

Page 1 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. † J
--------------	---	----------

ENCLOSURE: DRG. NO. : CLW/ES/3/SK-1/0194/† J

TECHNICAL SPECIFICATION FOR
CONTROL CUBICLE -1 (SB -1)
 FOR 3-PHASE ELECTRIC LOCOMOTIVES.

Specification No : CLW/ES/3/0194/† J

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
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 2 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. † J
--------------	---	----------

ALTERATION RECORD SHEET

AMENDMENT NO.	DATE OF AMENDT.	ALT	REASON	INITIAL
1.	29.04.2010	A	1. Drg. Of Page No. 4 has been deleted. 2. Modified Drg. Of sheet no. 26 has been added. 3. Page no 20 to 25 has been added	S/d-
2.	21.06.2010	B	Modification sheet no RDSO/2009/EL/MS/0377 (Rev. 0) dated 22.04.09 has been included. Clause no. 13.1 of page no. 19 has been added.	S/d-
3.	11.11.2010	C	One no. of 6 Amps MCB has been provided for speed sensor monitoring as per letter no. C- D&D/T/07 dated 01.10.10	S/d-
4.	20.02.2017	D	Specn. no. for Bare Panel has been corrected and sources are modified at sheet no. 24.	S/d-
5.	25.05.2018	E	OEM/Part-I source is replaced by CLW Approved sources (the term only)	S/d-
6.	21.03	F	Schematic Position and quantity has been modified and MCB for speed sensor has been deleted.	S/d-
7.	26.09.2019	G	Clause No. 19 (Page No. 25) has been added for modifications required for push pull operation in WAP-5 & WAP-7 locos.	S/d-
8.	24.03.2021	H	(i) Modification in existing control electronics (CE) resetting scheme of 3 phase loco vide RDSO/2018/EL/MS/0475 dtd. 12.12.2018 (ii) Modification in Earth fault circuit for elimination of spurious message on account of Earthing of control cable in 3 phase loco (MS-480) (iii) MS-413, paralleling of interlock of Aux-contactor of 3 phase loco. (iv) Modification in Blocking Diode to improve the reliability of 3 phase locos vide RDSO/2017/EL/MS/0467 Rev '0' dt. 07.12.2017	S/d-
9.	19.06.2021	I	Sub-D Connectors along with related cabling are to be deleted from the scope of supply as per Dy.CEE/D&D-I letter no. C/D&D/T/42 dtd.. 14.06.2021	S/d-
10	4,5,6,7,8,9,10,11,12,13,14, 19,20,21	J	(i) Manufacturer name for list of electrical components should be as per CLW approved Vendor Directory on UVAM and type no. has been deleted. (ii) Complete Continuity test as per cable cutting chart to be done 100 % during routine test. Remark added for Crimping test marked as *. (iii) Final Cable cutting chart enclosed as Annexure-II. The references are for guidance only. (iv) RDSO/2018/EL/MS/0475 Rev. '1' dated 26.10.2023 has been implemented in WAG-9 loco (Page no. 4, 5, 19 & 21). Previous RDSO modification RDSO/2018/EL/MS/0475 Rev. '0' dtd. 12.12.2018 remains valid for WAP-5 & 7 only. (v) KAVACH has been incorporated in the cable cutting chart vide RDSO letter no. EL/0.1.3/3 dated 26.09.2023	

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

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

SPECIFICATION FOR CONTROL CUBICLE -1 (SB - 1) FOR 3-PHASE ELECTRIC LOCOMOTIVES

INDEX

Sl. No.	Description	Page no.
1.	INTRODUCTION	04 of 21
2.	CLIMATIC AND ENVIROMENTAL CONDITIONS OF LOCO	06 of 21
3.	LIST OF ELECTRICAL COMPONENTS	06 to 14 of 21
4.	STANDARDS	15 of 21
5.	WIRING AND CABLING	15 of 21
6.	SHEET METAL STRUCTURE	15 of 21
7.	ENVIROMENTAL AND OPERATIONAL CONDITIONS 7.1 ENVIROMENTAL CONDITIONS 7.2 OPERATIONAL CONDITIONS 7.3 RELIABILITY	15 of 21
8.	TEST CONDITIONS	16 of 21
9.	STANDARDS/UNITS	17 of 21
10.	SCOPE OF SUPPLY	17 of 21
11.	INSPECTION	17 of 21
12.	SUBMISSION OF TENDER QUOTATION	17 of 21
13.	TECHNICAL DOCUMENTS TO BE SUPPLIED BY SUPPLIER	17 of 21
14.	DETAILS OF SUB COMPONENTS TO BE PROCURED AS PER CLW's APPROVED SOURCES	18 to 19 of 21
15.	TESTS	20 of 21
16.	IMPORTANT INFORMATION	20 of 21
17.	ANNEXURE	20 of 21
18.	RDSO Mod. 0377	21 of 21
19.	Push Pull Modification	21 of 21
20.	RDSO Mod. 475, 480, 413, 0467, 475 Rev.1 & KAVACH	21 of 21

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 4 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. † J
--------------	---	----------

SPECIFICATION FOR CONTROL CUBICLE – 1 (SB- 1) FOR 3- PHASE ELECTRIC LOCOMOTIVES

1. INTRODUCTION

Control Cubicle -1 i.e. SB-1 is panel of contactors, switches , circuit breakers etc. used to control the various functions of the locomotive. SB1 Cubicle provides interface to both locomotive devices like Pantograph, Traction coverter, Auxiliary converter, and Pneumatic Panel etc. as well as to control electronics. The external interface is provided on circular SICEM Connectors for easy maintenance . This specification contains technical details of the cubicle structure, equipment mounted within, wiring procedure, enviromental specification & acceptance test criteria .SB1 is assembled as per the draing enclosed with this document. Drg no. 3EHP 130215

1. Rotary Switch - Failure Mode operation (152)
2. Rotary Switch - Bogie Cut-Out (154)
3. Rotary Switch - Configuration (160)
4. Rotary Switch - Vigilance Device cut off (237.1) & for CE Resetting Scheme Rev. '1' for WAG-9 Only.
5. Key Switch - Simulation (179)
6. Illuminated Push- Button – Configuration (161)
7. Wire Resistor – Earthing screen train bus (381.71)
8. Resistor – Maximum Current Relay (78.1)
9. Thermostat – Control Electronics (211.1) and the cable connecting the thermostat to the electronics (Not in the tenderer's scope of supply)
10. Relay – Maximum Current (78)
11. Relay – Minimum Voltage (86)
12. Resistor - Earth fault detection , Control Unit (90.7)
13. Connecting Bus – Train Bus (381.7)(Not in the tenderer's scope of supply)
14. Relay – Control Electronics 'OFF' (126.5)
15. Snubber Circuit for Relay Control Electronics 'OFF' (126.5A)
16. Snubber Circuit to Contactor, auxiliary contactor VCB (136.4A)
17. Snubber Circuit to item 126.7 (126.7A)
18. Snubber Circuit to Relay, Time Relay VCB (136.3A)
19. Relay – Time Relay (136.3)
20. Contactor – Auxiliary Contactor VCB (136.4) & CE Resetting Scheme Rev. '1' for WAG-9 only.
21. Contactor – Power Supply Cab (126.7/1)
22. DC/DC Converter (118.4/1)
23. Contactor – Control Electronics (218)
24. Contactor – Control Circuits 'ON' (126)
25. DC/DC converter (118.5/1)
26. Rack – Central Electronics (CEL1) (411) (Not in tenderer's scope of supply)
27. Blocking Diode – Illumination Test (123.1/1)
28. Blocking Diodes (123/7),(123/8)

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 5 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. † J
--------------	---	----------

29. Blocking Diodes (123/5)
30. Blocking Diodes (123/3)
31. Blocking Diodes (123/1)& Blocking Diodes (123/9)
32. Relay Earth fault – Control Circuit (89.7)
33. Circuit Breaker – Central Electronics (127.9/2)
34. Circuit Breaker – Central Electronics (127.9/1)
35. Circuit Breaker - Electronics, Auxiliary Converter (127.22//1)
36. Circuit Breaker - Monitoring (127.2/1)
37. Circuit Breaker – Power Supply Gate Units (127.11/1)
38. Circuit Breaker - Electronic Traction Converter (127.1/1)
39. Circuit Breaker – Lighting Front (310.1/1)
40. Circuit Breaker – Power Supply 24 V /48 V (127.91/1)
41. Circuit Breaker - Pantograph/ VCB Control (127.12)
42. Circuit Breaker - Driver's Cab (127.3/1)
43. Contactor for Head Light (338)
44. Mechanical Structure Complete with
45. Reset Vigilance Control Switch-02 nos. (similar to BPVR) for CE Resetting Scheme Rev. '1' for WAG-9 only and 01 no. for WAP-7 & 5.
46. Off Time Delay Module-02 nos. for CE Resetting Scheme Rev. '1' for WAG-9 only and 01 no. for WAP-5 only and Nil for WAP-7.
47. VS Diode -03 nos. similar to Train parting Diode 12 amps for WAG-9 only.
48. 01 no. of Aux. Contact block 2NO+2NC for CE Resetting scheme Rev. '1' for WAG-9 only.

- Connectors
- Wiring and other accessories
- Terminal Block

- Fastener and Fixing arrangement for attaching the thermostat (211.1/2) Although thermostat along with cable is not in the tenderer's scope of supply

- Fastener and fixing arrangement for attaching the casing containing the Central electronics (CEL1) (411) rack to the SB1 equipment cubicle, although the central electronics (CEL1)(411) rack is not in the tenderer's scope of supply

- Fastener and Fixing Clamps etc. for mounting the total cubicle (along with Central electronics (CEL1)(411)Rack) inside the locomotive.

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

2. CLIMATIC AND ENVIRONMENTAL CONDITIONS OF LOCO

Sl. no.	Climate and Environment conditions	Range
a.	Maximum atmospheric temperature	Under Sun : + 70°C In Shade : + 50°C
b.	Humidity	100% saturation during rainy season.
Ref. Site Conditions		
c.	Temperature	The maximum machine room temperature can be up to 70 °C and the equipment provided in the cubicle must function even at this temperature
d.	Humidity	60 %
c.	Altitude	160 m above mean sea level.
d.	Rainfall	Very heavy in certain areas.
e.	Atmosphere during hot weather	Extremely dusty and desert terrain in certain areas.
g.	Coastal area	Locomotive and equipment will be designed to work in coastal areas in humid and salt laden atmosphere.
h.	Vibration	The equipment , sub-system and their mounting arrangement will be designed to withstand vibrations and shocks encountered in service as specified in IEC 60077 unless otherwise prescribed.

3. LIST OF ELECTRICAL COMPONENTS

The following electrical components which are mounted in the cubicle 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.**

Maximum Current Relay

Scheme Position : 78
Required Number : 01
Identification : DIK A210013R0037

Details :

Manufacturer : ~~SECHERON~~ **As per CLW approved Vendor Directory on UVAM**
Type : ~~SSA-DI/POS.12~~
Nominal Data : 2.5 A/ 3.3 A – 50 Hz

Resistor 50 W

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 7 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. 1 J
--------------	---	----------

Scheme Position : 78.1
Required Number : 01
Identification : NBT300213P0001

Details :

Manufacturer : ~~DANOTHERM~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~WID-050W~~
Nominal Data : 1.0 ohm +15/-5%, 50 W

Minimum Voltage Relay

Scheme Position : 86
Required Number : 01
Identification : 3EHP585821R0202

Details :

Manufacturer : ~~MESUCO~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~MES-VSA/5R~~
Nominal Data : 200 V/140 V-47 ... 63 Hz

Earth Fault Relay

Scheme Position : 89.7
Required Number : 01
Identification : HBVW400011R0001

Details :

Manufacturer : ~~B+Z~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~ABB-BVW-2800/110V~~
Nominal Data : 150 mA-43 ohm +/- 10 %

Resistor 100 W

Scheme Position : 90.7
Required Number : **3**
Identification : NBT300209P0063

Details :

Manufacturer : DANOTHERM *As per CLW approved Vendor Directory on UVAM*
Type : GRF-30/265-401284
Nominal Data : 390 Ohm +/- 10 %, 100 W

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 8 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. 1 J
--------------	---	----------

DC/DC Converter

Scheme Position :118.4
Required Number : 01
Identification : 3EHP590001R0100

Details :

Manufacturer : ~~MELCHER~~ As per CLW approved Vendor Directory on UVAM
Type : ~~MEC-PSB-483-7LIR-B02~~
Nominal Data : 58...144 V DC -3 A- 48 V DC

DC/DC Converter

Scheme Position :118.5
Required Number : 01
Identification : 3EHP590001R0090

Details :

Manufacturer : ~~MELCHER~~ As per CLW approved Vendor Directory on UVAM
Type : ~~MEC-PSB-243-7LIR-B02~~
Nominal Data : 31...144 V DC -3A- 24 V DC

Diode Block -5

Scheme Position : 123
Required Number : 05
Identification : HBT585480R0001

Details :

Manufacturer : ~~B+Z~~ As per CLW approved Vendor Directory on UVAM
Type : ~~ABB-DIBLO-5~~
Nominal Data : 1.5 A-1600 V- 5 DIOD

Socket

Scheme Position : 123, 123.1
Required Number : 05
Identification : HBT415175P0001

Details :

Manufacturer : ~~ELESTA~~ As per CLW approved Vendor Directory on UVAM
Type : ~~GRI-HYTREL-4056~~
Nominal Data : 14 Poles – 6 A – 240 V AC

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 9 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. 1 J
--------------	---	----------

Fixation

Scheme Position : 123, 123.1
 Required Number : 05
 Identification : HBT415177P0001

Details :

Manufacturer : ~~ELESTA~~ *As per CLW approved Vendor Directory on UVAM*
 Type : ~~ELE—X12 CR NI 177~~
 Nominal Data : 76 MM HIGH – 82 MM BR

Contact 1.0 mm²

Scheme Position :123, 123.1
 Required Number : 70
 Identification : HBT415176P0001

Details :

Manufacturer : ~~ELESTA~~ *As per CLW approved Vendor Directory on UVAM*
 Type : ~~GRI—MS 58~~
 Nominal Data : 1.0 mm² -0 GROOVE

Diode Block

Scheme Position : 123.1
 Required Number : 01
 Identification : HBTB585480R0003

Details :

Manufacturer : ~~B+Z~~ *As per CLW approved Vendor Directory on UVAM*
 Type : ~~ABB—DIBLO—8GA~~
 Nominal Data : 0.3 A-1400 V – 8 DIOD

Contactor

Scheme Position :126, 218
 Required Number : 02
 Identification : HBTB585633R0820

Details :

Manufacturer : ~~SCHALTBAU~~ *As per CLW approved Vendor Directory on UVAM*
 Type : ~~SBM—S164C1DT/110V~~
 Nominal Data : 110 V DC –NO

Relay

Scheme Position : 126.5
 Required Number : 01

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 10 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. 1 J
------------------	---	----------

Identification : 3EHP585807P1207

Details :

Manufacturer : ~~TELEMECANIQUE~~ *As per CLW approved Vendor Directory on UVAM*

Type : ~~TEL-CA3-DN-22FW~~

Nominal Data : 10 A-600 V DC -110 V DC

Snubber Circuit

Scheme Position : 126.5A, 126.7A, 136.3A, 136.4A

Required Number : 04

Identification : 3EHW470024R0005

Details :

Manufacturer : ~~ABB~~ *As per CLW approved Vendor Directory on UVAM*

Type : ~~ABB-DSA1/1N5654A~~

Nominal Data : 110/120 V DC

Relay

Scheme Position : 126.7, 136.3

Required Number : 02

Identification : HBTB585683R4227

Details :

Manufacturer : ~~TELEMECANIQUE~~ *As per CLW approved Vendor Directory on UVAM*

Type : ~~TEL-LP1-D12008FW~~

Nominal Data : 12 A/25 A- 750 V – 4 POLES

Accessories (Relay)

Scheme Position : 126.7

Required Number : 01

Identification : 3EHP585771R0006

Details :

Manufacturer : ~~TELEMECANIQUE~~ *As per CLW approved Vendor Directory on UVAM*

Type : ~~TEL-LA1-DC-22~~

Nominal Data : 2 NO, 2 NC

Circuit Breaker DC

Scheme Position : 127.1,127.12,127.2,127.9 ,127.91,310.1

Required Number : 07

Identification : HBTB585555R1013

Details :

Manufacturer : ~~CMC~~ *As per CLW approved Vendor Directory on UVAM*

Type : ~~CMC-QX1-DH-9538-6A~~

Nominal Data : ~~6 A~~ **10A** – 250 VDC-1 POLE

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 11 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. 1 J
------------------	---	----------

Circuit Breaker DC

Scheme Position : 127.11
 Required Number : 01
 Identification : HBTB585555R1043

Details :

Manufacturer : CMC *As per CLW approved Vendor Directory on UVAM*
 Type : CMC-QX1-DH-8538-20-A
 Nominal Data : 20 A – 250 VDC-1 POLE

Circuit Breaker DC

Scheme Position : 127.3 ,127.22
 Required Number : 02
 Identification : HBTB585555R1023

Details :

Manufacturer : CMC *As per CLW approved Vendor Directory on UVAM*
 Type : CMC-QX1-DH-9538-10A
 Nominal Data : 10 A – 250 VDC-I POLE

Time Delay Module

Scheme Position : 136.3
 Required Number : 03
 Identification : 3EHP590028R0001

Details :

Manufacturer : TELEMECANIQUE *As per CLW approved Vendor Directory on UVAM*
 Type : TEL-LA4-DT-0U
 Nominal Data : 0,1.....2 S - 24.....250 V

Contactor

Scheme Position : 136.4
 Required Number : 02
 Identification : HBTB585683R1127

Details :

Manufacturer : TELEMECANIQUE *As per CLW approved Vendor Directory on UVAM*
 Type : TEL-LP1-D09-10FW
 Nominal Data : 9A/25 A-750 V – 3 POLES

Rotary Switch

Scheme Position : 152
 Required Number : 01
 Identification : HBTB585580R1032

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 12 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. I J
------------------	---	----------

Details :

Manufacturer : ~~SPRING~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~SPR-P-03-R-06A-500-V~~
Nominal Data : I O- 90 DEG

Rotary Switch

Scheme Position : 154
Required Number : 01
Identification : HBTB585580R1022

Details :

Manufacturer : ~~SPRING~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~SPR-P-02-R-06A-500-V~~
Nominal Data : NORM I I+II II-90 GD

Rotary Switch

Scheme Position : 160, 237.1
Required Number : **03**
Identification : HBTB585580R0034

Details :

Manufacturer : ~~SPRING~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~SPR-P-04-R-06A-500-V~~
Nominal Data : O I- 90 GD

Booted Push Button Head

Scheme Position : 161
Required Number : 01
Identification : 3EHP585818P2151

Details :

Manufacturer : ~~TELEMECANIQUE~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~TEL-ZB2-BW557~~
Nominal Data : YELLOW – BLACK – BEZEL

Illum. Push button Body

Scheme Position : 161
Required Number : 01
Identification : 3EHP585819P2010

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 13 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. † J
------------------	---	----------

Details :

Manufacturer : ~~TELEMECANIQUE~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~TEL-ZB2-BW061~~
Nominal Data : 1 NO – STANDARD

Multi-LED

Scheme Position : 161
Required Number : 01
Identification : 3EHP585726P0024

Details :

Manufacturer : ~~EAO~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~EAO-700.002.24~~
Nominal Data : 18 mA-24 VDC-YELLOW

Key Switch

Scheme Position : 179
Required Number : 01
Identification : 3EHP585704R2222

Details :

Manufacturer : ~~SCHWEIZE~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~GUT-SS 22Y 21000~~
Nominal Data : 20/2S-2A-250 V-1NO

Thermostat (Not included in tenderer's scope of supply)

Scheme Position : 211.7
Required Number : 01
Identification : 3EHP590484R0003

Details :

Manufacturer : ~~TRAFAG~~ *As per CLW approved Vendor Directory on UVAM*
Type : ~~TRF-414.2620~~
Nominal Data : 70 DEFREE CELSIUS

Connecting Box Train bus (Not included in tenderer's scope of supply)

Scheme Position : 381.7
Required Number : 01
Identification : 3EHE100002R0001

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 14 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. † J
------------------	---	----------

Details :

Manufacturer : ~~CHVEK~~ *As per CLW approved Vendor Directory on UVAM*
 Type : ~~ABB-XV-B708-A15~~
 Nominal Data : 3 X SUB-D 9 POLES

RESISTOR 25 W

Scheme Position : 381.71
 Required Number : 01
 Identification : NBT300207P0097

Details :

Manufacturer : ~~DANOTHERM~~ *As per CLW approved Vendor Directory on UVAM*
 Type : ~~WID-025-W~~
 Nominal Data : 10 Kohm- 25 W

6U RACK including PCBS (Not included in tenderer's scope of supply)

Scheme Position : 411
 Required Number : 01
 Identification : 3EHL409256R0001

Details :

Manufacturer : ~~ADTRANZ-INDIA/SWITZERLAND~~
As per CLW approved Vendor Directory on UVAM
 Type : ~~HV-B494~~

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 15 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. 1 J
------------------	---	----------

4. STANDARDS

IEC 60077	: Electrical Traction Equipment
NF.F.16.101	: Rolling stock, Fire behavior, Materials Choosing
NF.F.16.102	: Rolling stock, Fire behavior, Effects on electrical equipment
3EHN600359	: Insulation Co-ordination
3EHN600385	: Min. insulation distance for basis insulation within air
IEC 60571	: Electronic equipment for traction rolling stock

These standards will be available for study and reference at C-D&D/CLW

5. WIRING AND CABLING

1. The cables for wiring within the cubicle will be of RADOX CABLES (Electron Beam irradiated crosslinked Thin walled cables from M/s. HUBER & SUHNER, Germany) till some other type of cable is approved by CLW. The cables will be of fire retardant type
2. All connections 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.
3. 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. But these details will be available for study and reference at C-D&D/CLW.
4. Cables for terminal connections will have only crimped joints.
5. The Cable size and cabling has to be according to CLW Documents which will be passed on subsequently to the successful tenderer/s.

6. SHEET METAL STRUCTURE

The cubicle is of detachable type and shall comply with the dimensions and tolerances specified in relevant part drawings documents which will be passed on subsequently to the successful tenderer/s but these details will be available for study and reference at C-D&D/CLW. 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 Fastener and the fixing clamps etc. for mounting the total cubicle along with the central electronics (CEL2) (412) Rack inside the locomotive has to be supplied by the tenderer).The dimensions and weight of the complete cubicle shall not be exceeded.

7. ENVIRONMENTAL AND OPERATIONAL CONDITIONS

The SB1 Cubicle shall be used under the following conditions :

7.1 Environmental Conditions

Environmental Condition within machine room :

Air Circulation	: Weak forced cooling
Operational temperature	: 0.....+65 °C
Environmental air	: salty, dusty
Air humidity	: Condensation possible

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 16 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. † J
------------------	---	----------

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 values for environmental temperature and air humidity according to 7.1 “Condition within machine room”.

7.3 Reliability

Operational Conditions	: according to 7.2
Availability Rate	: 98 %
Lifetime of the Loco	: min. 30 years (Maintenance, spare parts, life time)

8. TEST CONDITIONS

8.1 TYPE TESTING :

- Type test certificate of material and equipments used in the cubicle must be provided from an approved test house /supplier has to be procured during inspection and along with supplies.
- Certificate for fasteners used and their material to be produced and supplied along with supplies.
- Welding to be checked properly as per an approved test plan, which will be given to successful tenderer.
- Panel should be electrically tested after wiring as per relevant standards to be passed on to the successful tenderer.
- All electrical equipment's procured shall be tested at assembly stages. Acceptance Test certificates shall be produced for OEM components. For use of any make/type of equipments/components other than that specified prior approval of CLW is required. Such approval will be given only after a thorough type test and field validation.

8.2 ROUTINE TESTING

The Cubicle will be tested for the following routine tests :

- Integrity and completeness.
- Testing of inter-connections and functionality of different sub assemblies within the panel.
- Suitable checking fixtures are to be made by successful tenderers for checking the dimensions of the complete assembled panels .Certificate for raw materials and fasteners to be provided.
- Complete cubicle and electrical items will be tested as per relevant standards.

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 17 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. † J
------------------	---	----------

8.3 Details of Type & Routine test are given clause no. 15.

9. STANDARDS /UNITS

Only international standards like IEC, ISO internal standards of ADTRANZ, Switzerland like BBC/ABB/Adtranz-Standards only are acceptable. Only the SI unit will be accepted.

10. SCOPE OF SUPPLY

One Control Cubicle 2 assembled as per the drawing no. 3EHP 130216 R0002, duly tested as per chapter 8 of this document.

11. INSPECTION

1. The Type/ Routine inspection will be carried out by authorized representative of Dy. CEE/Design.
2. The complete testing to be carried out as per clause 8 of this specification
3. The purchaser may carry out stage inspection during inspection of components, cabling or assly. stage of complete cubicle.

12. SUBMISSION OF TENDER QUOTATION

- 12.1 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 requirement of the specification and quality of materials and workmanship.
- 12.2 Quotation shall not be considered complete unless all information is furnished and therefore liable to be rejected.

13. 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 drawing

13.1 All individual components of the panel should be procured as per Annexure – I

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Annexure – 1 (SB-1)

14. Details of Sub-components to be procured from CLW Approved sources

Sl. no.	Description	Specn. No.	Sch. Pos.	ABB Identification No.	Qty/Panel
1	Maximum Current Relay 2.5 A/3.3 A, 50 Hz	CLW/ES/3/0059/D or latest	78	DIKA210013R0037	1 No.
2	Resistor 50 W 12 + 15/-5	CLW/ES/3/0014/D or latest	78.1	NBT300213P0001	1 No.
3	Minimum Voltage Relay	CLW/ES/3/0060/B or latest	68	3EHP58521R0202	1 No.
4	Current Relay 150 m, 43 ohm, 36/110 V (Earth fault Relay)	CLW/ES/3/0090/B or latest	89.7	HBVW400011R0001	1 No.
5	Resistor 100 W, 390 ohm	CLW/ES/3/0014/D or latest	90.7	NBT300209P0063	2 Nos. 3 Nos
6	DC-DC Converter	CLW/ES/3/0054/B or latest	118.4	3EHP590001R0100	1 No.
7	DC-DC Converter	CLW/ES/3/0054/B or latest	118.5	3EHP590001 R0090	1 No.
8	Diode Block – 5 with socket, fixation and contacts	CLW/ES/3/0055/B or latest	123.1	HBTB585480R0001	5 Nos.
9	Diode Block – 8 with socket, fixation and contacts	CLW/ES/3/0055/B or latest	123.1	HBTB585480R0003	1 No.
10	Contactor (Contactor – control Electronics & Contactor – control electronics circuit 'ON')	CLW/ES/3/0034/B or latest	126 & 218	HBTB585633R0820	2 Nos.
11	Relay (Aux. Contactor) TEL CA3 DN 22 FW 10 A 600 V DC – 110 V DC	CLW/ES/3/0066/A or latest	126.5	3EHP585807P1207	1 No.
12	Snubber Circuit	CLW/ES/3/0067/A or latest	126.5A 126.7A 136.3A 136.4A	3EHW470024R0005	4 Nos.
13	Time Relay for VCB with Aux Contact	CLW/ES/3/0064/A or latest	126.7& 136.3	HBTB585683R4227 3EHP585771R0006	2 Nos.
14	Circuit Breaker DC	CLW/ES/3/0037/B or latest	127.1/1 127.12 127.2 127.9/1 & 2 127.91 310.1	HBTB585555R1013	7 Nos.

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

15	Circuit Breaker DC	CLW/ES/3/0037/B or latest	127.11	HBTB585555R1043	1 No.
16	Circuit Breaker DC	CLW/ES/3/0037/B or latest	127.3 127.22	HBTB585555R1023	2 Nos.
17	Time Delay Module	CLW/ES/3/0064/A or latest	136.3 & CE Reset	3EHP590028R0001	1 No. 3 Nos for WAG-9
18	Aux. Contactor for VCB/Panto	CLW/ES/3/0040/A or latest	136.4 & CE Reset	HBTB585683R1127	1 No. 2 Nos for WAG-9
19	Rotary Switch Failure mode operation	CLW/ES/3/0068/A or latest	152	HBTB585580R1032	1 No.
20	Rotary Switch Bogie Cut out	CLW/ES/3/0068/A or latest	154	HBTB585580R1022	1 No.
21	Rotary switch configuration	CLW/ES/3/0068/A or latest	160, 237.1 & CE Reset	HBTB585580R0034	2 Nos. 3 Nos for WAG-9
22	Illuminated configuration	CLW/ES/3/0072/C or latest	161	3EHP585818P2151 3EHP585819P2010 3EHP585726P0024	1 No.
23	Key Switch Simulation	CLW/ES/3/0079 or latest	179	3EHP585704R2222	1 No.
24	Resistor 25 W Earthing Resistor Screen Train Bus in SB-1	CLW/ES/3/0014/D or latest	381.71	NBT300207P0097	1 No.
25	Cable	CLW/ES/3/0458/C or latest CLW/ES/3/0459 or latest		3EHP130215R0200	
26	Set of Screw Type terminal Block	CLW/ES/3/0645/B or latest			
27	Contactor for Head Light (Contactor Type-6)	CLW/ES/3/0034/B or latest	338	HBTB585402R0821	1 No.
28	Wago Type Terminal Block	CLW/ES/3/0644/A or latest			
28	Bare SB-1 Panel	CLW/MS/3/098 Alt. 10 or latest		3EHP130215	1 No.
29	2 Amps, 250 V Fuse				03 Nos.
30	VCU Reset Push Button similar to BPVR	CLW/ES/3/0072/G or latest	CE Reset		02 Nos for WAG-9
31	VS Diode 12 Amps	CLW/ES/D-2	CE Reset		03 Nos for WAG-9
32	Auxiliary Contact Block 2NO+2NC	CLW/ES/3/203/B or latest	CE Reset		01 No. for WAG-9

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

15. Tests

SI 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)	Fire –retardant test of all insulating material	Yes	No
(v)	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*	No Yes*
(vi)	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.*

16. Important Information :-

16.1 All the insulating material should have Fire Retardant Property as per CLW individual specn.

16.2 The Cable for wiring of SB-1 Panel will be with Electron beam irradiated 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.

16.3 The Cable and terminal connections will have only proper crimping joints.

16.4 All necessary amendments according to TOT modification or RDSO modification have to be incorporated by the firm in consultation in the CLW at firms own cost.

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

17. Annexure :

- (i) All specification of components, sub components.
- (ii) All documents referred for Cabling are 3EHP431440, 3EHP130215, & 3EHP130215R0200, 3EHP601578
- (iii) All necessary amendments according to TOT modification or RDSO modification have to be incorporated by the firm in consultation with the CLW at firms own cost.
- (iv) Document of cable list of Control Cubicle - 1 (SB- 1) – 3EHP431440 along with MO.18 Identification no. of Control Cubicle -1 (SB-1) 3EHP130215.
- (v) Identification no of Cable loom 3EHP601578.

Note: The above mentioned references are for guidance only.

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

Page 21 of 21	Specification No. CLW/ES/3/0194 CONTROL CUBICLE -1 (SB -1)	ALT. † J
------------------	---	----------

18. Modification sheet no. RDSO/2009EL/MS/0377 (Rev. 0) dated 22.04.09 has been included.
19. Modifications for push Pull operation in WAP-5 & WAP-7 locomotives to be incorporated in SB-1. As per scheme issued vide letter no. C-D&D/ T/ 47 dtd.8.8.19.
20. (i) Modification in existing control electronics (CE) resetting scheme of 3 Phase loco vide RDSO/2018/EL/MS/0475 dt 12.12.18.
- (ii) Modification in Earth Fault Circuit for elimination of spurious message on account of earthing of control cable in 3 phase loco (MS 480).
- (iii) MS-413, paralleling of interlock of Aux. Contactor of 3 phase loco.
- (iv) Modification in Blocking diode to improve the reliability of 3 phase locos vide RDSO/2017/EL/MS/0467 Rev '0' dt. 07.12.2017.
- (v) Modification sheet no. RDSO/2018/EL/MS/0475 (Rev. 1) dated 26.10.23 has been implemented in WAG-9 Locomotive. Previous RDSO modification RDSO/2018/EL/MS/0475 Rev. '0' dated 12.12.2018 remains valid for WAP-5 & 7 only.
- (vi) KAVACH has been incorporated in the cable cutting chart vide RDSO letter no. EL/0.1.3/3 dated 26.09.2023.

Prepared By	Checked By	Approved By
SSE/Design	AEE/Design	Dy.CEE/D-II

ANNEXURE-II**Cable Connection chart of Control Cubicle SB1 for WAP7/WAG9/WAP5**

* Sub-D Connectors along with related Cabling are deleted from the scope of supply as per Dy.CEE/D&D letter no.C-D&D /T/42 dated.14.06.2021.

35 PIN FOR WAG 9 AND 61 PIN FOR WAP 7&5/12 GRADE XK22V:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	XK 22V:01-1	XB 22 S-3
2	2.5	2050	XK 22V:01-2	XB 22 S-3
3	2.5	2050	XK 22V:01-3	XB 22 S-3
4	2.5	2050	XK 22V:01-4	XB 22 S-3
5	1.5	2063	XK 22V:01-5	XK 22A:01-7
6	1.5	2064	XK 22V:01-6	78-C
7	1.5	2067	XK 22V:01-7	XK 22A:01-8
8	1.5	2069	XK 22V:01-8	XF 22S:01-1
9	2.5	2094	XK 22V:01-9	XB 22S-17
10	2.5	2094	XK 22V:01-10	XB 22S-17
11	2.5	2094	XK 22V:01-11	XB 22S-17
12	2.5	2094	XK 22V:01-12	XB 22S-17
13	2.5	2095	XK 22V:01-13	XB 22S-19
14	2.5	2095	XK 22V:01-14	XB 22S-20
15	2.5	2096	XK 22V:01-15	XB 22S-21
16	2.5	2096	XK 22V:01-16	XB 22S-21
17	1.5	2300	XK 22V:01-17	XK 22A:01-10
18	1.5	2310	XK 22V:01-18	XK 22A:01-11
19	1.5	2312	XK 22V:01-19	XF 22S:01-2
20	1.5	2314	XK 22V:01-20	XF 22S:01-4
21	1.5	2319	XK 22V:01-21	XF 22S:01-6
22	2.5	2320	XK 22V:01-22	XK 22R-3
23	1.5	2325	XK 22V:01-23	XF 22S:01-7
24	2.5	2326	XK 22V:01-24	XF 22S:01-9
25	1.5	2327	XK 22V:01-25	XF 22S:01-10
26	1.5	2501	XK 22V:01-26	XF 22S:01-11
27	1.5	2510	XK 22V:01-27	TS211.1/2-Q2
28	1.5	2511	XK 22V:01-28	86 – 18
29	1.5	2515	XK 22V:01-29	XF 22S:02-47
30	0.5	2517	XK 22V:01-30	XF 22S:01-1/4
31	1.5	2808	XK 22V:01-31	XK 22H-3
32	1.5	2809	XK 22V:01-32	XK 22H-4
33	1.5	2817	XK 22V:01-33	XK 22H-5
34	1.5	2819	XK 22V:01-34	XK 22H-6
35	2.5	2864	XK 22V:01-35	XK 22R-17
FOR WAP7 AND WAP5 ONLY				

36	1.5	2331 AR	XK 22V:01-36	XF22S:02-33
37	1.5	2050 AR	XK 22V:01-37	XF22S:03-62
38	1.5	2111 AR	XK 22V:01-38	XF22S:02-36
39	1.5	2500 AR	XK 22V:01-39	XF22S:02-31
40	1.5	2503 AR	XK 22V:01-40	XF22S:02-32
41	1.5	4242 AR	XK 22V:01-41	XF22S:02-34
42	1.5	5672 AR	XK 22V:01-42	XF22S:02-58
43	1.5	5671 AR	XK 22V:01-43	XF22S:02-57
44	1.5	2069A	XK 22V:01-45	Reset PB-14 (Mod 475) WAP-7
45	1.5	2069B	XK 22V:01-46	136.4-21 (Mod 475) WAP-7
46	1.5	3048	XK 22V:01-47	Timer-18 (Mod 475) WAP-5

61 PIN / 16 GRADE XK22V :02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2866	XK 22V:02-1	XK 22R-18
2	2.5	2867	XK 22V:02-2	XK 22R-19
3	1.5	2874	XK 22V:02-3	XK 22H-9
4	1.5	2894	XK 22V:02-4	XK 22H-10
5	1.5	3000	XK 22V:02-5	237.1-4
6	1.5	3001	XK 22V:02-6	XK 22A:01-12
7	1.5	3042	XK 22V:02-7	XF 22S:01-21
8	2.5	3054	XK 22V:02-8	XK 22D:01-4
9	1.5	3097	XK 22V:02-9	XK 22A:01-4
10	1.5	3530	XK 22V:02-10	XK 22A:01-14
11	1.5	4200	XK 22V:02-11	237.1-3
12	1.5	4201	XK 22V:02-12	XF 22S:01-24
13	1.5	4218	XK 22V:02-13	XK 22A:01-15
14	1.5	4234	XK 22V:02-14	XK 22A:01-16
15	1.5	4235	XK 22V:02-15	XK 22A:01-17
16	1.5	4236	XK 22V:02-16	XF 22S:01-39
17	1.5	4238	XK 22V:02-17	XF 22S:01-40
18	1.5	4243	XK 22V:02-18	XF 22S:01-41
19	1.5	5091	XK 22V:02-19	XK 22H-11
20	1.5	5092	XK 22V:02-20	XK 22H-12
21	1.5	5209	XK 22V:02-21	XK 22R-12
22	1.5	5210	XK 22V:02-22	XK 22R-13
23	2.5	2098A	XK 22V:02-23	XF 22S:02-2
24	1.5	2098B	XK 22V:02-24	86-20
25	1.5	2099A	XK 22V:02-25	XF 22S:02-3
26	1.5	2099B	XK 22V:02-26	XK 22D:02-11
27	2.5	2111A	XK 22V:02-27	XF 22S:02-10
28	1.5	2331B	XK 22V:02-28	XK 22D:02-15
29	1.5	2500B	XK 22V:02-29	XF 22S:02-18
30	1.5	2503A	XK 22V:02-30	XK 22A:01-26

31	1.5	2503B	XK 22V:02-31	XF 22S:02-20
32	1.5	2504A	XK 22V:02-32	126.7A/1 – 2+
33	1.5	2504B	XK 22V:02-33	126.7/1 – 76
34	1.5	2514A	XK 22V:02-34	XK 22A:01-27
35	1.5	2516A	XK 22V:02-35	XF 22A:01-28
36	1.5	2861B	XK 22V:02-36	XK 22F-11
37	1.5	2862B	XK 22V:02-37	XK 22F-13
38	1.5	2863B	XK 22V:02-38	XK 22F-15
39	1.5	3046A	XK 22V:02-39	XF 22S:01-1/5
40	2.5	3064A	XK 22V:02-40	XK 22A:02-15
41	2.5	3065A	XK 22V:02-41	XK 22A:02-16
42	2.5	3066A	XK 22V:02-42	XK 22A:02-17
43	2.5	3067A	XK 22V:02-43	XK 22A:02-18
44	1.5	3549A	XK 22V:02-44	XF 22S:03-30
45	1.5	3549B	XK 22V:02-45	XF 22S:03-39
46	2.5	5108A	XK 22V:02-46	XK 22R-14
47	2.5	5108B	XK 22V:02-47	XK 22R-16
FOR WAP7 AND WAP5 ONLY				
48	1.5	UH06	XK 22V:02-48	XF 22S:02-52
49	1.5	UH07	XK 22V:02-49	XF 22S:02-53
50	1.5	UH08	XK 22V:02-50	XF 22S:02-54
51	1.5	UH09	XK 22V:02-51	XF 22S:02-55
52	1.5	UH10	XK 22V:02-52	XF 22S:02-56
53	1.5	UH11	XK 22V:02-53	XF 22S:03-53
54	1.5	UH12	XK 22V:02-54	XF 22S:03-54
55	1.5	2806	XK 22V:02-55	XF 22S:03-55
56	1.5	2860	XK 22V:02-56	XF 22S:03-56
57	1.5	HI01	XK 22V:02-57	XF 22S:01-53
58	1.5	HI02	XK 22V:02-58	XF 22S:01-54

22 PIN / 12 GRADE XK22V :03

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2320	XK 22V:03-7	136.3-R2
2	1.5	2890	XK 22V:03-11	XF 22S:03-33
3	1.5	3542C	XK 22V:03-16	XF 22S:03-41
4	1.5	3542D	XK 22V:03-17	XF 22S:03-42
5	2.5	2340	XK 22V:03-6	XK 22R-1
6	1.5	2329	XK 22V:03-8	XK 22D:02-8
7	2.5	5101B	XK 22V:03-9	XK 22R-15
8	2.5	5101A	XK 22V:03-10	XK 22R-10
9	2.5	2876	XK 22V:03-12	XK 22H-26
10	1.5	2877B	XK 22V:03-13	XK 22H-27
11	1.5	2877A	XK 22V:03-14	XK 22H-28
12	1.5	5094	XK 22V:03-15	XK 22H-29
13	1.5	3034B	XK 22V:03-18	XF 22S:02-48
14	2.5	3035B	XK 22V:03-19	XF 22S:02-49

15	1.5	3008	XK 22V:03-20	XF 22S:02-50
16	1.5	5671B	XK 22V:03-21	XF 22S:02-51
FOR WAP7 AND WAP5 ONLY				
17	1.5	UH01	XK 22V:03-01	XF 22S:01-48
18	1.5	UH02	XK 22V:03-02	XF 22S:01-49
19	1.5	UH03	XK 22V:03-03	XF 22S:01-50
20	1.5	UH04	XK 22V:03-04	XF 22S:01-51
21	1.5	UH05	XK 22V:03-05	XF 22S:01-52
22	1.5	3035A	XK 22V:03-22	XF 22S:03-52

**LINK CABLE FOR MODIFICATION TO DRIVE MR BLOWER AND SCAVENGE
BLOWER BYTHREE PHASE SUPPLY**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2896 + 2890	XF22S:02-1/6	XF22S:03-33

PIN / 12 GRADE XK22D:02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	1521	XK 22D:02-2	78.1-Q1
2	1.5	1522	XK 22D:02-3	136.3-R4
3	2.5	2050	XK 22D:02-4	XB22S-1
4	2.5	2050	XK 22D:02-5	XB22S-2
5	1.5	2062	XK 22D:02-6	XF 22S:03-34
6	1.5	2326	XK 22D:02-7	XF 22S:01-8
7	1.5	2329	XK 22D:02-8	XF 22S:03-38
8	2.5	3533	XK 22D:02-9	XK 22D:01-7
9	2.5	3533	XK 22D:02-9	XK 22D:03-7
10	1.5	2099A	XK 22D:02-10	XF 22S:02-3
11	1.5	2330A	XK 22D:02-12	XF 22S:02-12
12	1.5	2330B	XK 22D:02-13	XF 22S:02-13
13	1.5	2331A	XK 22D:02-14	XK 22A:01-22

35 PIN / 12 GRADE XK22R

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2340	XK 22R-1	XK 22R-4
2	2.5	2098A	XK 22R-2	XK 22H-13
3	1.5	2320	XK 22R-3	XF 22S:03-37
4	1.5	2325	XK 22R-5	XF 22S:01-7
5	2.5	2601A	XK 22R-6	XK 22R-7
6	2.5	2601A	XK 22R-6	127.11/1-2
7	2.5	2050	XK 22R-8	XB 22S-6
8	2.5	2050	XK 22R-9	XB 22S-6
9	2.5	5101A	XK 22R-10	127.1/1-2

10	2.5	2050	XK 22R-11	XB 22S-6
11	1.5	2864	XK 22R-17	XK 22F-5
12	1.5	2866	XK 22R-18	XK 22F-6
13	1.5	2867	XK 22R-19	XK 22F-7
14	1.5	2861A	XK 22R-20	XK 22F-10
15	1.5	2862A	XK 22R-21	XK 22F-12
16	1.5	2863A	XK 22R-22	XK 22F-14

35P/12 GRADE XK22HL (ONLY FOR WAP 7 & 5)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	UH01	XK22HL:01	XF22S:01-48
2	1.5	UH02	XK22HL:02	XF22S:01-49
3	1.5	UH03	XK22HL:03	XF22S:01-50
4	1.5	UH04	XK22HL:04	XF22S:01-51
5	1.5	UH05	XK22HL:05	XF22S:01-52
6	1.5	UH06	XK22HL:06	XF22S:02-52
7	1.5	UH07	XK22HL:07	XF22S:02-53
8	1.5	UH08	XK22HL:08	XF22S:02-54
9	1.5	UH09	XK22HL:09	XF22S:02-55
10	1.5	UH10	XK22HL:10	XF22S:02-56
11	1.5	UH11	XK22HL:11	XF22S:03-53
12	1.5	UH12	XK22HL:12	XF22S:03-54
13	1.5	UH13	XK22HL:13	XF22S:03-58

35 PIN / 12 GRADE XK22F

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	XK 22F-1	XB22S-2
2	1.5	2805	XK 22F-2	XF22S:01-1/1
3	1.5	2806	XK 22F-3	XF22S:01-1/2
4	0.5	2860	XK 22F-4	XF22S:01-1/3
5	1.5	2869	XK 22F-8	XF22S:01-20
6	1.5	2801A	XK 22F-9	XF22S:03-14

35 PIN / 12 GRADE XK22H

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	XK 22H-1	XK22H-2
2	2.5	2050	XK 22H-1	XB22S-2
3	1.5	2854	XK 22H-7	XF22S:01-18
4	1.5	2859	XK 22H-8	XF22S:01-19
5	1.5	5091	XK 22H-11	127.22/1-2
6	2.5	2098A	XK 22H-13	XF22S:02-2
7	1.5	2801A	XK 22H-14	XF22S:03-14
8	1.5	2850A	XK 22H-15	XF22S:03-18
9	1.5	2851A	XK 22H-16	XF22S:03-19

10	1.5	2852A	XK 22H-17	XF22S:03-20
11	1.5	2853A	XK 22H-18	XF22S:03-21
12	1.5	2855A	XK 22H-19	XF22S:03-22
13	1.5	2856A	XK 22H-20	XF22S:03-23
14	1.5	2857A	XK 22H-21	XF22S:03-24
15	1.5	3037A	XK 22H-22	XF22S:03-29
16	1.5	2840A	XK 22H-23	XF22S:02-1/5
17	1.5	2896	XK 22H-25	XF22S:02-1/6
18	1.5	2890	XK 22H-24	XF22S:03-33

35 PIN / 12 GRADE XK22A:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4201	XK 22A:01-1	XF22S:01-24
2	1.5	2319	XK 22A:01-2	XF22S:01-6
3	2.5	2062	XK 22A:01-3	127.12-2
4	2.5	2050	XK 22A:01-5	XB22S-1
5	2.5	2050	XK 22A:01-6	XB22S-1
6	1.5	2069	XK 22A:01-9	XF22S:01-1
7	2.5	3054	XK 22A:01-13	XK22D:03-4
8	1.5	4235	XK 22A:01-17	XF22S:01-38
9	1.5	2097A	XK 22A:01-18	XF22S:02-1
10	1.5	2099A	XK 22A:01-19	XF22S:02-3
11	2.5	2111A	XK 22A:01-20	XF22S:02-10
12	1.5	2111A	XK 22A:01-20	126.7/1-2
13	1.5	2313A	XK 22A:01-21	XF22S:02-11
14	1.5	2331A	XK 22A:01-22	XF22S:02-14
15	1.5	2333A	XK 22A:01-23	XF22S:02-15
16	1.5	2334A	XK 22A:01-24	XF22S:02-16
17	1.5	2500A	XK 22A:01-25	XF22S:02-17
18	1.5	2503A	XK 22A:01-26	XF22S:02-19
19	1.5	2514A	XK 22A:01-27	XF22S:02-21
20	1.5	2520A	XK 22A:01-29	XF22S:02-22
21	1.5	2521A	XK 22A:01-30	XF22S:02-23
22	1.5	2522A	XK 22A:01-31	XF22S:02-24
23	1.5	2523A	XK 22A:01-32	XF22S:02-25
24	1.5	2524A	XK 22A:01-33	XF22S:02-26
25	1.5	2525A	XK 22A:01-34	XF22S:03-7
26	1.5	2526A	XK 22A:01-35	XF22S:03-8

61 PIN / 16 GRADE XK22A:02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2527A	XK 22A:02-1	XF22S:03-9
2	1.5	2532A	XK 22A:02-2	XF22S:03-10
3	1.5	2540A	XK 22A:02-3	XF22S:03-11
4	1.5	2541A	XK 22A:02-4	XF22S:03-12
5	1.5	2542A	XK 22A:02-5	XF22S:03-13

6	1.5	2803A	XK 22A:02-6	XF22S:03-15
7	1.5	2804A	XK 22A:02-7	XF22S:03-16
8	1.5	2807A	XK 22A:02-8	XF22S:03-17
9	1.5	3005A	XK 22A:02-9	XF22S:03-25
10	1.5	3020A	XK 22A:02-10	XF22S:03-26
11	1.5	3033A	XK 22A:02-11	XF22S:02-1/1
12	1.5	3034A	XK 22A:02-12	XF22S:03-27
13	1.5	3035A	XK 22A:02-13	XF22S:03-28
14	1.5	3060A	XK 22A:02-14	XF22S:02-1/2
15	1.5	3069A	XK 22A:02-19	XF22S:02-1/3
16	1.5	3071A	XK 22A:02-20	XF22S:02-1/4
17	1.5	3117A	XK 22A:02-26	XF22S:03-1/1
18	1.5	3501A	XK 22A:02-27	XF22S:01-43
19	1.5	3543A	XK 22A:02-28	XF22S:01-46
20	1.5	3544A	XK 22A:02-29	XF22S:01-47
21	2.5	3549A	XK 22A:02-30	XF22S:03-43
22	1.5	3554A	XK 22A:02-31	XF22S:03-46
23	1.5	4211A	XK 22A:02-32	XF22S:01-45
24	1.5	4232A	XK 22A:02-33	XF22S:03-31
25	1.5	4237A	XK 22A:02-34	XF22S:03-1/2
26	1.5	4242A	XK 22A:02-35	XF22S:03-1/3
27	1.5	5671A	XK 22A:02-36	XF22S:03-1/4
28	1.5	5672A	XK 22A:02-37	XF22S:03-1/5
29	1.5	5673A	XK 22A:02-38	XF22S:03-1/6
30	1.5	3542A	XK 22A:02-61	XF22S:03-40
31	1.5	3549A	XK22A:02-59	XF22S:03-30 (Mod. Of Twin Beam Headlight)
<u>FOR WAP7 AND WAP5 ONLY</u>				
35	1.5	2500AR	XK 22A:02-39	XF22S:03-48
36	1.5	2503AR	XK 22A:02-40	XF22S:03-49
37	1.5	2331AR	XK 22A:02-41	XF22S:03-50
38	1.5	4242AR	XK 22A:02-42	XF22S:03-51
39	1.5	2111AR	XK 22A:02-43	XF22S:02-36
40	1.5	5671AR	XK 22A:02-44	XF22S:02-57
41	1.5	5672AR	XK 22A:02-45	XF22S:02-58
42	1.5	2050AR	XK 22A:02-50	XF22S:03-62

13 PIN / 12 GRADE XK22D:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	3054	XK 22D:01-1	XK22D:01-4
2	2.5	3054	XK 22D:01-1	XK22D:03-4
3	2.5	2050	XK 22D:01-3	XB22S-1
6	2.5	3531	XK 22D:01-5	XK22D:03-5
7	2.5	3532	XK 22D:01-6	XK22D:03-6

13 PIN / 12 GRADE XK22D:03

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	3533	XK22D:03-1	XK22D:03-7
2	2.5	2050	XK22D:03-3	XB22S-2

22 PIN FOR WAP 7 & 5 / 12 GRADE XK22U:01

Sl. No.	Cable Cross Section	Cable no. For WAP 7 & 5 Only	Connection From	Connection To
1	((5*4*1)+2)) FOR WAP 7 & 5 ONLY	2500A	XK22U:01-1	XF22S:02-27
2		2503A	XK22U:01-2	XF22S:02-28
3		2331A	XK22U:01-3	XF22S:02-29
4		4242A	XK22U:01-4	XF22S:02-30
5		2500AR	XK22U:01-5	XF22S:02-31
6		2503AR	XK22U:01-6	XF22S:02-32
7		2331AR	XK22U:01-7	XF22S:02-33
8		4242AR	XK22U:01-8	XF22S:02-34
9		2111A	XK22U:01-9	XF22S:02-35
10		U10A	XK22U:01-10	XF22S:02-37
11		U11A	XK22U:01-11	XF22S:02-38
12		2111AR	XK22U:01-12	XF22S:02-36
13		U13A	XK22U:01-13	XF22S:02-39
14		2050AR	XK22U:01-14	XF22S:03-62
15		5672A	XK22U:01-15	XF22S:02-60
16		5672AR	XK22U:01-16	XF22S:02-58
17		5671AR	XK22U:01-17	XF22S:02-57
18		5671A	XK22U:01-18	XF22S:02-59
19		SPARE 19	XK22U:01-19	SPARE
20		SPARE 20	XK22U:01-20	SPARE
21		SPARE 21	XK22U:01-21	SPARE
22		SPARE 22	XK22U:01-22	SPARE

13 PIN FOR WAG 9 ONLY / 12 GRADE XK22U:01

Sl. No.	Cable Cross Section	Cable no. For WAG 9 Only	Connection From	Connection To
1	((3*4*1)+1)) FOR WAG 9 ONLY	U01	XK22U:01-1	XF22S:02-27
2		U02	XK22U:01-2	XF22S:02-28
3		U03	XK22U:01-3	XF22S:02-29
4		U04	XK22U:01-4	XF22S:02-30
5		U05	XK22U:01-5	XF22S:02-31
6		U06	XK22U:01-6	XF22S:02-32
7		U07	XK22U:01-7	XF22S:02-33
8		U08	XK22U:01-8	XF22S:02-34
9		U09	XK22U:01-9	XF22S:02-35
10		U10A	XK22U:01-10	XF22S:02-37
11		U11A	XK22U:01-11	XF22S:02-38
12		U12A	XK22U:01-12	XF22S:02-36

13		U13A	XK22U:01-13	XF22S:02-39
----	--	------	-------------	-------------

22 PIN FOR WAP 7 & 5 ONLY / 12 GRADE XK22U: 02

Sl. No.	Cable Cross Section	Cable no. For WAP7 & 5 Only	Connection From	Connection To
1	((5*4*1)+2)) FOR WAP 7 & 5 ONLY	2500A	XK22U:02-1	XF22S:02-27
2		2503	XK22U:02-2	XF22S:02-28
3		2331A	XK22U:02-3	XF22S:02-29
4		4242A	XK22U:02-4	XF22S:02-30
5		2500AR	XK22U:02-5	XF22S:02-31
6		2503AR	XK22U:02-6	XF22S:02-32
7		2331AR	XK22U:02-7	XF22S:02-33
8		4242AR	XK22U:02-8	XF22S:02-34
9		2111A	XK22U:02-9	XF22S:02-35
10		U10B	XK22U:02-10	XF22S:02-40
11		U11B	XK22U:02-11	XF22S:02-41
12		2111AR	XK22U:02-12	XF22S:02-36
13		U13B	XK22U:02-13	XF22S:02-42
14		2050AR	XK22U:02-14	XF22S:03-62
15		5672A	XK22U:02-15	XF22S:02-60
16		5672AR	XK22U:02-16	XF22S:02-58
17		5671AR	XK22U:02-17	XF22S:02-57
18		5671A	XK22U:02-18	XF22S:02-59
19		SPARE 19	XK22U:02-19	SPARE
20		SPARE 20	XK22U:02-20	SPARE
21		SPARE 21	XK22U:02-21	SPARE
22		SPARE 22	XK22U:02-22	SPARE

13 PIN FOR WAG 9 ONLY / 12 GRADE XK22U: 02

Sl. No.	Cable Cross Section	Cable no. For WAG9 Only	Connection From	Connection To
1	((3*4*1)+1)) FOR WAG 9 ONLY	U01	XK22U:02-1	XF22S:02-27
2		U02	XK22U:02-2	XF22S:02-28
3		U03	XK22U:02-3	XF22S:02-29
4		U04	XK22U:02-4	XF22S:02-30
5		U05	XK22U:02-5	XF22S:02-31
6		U06	XK22U:02-6	XF22S:02-32
7		U07	XK22U:02-7	XF22S:02-33
8		U08	XK22U:02-8	XF22S:02-34
9		U09	XK22U:02-9	XF22S:02-35
10		U10B	XK22U:02-10	XF22S:02-40
11		U11B	XK22U:02-11	XF22S:02-41
12		U12B	XK22U:02-12	XF22S:02-36
13		U13	XK22U:02-13	XF22S:02-42

5 PIN XK22P:01

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1(2P+S)	1501	XK22P:01-1	XF22S:03-1
2	1(2P+S)	1502	XK22P:01-2	XF22S:03-0
3	1(2P+S)	1503	XK22P:01-3	XF22S:03-5

5 PIN XK22P:02

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1(2P+S)	1501	XK22P:02-1	XF22S:03-1
2	1(2P+S)	1502	XK22P:02-2	XF22S:03-3
3	1(2P+S)	1503	XK22P:02-3	XF22S:03-5

5 PIN XK22P:03

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1(2P+S)	1501	XK22P:03-1	XF22S:03-1
2	1(2P+S)	1502	XK22P:03-2	XF22S:03-3
3	1(2P+S)	1503	XK22P:03-3	XF22S:03-5

5 PIN XK22P:04

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1(2P+S)	1501	XK22P:04-1	XF22S:03-2
2	1(2P+S)	1502	XK22P:04-2	XF22S:03-4
3	1(2P+S)	1503	XK22P:04-3	XF22S:03-6

5 PIN XK22P:05

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1(2P+S)	1501	XK22P:05-1	XF22S:03-2
2	1(2P+S)	1502	XK22P:05-2	XF22S:03-4
3	1(2P+S)	1503	XK22P:05-3	XF22S:03-6

LINK CABLE 152 (Rotary Switch Failure Mode Operation)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4201	152-1	127.9/1-2
2	1.5	4201	152-1	154-1
3*	0.5	5676	152-2	411.LA-3

LINK CABLE 154 (Rotary Switch Bogie Cut Out)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4201	154-1	152-1
2	1.5	4201	154-1	154-3
3*	0.5	2401	154-2	411.LA-9
4*	0.5	2402	154-4	411.LA-2
5	1.5	4201	154-3	154-1
6	1.5	4201	154-3	160-3

LINK CABLE 160 (Rotary Switch Configuration)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4201	160-3	154-3
2	1.5	4201	160-3	161-13
3*	0.5	2404	160-4	411.LA-10

LINK CABLE 237.1 (Rotary Switch Vigilance Device)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2069	237.1-1	XF22S:01-1
2	1.5	4236	237.1-2	XF22S:01-39
3	1.5	4200	237.1-3	XK22V:02-11
4	1.5	4200	237.1-3	237.1-7
5	1.5	3000	237.1-4	XK22V:02-5
6	1.5	3000	237.1-8	XF22S:03-36
7	1.5	2069	237.1-1	211.1/1-Q1

LINK CABLE 161 (Illuminated Push Button)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2050	161-X2	XB22S-4
2	1.5	4201	161-13	160-3
3	1.5	4201	161-13	78-A
4*	0.5	2407	161-X1	411.LG-3
5*	0.5	2405	161-14	411.LD-1

179 (Key Switch Simulation SB1)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4201	179-1	XF22S:01-24
2	1.5	5676	179-2	XF22S:01-42

381.71 (Resistor for Screen Train Bus)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	U13A	381.71-Q1	XF22S:02-39
2	1.5	U13B	381.71-Q1	XF22S:02-42
3	2.5	0	381.71-Q2	XB22S-15

78.1 (Resistor for Maximum Current Relay)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	1521	78.1-Q1	XK22D:02-2
2	1.5	1521	78.1-Q1	78-U
3	1.5	1523	78.1-Q2	136.3-R3

86 (Minimum Voltage Relay)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2314	86-15-U	XF22S:01-4
2	1.5	2511	86-18-U	XK22V:01-28
3	1.5	2098B	86-20-L	XK22V:02-24
4	1.5	2050	86-21-L	XB22S-11
5	1.5	1502	86-13-L	XF22S:03-4
6	1.5	1501	86-12-L	XF22S:03-2
7	1.5	2320	86-14-U	78-D
8	1.5	2069	86-19-U	211.1/1-Q1

381.7 (Resistor for Screen Train Bus)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	0	381.7-M	XB22S-15

78 (Maximum Current Relay)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4201	78-A	XF22S:01-28
2	1.5	2064	78-C	XK22V:01-6
3	1.5	2320	78-D	XF22S:03-37
4	1.5	0	78-M	XB22S-15
5	1.5	4201	78-A	161-13
6	1.5	2320	78-D	86-14
7	1.5	1521	78-U	78.1-Q1
8	1.5	1522	78-V	136.3-R4
9*	0.5	2088	78-B	411.LD-4

89.7 (Earth Fault Relay)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2801A	89.7-A	127.2/1-2
2	1.5	2022	89.7-U	90.7/1-Q2
3	1.5	0	89.7-V	XB22S-15
4*	0.5	2801A	89.7-A	411.JJ-2
5*	0.5	2870	89.7-B	411.QD-11

90.7/1 (Resistor for Earth Fault Relay)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2095	90.7/1-Q1	XB22S-20
2	1.5	2022	90.7/1-Q2	89.7-U
3	1.5	2022	90.7/1-Q2	90.7/2-Q1

90.7/3 (Resistor for earth fault Relay as per RDSO modification 480)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2022 (MOD)	90.7/3-Q1	90.7/2-Q1
2	1.5	2050	90.7/3-Q2	90.7/2-Q2

90.7/2 (Resistor for Earth Fault Relay)

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2022	90.7/2-Q1	90.7/1-Q2
2	1.5	2050	90.7/2-Q2	XB22S-15

127.3/1 (10A) CB for Driver's Cab

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2101A	127.3/1-2	126.7/1-1

127.12 (6A) CB for Panto/VCB Control

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2062	127.12-2	XK22A:01-3
2	2.5	2062	127.12-2	XF22S:03-34

127.91/1 (6A) CB for 24/48V Power Supply

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2005A	127.91/1-2	118.4/1-V1+
2	2.5	2005A	127.91/1-2	118.5/1-V1+

310.1/1 (6A) CB for Lighting Front

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2101C	310.1/1-2	126.7/1-3

127.1/1 (6A) CB for Electronic Traction Converter

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	5101A	127.1/1-2	XK22R-10

127.11/1 (20A) CB for Power Supply Gate Unit

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2601A	127.11/1-2	XK22R-6

127.2/1 (6A) CB for Monitoring

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2801A	127.2/1-2	XF22S:03-14
2	1.5	2801A	127.2/1-2	89.7-A

127.22/1 (6A) CB for Aux. Converter-1

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	5091	127.22/1-2	XK22H-11

127.9/1 (6A) CB for Central Electronic-1

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4201	127.9/1-2	XF22S:01-28
2	1.5	4201	127.9/1-2	152-1

127.9/2 (6A) CB for Central Electronic-2

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4202	127.9/2-2	XF22S:01-34

126.5 Relay Control Electronics OFF

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2505	126.5-21	XF22S:01-12
2	1.5	2070	126.5-A1	126.5-14
3	1.5	2070	126.5-A1	126.5A-2+
4	1.5	2050	126.5-A2	126.5A-4 -
5	1.5	2505	126.5-13	126.5-21
6	1.5	2070	126.5-14	126.5-A1
7	1.5	2503	126.5-21	126.5-13 (Not required as per shop)
8	1.5	2808	126.5-22	126-A1

126.5A Snubber

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2070	126.5A-1+	123/7-10
2	1.5	2070	126.5A-2+	126.5-A1
3	1.5	2050	126.5A-3-	XB22S-8
4	1.5	2050	126.5A-4-	126.5-A2

136.4 Auxiliary Contactor VCB

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2314	136.4-1	XF22S:01-4 (MS 390)
2	1.5	2312	136.4-2	XF22S:01-2 (MS 390)
3	1.5	2311	136.4-A1	136.4A-1+
4	1.5	2050	136.4-A2	136.4A-4-
5	1.5	2312	136.4-4	XF22S:01-3 (MS 390)
6	1.5	2314	136.4-3	XF22S:01-4 (MS 390)
7	1.5	2069B	136.4-21	XK22V:01-46 (WAP-7)
7	1.5	2069B	136.4-21	XK22V:03-2 (WAG-9)
8	1.5	2069C	136.4-22	Reset Relay-A1

Note: XF22S:01-2 and XF22S:01-3 are shorted.

136.4A Snubber

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2311	136.4A-1	136.4-A1
2	1.5	2050	136.4A-3	XB22S-4
3	1.5	2050	136.4A-4	136.4-A2
4*	0.5	2311	136.4A-2	411.LG-9

126.7/1 Contactor Power Supply to Cab

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2111A	126.7/1-2	XK22A:01-20
2	1.5	2097A	126.7/1-53	XF22S:02-1
3	1.5	2099A	126.7/1-54	XF22S:02-4
4	1.5	2503B	126.7/1-75	XF22S:02-20
5	1.5	2504B	126.7/1-76	XK22V:02-33
6	2.5	2101A	126.7/1-1	127.3/1-2
7	1.5	2504A	126.7/1-A1	126.7A/1-1+
8	1.5	2050	126.7/1-A2	126.7A/1-4-
9	1.5	2101C	126.7/1-3	310.1/1-2
10	1.5	3501A	126.7/1-4	XF22S:01-43

126.7A/1 Snubber

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2504A	126.7A/1-1	126.7/1-A1
2	1.5	2504A	126.7A/1-2	XK22V:02-32
3	1.5	2050	126.7A/1-3	XB22S-8
4	1.5	2050	126.7A/1-4	126.7/1-A2

136.3 Time Relay VCB

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2326	136.3-R1	XF22S:01-9
2	1.5	2328	136.3-R2	XK22V:03-7
3	1.5	1522	136.3-R4	XK22D:02-3
4	1.5	2326	136.3-A1	136.3A-1+
5	1.5	2050	136.3-A2	136.3A-4-
6	1.5	2326	136.3-R1	136.3A-2+
7	1.5	1523	136.3-R3	78.1-Q2
8	1.5	1522	136.3-R4	78-V
9	1.5	2890	136.3-2	XF22S:03-33
10	1.5	2062	136.3-1	XF22S:03-34

11	1.5	2326	136.3-(T)-16	136.3-A1
----	-----	------	--------------	----------

136.3A Snubber

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2326	136.3A-1	136.3-A1 (T)
2	1.5	2326	136.3A-1	136.3-A1
3	1.5	2326	136.3A-2	136.3-R1
4	1.5	2050	136.3A-3	XB22S-4
5	1.5	2050	136.3A-4	136.3-A2

218 Contactor Type-4

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	10	2095	218-1+	XB22S-19
2	10	2096	218-2	XB22S-21
3	1.5	2513	218-A1	Reset Relay-22
4	1.5	2050	218-A2	XB22S-4 ((Pin no. 1 to 13 is shorted)

126 Contactor Type-4

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	10	2094	126-1+	XB22S-18
2	10	2094	126-1+	XB22S-18
3	10	2095	126-2-	XB22S-19
4	10	2095	126-2-	XB22S-20
5	1.5	2508	126-A1	126.5-22
6	1.5	2050	126-A2	XB22S-7

338/1 Contactor Type-6

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3542 C	338/1-1	XF22S:03-41
2	1.5	3549 C	338/1-2	XF22S:03-43
3	1.5	3549 A	338/1-A1	XF22S:03-30
4	1.5	2050	338/1-A2	XB22S-8 (Pin no. 1 to 13 is shorted)

118.4/1 DC-DC Converter

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	118.4/1-GI	XB22S-6
2	2.5	2050	118.4/1-G0	XB22S-7

3	2.5	2098A	118.4/1-V0	XF22S:02-2
4	2.5	2005A	118.4/1-VI	127.91/1-2

118.5/1 DC-DC Converter

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	118.5/1-GI	XB22S-7
2	2.5	2050	118.5/1-G0	XB22S-7
3	2.5	2097A	118.5/1-V0	XF22S:02-1
4	2.5	2005A	118.5/1-V1	127.91/1-2

211.1/1

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2069	211.1/1-Q1	237.1/1-1
2	1.5	2069	211.1/1-Q1	86-19
3	1.5	2510	211.1/1-Q2	XK22V:01-27

2096

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	6	2096	S2096.1-Q1	XB22S-21

2095

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2095	S2095.1-Q1	XB22S-19
2	2.5	2095	S2095.1-Q1	XB22S-20

O-MASSE-M

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	10	0	MASSE22S-M	XB22S-16
2	2.5	0	MASSE22S-M	411-M
3	2.5	0	MASSE22S-M	411-M

SB1 VCU RESET MODIFICATIONS (RDSO MS 475 Rev. '1') (Only For WAG 9 not for WAP 5&7)

Sl. No.	Cable Size Sq. mm	Cable no.	From	To	Remarks
1	1.5	2069	XF22S:01-1	XF22S:02-27 (UIC-1)	NEW
RESET SWITCH MASTER					
2	1.5	2069	XF22S:01-1	RESET SWITCH MASTER-13	NEW
3	1.5	2069B	RESET SWITCH MASTER-14	XK22V:03-1	SB1 TO SB2
4	1.5	2069B	XK77V:03-1	130.1-21	EXISTS
5	1.5	2069C	130.1-22	XK77V:03-2	SB2 TO SB1 EXISTS
6	1.5	2069C	XK22V:03-2	136.4-21	EXISTS
7	1.5		XF22S:02-28 (UIC-2)	VS Diode Back (D1)	NEW
8	1.5	2069D	136.4-22	VS Diode Front (D1)	NEW
VCU RESET RELAY LC1D09 (AUX CONTACTOR VCB/PANTO)					
9	1.5	2069D	136.4-22	VCU RESET RELAY-A1	EXISTS (Relay Changed)
10	1.5	2050	VCU RESET RELAY-A2	XB22S-12	EXISTS(Relay Changed)
11	1.5	2511	86-19	XK22V:01-28	SB1 TO SB2 EXISTS
12	1.5	2511	XK77V:01-28	126.6-43	EXISTS
13	1.5	2512	126.6-44	211-13	
14	1.5	2515	211-14	XK77V:01-29	SB2 TO SB1 EXISTS
15	1.5	2515	XF22S:02-47	123/7-1	EXISTS
16	1.5	2513	123/7-2	XF22S:01-14	
17	1.5	2513	XF22S:01-14	VCU RESET RELAY-21	EXISTS (Relay Changed)
18	1.5	2513A	VCU RESET RELAY-22	XF22S:01-17A	EXISTS (cable no. changed)
19	1.5	2513A	XF22S:01-17A	218-A1	EXISTS (cable no. changed)
20	1.5	2050	218-A2	XB22S-12	EXISTS
MUIR					
21	1.5	2069D	136.4-22	MUIR-Y	NEW
22	1.5	2069	XF22S:01-1	MUIR-A1 & 15 shorted	NEW
23	1.5		MUIR-A2	XB22S-12	NEW
24	1.5	2069F	MUIR -18	VS Diode Back (D2)	NEW
25	1.5	2069F	VS Diode Front (D2)	ZCAB-1	NEW
26	1.5	----	ZCAB-1	ZCAB-3	ZCAB-1&3 shorted
27	1.5	2500A	ZCAB-2	XF22S:02-17	NEW
28	1.5	2500B	ZCAB-4	XF22S:02-18	NEW
PBIR					
29	1.5	2069	XF22S:01-1	VCU RESET RELAY-43	NEW

				(13)	
30	1.5	2069E	VCU RESET RELAY-44 (14)	PBIR -Y	NEW
31	1.5	2050	PBIR -A2	XB22S-12	NEW
32	1.5	2069	XF22S:01-1	PBIR-A1 & 15 shorted	NEW
33	1.5	2069F	PBIR -18	VS Diode Back (D3)	NEW
34	1.5	2069F	VS Diode Front (D3)	ZCAB-5	NEW
35	1.5		ZCAB-5	ZCAB-7	ZCAB-5&7 shorted
36	1.5	2503A	ZCAB-6	XF22S:02-19	NEW
37	1.5	2503B	ZCAB-8	XF22S:02-20	NEW
RESET SWITCH SLAVE					
38	1.5		XF22S:02-29 (UIC-3)	RESET SWITCH SLAVE-13	NEW
39	1.5		RESET SWITCH SLAVE-14	XK22V:03-4	NEW
40	1.5		XK22V:03-5	XF22S:02-30 (UIC-4)	NEW

SB1 VCU RESET MODIFICATIONS (RDSO MS 475) (Only For WAP 5 & 7) XK77V:01 CONNECTOR CHANGES FROM 35P/40 TO 61P/40 FOR PUSH PULL MOD. PINS ARE IN USE FROM 36-43. SO, WE CAN USE PINS 45-47 FOR VCU RESET

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2069	XF22S:01-1	RESET SWITCH-13(NO)
2	1.5	2069A	RESET SWITCH-14(NO)	XK22V:01-45
3	1.5	2069B	XK22V:01-46	136.4-21
4	1.5	2069C	136.4-22	RESET RELAY- A1
5	1.5	2050	RESET RELAY -A2	XB22S-12
6	1.5	2513	XF22S:01-14	RESET RELAY- 21(NC)
7	1.5	2513A	RESET RELAY-22(NC)	218-A1
8	1.5	3048	XK22V:01-47	NEW TIMER-18
9	1.5	2069	XF22S:01-1	RESET RELAY- 13 (NO)
10	1.5	2069	RESET RELAY -13	NEW TIMER -A1
11	1.5	2069	NEW TIMER -A1	NEW TIMER-15
12	1.5	2069Y	RESET RELAY- 14 (NO)	NEW TIMER-Y1
13	1.5	2050	RESET RELAY -A2	NEW TIMER- A2

Connections Only for WAP 7 & 5

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	2050	XB22S-12	XF22S:03-44
2	1.5	0	XB22S-15	XF22S:03-58
3	6	2095	XB22S:20	S2095.1-Q2
4	6	2096	XB22S:21	S2096.1-Q2
5	1.5	2500AR	XF22S:03-48	XF22S:02-31
6	1.5	2503AR	XF22S:03-49	XF22S:02-32
7	1.5	2331AR	XF22S:03-50	XF22S:02-33
8	1.5	4242AR	XF22S:03-51	XF22S:02-34

9	1.5	2111A	XF22S:02-10	XF22S:02-35
10	1.5	2331A	XF22S:02-14	XF22S:02-29
11	1.5	2500A	XF22S:02-17	XF22S:02-27
12	1.5	2503A	XF22S:02-19	XF22S:02-28

123/1 Blocking Diode

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2500A	123/1-1	XF22S:02-17
2	1.5	2501	123/1-2	XF22S:01-11
3	1.5	2500B	123/1-3	XF22S:02-18
4	1.5	2501	123/1-4	XF22S:01-11
5	1.5	2503A	123/1-5	XF22S:02-19
6	1.5	2505	123/1-6	XF22S:01-12
7	1.5	2503B	123/1-7	XF22S:02-20
8	1.5	2505	123/1-8	XF22S:01-12
9	1.5	2506	123/1-9	XF22S:01-17
10	1.5	2505	123/1-10	XF22S:01-13

123/3 Blocking Diode

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2111A	123/3-1	XF22S:02-10
2	1.5	4211A	123/3-2	XF22S:01-45
3	1.5	3543A	123/3-3	XF22S:01-46
4	1.5	3549A	123/3-4	XF22S:03-30
5	1.5	3544A	123/3-5	XF22S:01-47
6	1.5	3549B	123/3-6	XF22S:03-39
7	1.5	2333A	123/3-7	XF22S:02-15
8	1.5	2319	123/3-8	XF22S:01-6
9	1.5	2334A	123/3-9	XF22S:02-16
10	1.5	2327	123/3-10	XF22S:01-10

123/5 Blocking Diode

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	4238	123/5-1	XF22S:01-40
2	1.5	4232A	123/5-2	XF22S:03-31
3	1.5	4239A	123/5-3	XF22S:02-45
4	1.5	4232A	123/5-4	XF22S:03-31
5	1.5	2509	123/5-5	XF22S :02-46
6	1.5	2505	123/5-6	XF22S:01-13
7	1.5	3114	123/5-7	XF22S:01-22
8	1.5	3037A	123/5-8	XF22S:03-29
9	1.5	3115	123/5-9	XF22S:01-23
10	1.5	3037A	123/5-10	XF22S:03-29

123/7 Blocking Diode

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2515	123/7-1	XF22S:02-47
2	1.5	2513	123/7-2	XF22S:01-14
3	1.5	2518	123/7-3	XF22S:01-15
4	1.5	2513	123/7-4	XF22S:01-14
5	1.5	2519	123/7-5	XF22S:01-16
6	1.5	2513	123/7-6	XF22S:01-14
7	1.5	2312	123/7-7	XF22S:01-2
8	1.5	2327	123/7-8	XF22S:01-10
9	1.5	2066	123/7-9	XF22S:03-45
10	1.5	2070	123/7-10	126.5A-1+

123.1/1 Blocking Diode Dablo-8

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	2331A	123.1/1-1	XF22S:02-14
2	1.5	2514A	123.1/1-2	XF22S:02-21
3	1.5	4235	123.1/1-3	XF22S:01-38
4	1.5	3554A	123.1/1-4	XF22S:03-46
5	0.5	3503A	123.1/1-14	XF22S:03-47

123/8 Blocking Diode

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	1.5	3542A	123/8-1	XF22S:03-40
2	1.5	3542B	123/8-2	XF22S:03-41
3	1.5	3542C	123/8-3	XF22S:03-40
4	1.5	3542D	123/8-4	XF22S:03-42

*** 411.AJ SUB D 17 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	4201	411.AJ-A1	XF22S:01-30
2	2.5	2050	411.AJ-A2	XB22S-5

***411.CJ SUB D 17 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	2.5	4202	411.CJ-A1	XF22S:01-34
2	2.5	2050	411.CJ-A2	XB22S-9

***411.JA SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2840A	411.JA-1	XF22S:02-1/5
2	0.5	2500A	411.JA -3	XF22S:02-17
3	0.5	2541A	411.JA -4	XF22S:03-12
4	0.5	2050	411.JA -8	XB22S-9
5	0.5	3060A	411.JA -9	XF22S:02-1/2
6	0.5	2803A	411.JA -10	XF22S:03-28
7	0.5	4242A	411.JA -11	XF22S:03-1/3
8	0.5	2804A	411.JA -12	XF22S:03-16
9	0.5	4201	411.JA -15	XF22S:01-30
10	0.5	2520A	411.JA -2	XF22S:02-22

***411.JD SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	3117A	411.JD-1	XF22S:03-1/1
2	0.5	2526A	411.JD-2	XF22S:03-8
3	0.5	2050	411.JD-8	XB22S-9
4	0.5	2524A	411.JD-9	XF22S:02-26
5	0.5	4201	411.JD-15	XF22S:01-25
6	0.5	3000B	411.JD-10	XF22S:03-36
7	0.5	3008	411.JD-12	XF22S:02-50
8	0.5	2523A	411.JD-4	XF22S:02-25
9	0.5	2521A	411.JD-3	XF22S:02-23
10	0.5	2522A	411.JD-11	XF22S:02-24

***411.JG SUB D 25 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2099A	411.JG-6	XF22S:02-4
2	0.5	2099A	411.JG-7	XF22S:02-5
3	0.5	3020A	411.JG-9	XF22S:03-26
4	0.5	2099A	411.JG-10	XF22S:02-5
5	0.5	3071A	411.JG-18	XF22S:2-1/4
6	0.5	2542A	411.JG-19	XF22S:03-13
7	0.5	2532A	411.JG-20	XF22S:03-10
8	0.5	2099A	411.JG-22	XF22S:02-6
9	0.5	2807A	411.JG-23	XF22S:03-17
10	0.5	2099A	411.JG-04	XF22S:02-5
11	0.5	5672A	411.JG-17	XF22S:03-1/5

***411.JJ SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	3042	411.JJ-3	XF22S:01-21
2	0.5	4201	411.JJ-4	XF22S:01-31

3	0.5	2805	411.JJ-9	XF22S:01-1/1
4	0.5	4201	411.JJ-10	XF22S:01-31
5	0.5	3046A	411.JJ-12	XF22S:01-1/5
6	0.5	UH05	411.JJ-2	XF22S:01-52
7	0.5	2099A	411.JJ-6	XF22S:02-3
8	0.5	5673A	411.JJ-13	XF22S:03-1/6

***411.LA SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2517	411.LA-1	XF22S:01-1/4
2	0.5	2050	411.LA-8	XB22S-5
3	0.5	4243	411.LA-11	XF22S:01-41
4	0.5	4201	411.LA-15	XF22S:01-25
5	0.5	2402	411.LA-2	154-4
6	0.5	5675	411.LA-3	152-2
7	0.5	2401	411.LA-9	154-2
8	0.5	2404	411.LA-10	160-4
9	0.5	5671A	411.LA-4	XF22S:03-1/4
10	0.5	3034B	411.LA-12	XF22S:02-48

***411.LD SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	5676	411.LD-2	XF22S:01-42
2	0.5	2330A	411.LD-3	XF22S:02-12
3	0.5	2050	411.LD-8	XB22S-9
4	0.5	2312	411.LD-9	XF22S:01-3
5	0.5	3038	411.LD-10	XF22S:03-55
6	0.5	4201	411.LD-11	XF22S:01-33
7	0.5	4201	411.LD-15	XF22S:01-26
8	0.5	2405	411.LD-1	161-14
9	0.5	2088	411.LD-4	78-B
10	0.5	3035B	411.LD-12	XF22S:02-49

***411.LJ SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	3114	411.LJ-2	XF22S:01-22
2	0.5	4201	411.LJ-9	XF22S:01-32

FOR WAP 7 & 5 ONLY

4	0.5	HL01	411.LJ-6	XF22S:01-53
5	0.5	HL11	411.LJ-13	XF22S:03-57

***411.LG SUB D 25 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	4201	411.LG-2	XF22S:01-26
2	0.5	2099A	411.LG-4	XF22S:02-6
3	0.5	4201	411.LG-6	XF22S:01-33
4	0.5	2325	411.LG-10	XF22S:01-7
5	0.5	2320	411.LG-12	XF22S:03-37
6	0.5	2099A	411.LG-15	XF22S:02-7
7	0.5	2518	411.LG-18	XF22S:01-15
8	0.5	4201	411.LG-19	XF22S:01-32
9	0.5	2316	411.LG-21	XF22S:01-5
10	0.5	2326	411.LG-23	XF22S:01-8
11	0.5	2329	411.LG-24	XF22S:03-38
12	0.5	2407	411.LG-3	161-X1
13	0.5	2066	411.LG-7	XF22S:03-45
14	0.5	2311	411.LG-9	136.4A-2+
15	0.5	2506	411.LG-14	XF22S01-17
16	0.5	2503A	411.LG-17	XF22S03-47

***411.NI SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2098A	411.NI-1	XF22S:02-2
2	0.5	2050	411.NI-3	XB22S-10

***411.OA SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	3005A	411.OA-2	XF22S:03-25
2	0.5	2540A	411.OA-3	XF22S:03-11
3	0.5	3034A	411.OA-4	XF22S:03-27
4	0.5	2050	411.OA-8	XB22S-10
5	0.5	2069A	411.OA-11	XF22S:02-1/3
6	0.5	3035A	411.OA-12	XF22S:03-28
7	0.5	4202	411.OA-15	XF22S:01-34
8	0.5	2896	411.OA-10	XF22S:02-1/6
9	0.5	5671B	411.OA-1	XF22S:02-51
10	0.5	2500A	411.OA-9	XF22S:02-17

***411.OD SUB D 15 PIN**

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

No.	Section			
1	0.5	3033A	411.OD-1	XF22S:02-1/1
2	0.5	2527A	411.OD-2	XF22S:03-9
3	0.5	2521A	411.OD-3	XF22S:02-23
4	0.5	2323A	411.OD-4	XF22S:02-25
5	0.5	2050	411.OD-8	XB22S-10
6	0.5	2525A	411.OD-9	XF22S:03-7
7	0.5	2520A	411.OD-10	XF22S:02-22
8	0.5	2522A	411.OD-11	XF22S:02-24
9	0.5	5671A	411.OD-12	XF22S:03-1/4
10	0.5	4202	411.OD-15	XF22S:01-35

***411.OG SUB D 25 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2099A	411.OG-2	XF22S:02-7
2	0.5	4237A	411.OG-3	XF22S:03-1/2
3	0.5	2099A	411.OG-7	XF22S:02-08
4	0.5	2099A	411.OG-15	XF22S:02-08
5	0.5	5672A	411.OG-19	XF22S:03-1/5
6	0.5	5673A	411.OG-20	XF22S:03-1/6
7	0.5	4239A	411.OG-14	XF22S:02-45

***411.OJ SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	4202	411.OJ-2	XF22S:01-35
2	0.5	2519	411.OJ-3	XF22S:0-16
3	0.5	3115	411.OJ-9	XF22S:01-23
4	0.5	4202	411.OJ-10	XF22S:01-36

***411.QA SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2854	411.QA-1	XF22S:01-18
2	0.5	2853A	411.QA-2	XF22S:03-21
3	0.5	2857A	411.QA-3	XF22S:03-24
4	0.5	2850A	411.QA-4	XF22S:03-18
5	0.5	2050	411.QA-8	XB22S-10
6	0.5	2855A	411.QA-9	XF22S:03-22
7	0.5	2852A	411.QA-10	XF22S:03-20
8	0.5	2856A	411.QA-11	XF22S:03-23
9	0.5	2851A	411.QA-12	XF22S:03-19
10	0.5	4202	411.QA-15	XF22S:01-36

***411.QD SUB D 15 PIN**

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

No.	Section			
1	0.5	2859	411.QD-1	XF22S:01-19
2	0.5	2330B	411.QD-2	XF22S:02-13
3	0.5	2869	411.QD-3	XF22S:01-20
4	0.5	4202	411.QD-4	XF22S:01-37
5	0.5	2050	411.QD-8	XB22S-11
6	0.5	2312	411.QD-10	XF22S:01-3
7	0.5	4202	411.QD-15	XF22S:01-37
8	0.5	2870	411.QD-11	89.7-B
9	0.5	5675	411.QD-12	152-2
<u>For WAP 7 & 5 Only</u>				
10	0.5	2860	411.QD-9	XF22S:03-56

***411.QJ SUB D 15 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	2313A	411.QJ-1	XF22S:02-11
2	0.5	2325	411.QJ-4	XF22S:01-7
3	0.5	2329	411.QJ-6	XF22S:03-38
4	0.5	2316	411.QJ-9	XF22S:01-5
5	0.5	4202	411.QJ-10	XF22S:01-37
6	0.5	2326	411.QJ-12	XF22S:01-8
7	0.5	2320	411.QJ-13	XF22S:03-37
8	0.5	2509	411.QJ-3	XF22S:02-46

***411.XI SUB D 9 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	4201	411.XI-2	XF22S:01-27
2	0.5	2050	411.XI-3	XB22S-5
3	0.5	4201	411.XI-6	XF22S:01-27

***411.XG SUB D 9 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	5501	411.XG-1	381.7H-1
2	0.5	5502	411.XG-2	381.7H-2
3	0.5	5503	411.XG-3	381.7H-3
4	0.5	5504	411.XG-4	381.7H-4
5	0.5	5505	411.XG-5	381.7H-5
6	0.5	5506	411.XG-6	381.7H-6
7	0.5	5507	411.XG-7	381.7H-7
8	0.5	5508	411.XG-8	381.7H-8
9	0.5	5509	411.XG-9	381.7H-9
10	0.5	5511	411.XG-QE	381.7H-QE

***381.7H SUB D 9 PIN**

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	5501	381.7H-1	411.XG-1
2	0.5	5502	381.7H-2	411.XG-2
3	0.5	5503	381.7H-3	411.XG-3
4	0.5	5504	381.7H-4	411.XG-4
5	0.5	5505	381.7H-5	411.XG-5
6	0.5	5506	381.7H-6	411.XG-6
7	0.5	5507	381.7H-7	411.XG-7
8	0.5	5508	381.7H-8	411.XG-8
9	0.5	5509	381.7H-9	411.XG-9
10	0.5	5511	381.7H-QE	411.XG-QE

381.7F SUB D 9 PIN

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	U10A	381.7F-2	XF22S:02-37
2	0.5	U11A	381.7F-3	XF22S:02-38
3	0.5	U11A	381.7F-4	XF22S:02-38
4	0.5	U10B	381.7F-6	XF22S:02-40
5	0.5	U10B	381.7F-7	XF22S:02-40
6	0.5	U11B	381.7F-8	XF22S:02-41
7	0.5	U11B	381.7F-9	XF22S:02-41
8	0.5	U13A (SHIELD)	381.7F-10	XF22S:02-39
9	0.5	U10A	381.7F-1	XF22S:02-37
10	0.5	U10A	381.7F-5	XF22S:02-44

381.7D SUB D 4 PIN

Sl. No.	Cable Cross Section	Cable no.	Connection From	Connection To
1	0.5	4201	381.7D-1	XF22S:01-29
2	0.5	4201	381.7D-2	XF22S:01-29
3	0.5	2050	381.7D-4	XB22S:02-8
4	0.5	2050	381.7D-5	XB22S:02-8

KAVACH SB (Total 3 nos. Post. Each post consist of 25 nos. WAGO)

Cable No.	From		To		Length	Cable Size
	Wago No.	Location	Wago No.	Location		
2094 BATT+VE	XF22S:03-01/17	SB-1	XF22S:04/01	Kavach, SB	4 meter	4
2050 BATT-VE	XF22S:03-01/10	SB-1	XF22S:04/02	Kavach, SB	4 meter	4
2500A CAB1 BL KEY	XF22S:02/17	SB-1	XF22S:04/03	Kavach, SB	4 meter	2.5
2524A CAB1 FORWARD	XF22S:02/26	SB-1	XF22S:04/04	Kavach, SB	4 meter	2.5
2526A CAB1 REVERSE	XF22S:03/8	SB-1	XF22S:04/05	Kavach, SB	4 meter	1.5
E70 LE		Kavach SB	XF22S:04/11	E70	12 meter	1.5
LE GND		Kavach SB	XF22S:04/12	E70	12 meter	1.5
LE BV STATUS		Kavach SB	XF22S:04/13	E70	12 meter	1.5
LE BV STATUS FEEDBACK		Kavach SB	XF22S:04/14	E70	12 meter	1.5
NB		Kavach SB	XF22S:04/15	CCB 2.0	12 meter	1.5
NB-Ve		Kavach SB	XF22S:04/19	CCB 2.0	12 meter	1.5
FSB		Kavach SB	XF22S:04/16	CCB 2.0	12 meter	1.5
FSB-Ve		Kavach SB	XF22S:04/20	CCB 2.0	12 meter	1.5
EB		Kavach SB	XF22S:04/17	CCB 2.0	12 meter	1.5
EB-Ve		Kavach SB	XF22S:04/21	CCB 2.0	12 meter	1.5
LE		Kavach SB	XF22S:04/18	CCB 2.0	12 meter	1.5
LE-Ve		Kavach SB	XF22S:04/22	CCB 2.0	12 meter	1.5
SPARE		Kavach SB	XF22S:04/23			
SPARE		Kavach SB	XF22S:04/24			
SPARE		Kavach SB	XF22S:04/25			
BT-T +ve		Kavach SB	XF22S:04/26	CAB-1	15 meter	1.5
BP-T-ve		Kavach SB	XF22S:04/27	CAB-1	15 meter	1.5
MR-T+ve		Kavach SB	XF22S:04/28	CAB-1	15 meter	1.5
MR-T -ve		Kavach SB	XF22S:04/29	CAB-1	15 meter	1.5
BC1-T +ve		Kavach SB	XF22S:04/30	CAB-1	15 meter	1.5
BC1-T -ve		Kavach SB	XF22S:04/31	CAB-1	15 meter	1.5
BC2-T +ve		Kavach SB	XF22S:04/32	CAB-1	15 meter	1.5
BC2-T -ve		Kavach SB	XF22S:04/33	CAB-1	15 meter	1.5
CAB1 HORN		Kavach SB	XF22S:04/34	CAB-1	15 meter	1.5
CAB1 HORN BN		Kavach SB	XF22S:04/35	CAB-1	15 meter	1.5
CAB1 Vital EB +VE		Kavach SB	XF22S:04/36	CAB-1	15 meter	1.5
CAB1 Vital EB -VE		Kavach SB	XF22S:04/37	CAB-1	15 meter	1.5
CAB1 VEB COC +VE		Kavach SB	XF22S:04/38	CAB-1	15 meter	1.5
CAB1 VEB COC FB		Kavach SB	XF22S:04/39	CAB-1	15 meter	1.5
CAB1 VEB Coil Status+VE		Kavach SB	XF22S:04/40	CAB-1	15 meter	1.5
CAB1 VEB Coil Status+VE		Kavach SB	XF22S:04/41	CAB-1	15 meter	1.5
IRU1_NB		Kavach SB	XF22S:04/42	CAB-1	15 meter	1.5
IRU1_FSB		Kavach SB	XF22S:04/43	CAB-1	15 meter	1.5
IRU1_EB		Kavach SB	XF22S:04/44	CAB-1	15 meter	1.5
IRU1_GND		Kavach SB	XF22S:04/45	CAB-1	15 meter	1.5
IRU1_BYPASS +ve		Kavach SB	XF22S:04/46	CAB-1	15 meter	1.5
IRU1_BYPASS FB		Kavach SB	XF22S:04/47	CAB-1	15 meter	1.5
CAB1_Horn_Cock Status		Kavach SB	XF22S:04/48	CAB-1	15 meter	1.5
CAB1_Horn_Cock Status_FB		Kavach SB	XF22S:04/49	CAB-1	15 meter	1.5
SPARE		Kavach SB	XF22S:04/50			
CAB2 HORN		Kavach SB	XF22S:04/51	CAB-2	28 meter	1.5
CAB2 HORN BN		Kavach SB	XF22S:04/52	CAB-2	28 meter	1.5
IRU2_NB		Kavach SB	XF22S:04/53	CAB-2	28 meter	1.5

IRU2_FSB		Kavach SB	XF22S:04/54	CAB-2	28 meter	1.5
IRU2_EB		Kavach SB	XF22S:04/55	CAB-2	28 meter	1.5
IRU2_BYPASS +ve		Kavach SB	XF22S:04/56	CAB-2	28 meter	1.5
IRU2_BYPASS FB		Kavach SB	XF22S:04/57	CAB-2	28 meter	1.5
IRU2_GND		Kavach SB	XF22S:04/58	CAB-2	28 meter	1.5
CAB2_Vital_EB_+VE		Kavach SB	XF22S:04/59	CAB-2	28 meter	1.5
CAB2_Vital_EB_-VE		Kavach SB	XF22S:04/60	CAB-2	28 meter	1.5
CAB2_VEB_COC_+VE		Kavach SB	XF22S:04/61	CAB-2	28 meter	1.5
CAB2_VEB_COC_FB		Kavach SB	XF22S:04/62	CAB-2	28 meter	1.5
CAB2_VEB_Coil_Status +VE		Kavach SB	XF22S:04/63	CAB-2	28 meter	1.5
CAB2_VEB_Coil_Status FB		Kavach SB	XF22S:04/64	CAB-2	28 meter	1.5
CAB1_Horn_Cock Status		Kavach SB	XF22S:04/65	CAB-2	28 meter	1.5
CAB1_Horn_Cock Status_ FB		Kavach SB	XF22S:04/66	CAB-2	28 meter	1.5
SPARE		Kavach SB	XF22S:04/67			
SPARE		Kavach SB	XF22S:04/68			
SPARE		Kavach SB	XF22S:04/69			
SPARE		Kavach SB	XF22S:04/70			
SPARE		Kavach SB	XF22S:04/71			
SPARE		Kavach SB	XF22S:04/72			
SPARE		Kavach SB	XF22S:04/73			
SPARE		Kavach SB	XF22S:04/74			
SPARE		Kavach SB	XF22S:04/75			

**MODIFICATIONS SHEET FOR DEVELOPMENT TRACTION MOTOR
DROPPING DETECTION SYSTEM (RDSO/2023/EL/MS/0476 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	XK22V:02-59	XF22S:03-35	SB1
2	2.5	067 TM	XF22S:03-35	XK22A:02-58	SB1

Only for SB1.