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

TECHNICAL SPECIFICATION FOR
CONTROL CUBICLE-1 (SB-1)
FOR 3-PHASE ELECTRIC LOCOMOTIVES
Specification No : CLW/ES/3/0194
ISSUE DATE: 29.04.2010

Draft

ISSUED BY :

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ALTERATION RECORD SHEET

Amend. No.	Date of Amend.	Page No.	Alt.	Reason	Authority
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	Sd/-
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.	Sd/-
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	Sd/-
4.	20.02.2017		D	Specn. no. for Bare Panel has been corrected and sources are modified at sheet no. 24.	Sd/-
5.	25.05.2018		E	OEM/Part-I source is replaced by CLW Approved sources (the term only)	Sd/-
6.	21.03		F	Schematic Position and quantity has been modified and MCB for speed sensor has been deleted.	Sd/-
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.	Sd/-
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	As Signed
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	As Signed

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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	
11.	xx- 04-2026		K	(i) 35 Pin Connector at schematic position V01 of Cable Cutting Chart replaced by Set of Complete Socket / Socket 61P/40 PIN 'N' Indoor (ABB ID: HBTB315163R0011) in Annexure-I. (ii) Cable Connection Chart (Annexure -I) updated as per latest modifications. iii) Vibration test specified as essential in type test in clause No.15. iv) Verification of Routing of cables & Crimp connections added in type test & routine test in clause No.15. v) Crimp test on 5% or minimum 2 Sets per lot in routine test in clause No.15. vi) Existing Annexure-I under clause no.14 for sub components deleted and details of sub components with item ID & Specification No. added under clause. 5 for scope of supply. vii) Scope added in Clause no. 2 and Identification mark added in Clause No.13.	

The specification has been revised, digitized and all existing alteration have been incorporated.

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

1. INTRODUCTION

Control Cubicle SB-1 consists 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 converter, Auxiliary converter, and Pneumatic Panel etc. as well as control electronics. The external interface is provided through circular Connectors for easy maintenance. This specification contains technical details of the cubicle structure, equipment mounted, wiring procedure, environmental specification & acceptance test criteria. SB1 is assembled as per the drawing enclosed with this document. Drg no. 3EHP 130215

2. SCOPE

The scope of this specification covers the manufacturing and supply of Complete Control Cubicle SB-1 for Three Phase Electric Locomotives.

3. CLIMATIC AND ENVIRONMENTAL CONDITION OF LOCO

Maximum atmospheric temperatures	Under Sun : + 70°C In shade : + 50°C
Humidity	100% saturation during rainy season.
Reference site conditions	1) Ambient Temp. max 55°C, min 0°C 2) The contractor will indicate the expected temperature rise in the machine room under reference site conditions. 3) Humidity: 60 % 4) Altitude: 1776 m above mean sea level against USRBL project condition.
Rainfall	Very heavy in certain areas. The locomotive will be designed to permit its running at running at 10 km /hr in flood water level of 200 mm above rail level.
Atmosphere during hot weather	Extremely dusty and desert terrain in certain areas.
Coastal areas	Locomotive and equipment will be designed to work in coastal areas in humid and salt laden atmosphere.
Vibration.	The equipment, sub system and their mounting arrangement will be designed to withstand vibrations and shocks encountered in service as specified in IEC:61373 (Latest) corresponding unless otherwise prescribed.

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4. STANDARDS :

IEC 61373 : Shock and vibration testing of railway vehicle 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 3
EHN600385 : Min. insulation distance for basis insulation within air I
IEC 60571 : Electronic equipment for traction rolling stock

5. SCOPE OF SUPPLY

Control Cubicle SB-1 assembled as per the drawing no. 3EHP130215R0002. Sub components of the panel should be procured from approved vendors only. Details of sub components are as following

Sl. No.	Item Description	ABB Identification	UVAM Item ID	Specification No. (Latest alteration)	Qty/ Loco (Nos)	
					WAG-9	WAP-7/ WAP-5
1.	Rotary Switch - Failure Mode operation (152)	HBTB585580R1032	2100190	CLW/ES/3/0068	01	01
2.	Rotary Switch - Bogie Cut-Out (154)	HBTB585580R1022	2100190	CLW/ES/3/0068	01	01
3.	Rotary Switch - Configuration (160)	HBTB585580R0034	2100190	CLW/ES/3/0068	01	01
4.	Rotary Switch Vigilance Device (237.1)	----	2100190	CLW/ES/3/0068	01	01
5.	Illuminated Push- Button – Configuration (161	----	2100382	CLW/ES/3/0072	01	01
6.	Key Switch Simulation (179)	3EHP585704R2222	2100413	CLW/ES/3/0079	01	01
7.	Wire Resistor – Earthing screen train bus (381.71)	----	2100065	CLW/ES/3/0014	01	01
8.	Resistor to Maximum Current Relay (78.1)	NBT300213P0001	2100065	CLW/ES/3/0014	01	01
9.	Minimum Voltage Relay (86)	3EHP585821R0202	2100057	CLW/ES/3/0060	01	01
10.	Connecting Bus – Train Bus (381.7)(Not in the tenderer's scope of supply)	----	----	----	----	----
11.	Maximum Current Relay (78)	DKA210013R0037	2100039	CLW/ES/3/0059	01	01
12.	Earth Fault Relay Auxiliary Control Circuit (89.7)	HBVW400011R0001	2100061	CLW/ES/3/0090	01	01

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13.	Earthing Resistor Earth Fault Detection Control Circuit (90.7/1 90.7/2 90.7/3)	NBT300209P0063	2100065	CLW/ES/3/0014	03	03
14.	Circuit Breaker – Driver's Cab (127.3/1)	HBTB 585555 R1023	2100535	CLW/ES/3/0037	01	01
15.	Circuit Breaker – Panto/VCB Control (127.12)	HBTB 585555 R1013	2100535	CLW/ES/3/0037	01	01
16.	Circuit Breaker – Power Supply (127.91/1)	HBTB 585555 R1013	2100535	CLW/ES/3/0037	01	01
17.	Circuit Breaker – Lighting Front (310.1/1)	HBTB 585555 R1013	2100535	CLW/ES/3/0037	01	01
18.	Circuit Breaker – Electronic Traction Converter (127.1/1)	HBTB 585555 R1013	2100535	CLW/ES/3/0037	01	01
19.	Circuit Breaker –Power Supply Gate Unit (127.11/1)	HBTB 585555 R1043	2100535	CLW/ES/3/0037	01	01
20.	Circuit Breaker – Monitoring (127.2/1)	HBTB 585555 R1013	2100535	CLW/ES/3/0037	01	01
21.	Circuit Breaker – Aux. Converter-1(127.22/1)	HBTB 585555 R1013	2100535	CLW/ES/3/0037	01	01
22.	Circuit Breaker – Central Electronic-1(127.9/1)	HBTB 585555 R1013	2100535	CLW/ES/3/0037	01	01
23.	Circuit Breaker – Central Electronic-2(127.9/2)	HBTB 585555 R1013	2100535	CLW/ES/3/0037	01	01
24.	Relay Control Electronics OFF (126.5) (Type CAD32FD or similar)	3EHP585807 P12O7	2100060	CLW/ES/3/0066	01	01
25.	Snubber 126.5A	3EHW470024R0005	2100058	CLW/ES/3/0067	01	01
26.	Auxiliary Contactor VCB (136.4) (Type LC1D09 or similar)		2100095	CLW/ES/3/0040	01	01
27.	Snubber (136.4A)	3EHW470024R0005	2100058	CLW/ES/3/0067	01	01
28.	Contactor Power Supply to Cab (126.7/1) (Type LC1D128 or similar)	HBTB585683R4227	2100406	CLW/ES/3/0064	01	01
29.	Snubber (126.7A/1)	3EHW470024R0005	2100058	CLW/ES/3/0067	01	01
30.	Time Relay VCB (136.3) Type LC1D128 or similar	3EHP590028R0001	2100406	CLW/ES/3/0064	01	01

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31.	Off time delay relay				01	01
32.	Snubber (136.3A)	3EHW470024R0005	2100058	CLW/ES/3/0067	01	01
33.	Contactor For Control Electronics and Control Ckt. 'ON ' (Contactor Type - 4) (126 & 218)	HBTB585633R0820	2100100	CLW/ES/3/0034	02	02
34.	Contactor for Head Light (Contactor Type-6) (338)	HBTB585402R0821	2100100	CLW/ES/3/0034	01	01
35.	DC/DC for Converter - 2 (118.4/1)		2100403	CLW/ES/3/0054	01	01
36.	DC/DC for Converter - 2 (118.5/1)		2100403	CLW/ES/3/0054	01	01
37.	Blocking Diodes for Illumination Test (DIBLO-8) (123.1)	HBTB585480R0003	2100404	CLW/ES/3/0055	01	01
38.	Blocking Diodes (DIBLO - 5) (123/1,123/3,123/5,123/7, 123/8)	HBTB585480R0001	2100404	CLW/ES/3/0055	05	05
39.	TPBIR - Time Relay for MS 475 Rev. 2 for WAG-9	----	2100406	CLW/ES/3/0064	01	01
40.	Reset Relay for MS 475 Rev. 2 (Type LC1D09FD or similar)	----	2100095	CLW/ES/3/0040	01	01
41.	ZCAB (As Rotary Switch Configuration) for MS 475 Rev. 2	HBTB585580R0034	2100190	CLW/ES/3/0068	01	01
42.	Rack – Central Electronics (CEL1) (411) (Not in tenderer's scope of supply)	----	----	----	----	----
43.	Wago Type Terminal Block	----	2100171	CLW/ES/3/0644		
44.	Bare SB-1 Panel	----	2100237	CLW/MS/3/098	01	01
45.	2 Amps, 250 V Fuse	----	2101001	CLW/ES/F-8	03	03
46.	VS Diode similar to Train parting Diode 12 amps	----	2100779	CLW/ES/D-2		
47.	Aux. Contact block 2NO+2NC	----	2100060	CLW/ES/3/0066	01	01
48.	Cable tie	----	2100293	CLW/ES/3/0131	01	01
49.	Base for Cable Tie	----	2100133	CLW/ES/3/0131	----	----
50.	Bus bar	----	2100309	CLW/ES/3/0118	----	----
51.	Exp. Insulated Tube	----	2100234	CLW/ES/3/0154	----	----
52.	Shrinkdown Sleeve	----	2100048	CLW/ES/3/0154	----	----

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53.	Hardwares	----	2100233	CLW/MS/10/053 CLW/MS/3/040 CLW/ES/3/184	----	----
54.	Set of Non Metallic Plate	----	2100188	CLW/ES/3/0451	----	----
55.	Connectors	----	2100197	CLW/ES/3/0124	----	----
56.	Cable Lug	----	2100250	CLW/ES/3/0130	----	----
57.	Copper sleeves	----	2100320	CLW/ES/3/0205	----	----
58.	Faston Lug	----	2100259	CLW/ES/3/0643	----	----
59.	Rating Plate	----	2100516	CLW/ES/3/0252	----	----
60.	Cable Conduit	----	2100167	CLW/ES/3/0127	----	----

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Mechanical structure complete with following:

- 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.

6. LIST OF ELECTRICAL COMPONENTS

The following electrical components which are mounted in the cubicle shall be supplied by the panel supplier. Only the makes specified in CLW/BLW/RDSO approved UVAM 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		DKA210013R0037
Details			
	Manufacturer		As per CLW approved Vendor Directory on UVAM
	Nominal Data		2.5 A/ 3.3 A – 50 Hz

Resistor to Maximum Current Relay 50 W			
	Scheme Position	:	78.1
	Required Number		01

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	Identification		NBT300213P0001
Details			
	Manufacturer		As per CLW approved Vendor Directory on UVAM
	Nominal Data		1.0 ohm +15/-5%, 50 W

Minimum Voltage Relay			
	Scheme Position	:	86
	Required Number	:	01
	Identification	:	3EHP585821R0202
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	200 V/140 V-47 … 63 Hz

Earth Fault Relay Auxiliary Control Circuit			
	Scheme Position	:	89.7
	Required Number	:	01
	Identification	:	HBVW400011R0001
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	150 mA-43 ohm +/- 10 %

Earthing Resistor Earth Fault Detection Control Circuit			
	Scheme Position	:	90.7
	Required Number	:	3
	Identification	:	NBT300209P0063
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	390 Ohm +/- 10 %, 100 W

DC/DC for Converter - 1			
	Scheme Position	:	118.4/1
	Required Number	:	01
	Identification	:	3EHP590001R0100
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	58…144 V DC -3 A- 48 V DC

DC/DC for Converter - 2			
	Scheme Position	:	118.5
	Required Number	:	01

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	Identification	:	3EHP590001R0090
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	31…144 V DC -3A- 24 V DC

Blocking Diodes (DIBLO - 5)			
	Scheme Position	:	123
	Required Number	:	05
	Identification	:	HBTB585480R0001
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	1.5 A-1600 V- 5 DIOD

Socket			
	Scheme Position	:	123, 123.1
	Required Number	:	05
	Identification	:	HBT415175P0001
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	14 Poles – 6 A – 240 V AC

Fixation			
	Scheme Position	:	123, 123.1
	Required Number	:	05
	Identification	:	HBT415177P0001
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	76 MM HIGH – 82 MM BR

Contact 1.0 mm^2			
	Scheme Position	:	123, 123.1
	Required Number	:	70
	Identification	:	HBT415176P0001
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	1.0 mm2 -0 GROOVE

Blocking Diodes for Illumination Test (DIBLO- 8)			
	Scheme Position	:	123.1
	Required Number	:	01

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	Identification	:	HBTB585480R0003
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	0.3 A-1400 V – 8 DIOD

Contactor For Control Electronics and Control Ckt. 'ON ' (Contactor Type - 4)			
	Scheme Position	:	126, 218
	Required Number	:	02
	Identification	:	HBTB585633R0820
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	110 V DC –NO

Relay For Control Electronics Off / Temperature			
	Scheme Position	:	126.5
	Required Number	:	01
	Identification	:	3EHP585807P1207
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	-

Snubber Circuit			
	Scheme Position	:	126.5A, 126.7A, 136.3A, 136.4A
	Required Number	:	04
	Identification	:	3EHW470024R0005
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	110/120 V DC

Time Relay for VCB With Aux. Contacts			
	Scheme Position	:	126.7, 136.3
	Required Number	:	02
	Identification	:	HBTB585683R4227
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	

Accessories (Relay)			
	Scheme Position	:	126.7

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	Required Number	:	01
	Identification	:	3EHP585771R0006
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	2 NO, 2 NC

Circuit Breaker DC			
	Scheme Position	:	127.1/1, 127.12, 127.2/1, 127.9/1, 127.9/2, 127.91/1, 310.1/1
	Required Number	:	07
	Identification	:	HBTB585555R1013
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	6 A – 250 VDC-1 POLE

Circuit Breaker DC			
	Scheme Position	:	127.11
	Required Number	:	01
	Identification	:	HBTB585555R1043
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	20 A – 250 VDC-1 POLE

Circuit Breaker DC			
	Scheme Position	:	127.3/1 ,127.22/1
	Required Number	:	02
	Identification	:	HBTB585555R1023
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	10 A – 250 VDC-I POLE

Time Delay Module			
	Scheme Position	:	136.3
	Required Number	:	03
	Identification	:	3EHP590028R0001
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	0,1……2 S - 24…..250 V

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	Scheme Position	:	136.4
	Required Number	:	02
	Identification	:	HBTB585683R1127
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	9A/25 A-750 V – 3 POLES

Rotary Switch - Failure Mode operation			
	Scheme Position	:	152
	Required Number	:	01
	Identification	:	HBTB585580R1032
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	I O- 90 DEG

Rotary Switch - Bogie Cut-Out			
	Scheme Position	:	154
	Required Number	:	01
	Identification	:	HBTB585580R1022
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	NORM I I+II II-90 GD

Rotary Switch - Configuration			
	Scheme Position	:	160, 237.1, VCU Reset
	Required Number	:	03
	Identification	:	HBTB585580R0034
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	O I- 90 GD

Illuminated Push- Button – Configuration			
	Scheme Position	:	161
	Required Number	:	01
	Identification	:	3EHP585818P2151
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	YELLOW – BLACK – BEZEL

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Multi-LED			
	Scheme Position	:	161
	Required Number	:	01
	Identification	:	3EHP585726P0024
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	18 mA-24 VDC-YELLOW

Key Switch Simulation			
	Scheme Position	:	179
	Required Number	:	01
	Identification	:	3EHP585704R2222
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	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	:	As per CLW approved Vendor Directory on UVAM
	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
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	3 X SUB-D 9 POLES

RESISTOR 25 W			
	Scheme Position	:	381.71
	Required Number	:	01
	Identification	:	NBT300207P0097
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	10 Kohm- 25 W

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6U RACK including PCBS (Not included in tenderer's scope of supply)			
	Scheme Position	:	411
	Required Number	:	01
	Identification	:	3EHL409256R0001
Details			
	Manufacturer	:	As per CLW approved Vendor Directory on UVAM
	Nominal Data	:	-

7. WIRING AND CABLING

1. The cables for wiring within the cubicle will be of Electron Beam irradiated cross linked Thin walled cables from RDSO approved vendors under UVAM Item ID: 3100272with strict compliance of governingspecification**.**
2. All connections will be connected on terminals of components 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.
4. Cables for terminal connections will have only crimped joints with Cable Lugs/ Copper Sleeves/ Faston Lugs, whichever is applicable. These items should strictly procured from approved vendors only as per governing specification.
5. Termination on WAGO type terminal blocks of cables, should be with Copper Sleeves. Fork type termination shall not be used.
6. Cable length and routing should be done in such a way that stress at termination point should be eliminated.
7. Transparent sleeves should be provided over the printed sleeves to avoid erasing of cable identification mark.

8. SHEET METAL STRUCTURE

The cubicle is of detachable type and shall comply with the dimensions and tolerances specified in relevant part drawings documents. 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.

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9. ENVIRONMENTAL AND OPERATIONAL CONDITIONS

The SB1 Cubicle shall be used under the following conditions :

9.1 Environmental conditions

Environmental condition within the machine room :

Air circulation	:	Weak forced cooling
Operational temperature	:	0…+65°C
Environmental air	:	Salty, dusty
Air humidity	:	Condensation possible

9.2 Operational conditions

Operation time :

Daily approx.	:	16 hours (approx. 330 days per year)
Yearly approx.	:	5.280 hours
Within 30 years approx	:	158, 400 hours

9.3 Reliability

Operation condition	:	according to 8.2
Availability rate	:	98%
Lifetime of the loco	:	min. 30 years (Maintenance, spare parts, lifetime)

10. TEST CONDITIONS

10.1 TYPE TESTING:

a. 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.
b. Certificate for fasteners used and their material to be produced and supplied along with supplies.
c. Welding to be checked properly as per an approved test plan, which will be given to successful tenderer.
d. Panel should be electrically tested after wiring as per relevant standards to be passed on to the successful tenderer.

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e. 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 is required. Such approval will be given only after a thorough type test and field validation.

10.2 ROUTINE TESTING:

The cubicle will be tested for the following routine test:

1. Integrity and completeness.
2. Testing of inter-connections and functionality of different sub-assemblies within the panel.
3. 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.
4. Complete cubicle and electrical items will be tested as per relevant standards.

10.3 Details of Type & Routine test are given clause no. 12.

11. INSPECTION

1. The Type inspection will be carried out by authorized representative of Design wing of CLW/ BLW and routine inspection by CLW/BLW/TPI.
2. The purchaser may carry out stage inspection during inspection of components, cabling or assembly stage of complete cubicle.

12. Tests

Sl No.	Description	Type Test	Routine Test
I.	Dimensional Checking	Yes	Yes
II.	Verification of Routing of cables & Crimp connections	Yes	Yes
III.	Verification of Electrical & Mechanical equipments and its test reports	Yes	Yes
IV.	Complete Continuity test as per cable connection chart	Yes	Yes *(100%)*
V.	Fire –retardant test of all insulating material	Yes	No
VI.	Measurement of resistance	Yes	Yes
VII.	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 cable crimped with Contact Pins, Cable Lugs, Copper Sleeves, Faston Lugs as per requirements of EN50343 (Latest)	*****Yes	*****Yes 5% or minimum 2 Sets per lot
VIII.	Vibration Test	Yes	No

***** *Sample cable of each size* crimped with Contact Pins/Cable Lugs/Copper Sleeves/ Faston Lugs *are to be prepared in front of the inspecting official which shall be tested as per EN 50343*

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(Latest) for crimping quality in house with calibrated testing equipment

13. IDENTIFICATION MARK

Following details shall be provided on equipment:

- Name of the firm
- Equipment serial no.
- Month & year of manufacture

14. SUBMISSION OF TENDER QUOTATION

14.1 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.

14.2 Quotation shall not be considered complete unless all information is furnished and therefore liable to be rejected.

15. TECHNICAL DOCUMENTS TO BE SUPPLIED BY THE SUPPLIER:

i) Type Test Reports
ii) Routine test report along with each set
iii) Detailed drawing

.

16. IMPORTANT INFORMATIONS

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

16.2 The Cable and terminal connections will have only proper crimping joints with Cable Lugs/ Copper Sleeves/ Faston Lugs, whichever is applicable.

16.3 Firm should ensure that subject item being supplying with all latest modifications.

16.4 Firm should regular follow RDSO link https://rdso.indianrailways.gov.in/view_section.jsp?lang=0&id=0,4,6523,7086,7087,7092,7133,7140 for latest modifications.

16.5 All modification have to be incorporated by the firm in consultation with CLW at firms own cost and without any financial repercussion on Railways.

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

17. Reference

a. ABB Document No. 3EHP431440, 3EHP130215 & 3EHP601578.
b. Document of cable list of Control Cubicle SB-1: 3EHP431440 along with MO.18 Identification no. of Control Cubicle SB-1: 3EHP130215.
c. Identification no of Cable loom 3EHP601578.

Note: The above mentioned references are given for guidance only

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ANNEXURE-I

Cable Connection chart of Control Cubicle SB1 for WAG9/ WAP7/WAP5

61 PIN / 16 GRADE XK22V :01 (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	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	XK22V:01-27	211.1/1-Q2
28.	1.5	2511	XK 22V:01-28	86-18-U
29.	1.5	2515	XK 22V:01-29	XF 22S:02-47
30.	1.5	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
36.	1.5	2069A	XK 22V:01-45	XF 22S:02-28 (MS 475 Rev.2)

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37.	1.5	2069B	XK 22V:01-46	136.4-21 (MS 475 Rev.2)
38.	1.5	SLAVE A	XK 22V:01-47	XF 22S:02-29 (MS 475 Rev.2)
39.	1.5	SLAVE A	XK 22V:01-48	XK 22A:02-49 (MS 475 Rev.2)
40.	1.5	SLAVE B	XK 22V:01-49	XF 22S:02-30 (MS 475 Rev.2)
41.	1.5	2069D	XK 22V:01-52	XF 22S:01-56 (MS 475 Rev.2)
42.	1.5	2069E	XK 22V:01-53	XF 22S:01-57 (MS 475 Rev.2)
43.	1.5	5671	XK 22V:01-54	XF 22S:01-58 (MS 475 Rev.2)
44.	1.5	2331 AR	XK 22V:01-36	XF22S:02-33
45.	1.5	2050 AR	XK 22V:01-37	XF22S:03-62
46.	1.5	2111 AR	XK 22V:01-38	XF22S:02-36
47.	1.5	2500 AR	XK 22V:01-39	XF22S:02-31
48.	1.5	2503 AR	XK 22V:01-40	XF22S:02-32
49.	1.5	4242 AR	XK 22V:01-41	XF22S:02-34
50.	1.5	5672 AR	XK 22V:01-42	XF22S:02-58
51.	1.5	5671 AR	XK 22V:01-43	XF22S:02-57
52.	1.5	2069A	XK 22V:01-45	Reset PB-14 (Mod 475) WAP-7
53.	1.5	2069B	XK 22V:01-46	136.4-21 (Mod 475) WAP-7
54.	1.5	3048	XK 22V:01-47	Timer-18 (Mod 475) WAP-5

61 PIN / 16 GRADE XK22V :02 (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	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

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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-L
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	2516A	XK 22A:01-28	XK 22V:02-35
37.	1.5	2861B	XK 22V:02-36	XK 22F-11
38.	1.5	2862B	XK 22V:02-37	XK 22F-13
39.	1.5	2863B	XK 22V:02-38	XK 22F-15
40.	1.5	3046A	XK 22V:02-39	XF 22S:01-1/5
41.	2.5	3064A	XK 22V:02-40	XK 22A:02-15
42.	2.5	3065A	XK 22V:02-41	XK 22A:02-16
43.	2.5	3066A	XK 22V:02-42	XK 22A:02-17
44.	2.5	3067A	XK 22V:02-43	XK 22A:02-18
45.	1.5	3549A	XK 22V:02-44	XF 22S:03-30
46.	1.5	3549B	XK 22V:02-45	XF 22S:03-39
47.	2.5	5108A	XK 22V:02-46	XK 22R-14
48.	2.5	5108B	XK 22V:02-47	XK 22R-16
49.	1.5	3101A	XK 22V:02-61	XF 22S:01-1/6
50.	1.5	UH06	XK 22V:02-48	XF 22S:02-52
51.	1.5	UH07	XK 22V:02-49	XF 22S:02-53
52.	1.5	UH08	XK 22V:02-50	XF 22S:02-54
53.	1.5	UH09	XK 22V:02-51	XF 22S:02-55
54.	1.5	UH10	XK 22V:02-52	XF 22S:02-56
55.	1.5	UH11	XK 22V:02-53	XF 22S:03-53

56.	1.5	UH12	XK 22V:02-54	XF 22S:03-54
57.	1.5	2806	XK 22V:02-55	XF 22S:03-55
58.	1.5	2860	XK 22V:02-56	XF 22S:03-56
59.	1.5	Hl01	XK 22V:02-57	XF 22S:01-53
60.	1.5	Hl02	XK 22V:02-58	XF 22S:01-54

22 PIN / 12 GRADE XK22V :03 (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	2069B	XK22V:03-1	130.1-21 (To be deleted)
2.	1.5	2069B	XK22V:03-2	136.4-21 (To be deleted)
3.	2.5	2340	XK 22V:03-6	XK 22R-1
4.	1.5	2320	XK 22V:03-7	136.3-R2
5.	1.5	2329	XK 22V:03-8	XK 22D:02-8
6.	2.5	5101B	XK 22V:03-9	XK 22R-15
7.	2.5	5101A	XK 22V:03-10	XK 22R-10
8.	1.5	3551 B	XK 22V:03-11	XF 22S:02-1/6 (MS- 500)
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	3542C	XK 22V:03-16	XF 22S:03-41
14.	1.5	3542D	XK 22V:03-17	XF 22S:03-42
15.	1.5	3034B	XK 22V:03-18	XF 22S:02-48
16.	2.5	3035B	XK 22V:03-19	XF 22S:02-49
17.	1.5	3008	XK 22V:03-20	XF 22S:02-50
18.	1.5	5671B	XK 22V:03-21	XF 22S:02-51
19.		3037	XK 22V:03-22	XF 22S:03-29 (BLCP in direct mode)
20.	1.5	UH01	XK 22V:03-01	XF 22S:01-48
21.	1.5	UH02	XK 22V:03-02	XF 22S:01-49
22.	1.5	UH03	XK 22V:03-03	XF 22S:01-50
23.	1.5	UH04	XK 22V:03-04	XF 22S:01-51
24.	1.5	UH05	XK 22V:03-05	XF 22S:01-52
25.	1.5	3035A	XK 22V:03-22	XF 22S:03-32

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

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	2896 + 2890	XF22S:02-1/6	XF22S:03-33 Link to be removed (MS 500)

PIN / 12 GRADE XK22D:02(For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	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	XK 22V:03-8
8.	1.5	2329	XK 22D:02-8	XF 22S:03-38
9.	2.5	3533	XK 22D:02-9	XK 22D:01-7
10.	2.5	3533	XK 22D:02-9	XK 22D:03-7
11.	1.5	2099A	XK 22D:02-10	XF 22S:02-3
12.	1.5	2099B	XK 22D:02-11	XK 22V:02-26
13.	1.5	2330A	XK 22D:02-12	XF 22S:02-12
14.	1.5	2330B	XK 22D:02-13	XF 22S:02-13
15.	1.5	2331A	XK 22D:02-14	XK 22A:01-22
16.	1.5	2331B	XK 22D:02-15	XK 22V:02-28

35 PIN / 12 GRADE XK22R (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	2.5	2340	XK 22R-1	XK 22V:03-6
2.	2.5	2340	XK 22R-1	XK 22R-4
3.	2.5	2098A	XK 22R-2	XK 22H-13
4.	1.5	2320	XK 22R-3	XF 22S:03-37
5.	2.5	2320	XK 22R-3	XK 22V:01-22
6.	2.5	2340	XK 22R-4	XK 22R-1
7.	1.5	2325	XK 22R-5	XF 22S:01-7
8.	2.5	2601A	XK 22R-6	XK 22R-7
9.	2.5	2601A	XK 22R-6	127.11/1-2
10.	2.5	2601A	XK 22R-7	XK 22R-6
11.	2.5	2050	XK 22R-8	XB 22S-6

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12.	2.5	2050	XK 22R-9	XB 22S-6
13.	2.5	5101A	XK 22R-10	XK 22V:03-10
14.	2.5	5101A	XK 22R-10	127.1/1-2
15.	2.5	2050	XK 22R-11	XB 22S-6
16.	1.5	5209	XK 22R-12	XK 22V:02-21
17.	1.5	5210	XK 22R-13	XK 22V:02-22
18.	2.5	5108A	XK 22R-14	XK 22V:02-46
19.	2.5	5101B	XK 22R-15	XK 22V:03-9
20.	2.5	5108B	XK 22R-16	XK 22V:02-47
21.	1.5	2864	XK 22R-17	XK 22F-5
22.	2.5	2864	XK 22R-17	XK 22V:01-35
23.	2.5	2866	XK 22R-18	XK 22V:02-1
24.	1.5	2866	XK 22R-18	XK 22F-6
25.	2.5	2867	XK 22R-19	XK 22V:02-2
26.	1.5	2867	XK 22R-19	XK 22F-7
27.	1.5	2861A	XK 22R-20	XK 22F-10
28.	1.5	2862A	XK 22R-21	XK 22F-12
29.	1.5	2863A	XK 22R-22	XK 22F-14

35P/12 GRADE XK22HL (For WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	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:02-54
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 (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	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	2864	XK 22F-5	XK 22R-17
6.	1.5	2866	XK 22F-6	XK 22R-18
7.	1.5	2867	XK 22F-7	XK 22R-19
8.	1.5	2869	XK 22F-8	XF22S:01-20
9.	1.5	2801A	XK 22F-9	XF22S:03-14
10.	1.5	2861A	XK 22F-10	XK 22R-20
11.	1.5	2861B	XK 22F-11	XK 22V:02-36
12.	1.5	2862A	XK 22F-12	XK 22R-21
13.	1.5	2862B	XK 22F-13	XK 22V:02-37
14.		2863A	XK 22F-14	XK 22R-22
15.	1.5	2863B	XK 22F-15	XK 22V:02-38

35 PIN / 12 GRADE XK22H (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	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.	2.5	2050	XK22H-2	XK 22H-1
4.	1.5	2808	XK 22H-3	XK 22V:01-31
5.	1.5	2809	XK 22H-4	XK 22V:01-32
6.	1.5	2817	XK 22H-5	XK 22V:01-33
7.	1.5	2819	XK 22H-6	XK 22V:01-34
8.	1.5	2854	XK 22H-7	XF22S:01-18
9.	1.5	2859	XK 22H-8	XF22S:01-19
10.	1.5	2874	XK 22H-9	XK 22V:02-3
11.	1.5	2894	XK 22H-10	XK 22V:02-4
12.	1.5	5091	XK 22H-11	XK 22V:02-19
13.	1.5	5091	XK 22H-11	127.22/1-2
14.	1.5	5092	XK 22H-12	XK 22V:02-20
15.	2.5	2098A	XK 22H-13	XK 22R-2
16.	2.5	2098A	XK 22H-13	XF22S:02-2
17.	1.5	2801A	XK 22H-14	XF22S:03-14
18.	1.5	2850A	XK 22H-15	XF22S:03-18
19.	1.5	2851A	XK 22H-16	XF22S:03-19
20.	1.5	2852A	XK 22H-17	XF22S:03-20
21.	1.5	2853A	XK 22H-18	XF22S:03-21
22.	1.5	2855A	XK 22H-19	XF22S:03-22
23.	1.5	2856A	XK 22H-20	XF22S:03-23
24.	1.5	2857A	XK 22H-21	XF22S:03-24
25.	1.5	3037A	XK 22H-22	XF22S:03-29
26.	1.5	2840A	XK 22H-23	XF22S:02-1/5
27.	1.5	2896	XK 22H-25	XF22S:02-1/6 To be removed MS 500

28.	1.5	2890	XK 22H-24	XF22S:03-33 To be disconnected MS 500
29.	2.5	2876	XK 22H-26	XK 22V:03-12
30.	1.5	2877B	XK 22H-27	XK22V:03-13
31.	1.5	2877A	XK 22H-28	XK22V:03-14
32.	1.5	5094	XK 22H-29	XK 22V:03-15

35 PIN / 12 GRADE XK22A:01 (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	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.	1.5	3097	XK 22A:01-4	XK 22V:02-9
5.	2.5	2050	XK 22A:01-5	XB22S-1
6.	2.5	2050	XK 22A:01-6	XB22S-1
7.	1.5	2063	XK 22A:01-7	XK 22V:01-5
8.	1.5	2067	XK 22A:01-8	XK 22V:01-7
9.	1.5	2069	XK 22A:01-9	XF22S:01-1
10.	1.5	2300	XK 22A:01-10	XK 22V:01-17
11.	1.5	2310	XK 22A:01-11	XK 22V:01-18
12.	1.5	3001	XK 22A:01-12	XK 22V:02-6
13.	2.5	3054	XK 22A:01-13	XK22D:03-4
14.	1.5	3530	XK 22A:01-14	XK 22V:02-10
15.	1.5	4218	XK 22A:01-15	XK 22V:02-13
16.	1.5	4234	XK 22A:01-16	XK 22V:02-14
17.	1.5	4235	XK 22A:01-17	XK 22V:02-15
18.	1.5	4235	XK 22A:01-17	XF22S:01-38
19.	1.5	2097A	XK 22A:01-18	XF22S:02-1
20.	1.5	2099A	XK 22A:01-19	XF22S:02-3
21.	2.5	2111A	XK 22A:01-20	XF22S:02-10
22.	1.5	2111A	XK 22A:01-20	126.7/1-2
23.	1.5	2313A	XK 22A:01-21	XF22S:02-11
24.	1.5	2331A	XK 22A:01-22	XK 22D:02-14
25.	1.5	2331A	XK 22A:01-22	XF22S:02-14
26.	1.5	2333A	XK 22A:01-23	XF22S:02-15
27.	1.5	2334A	XK 22A:01-24	XF22S:02-16
28.	1.5	2500A	XK 22A:01-25	XF22S:02-17
29.	1.5	2503A	XK 22A:01-26	XK 22V:02-30
30.	1.5	2503A	XK 22A:01-26	XF22S:02-19
31.	1.5	2514A	XK 22A:01-27	XK 22V:02-34

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32.	1.5	2514A	XK 22A:01-27	XF22S:02-21
33.	1.5	2516A	XK 22A:01-28	XK 22V:02-35
34.	1.5	2520A	XK 22A:01-29	XF22S:02-22
35.	1.5	2521A	XK 22A:01-30	XF22S:02-23
36.	1.5	2522A	XK 22A:01-31	XF22S:02-24
37.	1.5	2523A	XK 22A:01-32	XF22S:02-25
38.	1.5	2524A	XK 22A:01-33	XF22S:02-26
39.	1.5	2525A	XK 22A:01-34	XF22S:03-7
40.	1.5	2526A	XK 22A:01-35	XF22S:03-8

61 PIN / 16 GRADE XK22A:02 (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	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 Only for WAP-5 (Parking Brake)
15.	2.5	3064A	XK 22A:02-15	XK 22V:02-40
16.	2.5	3065A	XK 22A:02-16	XK 22V:02-41
17.	2.5	3066A	XK 22A:02-17	XK 22V:02-42
18.	2.5	3067A	XK 22A:02-18	XK 22V:02-43
19.	1.5	3069A	XK 22A:02-19	XF22S:02-1/3
20.	1.5	3071A	XK 22A:02-20	XF22S:02-1/4 Only for WAP-5 (Parking Brake)
21.	1.5	3117A	XK 22A:02-26	XF22S:03-1/1
22.	1.5	3501A	XK 22A:02-27	XF22S:01-43
23.	1.5	3543A	XK 22A:02-28	XF22S:01-46
24.	1.5	3544A	XK 22A:02-29	XF22S:01-47
25.	2.5	3549A	XK 22A:02-30	XF22S:03-43
26.	1.5	3554A	XK 22A:02-31	XF22S:03-46
27.	1.5	4211A	XK 22A:02-32	XF22S:01-45

28.	1.5	4232A	XK 22A:02-33	XF22S:03-31
29.	1.5	4237A	XK 22A:02-34	XF22S:03-1/2
30.	1.5	4242A	XK 22A:02-35	XF22S:03-1/3
31.	1.5	5671A	XK 22A:02-36	XF22S:03-1/4
32.	1.5	5672A	XK 22A:02-37	XF22S:03-1/5
33.	1.5	5673A	XK 22A:02-38	XF22S:03-1/6
34.	1.5	3551A	XK 22A:02-54	XF22S:01-55 MS 500
35.	1.5	3549A	XK22A:02-59	XF22S:03-30 (Mod.Of Twin Beam Headlight)
36.	1.5	3542A	XK 22A:02-61	XF22S:03-40
37.				
38.	1.5	2069A	XK 22A::02-47	XF22S:02-28 (UIC-2) (MS 475 Rev.2)
39.	1.5	SLAVE A	XK 22A::02-48	XF22S:02-29 (UIC-3) (MS 475 Rev.2)
40.	1.5	SLAVE A	XK 22A::02-49	XK 22V:01-48 (MS 475 Rev.2)
41.	1.5	2500AR	XK 22A:02-39	XF22S:03-48
42.	1.5	2503AR	XK 22A:02-40	XF22S:03-49
43.	1.5	2331AR	XK 22A:02-41	XF22S:03-50
44.	1.5	4242AR	XK 22A:02-42	XF22S:03-51
45.	1.5	2111AR	XK 22A:02-43	XF22S:02-36
46.	1.5	5671AR	XK 22A:02-44	XF22S:02-57
47.	1.5	5672AR	XK 22A:02-45	XF22S:02-58
48.	1.5	2050AR	XK 22A:02-50	XF22S:03-62

13 PIN / 12 GRADE XK22D:01 (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	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
4.	2.5	3054	XK 22D:01-4	XK 22V:02-8
5.	2.5	3054	XK22D:01-4	XK 22D:01-1
6.	2.5	3531	XK 22D:01-5	XK22D:03-5
7.	2.5	3532	XK 22D:01-6	XK22D:03-6
8.	2.5	3533	XK 22D:01-7	XK 22D:02-9

13 PIN / 12 GRADE XK22D:03 (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To

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1.	2.5	3533	XK22D:03-1	XK22D:03-7
2.	2.5	2050	XK22D:03-3	XB22S-2
3.	2.5	3054	XK22D:03-4	XK 22A:01-13
4.	2.5	3054	XK22D:03-4	XK 22D:01-1
5.	2.5	3531	XK22D:03-5	XK 22D:01-5
6.	2.5	3532	XK22D:03-6	XK 22D:01-6
7.	2.5	3533	XK 22D:03-7	XK 22D:02-9
8.	2.5	3533	XK22D:03-7	XK22D:03-1

22 PIN / 12 GRADE XK22U:01 (For WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	(5x4x1) +2	2500A	XK22U:01-1	XF22S:02-27
2.	(5x4x1) +2	2503A	XK22U:01-2	XF22S:02-28
3.	(5x4x1) +2	2331A	XK22U:01-3	XF22S:02-29
4.	(5x4x1) +2	4242A	XK22U:01-4	XF22S:02-30
5.	(5x4x1) +2	2500AR	XK22U:01-5	XF22S:02-31
6.	(5x4x1) +2	2503AR	XK22U:01-6	XF22S:02-32
7.	(5x4x1) +2	2331AR	XK22U:01-7	XF22S:02-33
8.	(5x4x1) +2	4242AR	XK22U:01-8	XF22S:02-34
9.	(5x4x1) +2	2111A	XK22U:01-9	XF22S:02-35
10.	(5x4x1) +2	U10A	XK22U:01-10	XF22S:02-37
11.	(5x4x1) +2	U11A	XK22U:01-11	XF22S:02-38
12.	(5x4x1) +2	2111AR	XK22U:01-12	XF22S:02-36
13.	(5x4x1) +2	U13A	XK22U:01-13	XF22S:02-39
14.	(5x4x1) +2	2050AR	XK22U:01-14	XF22S:03-62
15.	(5x4x1) +2	5672A	XK22U:01-15	XF22S:02-60
16.	(5x4x1) +2	5672AR	XK22U:01-16	XF22S:02-58
17.	(5x4x1) +2	5671AR	XK22U:01-17	XF22S:02-57
18.	(5x4x1) +2	5671A	XK22U:01-18	XF22S:02-59
19.	(5x4x1) +2	SPARE 19	XK22U:01-19	SPARE
20.	(5x4x1) +2	SPARE 20	XK22U:01-20	SPARE
21.	(5x4x1) +2	SPARE 21	XK22U:01-21	SPARE
22.	(5x4x1) +2	SPARE 22	XK22U:01-22	SPARE

13 PIN / 12 GRADE XK22U:01 (For WAG-9)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	(3x4x1) +1	U01	XK22U:01-1	XF22S:02-27
2.	(3x4x1) +1	U02	XK22U:01-2	XF22S:02-28
3.	(3x4x1) +1	U03	XK22U:01-3	XF22S:02-29
4.	(3x4x1) +1	U04	XK22U:01-4	XF22S:02-30
5.	(3x4x1) +1	U05	XK22U:01-5	XF22S:02-31

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6.	(3x4x1) +1	U06	XK22U:01-6	XF22S:02-32
7.	(3x4x1) +1	U07	XK22U:01-7	XF22S:02-33
8.	(3x4x1) +1	U08	XK22U:01-8	XF22S:02-34
9.	(3x4x1) +1	U09	XK22U:01-9	XF22S:02-35
10.	(3x4x1) +1	U10A	XK22U:01-10	XF22S:02-37
11.	(3x4x1) +1	U11A	XK22U:01-11	XF22S:02-38
12.	(3x4x1) +1	U12A	XK22U:01-12	XF22S:02-36
13.	(3x4x1) +1	U13A	XK22U:01-13	XF22S:02-39

22 PIN/ 12 GRADE XK22U: 02(For WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	(5x4x1) +2	2500A	XK22U:02-1	XF22S:02-27
2.	(5x4x1) +2	2503	XK22U:02-2	XF22S:02-28
3.	(5x4x1) +2	2331A	XK22U:02-3	XF22S:02-29
4.	(5x4x1) +2	4242A	XK22U:02-4	XF22S:02-30
5.	(5x4x1) +2	2500AR	XK22U:02-5	XF22S:02-31
6.	(5x4x1) +2	2503AR	XK22U:02-6	XF22S:02-32
7.	(5x4x1) +2	2331AR	XK22U:02-7	XF22S:02-33
8.	(5x4x1) +2	4242AR	XK22U:02-8	XF22S:02-34
9.	(5x4x1) +2	2111A	XK22U:02-9	XF22S:02-35
10.	(5x4x1) +2	U10B	XK22U:02-10	XF22S:02-40
11.	(5x4x1) +2	U11B	XK22U:02-11	XF22S:02-41
12.	(5x4x1) +2	2111AR	XK22U:02-12	XF22S:02-36
13.	(5x4x1) +2	U13B	XK22U:02-13	XF22S:02-42
14.	(5x4x1) +2	2050AR	XK22U:02-14	XF22S:03-62
15.	(5x4x1) +2	5672A	XK22U:02-15	XF22S:02-60
16.	(5x4x1) +2	5672AR	XK22U:02-16	XF22S:02-58
17.	(5x4x1) +2	5671AR	XK22U:02-17	XF22S:02-57
18.	(5x4x1) +2	5671A	XK22U:02-18	XF22S:02-59
19.	(5x4x1) +2	SPARE 19	XK22U:02-19	SPARE
20.	(5x4x1) +2	SPARE 20	XK22U:02-20	SPARE
21.	(5x4x1) +2	SPARE 21	XK22U:02-21	SPARE
22.	(5x4x1) +2	SPARE 22	XK22U:02-22	SPARE

13 PIN / 12 GRADE XK22U: 02 (For WAG-9)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	(3x4x1) +1	U01	XK22U:02-1	XF22S:02-27
2.	(3x4x1) +1	U02	XK22U:02-2	XF22S:02-28
3.	(3x4x1) +1	U03	XK22U:02-3	XF22S:02-29

Prepared by	Checked by	Approved by
SSE/D/Elect.	AEE/D-II	Dy.CEE/D-II

4.	(3x4x1) +1	U04	XK22U:02-4	XF22S:02-30
5.	(3x4x1) +1	U05	XK22U:02-5	XF22S:02-31
6.	(3x4x1) +1	U06	XK22U:02-6	XF22S:02-32
7.	(3x4x1) +1	U07	XK22U:02-7	XF22S:02-33
8.	(3x4x1) +1	U08	XK22U:02-8	XF22S:02-34
9.	(3x4x1) +1	U09	XK22U:02-9	XF22S:02-35
10.	(3x4x1) +1	U10B	XK22U:02-10	XF22S:02-40
11.	(3x4x1) +1	U11B	XK22U:02-11	XF22S:02-41
12.	(3x4x1) +1	U12B	XK22U:02-12	XF22S:02-36
13.	(3x4x1) +1	U13	XK22U:02-13	XF22S:02-42

5 PIN XK22P:01

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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 Size (mm^2)	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 Size (mm^2)	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

Prepared by	Checked by	Approved by
SSE/D/Elect.	AEE/D-II	Dy.CEE/D-II

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5 PIN XK22P:05

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	4201	152-1	127.9/1-2
2.	1.5	4201	152-1	154-1

LINK CABLE 154 (Rotary Switch Bogie Cut Out)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	4201	154-1	152-1
2.	1.5	4201	154-1	154-3
3.	1.5	4201	154-3	154-1
4.	1.5	4201	154-3	160-3

LINK CABLE 160 (Rotary Switch Configuration)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	4201	160-3	154-3
2.	1.5	4201	160-3	161-13

LINK CABLE 237.1 (Rotary Switch Vigilance Device)

Sl. No.	Cable Size (mm^2)	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	4200	237.1-7	237.1-3
7.	1.5	3000	237.1-8	XF22S:03-36
8.	1.5	2069	237.1-1	211.1/1-Q1

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LINK CABLE 161 (Illuminated Push Button)

Sl. No.	Cable Size (mm^2)	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

179 (Key Switch Simulation SB1)

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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 Size (mm^2)	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 Size (mm^2)	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

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8.	1.5	2069	86-19-U	211.1/1-Q1

381.7 (Resistor for Screen Train Bus)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	2.5	0	381.7-M	XB22S-15

78 (Maximum Current Relay)

Sl. No.	Cable Size (mm^2)	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 U
7.	1.5	1521	78-U	78.1-Q1
8.	1.5	1522	78-V	136.3-R4

89.7 (Earth Fault Relay)

Sl. No.	Cable Size (mm^2)	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

90.7/1 (Resistor for Earth Fault Relay)

Sl. No.	Cable Size (mm^2)	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

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

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	2022	90.7/2-Q1	90.7/1-Q2
2.	1.5	2022 (MOD)	90.7/2-Q1	90.7/3-Q1
3.	1.5	2050	90.7/2-Q2	90.7/3-Q2
4.	1.5	2050	90.7/2-Q2	XB22S-15

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

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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 Size (mm^2)	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 Size (mm^2)	Cable No.	Connection From	Connection To

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1.	1.5	2101C	310.1/1-2	126.7/1-3

127 .1/1 (6A) CB for Electronic Traction Converter

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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 Size (mm^2)	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 (10 A) CB for Aux. Converter-1

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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 Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	4202	127.9/2-2	XF22S:01-34

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126.5 Relay Control Electronics OFF

Sl. No.	Cable Size (mm^2)	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 (MS 503)
9.	1.5	2505	126.5-13	126.5-43 (MS 503)
10.	1.5	2070	126.5-14	126.5-44 (MS 503)
11.	1.5	2503	126.5-21	126.5-13 (MS 503)
12.	1.5	2808	126.5-22	126.5-14 (MS 503)

126.5A Snubber

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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+

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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)
8.	1.5	2069B	136.4-21	XK22V:03-2 (WAG-9) (To be deleted)
9.	1.5	2069C	136.4-22	Reset Relay-A1(475) (To be deleted)
10.	1.5	2069B	136.4-21	XK 22V:01-46 (WAG-9) (MS MS 475 Rev.2)
11.	1.5	2314	136.4-3	136.4-1 (MS 503)
12.	1.5	2312	136.4-4	136.4-2 (MS 503)

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

136.4A Snubber

Sl. No.	Cable Size (mm^2)	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

126.7/1 Contactor Power Supply to Cab

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	2111A	126.7/1-2	XK22A:01-20
2.	1.5	5671	126.7/1-13	XF22S:01-58 (For WAG-9 only) (MS 475 Rev.2)
3.	1.5	2097A	126.7/1-53	XF22S:02-1
4.	1.5	2099A	126.7/1-54	XF22S:02-4
5.	1.5	2503B	126.7/1-75	XF22S:02-20
6.	1.5	2504B	126.7/1-76	XK22V:02-33

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7.	2.5	2101A	126.7/1-1	127.3/1-2
8.	1.5	2504A	126.7/1-A1	126.7A/1-1+
9.	1.5	2050	126.7/1-A2	126.7A/1-4-
10.	1.5	2101C	126.7/1-3	310.1/1-2
11.	1.5	3501A	126.7/1-4	XF22S:01-43
12.	1.5	2097A	126.7/1-53	126.7/1-87 (MS 503)
13.	1.5	2099A	126.7/1-54	126.7/1-88 (MS 503)
14.	1.5	2503B	126.7/1-61	126.7/1-75 (MS 503)
15.	1.5	2504B	126.7/1-62	126.7/1-76 (MS 503)
16	1.5	2111A	126.7/1-2	XF22S:02-10

126.7A/1 Snubber

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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.	2.5	2050	136.3-R4	XK 22D:02-4
5.	1.5	2326	136.3-A1(T)	136.3A-1+
6.	1.5	2050	136.3-A2	136.3A-4-
7.	1.5	2326	136.3-R1	136.3A-2+
8.	1.5	1523	136.3-R3	78.1-Q2
9.	1.5	1522	136.3-R4	78-V
10.	1.5	2890	136.3-2	XF22S:03-33 MS 500 Connection to be removed
11.	1.5	2062	136.3-1	XF22S:03-34

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12.	1.5	2326	136.3-(T)-16	136.3-A1
13	1.5	2326	136.3-A2	136.3-A2(T)

136.3A Snubber

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	2326	136.3A-1+	136.3-A1(T)
2.	1.5	2326	136.3A-2+	136.3-R1
3.	1.5	2050	136.3A-3	XB22S-4
4.	1.5	2050	136.3A-4-	136.3-A2

218 Contactor Type-4

Sl. No.	Cable Size (mm^2)	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	2513	218-A1	XF22S:01-17
5	1.5	2050	218-A2	XB22S-4 (Pin no.1 to 13 is shorted)

126 Contactor Type-4

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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

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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 Size (mm^2)	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-V1+	127.91/1-2

118.5/1 DC-DC Converter

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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-U
3.	1.5	2510	211.1/1-Q2	XK22V:01-27

2096

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	6	2096	S2096.1-Q1	XB22S-21

2095

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To

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1.	2.5	2095	S2095.1-Q1	XB22S-19
2.	2.5	2095	S2095.1-Q1	XB22S-20

O-MASSE-M

Sl. No.	Cable Size (mm^2)	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

123/1 Blocking Diode

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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

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Prepared by	Checked by	Approved by
SSE/D/Elect.	AEE/D-II	Dy.CEE/D-II

123/5 Blocking Diode

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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 Diblo-8

Sl. No.	Cable Size (mm^2)	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

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123/8 Blocking Diode

Sl. No.	Cable Size (mm^2)	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
5.	1.5	2069D	123/8-5	XF22S:01-56 (WAG-9 only) (MS 475 Rev.2)
6.	1.5	2069D	123/8-6	ZCAB-1 (WAG-9 only) (MS 475 Rev.2)
7.	1.5	2069E	123/8-7	XF22S:01-57 (WAG-9 only) (MS 475 Rev.2)
8.	1.5	2069E	123/8-8	ZCAB-5 (WAG-9 only) (MS 475 Rev.2)

381.7F SUB D 9 PIN

Sl. No.	Cable Size (mm^2)	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 Size (mm^2)	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

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4.	0.5	2050	381.7D-5	XB22S:02-8

TTPBIR - Time Relay for MS 475 Rev. 2 for WAG-9

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	2069D	TPBIR-18	XF22S:01-56
2.	1.5	2069T	TPBIR- A1	Reset Relay-14
3.	1.5	2069	TPBIR-15	Reset Relay-13
4.	1.5	2069 C	TPBIR-Y	Reset Relay-A1
5.	1.5	2069 C	TPBIR-Y	136.4-22
6.	1.5	2050	TPBIR- A2	Reset Relay-A2

Reset Relay for MS 475 Rev. 2 for WAG-9 (Type LC1D09FD or similar)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	2069	Reset Relay-13	TPBIR-15
2.	1.5	2069	Reset Relay-13	XF22S:01-1
3.	1.5	2069T	Reset Relay-14	TPBIR- A1
4.	1.5	2069 C	Reset Relay-A1	TPBIR-Y
5.	1.5	2050	Reset Relay-A2	TPBIR- A2
6.	1.5	2050	Reset Relay-A2	XB22S-13
7.	1.5	2513	Reset Relay-21	XF22S:01-14
8.	1.5	2513	Reset Relay-22	218-A1

ZCAB (As Rotary Switch Configuration) for MS 475 Rev. 2 for WAG-9

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	2069 F	ZCAB-1	ZCAB-3
2.	1.5	2069 D	ZCAB-1	123/8-6
3.	1.5	2500 A	ZCAB-2	XF22S:02-17
4.	1.5	2500 B	ZCAB-4	XF22S:02-18
5.	1.5	2069 F	ZCAB-5	ZCAB-7
6.	1.5	2069 E	ZCAB-5	123/8-8
7.	1.5	2503 A	ZCAB-6	XF22S:02-19
8.	1.5	2503 B	ZCAB-8	XF22S:02-20

Prepared by	Checked by	Approved by
SSE/D/Elect.	AEE/D-II	Dy.CEE/D-II

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VS Diode

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	3551A	VS Diode-Q1	XF22S:01-55 (MS 500)
2.	1.5	3551A	VS Diode-Q 2	XF22S:02-1/6 (MS 500)
3.	1.5	3551AB	XF22S:02-1/6	411.OA-10 (MS 500)

Screw Type Terminal Block XB 22 S (For WAG9, WAP7 & WAP5)

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	2.5	2050	XB22S-1	XK 22A:01-5
2.	2.5	2050	XB22S-1	XK 22A:01-6
3.	2.5	2050	XB22S-1	XK 22D:01-3
4.	2.5	2050	XB22S-2	XK 22F-1
5.	2.5	2050	XB22S-2	XK 22H-1
6.	2.5	2050	XB22S-2	XK 22D:02-5
7.	2.5	2050	XB22S-2	XK22D:03-3
8.	2.5	2050	XB 22 S-3	XK 22V:01-1
9.	2.5	2050	XB 22 S-3	XK 22V:01-2
10.	2.5	2050	XB 22 S-3	XK 22V:01-3
11.	2.5	2050	XB 22 S-3	XK 22V:01-4
12.	1.5	2050	XB22S-4	161-X2
13.	1.5	2050	XB22S-4	136.4A-3
14.	1.5	2050	XB22S-4	136.3A-3
15.	1.5	2050	XB22S-4	218-A2
16.	2.5	2050	XB 22S-6	XK 22R-8
17.	2.5	2050	XB 22S-6	XK 22R-9
18.	2.5	2050	XB 22S-6	XK 22R-11
19.	2.5	2050	XB22S-6	118.4/1-GI
20.	1.5	2050	XB22S-7	126-A2
21.	2.5	2050	XB22S-7	118.4/1-G0
22.	2.5	2050	XB22S-7	118.5/1-GI
23.	2.5	2050	XB22S-7	118.5/1-G0
24.	1.5	2050	XB22S-8	126.5A-3-
25.	1.5	2050	XB22S-8	126.7A/1-3
26.	1.5	2050	XB22S-8	338/1-A2
27.	1.5	2050	XB22S-11	86-21-L

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28.	2.5	0	XB22S-15	381.71-Q2
29.	2.5	0	XB22S-15	381.7-M
30.	1.5	0	XB22S-15	78-M
31.	1.5	0	XB22S-15	89.7-V
32.	1.5	2050	XB22S-15	90.7/2-Q2
33.	10	0	XB22S-16	MASSE22S-M
34.	2.5	2094	XB 22S-17	XK 22V:01-9
35.	2.5	2094	XB 22S-17	XK 22V:01-10
36.	2.5	2094	XB 22S-17	XK 22V:01-11
37.	2.5	2094	XB 22S-17	XK 22V:01-12
38.	10	2094	XB22S-18	126-1+
39.	10	2094	XB22S-18	126-1+
40.	2.5	2095	XB 22S-19	XK 22V:01-13
41.	10	2095	XB22S-19	218-1+
42.	10	2095	XB22S-19	126-2-
43.	2.5	2095	XB22S-19	S2095.1-Q1
44.	2.5	2095	XB 22S-20	XK 22V:01-14
45.	2.5	2095	XB22S-20	90.7/1-Q1
46.	10	2095	XB22S-20	126-2-
47.	2.5	2095	XB22S-20	S2095.1-Q1
48.	2.5	2096	XB 22S-21	XK 22V:01-15
49.	2.5	2096	XB 22S-21	XK 22V:01-16
50.	10	2096	XB22S-21	218-2
51.	6	2096	XB22S-21	S2096.1-Q1
52.	0.5	2050	XB22S:02-8	381.7D-4
53.	0.5	2050	XB22S:02-8	381.7D-5

Note: 1 to 13 is shorted

Wago Type Terminal block XF 22S:01 (For WAG9, WAP7 & WAP5)

Note: Cable terminations shall be crimped with copper sleeves.

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	2069	XF 22S:01-1	XK 22V:01-8
2.	1.5	2069	XF22S:01-1	XK 22A:01-9
3.	1.5	2069	XF22S:01-1	237.1-1
4.	1.5	2312	XF22S:01-2 (MS 390)	136.4-2
5.	1.5	2312	XF22S:01-2	123/7-7
6.	1.5	2312	XF22S:01-3 (MS 390)	136.4-4
7.	1.5	2314	XF 22S:01-4	XK 22V:01-20

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8.	1.5	2314	XF22S:01-4	86-15-U
9.	1.5	2314	XF22S:01-4 (MS 390)	136.4-1
10.	1.5	2314	XF22S:01-4 (MS 390)	136.4-3
11.	1.5	2319	XF 22S:01-6	XK 22V:01-21
12.	1.5	2319	XF22S:01-6	XK 22A:01-2
13.	1.5	2319	XF22S:01-6	123/3-8
14.	1.5	2325	XF 22S:01-7	XK 22V:01-23
15.	1.5	2325	XF 22S:01-7	XK 22R-5
16.	1.5	2326	XF 22S:01-8	XK 22D:02-7
17.	2.5	2326	XF 22S:01-9	XK 22V:01-24
18.	1.5	2326	XF22S:01-9	136.3-R1
19.	1.5	2327	XF 22S:01-10	XK 22V:01-25
20.	1.5	2327	XF22S:01-10	123/3-10
21.	1.5	2327	XF22S:01-10	123/7-8
22.	1.5	2501	XF 22S:01-11	XK 22V:01-26
23.	1.5	2501	XF22S:01-11	123/1-2
24.	1.5	2501	XF22S:01-11	123/1-4
25.	1.5	2505	XF22S:01-12	126.5-21
26.	1.5	2505	XF22S:01-12	123/1-6
27.	1.5	2505	XF22S:01-12	123/1-8
28.	1.5	2505	XF22S:01-13	123/1-10
29.	1.5	2505	XF22S:01-13	123/5-6
30.	1.5	2513	XF22S:01-14	123/7-2
31.	1.5	2513	XF22S:01-14	123/7-4
32.	1.5	2513	XF22S:01-14	123/7-6
33.	1.5	2518	XF22S:01-15	123/7-3
34.	1.5	2519	XF22S:01-16	123/7-5
35.	1.5	2506	XF22S:01-17	123/1-9
36.	1.5	2854	XF22S:01-18	XK 22H-7
37.	1.5	2859	XF22S:01-19	XK 22H-8
38.	1.5	2869	XF22S:01-20	XK 22F-8
39.	1.5	3042	XF 22S:01-21	XK 22V:02-7
40.	1.5	3114	XF22S:01-22	123/5-7
41.	1.5	3115	XF22S:01-23	123/5-9
42.	1.5	4201	XF 22S:01-24	XK 22V:02-12
43.	1.5	4201	XF22S:01-24	XK 22A:01-1
44.	1.5	4201	XF22S:01-24	179-1
45.	1.5	4201	XF22S:01-28	78-A
46.	1.5	4201	XF22S:01-28	127.9/1-2
47.	0.5	4201	XF22S:01-29	381.7D-1

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48.	0.5	4201	XF22S:01-29	381.7D-2
49.	1.5	4202	XF22S:01-34	127.9/2-2
50.	1.5	4235	XF22S:01-38	XK 22A:01-17
51.	1.5	4235	XF22S:01-38	123.1/1-3
52.	1.5	4236	XF 22S:01-39	XK 22V:02-16
53.	1.5	4236	XF22S:01-39	237.1-2
54.	1.5	4238	XF 22S:01-40	XK 22V:02-17
55.	1.5	4238	XF22S:01-40	123/5-1
56.	1.5	4243	XF 22S:01-41	XK 22V:02-18
57.	1.5	5676	XF22S:01-42	179-2
58.	1.5	3501A	XF22S:01-43	XK 22A:02-27
59.	1.5	4211A	XF22S:01-45	XK 22A:02-32
60.	1.5	4211A	XF22S:01-45	123/3-2
61.	1.5	3543A	XF22S:01-46	XK 22A:02-28
62.	1.5	3543A	XF22S:01-46	123/3-3
63.	1.5	3544A	XF22S:01-47	XK 22A:02-29
64.	1.5	3544A	XF22S:01-47	123/3-5
65.	1.5	3551A	XF22S:01-55	XK 22A:02-54 (MS 500)
66.	1.5	3551A	XF22S:01-55	VS Diode-Q1 (MS 500)
67.	1.5	2097A	XF22S:02-1	XK 22A:01-18
68.	1.5	2097A	XF22S:02-1	126.7/1-53
69.	2.5	2097A	XF22S:02-1	118.5/1-V0
70.	2.5	2098A	XF 22S:02-2	XK 22V:02-23
71.	2.5	2098A	XF22S:02-2	XK 22H-13
72.	2.5	2098A	XF22S:02-2	118.4/1-V0
73.	1.5	2099A	XF 22S:02-3	XK 22V:02-25
74.	1.5	2099A	XF22S:02-3	XK 22A:01-19
75.	1.5	2099A	XF 22S:02-3	XK 22D:02-10
76.	1.5	2099A	XF22S:02-4	126.7/1-54
77.	2.5	2111A	XF 22S:02-10	XK 22V:02-27
78.	2.5	2111A	XF22S:02-10	XK 22A:01-20
79.	1.5	2111A	XF22S:02-10	123/3-1
80.	1.5	2313A	XF22S:02-11	XK 22A:01-21
81.	1.5	2330A	XF 22S:02-12	XK 22D:02-12
82.	1.5	2330B	XF 22S:02-13	XK 22D:02-13
83.	1.5	2331A	XF22S:02-14	XK 22A:01-22
84.	1.5	2331A	XF22S:02-14	123.1/1-1
85.	1.5	2333A	XF22S:02-15	XK 22A:01-23
86.	1.5	2333A	XF22S:02-15	123/3-7

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87.	1.5	2334A	XF22S:02-16	XK 22A:01-24
88.	1.5	2334A	XF22S:02-16	123/3-9
89.	1.5	2500A	XF22S:02-17	XK 22A:01-25
90.	1.5	2500A	XF22S:02-17	123/1-1
91.	1.5	2500B	XF 22S:02-18	XK 22V:02-29
92.	1.5	2500B	XF22S:02-18	123/1-3
93.	1.5	2503A	XF22S:02-19	XK 22A:01-26
94.	1.5	2503A	XF22S:02-19	123/1-5
95.	1.5	2503B	XF 22S:02-20	XK 22V:02-31
96.	1.5	2503B	XF22S:02-20	126.7/1-75
97.	1.5	2503B	XF22S:02-20	123/1-7
98.	1.5	2514A	XF22S:02-21	XK 22A:01-27
99.	1.5	2514A	XF22S:02-21	123.1/1-2
100.	1.5	2520A	XF22S:02-22	XK 22A:01-29
101.	1.5	2521A	XF22S:02-23	XK 22A:01-30
102.	1.5	2522A	XF22S:02-24	XK 22A:01-31
103.	1.5	2523A	XF22S:02-25	XK 22A:01-32
104.	1.5	2524A	XF22S:02-26	XK 22A:01-33
105.	0.5	U10A	XF22S:02-37	381.7F-2
106.	0.5	U10A	XF22S:02-37	381.7F-1
107.	0.5	U11A	XF22S:02-38	381.7F-3
108.	0.5	U11A	XF22S:02-38	381.7F-4
109.	1.5	U13A	XF22S:02-39	381.71-Q1
110.	0.5	U13A (SHIELD)	XF22S:02-39	381.7F-10
111.	0.5	U10B	XF22S:02-40	381.7F-6
112.	0.5	U10B	XF22S:02-40	381.7F-7
113.	0.5	U11B	XF22S:02-41	381.7F-8
114.	0.5	U11B	XF22S:02-41	381.7F-9
115.	1.5	U13B	XF22S:02-42	381.71-Q1
116.	0.5	U10A	XF22S:02-44	381.7F-5
117.	1.5	4239A	XF22S:02-45	123/5-3
118.	1.5	2509	XF22S :02-46	123/5-5
119.	1.5	2515	XF22S:02-47	123/7-1
120.	1.5	3034B	XF 22S:02-48	XK 22V:03-18
121.	2.5	3035B	XF 22S:02-49	XK 22V:03-19
122.	1.5	3008	XF 22S:02-50	XK 22V:03-20
123.	1.5	5671B	XF 22S:02-51	XK 22V:03-21
124.	1(2P+S)	1502	**XF22S:03-0**	XK22P:01-2
125.	1(2P+S)	1501	XF22S:03-1	XK22P:01-1
126.	1(2P+S)	1501	XF22S:03-1	XK22P:02-1

127.	1(2P+S)	1501	XF22S:03-1	XK22P:03-1
128.	1(2P+S)	1501	XF22S:03-2	XK22P:04-1
129.	1(2P+S)	1501	XF22S:03-2	XK22P:05-1
130.	1.5	1501	XF22S:03-2	86-12-L
131.	1(2P+S)	1502	XF22S:03-3	XK22P:02-2
132.	1(2P+S)	1502	XF22S:03-3	XK22P:03-2
133.	1(2P+S)	1502	XF22S:03-4	XK22P:04-2
134.	1(2P+S)	1502	XF22S:03-4	XK22P:05-2
135.	1.5	1502	XF22S:03-4	86-13-L
136.	1(2P+S)	1503	XF22S:03-5	XK22P:01-3
137.	1(2P+S)	1503	XF22S:03-5	XK22P:02-3
138.	1(2P+S)	1503	XF22S:03-5	XK22P:03-3
139.	1(2P+S)	1503	XF22S:03-6	XK22P:04-3
140.	1(2P+S)	1503	XF22S:03-6	XK22P:05-3
141.	1.5	2525A	XF22S:03-7	XK 22A:01-34
142.	1.5	2526A	XF22S:03-8	XK 22A:01-35
143.	1.5	2527A	XF22S:03-9	XK 22A:02-1
144.	1.5	2532A	XF22S:03-10	XK 22A:02-2
145.	1.5	2540A	XF22S:03-11	XK 22A:02-3
146.	1.5	2541A	XF22S:03-12	XK 22A:02-4
147.	1.5	2542A	XF22S:03-13	XK 22A:02-5
148.	1.5	2801A	XF22S:03-14	XK 22F-9
149.	1.5	2801A	XF22S:03-14	XK 22H-14
150.	1.5	2801A	XF22S:03-14	127.2/1-2
151.	1.5	2803A	XF22S:03-15	XK 22A:02-6
152.	1.5	2804A	XF22S:03-16	XK 22A:02-7
153.	1.5	2807A	XF22S:03-17	XK 22A:02-8
154.	1.5	2850A	XF22S:03-18	XK 22H-15
155.	1.5	2851A	XF22S:03-19	XK 22H-16
156.	1.5	2852A	XF22S:03-20	XK 22H-17
157.	1.5	2853A	XF22S:03-21	XK 22H-18
158.	1.5	2855A	XF22S:03-22	XK 22H-19
159.	1.5	2856A	XF22S:03-23	XK 22H-20
160.	1.5	2857A	XF22S:03-24	XK 22H-21
161.	1.5	3005A	XF22S:03-25	XK 22A:02-9
162.	1.5	3020A	XF22S:03-26	XK 22A:02-10
163.	1.5	3034A	XF22S:03-27	XK 22A:02-12
164.	1.5	3035A	XF22S:03-28	XK 22A:02-13
165.	1.5	3037A	XF22S:03-29	XK 22H-22
166.	1.5	3037A	XF22S:03-29	123/5-8

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Prepared by	Checked by	Approved by
SSE/D/Elect.	**AEE/D-II**	**Dy.CEE/D-II**

167.	1.5	3037A	XF22S:03-29	123/5-10
168.	1.5	3549A	XF22S:03-30 (Mod. Of Twin Beam Headlight)	XK22A:02-59
169.	1.5	3549 A	XF22S:03-30	338/1-A1
170.	1.5	3549A	XF22S:03-30	123/3-4
171.	1.5	4232A	XF22S:03-31	XK 22A:02-33
172.	1.5	4232A	XF22S:03-31	123/5-2
173.	1.5	4232A	XF22S:03-31	123/5-4
174.	1.5	3551 B	XF 22S:03-33	XK 22V:03-11 (MS 500)
175.	1.5	2890	XF22S:03-33	XK 22H-24 (To be disconnected MS 500)
176.	1.5	3551B	XF22S:03-33	XF22S:02-1/6 (MS 500)
177.	1.5	2890	XF22S:03-33	136.3-2 (Connection to be removed MS 500)
178.	1.5	2062	XF 22S:03-34	XK 22D:02-6
179.	2.5	2062	XF22S:03-34	127.12-2
180.	1.5	2062	XF22S:03-34	136.3-1
181.	1.5	3000	XF22S:03-36	237.1-8
182.	1.5	2320	XF 22S:03-37	XK 22R-3
183.	1.5	2320	XF22S:03-37	78-D
184.	1.5	2329	XF 22S:03-38	XK 22D:02-8
185.	1.5	3549B	XF22S:03-39	123/3-6
186.	1.5	3542A	XF22S:03-40	XK 22A:02-61
187.	1.5	3542A	XF22S:03-40	123/8-1
188.	1.5	3542C	XF22S:03-40	123/8-3
189.	1.5	3542C	XF 22S:03-41	XK 22V:03-16
190.	1.5	3542 C	XF22S:03-41	338/1-1
191.	1.5	3542B	XF22S:03-41	123/8-2
192.	1.5	3542D	XF 22S:03-42	XK 22V:03-16
193.	1.5	3542D	XF22S:03-42	123/8-4
194.	2.5	3549A	XF22S:03-43	XK 22A:02-30
195.	1.5	3549 C	XF22S:03-43	338/1-2
196.	1.5	2066	XF22S:03-45	123/7-9
197.	1.5	3554A	XF22S:03-46	XK 22A:02-31
198.	1.5	3554A	XF22S:03-46	123.1/1-4

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199.	0.5	3503A	XF22S:03-47	123.1/1-14
200.	1.5	2805	XF22S:01-1/1	XK 22F-2
201.	1.5	2806	XF22S:01-1/2	XK 22F-3
202.	0.5	2860	XF22S:01-1/3	XK 22F-4
203.	1.5	3033A	XF22S:02-1/1	XK 22A:02-11
204.	1.5	3060A	XF22S:02-1/2	XK 22A:02-14 Only for WAP-5 (Parking Brake)
205.	1.5	3069A	XF22S:02-1/3	XK 22A:02-19
206.	1.5	3071A	XF22S:02-1/4	XK 22A:02-20 Only for WAP-5 (Parking Brake)
207.	1.5	2840A	XF22S:02-1/5	XK 22H-23
208.	1.5	2896	XF22S:02-1/6	XK 22H-25 (To be removed MS 500)
209.	1.5	3551A	XF22S:02-1/6	VS Diode-Q 2 (MS 500)
210.	1.5	3551AB	XF22S:02-1/6	411.OA-10 (MS 500)
211.			XF22S:02-1/6	XF22S:03-33 (MS 500)
212.	1.5	3117A	XF22S:03-1/1	XK 22A:02-26
213.	1.5	4237A	XF22S:03-1/2	XK 22A:02-34
214.	1.5	4242A	XF22S:03-1/3	XK 22A:02-35
215.	1.5	5671A	XF22S:03-1/4	XK 22A:02-36
216.	1.5	5672A	XF22S:03-1/5	XK 22A:02-37
217.	1.5	5673A	XF22S:03-1/6	XK 22A:02-38

Wago Type Terminal block XF 22S:01 (Only for WAG9)

Note: Cable terminations shall be crimped with copper sleeves.

Sl. No.	**Cable Size (mm^2)**	**Cable No.**	**Connection From**	**Connection To**
1.	1.5	2069	XF 22S:01-1	XF 22S:02-27 (MS 475 Rev.2)
2.	1.5	2069D	XF 22S:01-56	XK 22V:01-52 (MS 475 Rev.2)
3.	1.5	2069E	XF 22S:01-57	XK 22V:01-53 (MS 475 Rev.2)
4.	1.5	5671	XF 22S:01-58	XK 22V:01-54 (MS 475 Rev.2)
5.	3x4x1	U01	XF22S:02-27	XK22U:01-1
6.	3x4x1	U01	XF22S:02-27	XK22U:02-1

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7.	1.5	2069	XF 22S:02-27	XF 22S:01-1 (MS 475 Rev.2)
8.	3x4x1	U02	XF22S:02-28	XK22U:01-2
9.	3x4x1	U02	XF22S:02-28	XK22U:02-2
10.	1.5	2069A	XF 22S:02-28	XK 22V:01-45 (MS 475 Rev.2)
11.	1.5	2069A	XF22S:02-28 (UIC-2)	XK 22A::02-47 (MS 475 Rev.2)
12.	1.5	SLAVE A	XF 22S:02-29	XK 22V:01-47 (MS 475 Rev.2)
13.	1.5	SLAVE A	XF22S:02-29 (UIC-3)	XK 22A::02-48 (MS 475 Rev.2)
14.	3x4x1	U03	XF22S:02-29	XK22U:01-3
15.	3x4x1	U03	XF22S:02-29	XK22U:02-3
16.	1.5	SLAVE B	XF 22S:02-30	XK 22V:01-49 (MS 475 Rev.2)
17.	3x4x1	U04	XF22S:02-30	XK22U:01-4
18.	3x4x1	U04	XF22S:02-30	XK22U:02-4
19.	3x4x1	U05	XF22S:02-31	XK22U:01-5
20.	3x4x1	U05	XF22S:02-31	XK22U:02-5
21.	3x4x1	U06	XF22S:02-32	XK22U:01-6
22.	3x4x1	U06	XF22S:02-32	XK22U:02-6
23.	3x4x1	U07	XF22S:02-33	XK22U:01-7
24.	3x4x1	U07	XF22S:02-33	XK22U:02-7
25.	3x4x1	U08	XF22S:02-34	XK22U:01-8
26.	3x4x1	U08	XF22S:02-34	XK22U:02-8
27.	3x4x1	U09	XF22S:02-35	XK22U:01-9
28.	3x4x1	U09	XF22S:02-35	XK22U:02-9
29.	3x4x1	U12A	XF22S:02-36	XK22U:01-12
30.	3x4x1	U12B	XF22S:02-36	XK22U:02-12
31.	3x4x1	U10A	XF22S:02-37	XK22U:01-10
32.	3x4x1	U11A	XF22S:02-38	XK22U:01-11
33.	3x4x1	U10B	XF22S:02-40	XK22U:02-10
34.	3x4x1	U11B	XF22S:02-41	XK22U:02-11
35.	3x4x1	U13	XF22S:02-42	XK22U:02-13

WAGO Type Terminal Block XF 22S (Only for WAP- 5 & WAP-7)

Note: Cable terminations shall be crimped with copper sleeves.

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	1.5	UH01	XF 22S:01-48	XK 22V:03-01
2.	1.5	UH01	XF22S:01-48	XK22HL:01

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3.	1.5	UH02	XF 22S:01-49	XK 22V:03-02
4.	1.5	UH02	XF22S:01-49	XK22HL:02
5.	1.5	UH03	XF 22S:01-50	XK 22V:03-03
6.	1.5	UH03	XF22S:01-50	XK22HL:03
7.	1.5	UH04	XF 22S:01-51	XK 22V:03-04
8.	1.5	UH04	XF22S:01-51	XK22HL:04
9.	1.5	UH05	XF 22S:01-52	XK 22V:03-05
10.	1.5	UH05	XF22S:01-52	XK22HL:05
11.	1.5	Hl01	XF 22S:01-53	XK 22V:02-57
12.	1.5	Hl02	XF 22S:01-54	XK 22V:02-58
13.	(5x4x1) +2	2500A	XF22S:02-27	XK22U:01-1
14.	(5x4x1)+2	2500A	XF22S:02-27	XK22U:02-1
15.	(5x4x1)+2	2503A	XF22S:02-28	XK22U:01-2
16.	(5x4x1)+2	2503	XF22S:02-28	XK22U:02-2
17.	(5x4x1)+2	2331A	XF22S:02-29	XK22U:01-3
18.	(5x4x1)+2	2331A	XF22S:02-29	XK22U:02-3
19.	(5x4x1)+2	4242A	XF22S:02-30	XK22U:01-4
20.	(5x4x1)+2	4242A	XF22S:02-30	XK22U:02-4
21.	1.5	2500 AR	XF22S:02-31	XK 22V:01-39
22.	(5x4x1)+2	2500AR	XF22S:02-31	XK22U:01-5
23.	(5x4x1)+2	2500AR	XF22S:02-31	XK22U:02-5
24.		2503 AR	XF22S:02-32	XK 22V:01-40
25.	(5x4x1) +2	2503AR	XF22S:02-32	XK22U:01-6
26.	(5x4x1) +2	2503AR	XF22S:02-32	XK22U:02-6
27.	1.5	2331 AR	XF22S:02-33	XK 22V:01-36
28.	(5x4x1) +2	2331AR	XF22S:02-33	XK22U:01-7
29.	(5x4x1) +2	2331AR	XF22S:02-33	XK22U:02-7
30.	1.5	4242 AR	XF22S:02-34	XK 22V:01-41
31.	(5x4x1) +2	4242AR	XF22S:02-34	XK22U:01-8
32.	(5x4x1) +2	4242AR	XF22S:02-34	XK22U:02-8
33.	(5x4x1) +2	2111A	XF22S:02-35	XK22U:01-9
34.	(5x4x1) +2	2111A	XF22S:02-35	XK22U:02-9
35.	1.5	2111 AR	XF22S:02-36	XK 22V:01-38
36.	(5x4x1) +2	2111AR	XF22S:02-36	XK22U:02-12
37.	(5x4x1) +2	2111AR	XF22S:02-36	XK22U:01-12
38.	1.5	2111AR	XF22S:02-36	XK 22A:02-43
39.	(5x4x1) +2	U10A	XF22S:02-37	XK22U:01-10
40.	(5x4x1) +2	U11A	XF22S:02-38	XK22U:01-11
41.	(5x4x1) +2	U13A	XF22S:02-39	XK22U:01-13
42.	(5x4x1) +2	U10B	XF22S:02-40	XK22U:02-10

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43.	(5x4x1) +2	U11B	XF22S:02-41	XK22U:02-11
44.	(5x4x1) +2	U13B	XF22S:02-42	XK22U:02-13
45.	1.5	2515	XF 22S:02-47	XK 22V:01-29
46.	1.5	UH06	XF 22S:02-52	XK 22V:02-48
47.	1.5	UH06	XF22S:02-52	XK22HL:06
48.	1.5	UH07	XF 22S:02-53	XK 22V:02-49
49.	1.5	UH07	XF22S:02-53	XK22HL:07
50.	1.5	UH08	XF 22S:02-54	XK 22V:02-50
51.	1.5	UH08	XF22S:02-54	XK22HL:08
52.	1.5	UH09	XF22S:02-54	XK22HL:09
53.	1.5	UH11	XF22S:02-54	XK22HL:11
54.	1.5	UH09	XF 22S:02-55	XK 22V:02-51
55.	1.5	UH10	XF 22S:02-56	XK 22V:02-52
56.	1.5	UH10	XF22S:02-56	XK22HL:10
57.	1.5	5671 AR	XF22S:02-57	XK 22V:01-43
58.	1.5	5671AR	XF22S:02-57	XK 22A:02-44
59.	(5x4x1)+2	5671AR	XF22S:02-57	XK22U:02-17
60.	(5x4x1)+2	5671AR	XF22S:02-57	XK22U:01-17
61.		5672 AR	XF22S:02-58	XK 22V:01-42
62.	1.5	5672AR	XF22S:02-58	XK 22A:02-45
63.	(5x4x1)+2	5672AR	XF22S:02-58	XK22U:01-16
64.	(5x4x1)+2	5672AR	XF22S:02-58	XK22U:02-16
65.	(5x4x1)+2	5671A	XF22S:02-59	XK22U:01-18
66.	(5x4x1)+2	5671A	XF22S:02-59	XK22U:02-18
67.	(5x4x1)+2	5672A	XF22S:02-60	XK22U:01-15
68.	(5x4x1)+2	5672A	XF22S:02-60	XK22U:02-15
69.	1.5	3549A	XF 22S:03-30	XK 22V:02-44
70.	1.5	3549B	XF 22S:03-39	XK 22V:02-45
71.	1.5	2500AR	XF22S:03-48	XK 22A:02-39
72.	1.5	2503AR	XF22S:03-49	XK 22A:02-40
73.	1.5	2331AR	XF22S:03-50	XK 22A:02-41
74.	1.5	4242AR	XF22S:03-51	XK 22A:02-42
75.	1.5	3035A	XF 22S:03-52	XK 22V:03-22
76.		UH11	XF 22S:03-53	XK 22V:02-53
77.		UH12	XF 22S:03-54	XK 22V:02-54
78.	1.5	UH12	XF22S:03-54	XK22HL:12
79.		2806	XF 22S:03-55	XK 22V:02-55
80.		2860	XF 22S:03-56	XK 22V:02-56
81.	1.5	UH13	XF22S:03-58	XK22HL:13
82.	1.5	2050 AR	XF22S:03-62	XK 22V:01-37

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83.	1.5	2050AR	XF22S:03-62	XK 22A:02-50
84.	(5x4x1)+2	2050AR	XF22S:03-62	XK22U:01-14
85.	(5x4x1)+2	2050AR	XF22S:03-62	XK22U:02-14
86.	0.5	2517	XF 22S:01-1/4	XK 22V:01-30
87.		3046A	XF 22S:01-1/5	XK 22V:02-39

Kavach WAGO Type Terminal Block (Total 3 nos. Post. Each post consist of 25 nos. WAGO)

Note: Cable terminations shall be crimped with copper sleeves.

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	4	2094 BATT+VE	XF22S:03-01/17	XF22S:04/01
2.	4	2050 BATT-VE	XF22S:03-01/10	XF22S:04/02
3.	2.5	2500A CAB1 BL KEY	XF22S:02/17	XF22S:04/03
4.	2.5	2524A CAB1 FORWARD	XF22S:02/26	XF22S:04/04
5.	1.5	2526A CAB1 REVERSE	XF22S:03/8	XF22S:04/05

Connections Only for WAP-7 & WAP-5

Note: Cable terminations shall be crimped with copper sleeves.

Sl. No.	Cable Size (mm^2)	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.				
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
13.	1.5	4242A	XF22S:03-1/3	XF22S:02-30
14.	1.5	5671A	XF22S:03-1/4	XF22S:02-59
15.	1.5	5672A	XF22S:03-1/5	XF22S:02-60
16.	1.5	2331AR	XF22S:03-33	XF22S:03-50

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PT FUSE (**Total 3 nos.) (01 IN OPERATION AND 02 NOS SPARE)**

Note: Cable terminations shall be crimped with copper sleeves.

Sl. No.	Cable Size (mm^2)	Cable No.	Connection From	Connection To
1.	2.5	1502	XF22S:03 - 0	PT FUSE – Q1
2.	2.5	1502	XF22S:03 – 3	PT FUSE – Q2

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Prepared by	Checked by	Approved by
SSE/D/Elect.	AEE/D-II	Dy.CEE/D-II