
भारतीय रेल
60020
ALSTOM
उ.रे
WAG 12B
60020
LIFT
LIFT
CHOCK

WAG 12B

CONT RAIL POWER 9000 kW

TWIN BO-BO TYPE WAG 12B ELECTRIC LOCOMOTIVE

1676 mm GAUGE

INDEX OF WAG 12B

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MAIN PARTICULARS OF LOCO – WAG12B

GENERAL

SYSTEM OF CURRENT	:	AC
LINE VOLTAGE	:	25000 V
WEIGHT IN W.O	:	180T +/- 1%
ADHESIVE WEIGHT	:	180T +/- 1%
AXLE LOAD	:	22.5T +/- 1%

CONTINUOUS RATING:

H.P.	:	12000
T.E.	:	55045 kg
SPEED	:	60 kmph
MAX. T.E.	:	71967 kg
MAX. SPEED	:	120 Kmph
WHEEL DIA (NEW)	:	1250 mm
(HALF WORN)	:	1207 mm
(FULLY WORN)	:	1164 mm

BOGIE

DRIVE ARRANGEMENT PINION	:	GEAR
DESIGN	:	2 AXLE

BRAKES

LOCO	:	AIR REGENERATIVE
TRAIN	:	AIR

PANTOGRAPH

NO	:	2
MAKE	:	FAIVELEY
TYPE	:	LX 3600 PN 035
WEIGHT	:	160 KG (W.O. INSULATOR)

TRANSFORMER

MAKE	:	ABB
TYPE	:	LOT 5848
No.	:	2
WEIGHT COMPLETE	:	7600 KG
COOLING	:	OFAF
INSULATION	:	A

RATING:

PRIMARY	:	1x5848 KVA, 25000 V, 234 A
SECONDARY	:	4x1462 KVA, 4x981 V, 4x1490 A
AUXILIARY	:	NO AUX. WINDING
HOTEL LOAD	:	NO HLC WINDING
FILTER	:	1x150 KVA, 1515 V, 99 A

POWER CONVERTER

NO	:	4
MAKE	:	ALSTOM
TYPE	:	E-BLOCK
COOLING	:	WFAF
TYPE OF GTO	:	-NA-
TYPE OF IGBT	:	CM1500-66R6206, MBN1500E33E2
TYPE OF DIODE	:	-NA-
CONNECTION	:	BRIDGE
NO.OF IGBT/CON	:	28 + 2 (MUB)
NO. OF DIODES/CON	:	-NA-

LINE CONVERTER

CONTINUOUS RATING	:	2x981 V
FREQUENCY	:	50 Hz +/- 3%
DC LINK VOLTAGE	:	1800 V

DRIVER CONVERTER

MOTOR VOLTAGE	:	1469 V (PHASE TO PHASE)
MAX. O/P CURRENT	:	565 A (PER PHASE)
MOTOR FREQUENCY	:	127 Hz

AUXILIARY CONVERTER

MAKE	:	ALSTOM
TYPE	:	OND-AUX
RATING	:	3-PH, 415 V, 190 KVA, 350 KVA (DEGRADED)

TRACTION MOTOR

MAKE	:	ALSTOM
TYPE	:	6 FRA 4567 E
No.	:	8
INSULATION	:	CLASS 200
SUSPENSION	:	AXLE HUNG, NOSE SUSPENDED
VENTILATION	:	FORCED AIR
WEIGHT	:	2850 KG
1 Hr RATING	:	1255 KW, 1404 V, 619 A, 1261 RPM
CONT. RATING	:	1148 KW, 1404 V, 570 A, 1261 RPM
GEAR RATIO	:	110/23

TRACTION MOTOR BLOWER

NO	:	4
BLOWER		
MAKE	:	HOWDEN, NADI
TYPE	:	EU MP560 LG180° SP
RATING	:	2.62 M3/S, 4140 Pa
MOTOR		
MAKE	:	LHP, BM
TYPE	:	TEFC 160M
RATING	:	3-ph, 415 V, 50 Hz, 12.5 KW, 2940 RPM
INSULATION	:	H

OIL COOLER BLOWER

NO	:	4
BLOWER		
MAKE	:	HOWDEN
TYPE	:	Centraxial HCLD 500/472 SP
RATING	:	4.85 M3/S, 2270 Pa
MOTOR		
MAKE	:	LHP
TYPE	:	LHP MGAN160B0448
RATING	:	3-ph, 415 V, 50 Hz, 16.3 KW, 2950 RPM
INSULATION	:	H

SCAVENGE BLOWER

NO	:	4
BLOWER		
MAKE	:	HOWDEN, NADI
TYPE	:	EU HB355 RD180° SP
RATING	:	0.44 M3/S, 1693 Pa
MOTOR		
MAKE	:	LHP, BM
TYPE	:	TEFC 80
RATING	:	3-ph, 415 V, 50 Hz, 1.2 KW, 2850 RPM
INSULATION	:	H

TRANSFORMER OIL PUMP

NO	:	4
PUMP		
MAKE	:	FLOWTECH
TYPE	:	-
RATING	:	1000 LPM
MOTOR		
MAKE	:	FLOWTECH
TYPE	:	-
RATING	:	3-ph, 415 V, 50 Hz, 3.2 KW
INSULATION	:	-

CONVERTER WATER PUMP

NO	:	4
PUMP		
MAKE	:	KSB
TYPE	:	B710
RATING	:	16.5 M3/H
MOTOR		
MAKE	:	KSB
TYPE	:	CANNED MOTOR
RATING	:	3-ph, 415 V, 50 Hz, 4.44 KW, 2871 RPM
INSULATION	:	H

MAIN COMPRESSOR

NO	:	2
COMPRESSOR		
MAKE	:	KNORR-BREMSE
TYPE	:	SL24
RATING	:	2400 LPM, 10 BAR
MOTOR		
MAKE	:	-
TYPE	:	-
RATING	:	3-ph, 415 V, 50 Hz, 32 KW, 2910 RPM
INSULATION	:	-

MACHINE ROOM BLOWER

NO	:	4
BLOWER		
MAKE	:	HOWDEN/NADI
TYPE	:	EU LB400 LG180° SP
RATING	:	1.67 M3/S, 1678 Pa
MOTOR		
MAKE	:	LHP
TYPE	:	TEFC132
RATING	:	3-ph, 415 V, 50 Hz, 4.4 KW, 2950 RPM
INSULATION	:	H

AUX COMPRESSOR

NO	:	2
COMPRESSOR		
MAKE	:	KNORR-BREMSE
TYPE	:	LP115
RATING	:	70 LPM, 8 BAR
MOTOR		
MAKE	:	-
TYPE	:	-
RATING	:	860 W, 110 VDC
INSULATION	:	-
BATTERY		
MAKE	:	SAFT
TYPE	:	Ni-Cd
RATING	:	2x100Ah

PROTECTIVE DEVICES

VIGILANCE CONTROL	:	YES
SLIP/SLIDE CONTROL	:	YES
MAIN OVERLOAD RELAY	:	YES
NO VOLT RELAY	:	YES
OVER VOLTAGE PROTECTION	:	YES
EARTH FAULT RELAY LOW	:	YES

Drawing of Locomotive

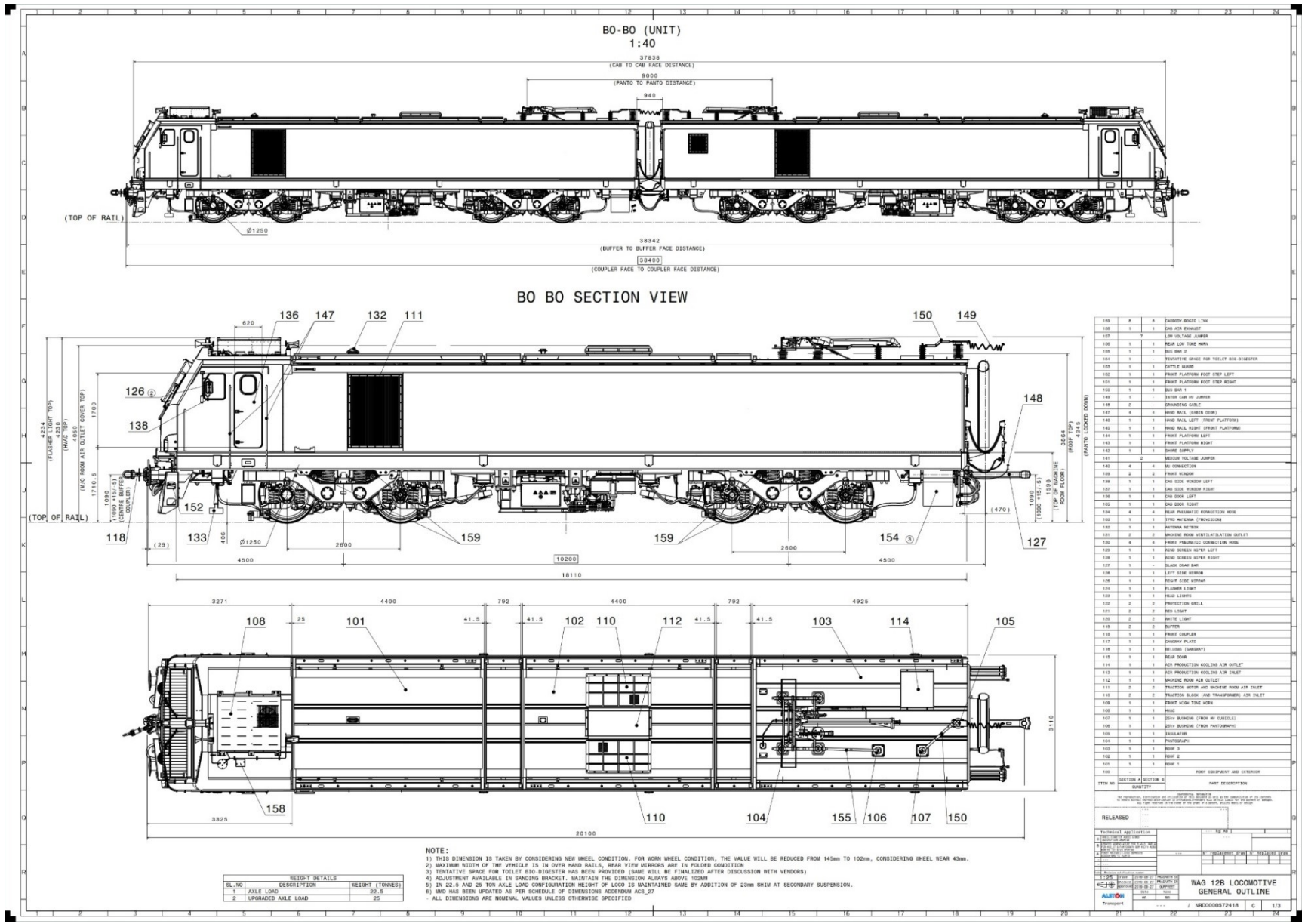


Figure-1: Locomotive General Layout

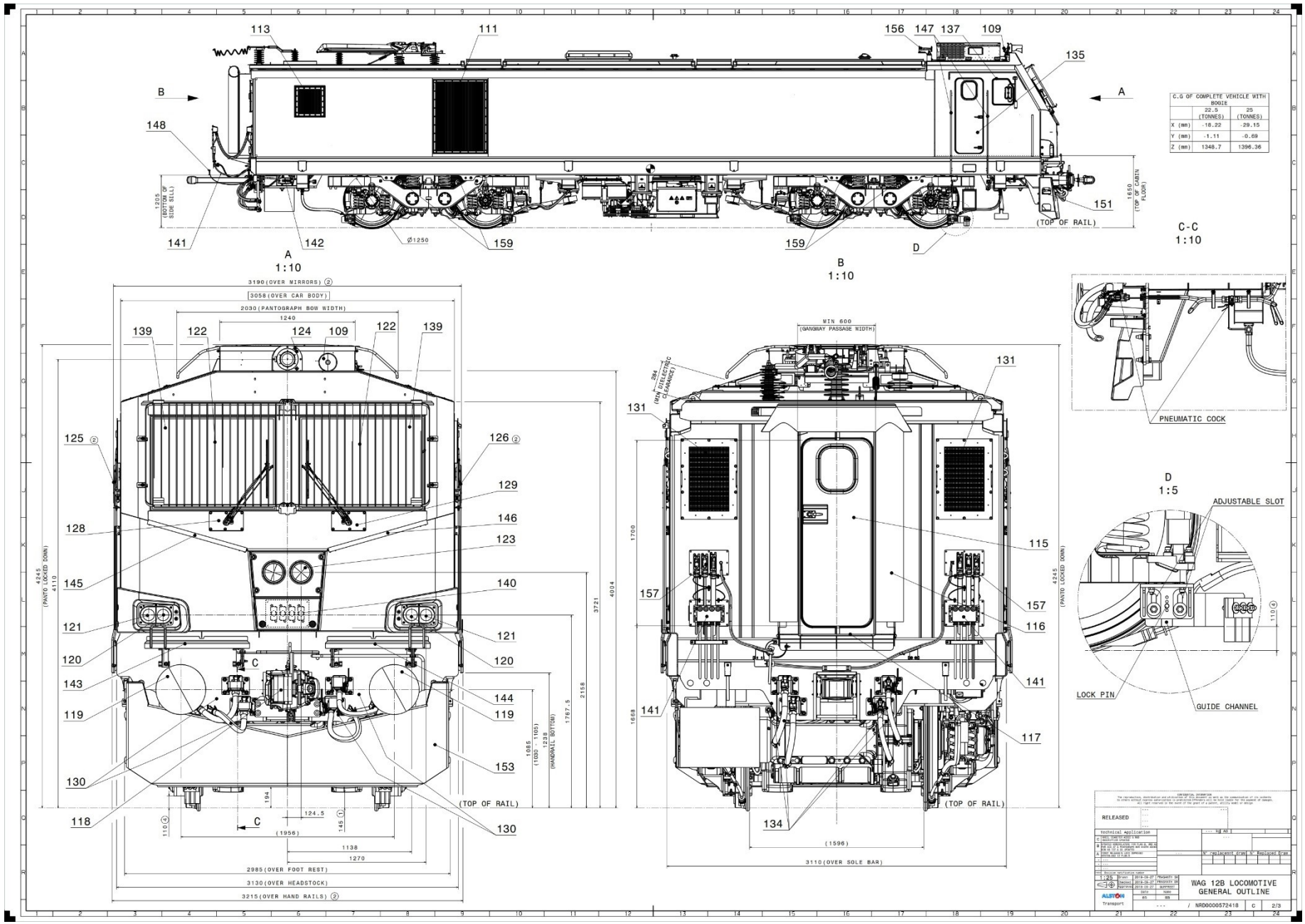


Figure-2 : Locomotive General Layout

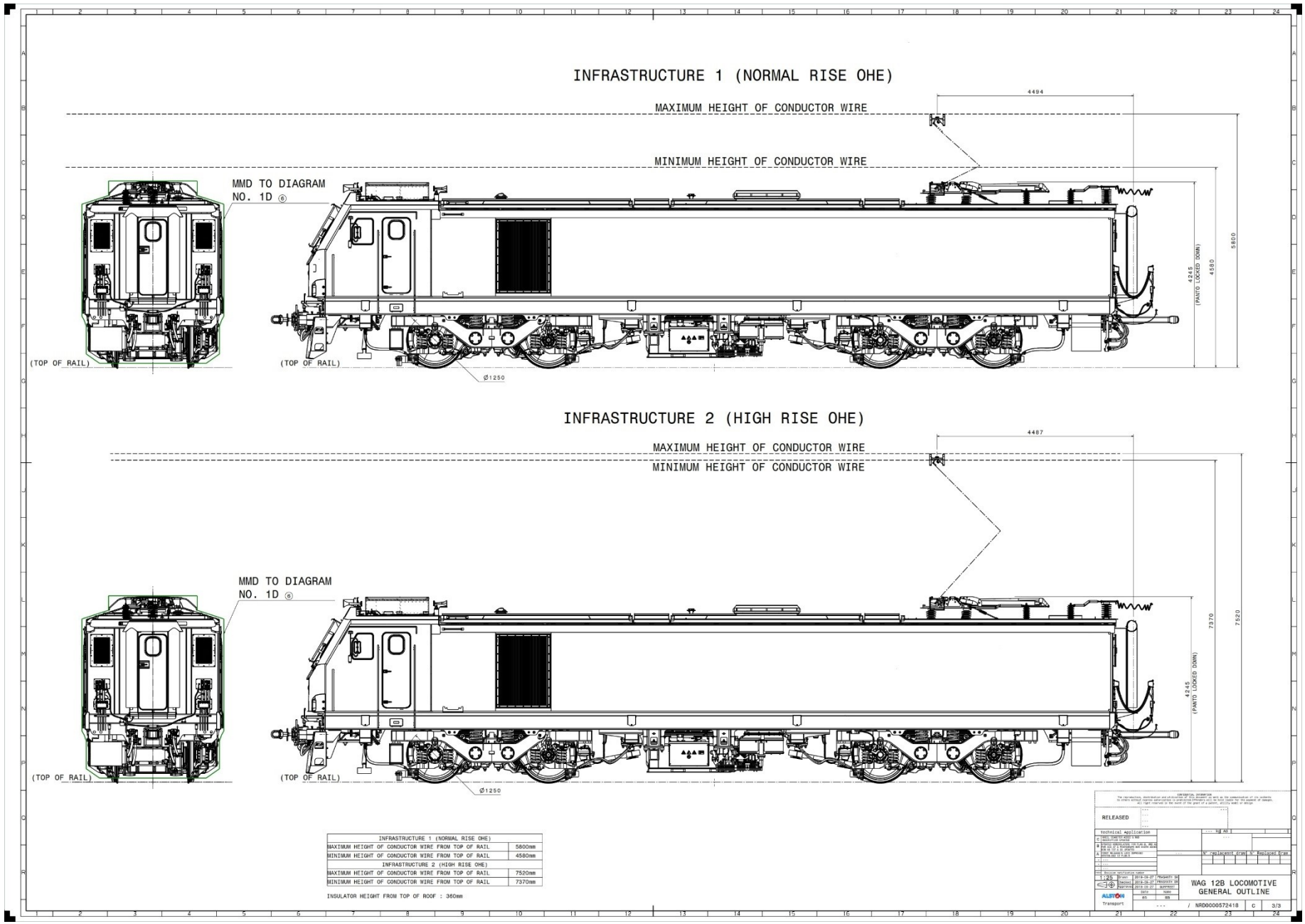


Figure-3 : Locomotive General Layout

Equipment Layout Drawing of Locomotive

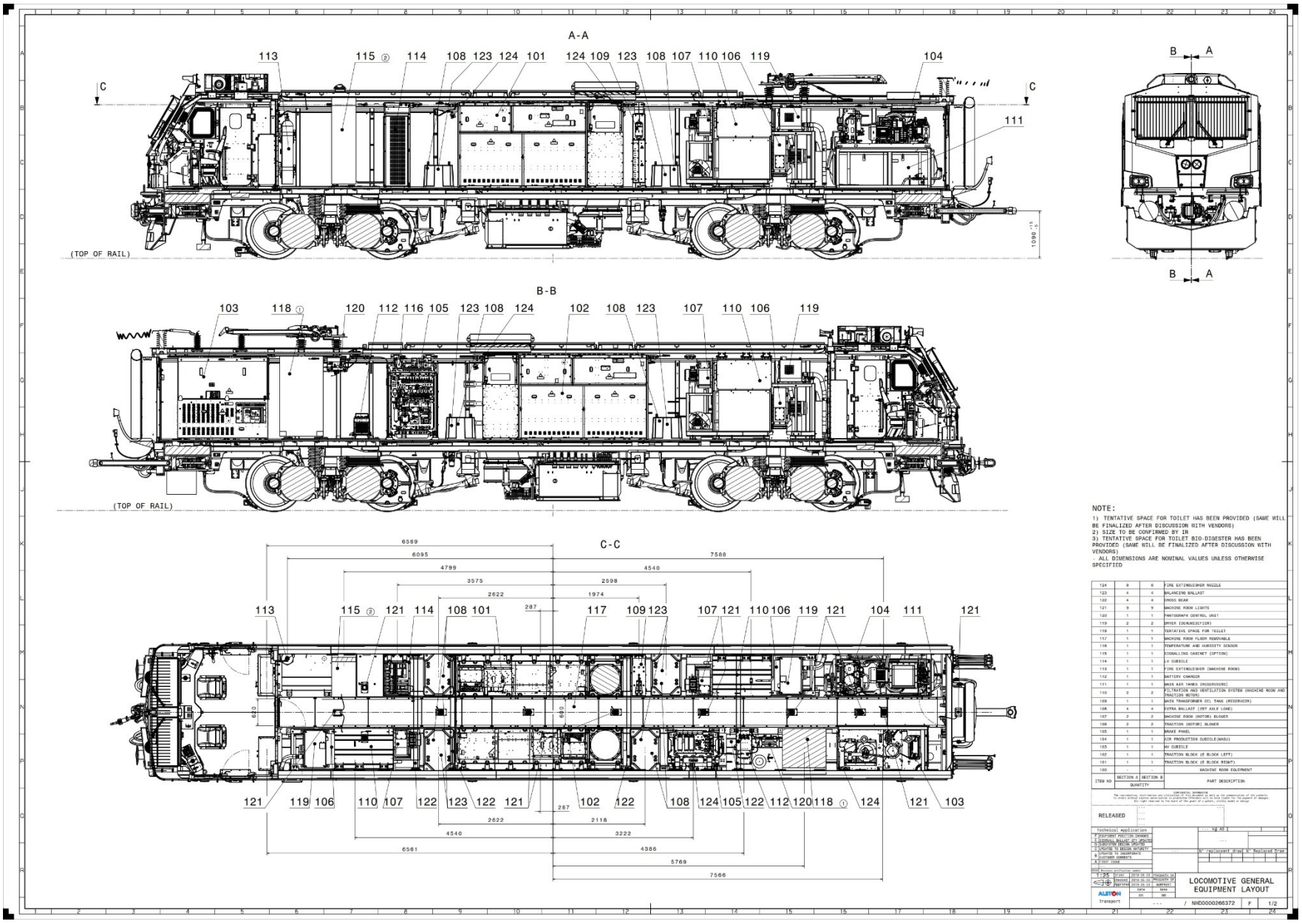


Figure - 4 : Locomotive Equipment Layout

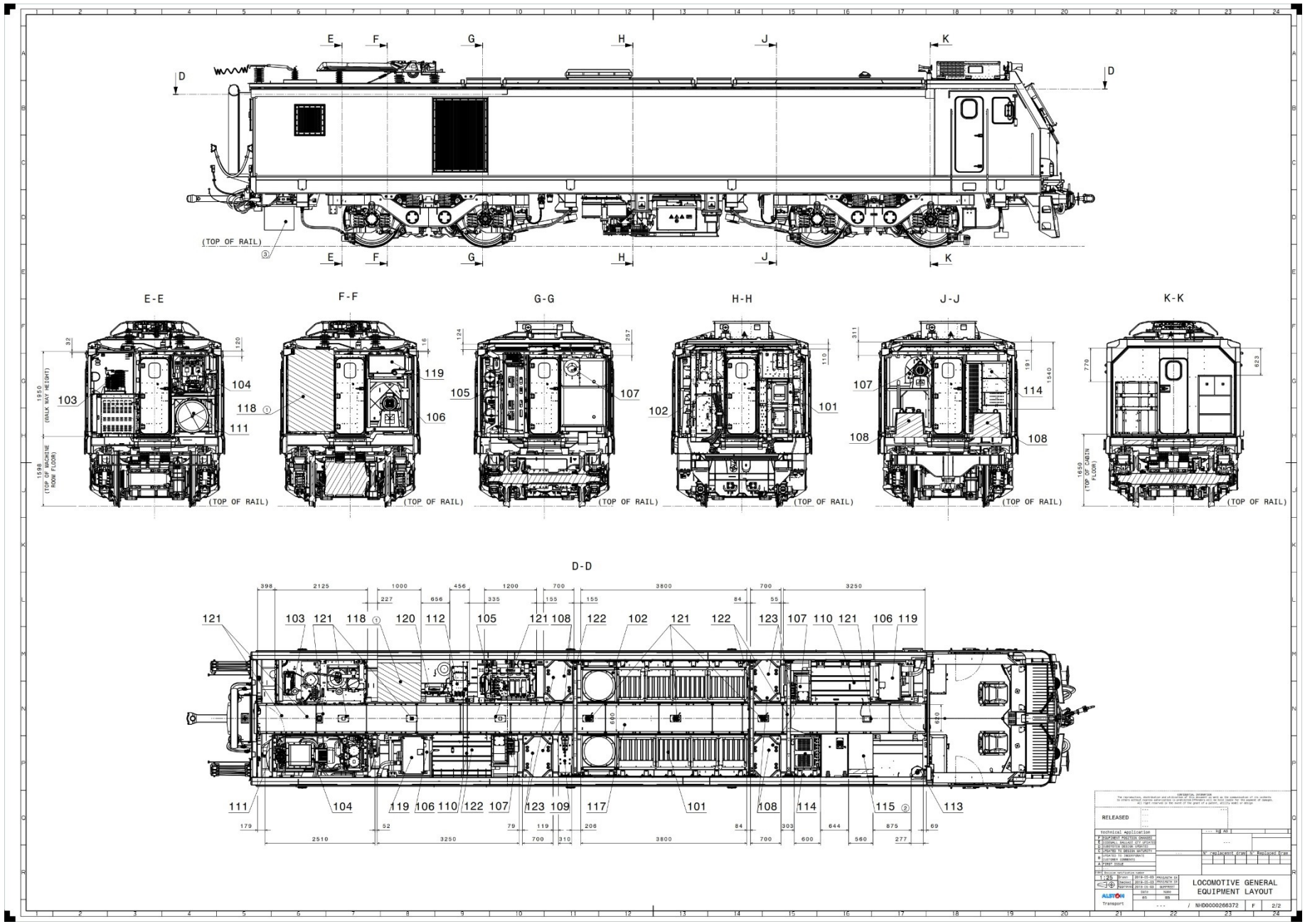


Figure – 5 : Locomotive Equipment Layout

Traction Motor Characteristic of Locomotive

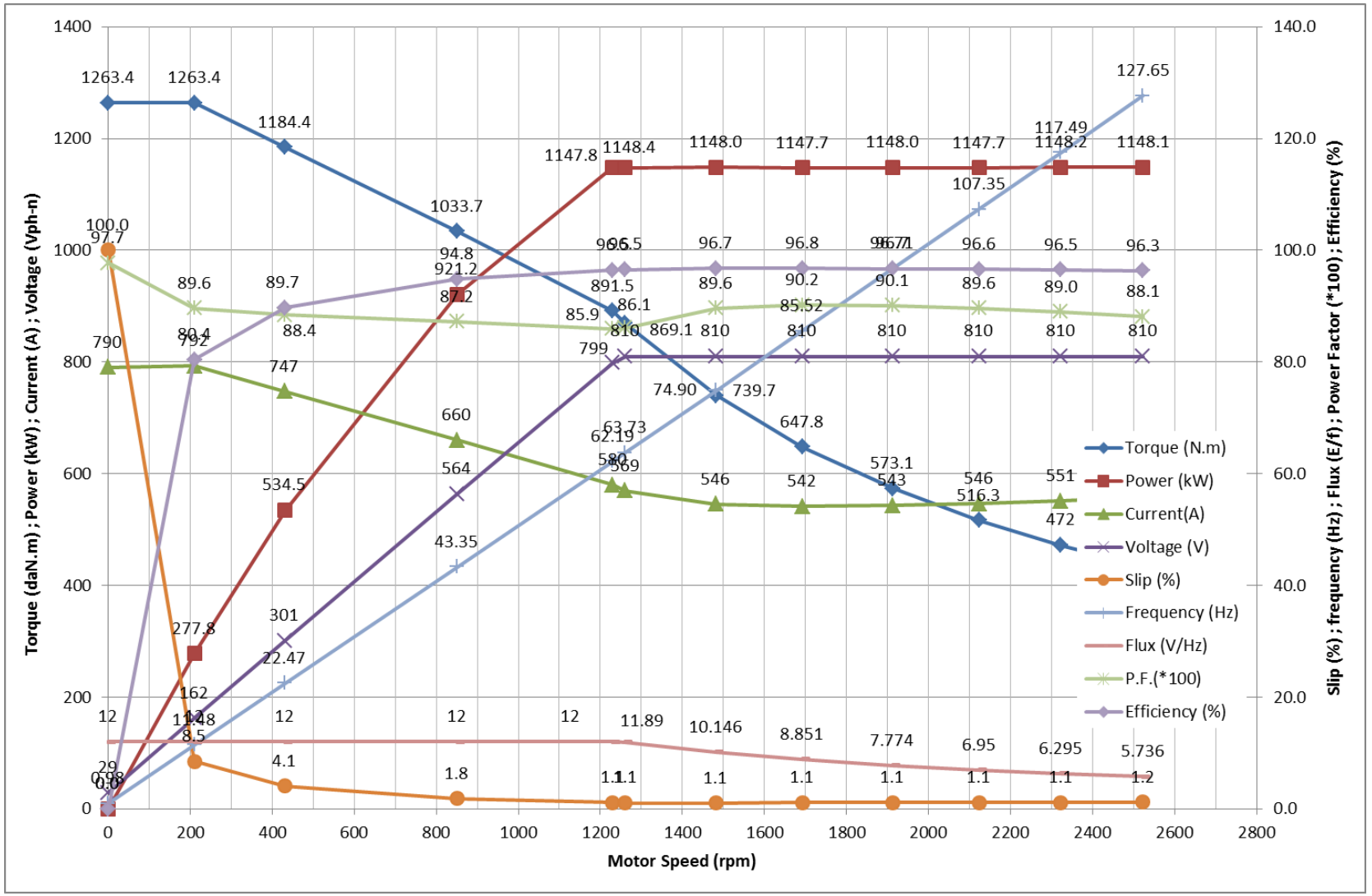


Figure - 6 : Nominal traction mode- motor characteristics

	Speed point	Torque	Mechanical Power	Current	Voltage	Voltage	Slip	Frequency	Flux	Power factor	Efficiency (sinus supply)
	pm	N.m	kW	Irms	Vph-n	Vph-ph	%	Hz	Wb	-	%
Point 1	0	12634	0.0	790	29	50	100.0	0.98	1.91	0.977	0.0
Point 2	210	12634	277.8	792	162	281	8.5	11.48	1.91	0.896	80.4
Point 3	431	11844	534.5	747	301	521	4.1	22.47	1.91	0.884	89.7
Point 4	851	10337	921.2	660	564	977	1.8	43.35	1.91	0.872	94.8
Point 5	1230	8915	1148.4	580	799	1384	1.1	62.19	1.91	0.859	96.5
Point 6	1261	8691	1147.8	569	810	1403	1.1	63.73	1.89	0.861	96.5
Point 7	1482	7397	1148.0	546	810	1403	1.1	74.90	1.61	0.896	96.7
Point 8	1692	6478	1147.7	542	810	1403	1.1	85.52	1.41	0.902	96.8
Point 9	1913	5731	1148.0	543	810	1403	1.1	96.71	1.24	0.901	96.7
Point 10	2123	5163	1147.7	546	810	1403	1.1	107.35	1.11	0.896	96.6
Point 11	2323	4720	1148.2	551	810	1403	1.1	117.49	1.00	0.890	96.5
Point 12	2523	4346	1148.1	557	810	1403	1.2	127.65	0.91	0.881	96.3

Table -1 : Nominal traction mode- motor characteristics

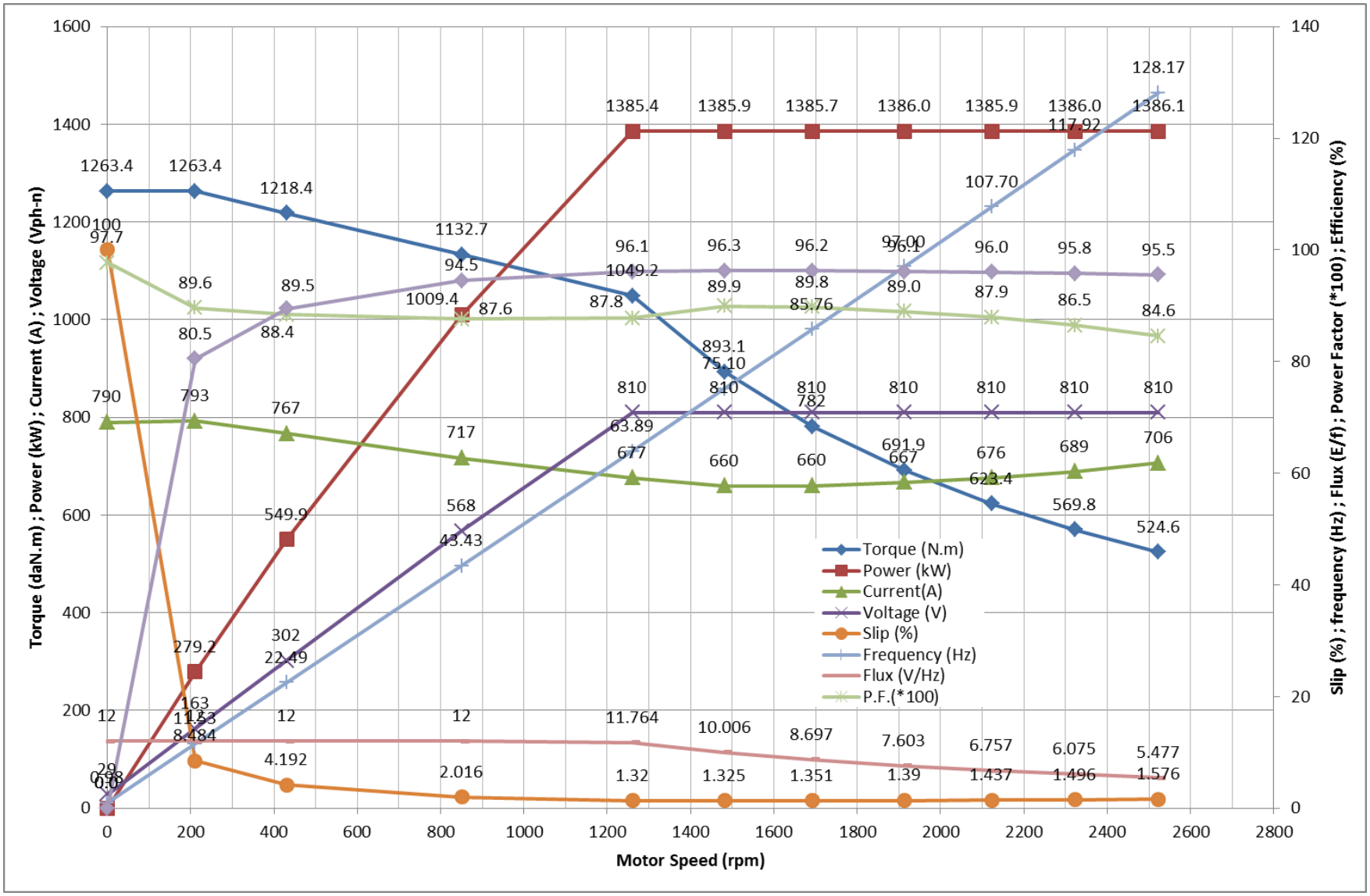


Figure - 7 : Max traction mode motor characteristics

	Speed point	Torque	Mechanical Power	Current	Voltage	Voltage	Slip	Frequency	Flux	Power factor	Efficiency
	pm	N.m	kW	Irms	Vph-n	Vph-ph	%	Hz	Wb	-	%
Point 1	0	12634	0	790	29	50	100	1	1.91	0.977	0
Point 2	211	12634	279	793	163	282	8.5	11.5	1.91	0.896	80.5
Point 3	431	12184	550	767	303	525	4.2	22.5	1.91	0.884	89.5
Point 4	851	11327	1009	717	568	984	2	43.4	1.91	0.876	94.5
Point 5	1236	10543	1365	672	810	1403	1.3	62.6	1.91	0.871	96.1
Point 6	1261	10492	1385	677	810	1403	1.3	63.9	1.87	0.878	96.1
Point 7	1377	9613	1386	664	810	1403	1.3	69.8	1.71	0.894	96.2
Point 8	1482	8931	1386	660	810	1403	1.3	75.1	1.59	0.899	96.3
Point 9	1692	7820	1386	660	810	1403	1.4	85.8	1.38	0.898	96.2
Point 10	1913	6919	1386	667	810	1403	1.4	97	1.21	0.89	96.1
Point 11	2123	6234	1386	676	810	1403	1.4	107.7	1.08	0.879	96
Point 12	2323	5698	1386	689	810	1403	1.5	117.9	0.97	0.865	95.8
Point 13	2523	5246	1386	706	810	1403	1.6	128.2	0.87	0.846	95.5

Table – 2 : Max traction mode motor characteristics

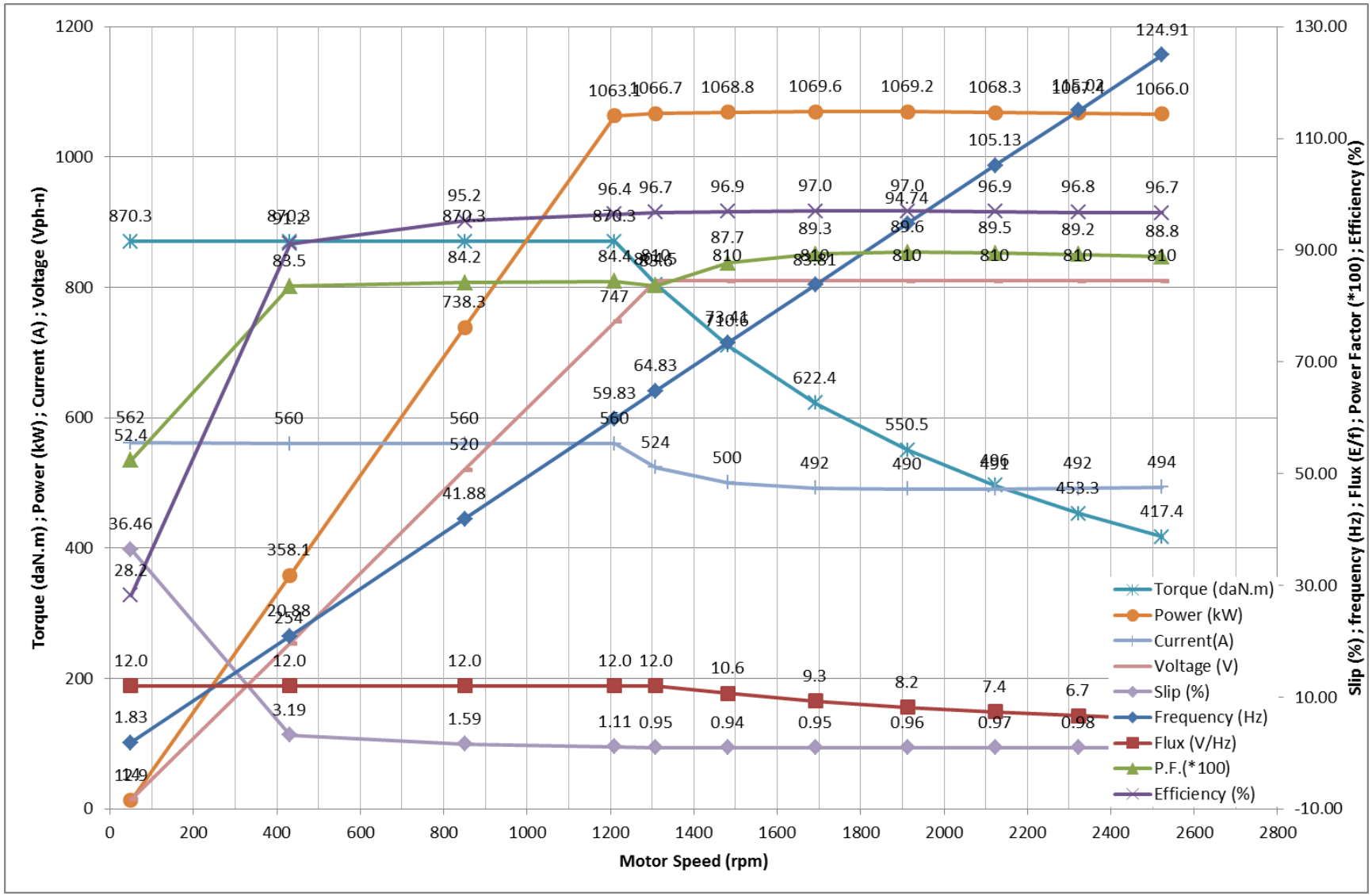


Figure – 8 : Braking mode motor characteristics

	Speed point	Torque	Mechanical Power	Current	Voltage	Voltage	Slip	Frequency	Flux	Power factor	Efficiency
	pm	N.m	kW	Irms	Vph-n	Vph-ph	%	Hz	Wb	-	%
Point 1	50	8703	45.6	562	14	24	36.5	1.8	1.91	0.524	28.2
Point 2	431	8703	393	561	254	440	3.2	20.9	1.91	0.835	81.2
Point 3	851	8703	776	560	520	901	1.6	41.9	1.91	0.842	95.2
Point 4	1210	8703	1103	560	747	1294	1.1	59.8	1.91	0.844	96.4
Point 5	1309	8045	1103	524	810	1403	0.9	64.8	1.91	0.836	96.7
Point 6	1482	7106	1103	500	810	1403	0.9	73.4	1.69	0.877	96.9
Point 7	1692	6224	1103	492	810	1403	0.9	83.8	1.48	0.893	97
Point 8	1913	5505	1103	491	810	1403	1	94.7	1.31	0.896	97
Point 9	2123	4960	1103	491	810	1403	1	105.1	1.17	0.895	96.9
Point 10	2323	4533	1103	492	810	1403	1	115	1.06	0.892	96.8
Point 11	2523	4174	1103	494	810	1403	1	124.9	0.97	0.888	96.7

Table -3 : Braking mode motor characteristics

TE – Speed and BE – Speed Characteristic

CONTINUOUS RATING WAG12B								
SPEED (Kmph)	**0**	**50**	**60**	**70**	**80**	**90**	**100**	**120**
Effort in N	706068	578217	540000	462857	405000	360000	324000	270000
T.E. (Tonne)	**72.05**	**59.00**	**55.10**	**47.23**	**41.33**	**36.73**	**33.06**	**27.55**
BRAKING EFFORT – SPEED CHARACTERISTICS FOR WAG-12B LOCOMOTIVE								
SPEED (Kmph)	**0**	**10**	**60**	**70**	**80**	**90**	**100**	**120**
B.E Effort in N	0	514000	514000	462857	**405000**	**360000**	**324000**	**270000**
B.E. (Tonne)	**0.00**	**52.45**	**52.45**	**47.23**	**41.33**	**36.73**	**33.06**	**27.55**
SHORT TIME RATING WAG12B At 1 TCU isolation (Degraded Condition)								
SPEED (Kmph)	**0**	**10**	**20**	**30**	**40**	**50**	**60**	70
Effort in N	**529875**	**529875**	**520093**	**506927**	**496845**	**485285**	**472680**	405154
T.E. (Tonne)	**54.07**	**54.07**	**53.07**	**51.73**	**50.70**	**49.52**	**48.23**	**41.34**

Table - 4 : TE/BE Vs Speed characteristics

Tractive Effort Speed Curve of Locomotive

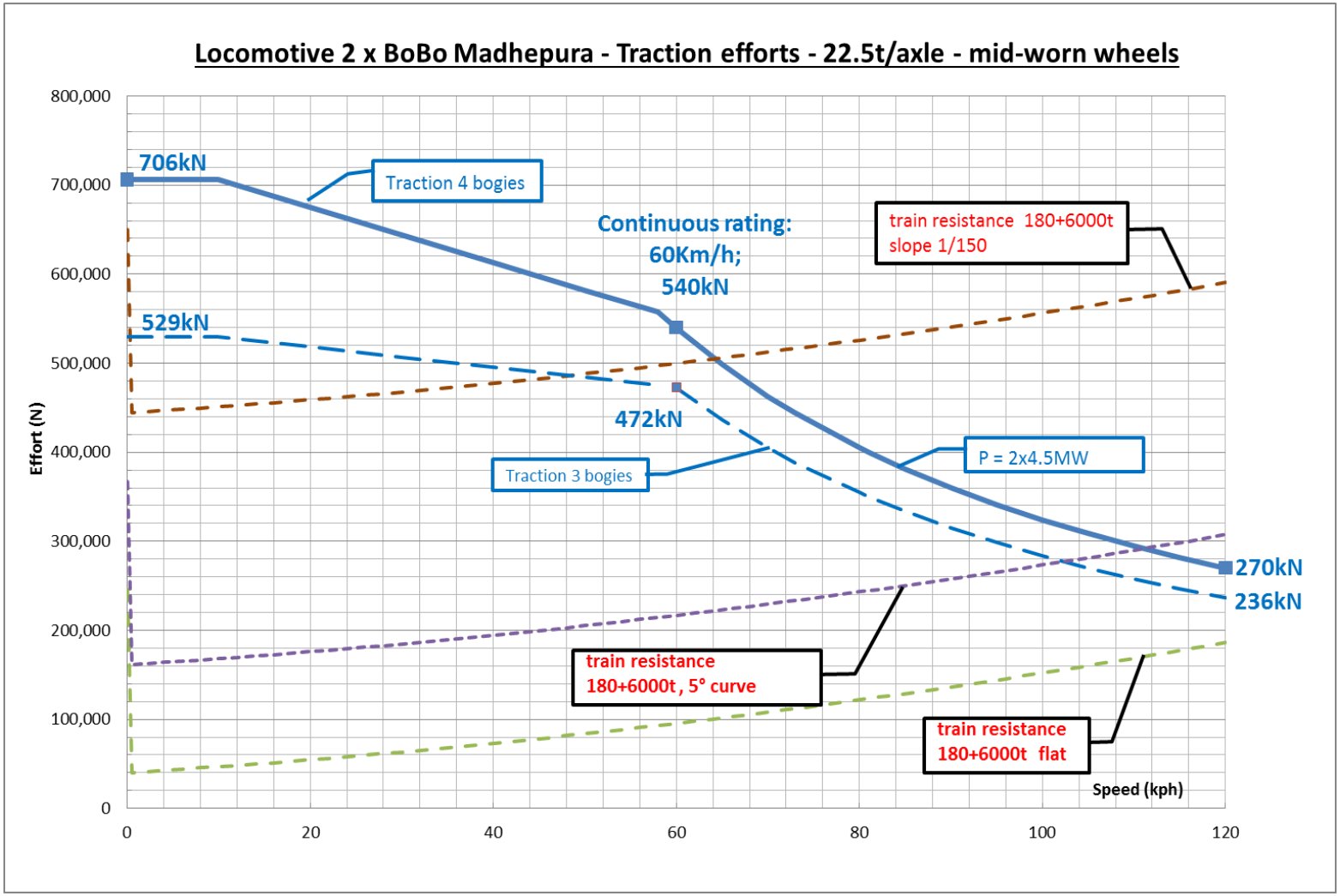


Figure - 9 : Traction Effort Speed Curve – 22.5t/axle

Braking Effort Speed Curve of Locomotive

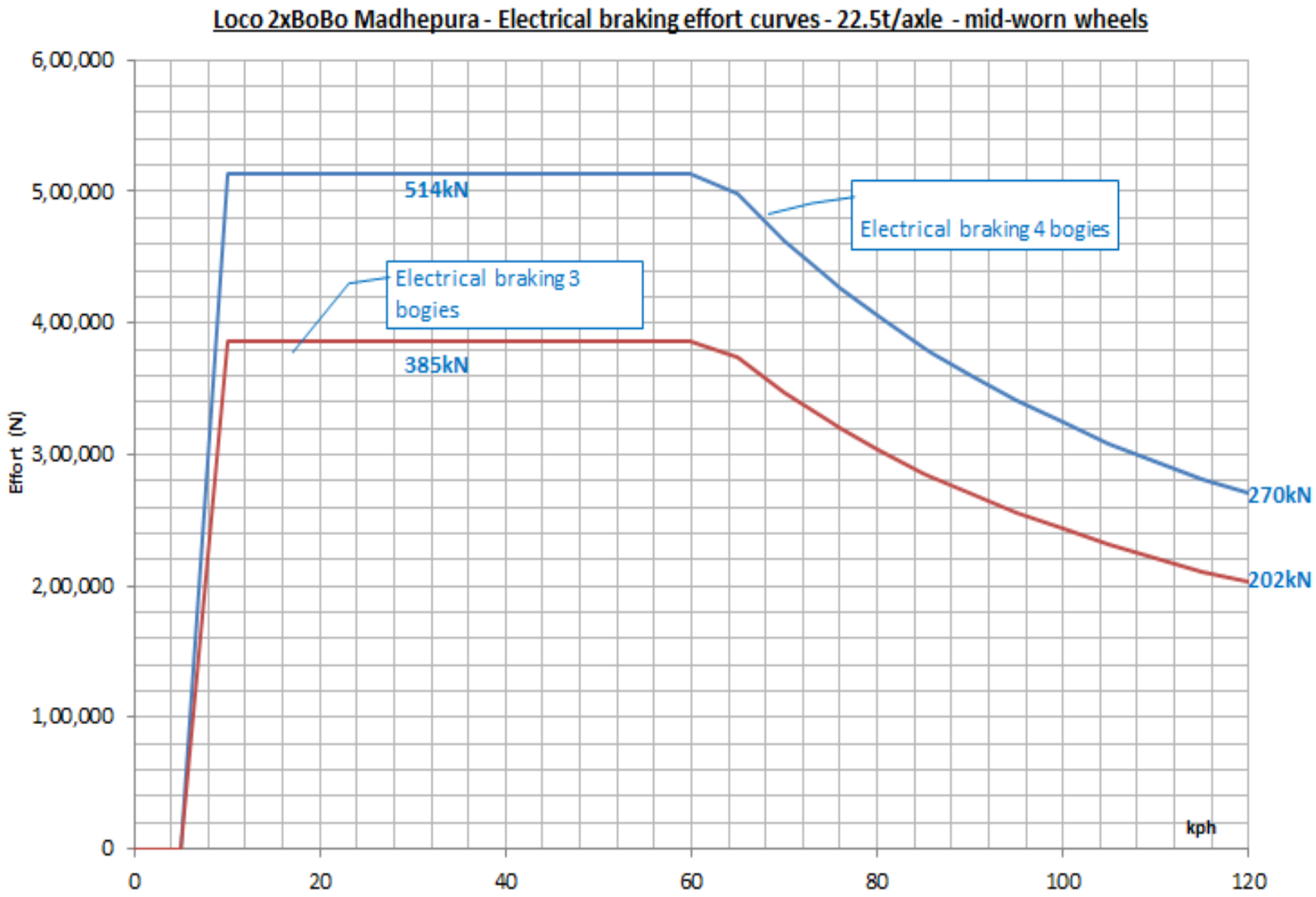


Figure - 10 : Electric Brake Effort Speed Curve – 22.5t/axle

Haulage Capacity of WAG 12B Locomotive

Axle Load 22.5 T, Normal Mode (8 Motors Working) & Dry Track

Case: 0° Curve

Speed in kmph	Level Track	Slope 1/500	Slope 1/200	Slope 1/150	Slope 1/100	Slope 1/75	Slope 1/50	Slope 1/40
START	7600	7318	6471	6000	4651	3764	2704	2221
10	7600	7318	6471	6000	4651	3764	2704	2221
15	7600	7318	6471	6000	4651	3764	2704	2221
20	6000	6000	6000	6000	4651	3764	2704	2221
30	6000	6000	6000	6000	4651	3764	2704	2221
40	6000	6000	6000	6000	4651	3764	2660	2131
50	6000	6000	6000	6000	4651	3647	2488	1994
60	6000	6000	6000	6000	4312	3348	2288	1835
70	6000	6000	6000	4991	3601	2800	1913	1531
80	6000	6000	5194	4229	3064	2386	1629	1302
90	6000	6000	4443	3633	2643	2061	1407	1122
100	6000	6000	3840	3153	2304	1800	1228	977
110	6000	5332	3350	2763	2027	1586	1082	859
120	5626	4593	2931	2427	1789	1402	955	757

Table - 5 : Haulage capacity Normal Mode, Dry & 0^0 Curved Track

Axle Load 22.5 T, Degraded Mode (6 Motors Working) & Dry Track

Case: 0° Curve

Speed in kmph	Level Track	Slope 1/500	Slope 1/200	Slope 1/150	Slope 1/100	Slope 1/75	Slope 1/50	Slope 1/40
START	7600	7318	5282	4489	3439	2774	1981	1618
10	7600	7318	5282	4489	3439	2774	1981	1618
15	7600	7318	5282	4489	3439	2774	1981	1618
20	6000	6000	5282	4489	3439	2774	1981	1618
30	6000	6000	5282	4489	3439	2774	1981	1618
40	6000	6000	5282	4489	3439	2774	1981	1618
50	6000	6000	5282	4489	3439	2774	1981	1618
60	6000	6000	5282	4489	3439	2774	1979	1582
70	6000	6000	5282	4343	3127	2426	1650	1316
80	6000	6000	4518	3674	2656	2063	1402	1115
90	6000	6000	3859	3151	2287	1778	1207	958
100	6000	5401	3330	2731	1989	1549	1050	831
110	5728	4622	2896	2384	1743	1359	919	725
120	4882	3981	2533	2093	1537	1199	810	637

Table - 6 : Haulage capacity Degraded Mode, Dry & 0^0 Curved Track