. TESTS

Sl. No.	Description	Type Test	Routine Test
(i)	Dimensional Checking	Yes	Yes
(ii)	Verification of Electrical & Mechanical Equipments and its test reports	Yes	Yes
(iii)	Complete Continuity test as per Cable cutting chart	Yes	Yes (100%)
(iv)	Measurement of resistance	Yes	Yes
(v)	Fire retardant test of all insulating material	Yes	No
(vi)	Crimping test:- To check whether proper crimping tool with required pressure is applied so that there is no void in the cross section of the crimped cable.	Yes *	Yes * (~~to be done on 5 % basis~~)
(vii)	Vibration Test (optional)	Yes	No

**** Sample cable crimped by each tool of each size are to be sealed in front of the inspector which shall be tested as per EN 50343 for crimping quality. The issued certificate shall be valid for inspection crimping during 3 Months and same process is to be repeated again for next 3 Months.***

15. IMPORTANT INFORMATION

15.1 All the insulating material should have Fire Retardant property as per CLW individual Specn.

15.3 The cable for wiring of Cubicle F Panel will be with Electron beam irradiated

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cable only. The cable size and cabling have to be according to the CLW document which will be passed on subsequently to the successful tenders.

15.4 The cable and terminal connections will have only proper crimping joints.

15.5 *Supplier will implement any modification arising out of the experience of Indian Railways applicable to Cubicle- F assembly, free of cost.*

15.6 *Final Cable cutting chart has been enclosed as Annexure-II. However, RDSO's Modification Sheet should be implemented by panel manufacturer time to time as required for .*

16. TECHNICAL DOCUMENTS TO BE SUPPLIED BY THE SUPPLIER

i) Type test reports :

ii) Routine test report along with each set :

iii) ~~Maintenance manual~~ :

iv) Detailed drawings :

17. Modifications for push pull operations in WAP-5 & WAP -7 locomotive to be incorporated in cubicle F as per scheme issued vide letter no. C-D&D /T/47 dtd. 08.08.19

18. REFERENCES

18.1 Cable cutting chart 3EHP431307

18.2 Document no. of cable list of Cubicle F -3EHP431307

18.3 Identification no. of Pre-assembly of Cubicle F is 3EHP130221R0002.

18.4 Cable Loom no. 3EHP130221R0I00

Note: The above mentioned references are for guidance only.

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ANNEXURE-II

Cable Connection chart of Cubicle F for WAP7/WAG9/WAP5 Supposed to be Included in CLW Spec no. CLW/ES/3/0652

35 PIN /40 GRADE 12 XK**A:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4245	XK**A:01-1	XF**A:04-18
2	1.5	2309	XK**A:01-2	XF**A:02-3
3	1.5	2061	XK**A:01-3	XF**A:01-25
4	1.5	3108	XK**A:01-4	XF**A:03-18
5	2.5	2050	XK**A:01-5	XF**A:01-7
6	2.5	2050	XK**A:01-6	XF**A:01-7
7	1.5	2063	XK**A:01-7	XF**A:01-14
8	1.5	2067	XK**A:01-8	XF**A:01-15
9	1.5	2069	XK**A:01-9	XF**A:01-16
10	1.5	2300	XK**A:01-10	XF**A:01-17
11	1.5	2310	XK**A:01-11	XF**A:01-18
12	1.5	3001	XK**A:01-12	XF**A:01-19
13	2.5	3054	XK**A:01-13	XF**A:01-20
14	1.5	3530	XK**A:01-14	XF**A:01-21
15	1.5	4218	XK**A:01-15	XF**A:01-22
16	1.5	4234	XK**A:01-16	XF**A:01-23
17	1.5	4235	XK**A:01-17	XF**A:01-24
18	1.5	2097	XK**A:01-18	XF**A:01-26
19	1.5	2099	XK**A:01-19	XF**A:01-27
20	1.5	2111	XK**A:01-20	XF**A:02-1
21	1.5	2313	XK**A:01-21	XF**A:02-4
22	1.5	2331	XK**A:01-22	XF**A:02-5
23	1.5	2333	XK**A:01-23	XF**A:02-6
24	1.5	2334	XK**A:01-24	XF**A:02-7
25	1.5	2500	XK**A:01-25	XF**A:02-8
26	1.5	2503	XK**A:01-26	XF**A:02-9
27	1.5	2514	XK**A:01-27	XF**A:02-10
28	1.5	2516	XK**A:01-28	XF**A:02-11
29	1.5	2520	XK**A:01-29	XF**A:02-12
30	1.5	2521	XK**A:01-30	XF**A:02-13
31	1.5	2522	XK**A:01-31	XF**A:02-14
32	1.5	2523	XK**A:01-32	XF**A:02-15
33	1.5	2524	XK**A:01-33	XF**A:02-16
34	1.5	2525	XK**A:01-34	XF**A:02-17
35	1.5	2526	XK**A:01-35	XF**A:02-18

61 PIN / 40 GRADE XK**A:02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2527	XK**A:02-1	XF**A:02-19
2	1.5	2532	XK**A:02-2	XF**A:02-20
3	1.5	2540	XK**A:02-3	XF**A:02-21
4	1.5	2541	XK**A:02-4	XF**A:02-22
5	1.5	2542	XK**A:02-5	XF**A:02-23
6	1.5	2803	XK**A:02-6	XF**A:02-24
7	1.5	2804	XK**A:02-7	XF**A:02-25
8	1.5	2807	XK**A:02-8	XF**A:02-26
9	1.5	3005	XK**A:02-9	XF**A:02-27
10	1.5	3020	XK**A:02-10	XF**A:02-28
11	1.5	3033	XK**A:02-11	XF**A:03-1
12	1.5	3034	XK**A:02-12	XF**A:03-2
13	1.5	3035	XK**A:02-13	XF**A:03-3
14	1.5	3060	XK**A:02-14	XF**A:03-4
15	2.5	3064	XK**A:02-15	XF**A:03-5
16	2.5	3065	XK**A:02-16	XF**A:03-6
17	2.5	3066	XK**A:02-17	XF**A:03-7
18	2.5	3067	XK**A:02-18	XF**A:03-8
19	2.5	3069	XK**A:02-19	XF**A:03-9
20	1.5	3071	XK**A:02-20	XF**A:03-10
21	1.5	3117	XK**A:02-26	XF**A:03-19
22	1.5	3501	XK**A:02-27	XF**A:03-20
23	1.5	3543	XK**A:02-28	XF**A:03-23
24	1.5	3544	XK**A:02-29	XF**A:03-24
25	1.5	3549	XK**A:02-30	XF**A:03-27
26	1.5	3554	XK**A:02-31	XF**A:04-1
27	1.5	4211	XK**A:02-32	XF**A:04-2
28	1.5	4232	XK**A:02-33	XF**A:04-3
29	1.5	4237	XK**A:02-34	XF**A:04-4
30	1.5	4242	XK**A:02-35	XF**A:04-5
31	1.5	5671	XK**A:02-36	XF**A:04-6
32	1.5	5672	XK**A:02-37	XF**A:04-7
33	1.5	5673	XK**A:02-38	XF**A:04-8
34	1.5	3542	XK**A:02-61	XF**A:03-22
34A	1.5	3549**	XK**A:02-59	XF**A:04-27 (LED Mod.)
FOR WAP 7 & 5 ONLY				
35	1.5	2500AR	XK**A:02-39	XF**A:05-10
36	1.5	2503AR	XK**A:02-40	XF**A:05-11
37	1.5	2331AR	XK**A:02-41	XF**A:05-12
38	1.5	4242AR	XK**A:02-42	XF**A:05-13
39	1.5	2111AR	XK**A:02-43	XF**A:05-14
40	1.5	5671AR	XK**A:02-44	XF**A:05-15

41	1.5	5672AR	XK**A:02-45	XF**A:05-16
42	1.5	2050AR	XK**A:02-50	XF**A:05-17

5 PIN /18 GRADE 40 XK**B

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1(2P+S)	1501	XK**B-1	224.2-1
2	1(2P+S)	1502	XK**B-2	224.2-3
3	1(2P+S)	1503	XK**B-3	224.2-FRE1(Earth)

61 PIN /GRADE 40 XK**A

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2050	XK**A-1	XF**A:01-6
2	1.5	2050	XK**A-2	XF**A:01-6
3	1.5	2063	XK**A-3	XF**A:01-14
4	1.5	2067	XK**A-4	XF**A:01-15
5	1.5	2069	XK**A-5	XF**A:01-16
6	1.5	2300	XK**A-6	XF**A:01-17
7	1.5	2310	XK**A-7	XF**A:01-18
8	1.5	3001	XK**A-8	XF**A:01-19
9	1.5	4234	XK**A-9	XF**A:01-23
10	1.5	4235	XK**A-10	XF**A:01-24
11	1.5	2061	XK**A-14	XF**A:01-25
12	1.5	2111	XK**A-15	XF**A:02-1
13	1.5	2309	XK**A-16	XF**A:02-3
14	1.5	2313	XK**A-17	XF**A:02-4
15	1.5	2331	XK**A-18	XF**A:02-5
16	1.5	2333	XK**A-19	XF**A:02-6
17	1.5	2334	XK**A-20	XF**A:02-7
18	1.5	2500	XK**A-21	XF**A:02-8
19	1.5	2503	XK**A-22	XF**A:02-9
20	1.5	2514	XK**A-23	XF**A:02-10
21	1.5	2516	XK**A-24	XF**A:02-11
22	1.5	2532	XK**A-25	XF**A:02-20
23	1.5	2540	XK**A-26	XF**A:02-21
24	1.5	2541	XK**A-27	XF**A:02-22
25	1.5	2542	XK**A-28	XF**A:02-23
26	1.5	2803	XK**A-29	XF**A:02-24
27	1.5	2804	XK**A-30	XF**A:02-25
28	1.5	2807	XK**A-31	XF**A:02-26
29	1.5	3005	XK**A-32	XF**A:02-27
30	1.5	3020	XK**A-33	XF**A:02-28
31	1.5	3034	XK**A-34	XF**A:03-2

32	1.5	3035	XK**A-35	XF**A:03-3
33	1.5	3060	XK**A-36	XF**A:03-4
34	2.5	3069	XK**A-37	XF**A:03-9
35	1.5	3071	XK**A-38	XF**A:03-10
36	1.5	3108	XK**A-39	XF**A:03-18
37	1.5	3502	XK**A-40	XF**A:04-19
38	1.5	4211	XK**A-41	XF**A:04-2
39	1.5	4242	XK**A-42	XF**A:04-5
40	1.5	REK154	XK**A-54	BUND.F-54
41	1.5	REK155	XK**A-55	BUND.F-55
42	1.5	REK156	XK**A-56	BUND.F-56
43	1.5	REK157	XK**A-57	BUND.F-57
44	1.5	REK158	XK**A-58	BUND.F-58
45	1.5	REK159	XK**A-59	BUND.F-59
46	1.5	REK160	XK**A-60	BUND.F-60
47	1.5	2099	XK**A-61	XF**A:01-27 (BUND-61)
48	1(2P+S)	1504	XK**A-11	224.2-5
49	1(2P+S)	1514	XK**A-12	224.5-6 -ve
50	1(2P+S)	1524	XK**A-13	224.2-FRE1
FOR WAP 7 & 5 ONLY				
51	1.5	2500AR	XK**A-43	XF**A:05-10
52	1.5	2503AR	XK**A-44	XF**A:05-11
53	1.5	2331AR	XK**A-45	XF**A:05-12
54	1.5	4242AR	XK**A-46	XF**A:05-13
55	1.5	2111AR	XK**A-49	XF**A:05-14
56	1.5	5671AR	XK**A-48	XF**A:05-15
57	1.5	5672AR	XK**A-50	XF**A:05-16
58	1.5	2050AR	XK**A-53	XF**A:05-17

35 PIN /40 GRADE 12 XK**C

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	0	XK**C-1	XF**A:01-1
2	2.5	2050	XK**C-2	XF**A:01-6
3	2.5	3054	XK**C-3	XF**A:01-20
4	2.5	3530	XK**C-4	XF**A:01-21
5	2.5	2097	XK**C-5	XF**A:01-26
6	2.5	2099	XK**C-6	XF**A:01-27
7	2.5	2111	XK**C-7	XF**A:02-1
8	2.5	3080	XK**C-8	XF**A:03-16
9	2.5	3501	XK**C-9	XF**A:03-20
10	2.5	3502	XK**C-10	XF**A:04-19
11	2.5	3512	XK**C-11	XF**A:03-21
12	2.5	3542	XK**C-12	XF**A:03-22

13	2.5	3543	XK**C-13	XF**A:03-23
14	2.5	3544	XK**C-14	XF**A:03-24
15	2.5	3545	XK**C-15	XF**A:03-25
16	2.5	3546	XK**C-16	XF**A:03-26
17	2.5	3551	XK**C-17	XF**A:03-28
18	2.5	3554	XK**C-18	XF**A:04-1
19	2.5	4232	XK**C-19	XF**A:04-3
20	2.5	4237	XK**C-20	XF**A:04-4
21	2.5	5671	XK**C-21	XF**A:04-6
22	2.5	5672	XK**C-22	XF**A:04-7
23	2.5	5673	XK**C-23	XF**A:04-8
24	2.5	REK-128	XK**C-28	BUND-28
25	2.5	REK-129	XK**C-29	BUND-29
26	2.5	REK-130	XK**C-30	BUND-30
27	2.5	REK-131	XK**C-31	BUND-31
28	2.5	REK-132	XK**C-32	BUND-32
29	2.5	REK-133	XK**C-33	BUND-33
30	2.5	REK-134	XK**C-34	BUND-34
31	2.5	REK-135	XK**C-35	BUND-35

31 PIN /32 GRADE XK**D

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	0	XK**D-1	XF**A:01-1
2	2.5	2050	XK**D-2	XF**A:01-8
3	2.5	3054	XK**D-3	XF**A:01-20
4	2.5	4218	XK**D-4	XF**A:01-22
5	2.5	2097	XK**D-5	XF**A:01-26
6	2.5	3081	XK**D-6	XF**A:03-17
7	2.5	4211	XK**D-7	XF**A:04-2 (BUND-2)
8	2.5	REK115	XK**D-15	BUND.F-15
9	2.5	REK116	XK**D-16	BUND.F-16
10	2.5	REK117	XK**D-17	BUND.F-17
11	2.5	REK118	XK**D-18	BUND.F-18
12	2.5	REK119	XK**D-19	BUND.F-19
13	2.5	REK120	XK**D-20	BUND.F-20

13 PIN /GRADE 32 150.A

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2111	150.A-1	XF**A:02-2
2	2.5	2524	150.A-2	XF**A:02-16
3	2.5	2525	150.A-3	XF**A:02-17

4	2.5	2526	150.A-4	XF**A:02-18
5	2.5	2527	150.A-5	XF**A:02-19
6	2.5	2520	150.A-6	XF**A:02-12
7	2.5	2521	150.A-7	XF**A:02-13
8	2.5	2522	150.A-8	XF**A:02-14
9	2.5	2523	150.A-9	XF**A:02-15
10	2.5	REK110	150.A-10	BUND.F-10
11	2.5	REK111	150.A-11	BUND.F-11
12	2.5	REK112	150.A-12	BUND.F-12
13	2.5	REK113	150.A-13	BUND.F-13

19 PIN /GRADE 22 293.A

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3064	293.A-L	XF**A:03-5
2	1.5	3065	293.A-M	XF**A:3-6
3	1.5	3066	293.A-K	XF**A:03-7
4	1.5	3067	293.A-U	XF**A:03-8
5	1.5	3069	293.A-B	XF**A:03-9
6	1.5	REK101	293.A-A	BUND.F-A
7	1.5	REK103	293.A-C	BUND.F-C
8	1.5	REK104	293.A-D	BUND.F-D
9	1.5	REK113	293.A-N	BUND.F-N
10	1.5	REK114	293.A-P	BUND.F-P
11	1.5	REK115	293.A-R	BUND.F-R
12	1.5	REK116	293.A-S	BUND.F-S
13	1.5	REK117	293.A-T	BUND.F-T
14	1.5	REK119	293.A-V	BUND.F-V

AUTO FLASHER FLCU

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3501	FLCU-3	XF**A:03-20
2	1.5	2099	FLCU-4	XF**A:01-27
3	1.5	3551	FLCU-5	XF**A :03-28
4	1.5	3554	FLCU-6	XF**A :04-1
5	1.5	3020	FLCU-8	XF**A :02-28
6	1.5	2050	FLCU-7	XF**A :04-20

TRANSDUCER OUTPUT

Sl. No.	Cable Cross	Cable no.	Connection From	Connection To

	Section			
1	1(2P+S)	1504	XK **A-11	224.2-(5)
2	1(2P+S)	1514	XK **A-12	224.2-(6)
3	1(2P+S)	1524	XK **A-13	MASSE-(0) 224.2-FRE4
4	1501	1501	XK**B-1	224.2-1 (Input)
5	1502	1502	XK**B-2	224.2-3 (Input)

RESISTOR HEADLIGHT 332

Sl. No.	**Cable Cross Section**	**Cable no.**	**Connection From**	**Connection To**
1	1.5	3542	332.3- Q1	XF**A03:20
2	1.5	3501	332.3- Q2	XF** A03:22
3	2.5	0	XF**A:01-1	MASSE-0

AUTO FLASH CIRCUIT

Sl. No.	**Cable Cross Section**	**Cable no.**	**Connection From**	**Connection To**
1	1.5	FLCU	FLCU 3	XBS 3
2	1.5	FLCU	FLCU 4	XBS 4
3	1.5	FLCU	FLCU 5	XBS 5
4	1.5	FLCU	FLCU 6	XBS 6
5	1.5	FLCU	FLCU 7	XBS 7
6	1.5	FLCU	FLCU 8	XBS 8

WAGO WIRE LINK

Sl. No.	**Cable Cross Section**	**Cable no.**	**Connection From**	**Connection To**
1	1.5	2050	XF**A:01-6	XF**A:04-20

WAGO SHORT LINK XF**A

Sl. No.	**Cable Cross Section**	**Cable no.**	**Connection From**	**Connection To**
1	WAGO 2.5	2050	XF**A:01-6	XF**A:01-7
2	WAGO 2.5	2050	XF**A:01-7	XF**A:01-8

3	WAGO 2.5	2050	XF**A:01-8	XF**A:01-9
4	WAGO 2.5	2050	XF**A:01-9	XF**A:01-10
5	WAGO 2.5	2050	XF**A:01-10	XF**A:01-11
6	WAGO 2.5	2050	XF**A:01-11	XF**A:01-12
7	WAGO 2.5	2050	XF**A:01-12	XF**A:01-13
8	WAGO 2.5	2111	XF**A:02-1	XF**A:02-2
9	WAGO 2.5	2050	XF**A:04-20	XF**A:04-21

MODIFICATIONS SHEET FOR DEVELOPMENT TRACTION MOTOR DROPPING DETECTION SYSTEM (RDSO/2023/EL/MS/0496 Rev. '0') (For WAP-7,WAG 9, WAG-9H, WAG-9HC)

Sl. No.	Cable Size Sq. mm	Cable no.	From	To	REMARKS
1	2.5	067 TM	XK**A:02-58	XF**A:01-28	Cubicle F (2)
2	2.5	067 TM	XF**A:01-28	XK**D-08	Cubicle F (2)
3	2.5	067 TM	XK**A:02-58	XF**A:01-28	Cubicle F (1)
4	2.5	067 TM	XF**A:01-28	XK**D-08	Cubicle F (1)

For Cubicle F Cab 1 and Cubicle F Cab 2.