

Allison Transmission
Bundled Report

Application	116-A353476-1
Iteration	1
Date	April 4, 2025 13:10:30
Units Of Measure	SI

The vehicle performance calculated by iSCAAN is an estimate for the specified vehicle and power train operating at standard engine conditions per SAE J1995 at 91 m (300 feet) altitude of 100 kPa barometric pressure and 25°C (77°F) inlet air temperature. Engine performance is significantly affected as operating altitude increases, therefore, Allison Transmission, Inc. does not represent and hereby disclaims that, under all conditions, the actual vehicle will achieve the simulated performance.

Application Profile

Application Name	Titan HET Z80 - Cummins X15 447kW red. 2360Nm - 4700
Owner	Andreas Wolf @ DGS Mainz
SCAAN Analysis Type	Standard Vehicle Run
Optional Analysis Type	
Classification	Standard
Review Status	Not Submitted

Mission

End User	Unknown
Selected Vocation	Heavy Haul — Equipment Hauler with Escort or Permit — Tractor Trailer (22-10-20)

Platform

Vehicle Manufacturer	Titan (Europe/ME/SA)
Vehicle Model	Z80
Vehicle Configuration	Tractor 6x6
Engine Rating	Cummins X 15 -- 447kW@2100rpm 2779Nm@1400rpm EU Stufe 3a FR11842 - red. 2360Nm -- without SEM/LRTP (116-L032710-E, Rev B)
Transmission	4700 INTL Retarder (1-L007442-T, Rev E)
Transmission Rating	4700 INTL Retarder Heavy Equipment Transport (HET) - Diesel Allison 6th Generation Controls without SEM/LRTP (1-L024294-R, Rev A)
Vehicle Parameters	Standard
Torque Converter	TC561 (1-L001260-TC, Rev B) - Recommended
Transmission Retarder	4000 Series High Capacity (1-L004745-TR, Rev E)
LRTP Status	

Allison Transmission Input Summary

Mission

End User	Unknown
Selected Vocation	Heavy Haul — Equipment Hauler with Escort or Permit — Tractor Trailer (22-10-20)

Platform

Vehicle Manufacturer	Titan (Europe/ME/SA)
Vehicle Model	Z80
Vehicle Configuration	Tractor 6x6
User Expected Engine Load	0%

Platform - Area and Weight

Frontal Area	14.000 m²
Height / Width	4.000 m / 3.500 m
Standard Wind Resistance Coefficient	0.800 (no Deflector)
User Defined Wind Resistance Coefficient	0.800 (no Deflector)
Gross Combined Weight	180000 kg (with Trailer)
Weight On Drive Wheels	78000 kg (43.33%)

Platform - Tires

Number Of Tires	6 (High Flotation (Terra))
Selected Tire	
Tire Revolutions	200 revs/km
Tire Rolling Radius	0.794 m
Standard Surface	Smooth Concrete (SC Factor = 1.00)
Selected Surface	Smooth Concrete (SC Factor = 1.00)
Standard On-Road Traction Limit Coefficient	0.700
Standard Off-Road Traction Limit Coefficient	0.000
User Defined On-Road Traction Limit Coefficient	0.700
User Defined Off-Road Traction Limit Coefficient	0.000
Tire/Wheel Inertia (estimated)	1373.3387 kg-m²

Accessory Losses (Power @ Governed Speed)

Accessory	Standard Loss (kW)	User Defined Loss (kW)
Fan (Clutch Fan)	29.1	29.1
Alternator / Generator	2.2	2.2
Air Compressor	2.2	2.2
Steering Pump	2.2	2.2
Air Conditioning	0.0	0.0
Implement Drive	0.0	0.0

Engine

Number of Power Packs	1
Engine Rating	Cummins X 15 -- 447kW@2100rpm 2779Nm@1400rpm EU Stufe 3a FR11842 - red. 2360Nm -- without SEM/LRTP (116-L032710-E, Rev B)
Engine Controls Type	Electronic
Evaluate at Altitude	No
Certifications	
Displacement	14.90 l
Peak Torque	2360.0 N-m
Peak Torque Speed	1400 rpm
Peak Power	446.9 kW
Peak Power Speed	2100 rpm
Governed Power	446.9 kW
Governed Speed	2100 rpm
Number Of Curves	1
Engine Curve Reference	FR11847
Cruise Velocity @ Speed	0.0 km/h @ 0 rpm
Engine Retarder	
Engine Inertia (estimated)	1.8370 kg-m²
Engine Idle Speed	700 rpm

Engine Curve - Standard Losses - Combined Low & High Curves (AC On Where Applicable)

Speed (rpm)	Gross Power (kW)	Gross Torque (N-m)	Net Power Fan On (kW)	Net Torque Fan On (N-m)	Net Power Fan Off (kW)	Net Torque Fan Off (N-m)	Point Identification
700	96.9	1322.0	92.1	1256.4	93.2	1271.1	
800	130.6	1559.0	125.1	1492.8	126.7	1512.0	
900	178.9	1898.0	172.4	1829.6	174.7	1853.9	
1000	234.3	2237.0	226.7	2165.3	229.9	2195.3	
1100	271.9	2360.0	263.1	2283.9	267.3	2320.2	
1200	296.6	2360.0	286.3	2278.7	291.8	2321.8	
1300	321.3	2360.0	309.4	2272.5	316.3	2323.2	
1400	346.0	2360.0	332.2	2265.6	340.8	2324.4	Peak Torque
1500	370.7	2360.0	354.7	2257.9	365.3	2325.4	
1600	395.4	2360.0	376.9	2249.5	389.8	2326.3	
1700	420.1	2360.0	398.8	2240.4	414.3	2327.1	
1800	444.8	2360.0	420.5	2230.6	438.8	2327.8	
1900	446.9	2246.1	419.1	2106.3	440.6	2214.5	
2000	446.9	2133.8	415.3	1982.8	440.4	2102.8	
2100	446.9	2032.0	411.1	1869.2	440.1	2001.5	Peak Governed
2230	0.0	0.0	-41.8	-179.0	-7.0	-29.9	No Load Governed

Engine Curve - User Defined Losses - Combined Low & High Curves (AC On Where Applicable)

Speed (rpm)	Gross Power (kW)	Gross Torque (N-m)	Net Power Fan On (kW)	Net Torque Fan On (N-m)	Net Power Fan Off (kW)	Net Torque Fan Off (N-m)	Point Identification
700	96.9	1322.0	92.1	1256.4	93.2	1271.1	
800	130.6	1559.0	125.1	1492.8	126.7	1512.0	
900	178.9	1898.0	172.4	1829.6	174.7	1853.9	
1000	234.3	2237.0	226.7	2165.3	229.9	2195.3	
1100	271.9	2360.0	263.1	2283.9	267.3	2320.2	
1200	296.6	2360.0	286.3	2278.7	291.8	2321.8	
1300	321.3	2360.0	309.4	2272.5	316.3	2323.2	
1400	346.0	2360.0	332.2	2265.6	340.8	2324.4	Peak Torque
1500	370.7	2360.0	354.7	2257.9	365.3	2325.4	
1600	395.4	2360.0	376.9	2249.5	389.8	2326.3	
1700	420.1	2360.0	398.8	2240.4	414.3	2327.1	
1800	444.8	2360.0	420.5	2230.6	438.8	2327.8	
1900	446.9	2246.1	419.1	2106.3	440.6	2214.5	
2000	446.9	2133.8	415.3	1982.8	440.4	2102.8	
2100	446.9	2032.0	411.1	1869.2	440.1	2001.5	Peak Governed
2230	0.0	0.0	-41.8	-179.0	-7.0	-29.9	No Load Governed

Transmission

Transmission Manufacturer	Allison Transmission
Transmission Family	4000 Series (1-L001323-TF, Rev U)
Transmission	4700 INTL Retarder (1-L007442-T, Rev E)
Transmission Rating	4700 INTL Retarder Heavy Equipment Transport (HET) - Diesel Allison 6th Generation Controls without SEM/LRTP (1-L024294-R, Rev A)
Torque Converter	TC561 (1-L001260-TC, Rev B) - Recommended
Transmission Retarder	4000 Series High Capacity (1-L004745-TR, Rev E)

Controls

Controls Release	Production Calibration (PC) for 4000 Series (1-L007292-CR, Rev E)
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Controls - Primary Gears (Shift Schedule)

DynActive	No
Speed Profile	Performance
Shift Speed & Strategy	2100 rpm S1 Performance
Equivalent DynActive Bias	0
Primary Mode: Gears	Low = 1, Start = 2, High = 7 (1-2-7)

Driveline

Transmission Output Torque Limit	No
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Driveline - Components

Component	Description	Ratio	Standard Efficiency (%)	User Defined Efficiency (%)
Propshaft -- One Piece -- Two Joint (1-L003521-DL)	Single	1.000	98.60	98.60
Axle -- Off Hwy Single Red -- 6x6 (1-L003573-DL)	Single	16.140	88.40	88.40
Aux Gearing -- Transfer Case -- Two Speed (1-L003523-DL)	Low	2.040	97.00	97.00
Aux Gearing -- Transfer Case -- Two Speed (1-L003523-DL)	High	1.030	97.00	97.00

Driveline - Overall Driveline Ratio

Description	Ratio	Standard Efficiency (%)	User Defined Efficiency (%)	N over V Ratio (rpm/kph)
High	16.624	84.55	84.55	55.526
Low	32.926	84.55	84.55	109.974

Allison Transmission Ratings and Guidelines Check









Note

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Results indicate the vehicle operating conditions at steady state (acceleration = 0).
The exclamation symbol indicates that Wheel Slip may occur.








Converter Rating And Guideline Checks

		Section Score - OK	
C01		Transmission / Converter Compatibility	
Overall Status		OK: Acceptable	
C02		Engine / Converter Compatibility	
Overall Status		OK: Acceptable	
C04		Engine Speed at Converter Stall	
Overall Status		Reference	
Actual		1668 rpm	
C05		Minimum Engine Speed	
Overall Status		OK: Acceptable	
Rating/Recommendation		1200 rpm (Min)	
Actual		1668 rpm	
Notes		Net peak torque speed (1100 rpm) + allowable variation (100 rpm).	
C07		Turbine Torque at Converter Stall	
Overall Status		OK: Acceptable	
Rating/Recommendation		3525.0 N-m (Max)	
Actual		3494.4 N-m	
C08		Converter Speed Ratio at Engine Governed Speed	
Overall Status		OK: Acceptable	
Rating/Recommendation		0.800 (Min)	
Actual		0.820	
C03		Converter Stall Torque Ratio	
Overall Status		Reference	
Actual		1.578	

Transmission Rating And Guideline Checks

 Section Score - OK		
T01		Transmission / Vocation Compatibility
Overall Status		OK: Acceptable
T02		Transmission / Engine Compatibility
Overall Status		OK: Acceptable
T17		Transmission Permitted in End User/Chassis Mfg Locations
Overall Status		OK: Acceptable
T15		Transmission Input Power (Gross)
Overall Status		OK: Acceptable
Rating/Recommendation		447.0 kW (Max)
Actual		446.9 kW
T14		Transmission Input Torque (Gross)
Overall Status		OK: Acceptable
Rating/Recommendation		2508.0 N-m (Max)
Actual		2360.0 N-m
T03		Transmission Input Speed
Overall Status		OK: Acceptable
Rating/Recommendation		1700 rpm / 2300 rpm
Actual		2100 rpm
T04		Transmission Output Speed
Overall Status		Reference
Actual		3286 rpm
Notes		Check made in Range 7L at 2100 rpm Engine Governed Speed.

Vehicle Rating And Guideline Checks - Standard

 Section Score - C		
V22		2nd Range Converter Stall Gradeability
Overall Status		Reference
Actual		23.09 %
V47		2nd Range 80% Converter Efficiency Gradeability
Overall Status		Reference
Actual		14.498
V16		Gradeability Required at Governed Speed
Overall Status		OK: Acceptable
Rating/Recommendation		8.00 % (Min)
Actual		25.65 %
Notes		Check is in Lockup Mode.
V17		Maximum Geared Vehicle Speed at Engine Governed Speed
Overall Status		Reference
Actual		59.2 km/h
Notes		Check is in 7L Lockup.
V18		Maximum Speed on 0.5% Grade
Overall Status		C: Consider - manufacturer to assess
Rating/Recommendation		104.6 km/h (Min)
Actual		34.3 km/h
Notes		At 1907.6 rpm Engine Speed, Range 5L.
V45		Heat Generated in 2nd Range 80% Converter Efficiency
Overall Status		Reference
Actual		97.20 kW
Notes		At 1978.3 rpm Engine Speed.

Allison Transmission
Vehicle Performance Summary

Note

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Full Throttle, Automatic Upshifts (Gradeability)

Engine Fan	Air Conditioning	Engine Power	Vehicle Parameters	Axle Ratio	Auxiliary Gearing Ratio
On	Off	Standard Power Curve	Standard	16.140	2.040

Gradeability	Percent Grade	Vehicle Speed (km/h)	Gear Range	Match Point
Stall Gradeability	23.1	0.0	2C	Stall
Launch Gradeability	21.1	0.0	2C	
Low Speed Gradeability	14.5	3.5	2C	80 Percent
Maximum Speed on Grade	0.0	30.3	7L	Road Load
	0.3	30.1	7L	
	0.5	29.9	7L	
	1.0	25.7	7L	
	2.0	18.4	5L	
	3.0	12.9	4L	
	4.0	12.4	4L	
	5.0	9.7	3L	
	6.0	9.4	3L	
	7.0	6.5	3C	
	8.0	5.3	3C	
	9.0	4.2	3C	
	10.0	4.1	2C	

Full Throttle, Automatic Upshifts (Gradeability)

Engine Fan	Air Conditioning	Engine Power	Vehicle Parameters	Axle Ratio	Auxiliary Gearing Ratio
On	Off	Standard Power Curve	Standard	16.140	1.030

Gradeability	Percent Grade	Vehicle Speed (km/h)	Gear Range	Match Point
Stall Gradeability	10.6	0.0	2C	Stall
Launch Gradeability	8.6	0.0	2C	
Low Speed Gradeability	6.5	6.8	2C	80 Percent
Maximum Speed on Grade	0.0	36.5	5L	Road Load
	0.3	36.3	5L	
	0.5	32.7	5L	
	1.0	25.5	4L	
	2.0	19.1	3L	
	3.0	11.6	3C	
	4.0	8.1	2C	
	5.0	8.1	2C	
	6.0	7.5	2C	
	7.0	6.1	2C	
	8.0	4.8	2C	
	9.0	3.4	2C	
	10.0	1.5	2C	

Full Throttle, Automatic Upshifts (Acceleration)

Engine Fan	Air Conditioning	Engine Power	Vehicle Parameters	Axle Ratio	Auxiliary Gearing Ratio
On	Off	Standard Power Curve	Standard	16.140	2.040

Speed (km/h)	Time (sec)	Distance (m)
0 - 20 km/h	15.3	58
0 - 30 km/h	Not Possible	Not Possible
0 - 40 km/h	Not Possible	Not Possible
0 - 60 km/h	Not Possible	Not Possible
0 - 80 km/h	Not Possible	Not Possible
0 - 100 km/h	Not Possible	Not Possible

Full Throttle, Automatic Upshifts (Acceleration)

Engine Fan	Air Conditioning	Engine Power	Vehicle Parameters	Axle Ratio	Auxiliary Gearing Ratio
On	Off	Standard Power Curve	Standard	16.140	1.030

Speed (km/h)	Time (sec)	Distance (m)
0 - 20 km/h	16.7	60
0 - 30 km/h	51.2	309
0 - 40 km/h	Not Possible	Not Possible
0 - 60 km/h	Not Possible	Not Possible
0 - 80 km/h	Not Possible	Not Possible
0 - 100 km/h	Not Possible	Not Possible

Allison Transmission Vehicle Full Throttle Performance

Note

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Results indicate the vehicle operating conditions at steady state (acceleration = 0).
The exclamation symbol indicates that Wheel Slip may occur.

Full Throttle, Automatic Upshifts (2C-3C-3L-4L-5L-6L-7L)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	2.040	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)		Match Point
2C	0.0	1668	0	425.43	397.19	0.0	23.09	391.91		
2C	0.8	1707	89	402.04	373.80	89.9	21.67	294.09		
2C	1.6	1788	177	374.98	346.73	167.6	20.03	219.74		
2C	2.4	1866	266	334.82	306.58	224.5	17.64	154.04		
2C	2.7	1893	295	320.74	292.49	238.8	16.80	136.78		70 Percent
2C	3.2	1953	354	293.05	264.80	262.0	15.17	107.22		
2C	3.5	1978	380	281.53	253.28	269.8	14.50	96.98		80 Percent
2C	4.0	2047	443	252.87	224.62	282.6	12.83	79.07		
2C	4.1	2053	448	250.53	222.28	283.4	12.69	77.93		85 Percent
2C	4.1	2054	449	250.05	221.80	283.5	12.67	77.69		
3C	4.1	1849	449	189.02	160.76	214.3	9.15	166.35		
3C	4.8	1887	531	176.67	148.42	236.9	8.44	139.06		
3C	5.6	1935	620	164.41	136.15	257.2	7.74	113.54		
3C	6.4	1983	708	152.60	124.33	272.9	7.06	93.20		
3C	6.7	2000	738	148.71	120.44	277.1	6.84	87.51		
3L	6.7	1407	738	146.68	118.41	273.4	6.72	10.33		
3L	7.2	1518	797	146.03	117.76	293.8	6.69	11.29		
3L	8.0	1687	885	144.94	116.67	324.0	6.62	12.82		
3L	8.9	1856	974	139.50	111.21	343.0	6.31	14.02		
3L	9.7	2024	1062	125.66	97.37	337.1	5.52	15.59		
4L	9.7	1518	1062	109.78	81.49	294.5	4.62	10.35		
4L	10.5	1644	1151	109.13	80.83	317.1	4.58	11.57		
4L	11.3	1771	1239	108.43	80.12	339.3	4.54	12.83		
4L	12.1	1897	1328	102.13	73.82	342.4	4.19	14.10		
4L	12.9	2024	1416	94.32	65.99	337.3	3.74	15.33		
4L	12.9	2025	1417	94.25	65.93	337.3	3.74	15.33		
5L	12.9	1417	1417	77.11	48.78	275.9	2.76	9.64		
5L	13.7	1505	1505	76.76	48.43	291.7	2.74	10.73		
5L	14.5	1593	1593	76.39	48.04	307.3	2.72	11.90		
5L	15.3	1682	1682	76.00	47.65	322.8	2.70	13.07		
5L	16.1	1770	1770	75.61	47.24	338.0	2.68	14.26		
5L	16.9	1859	1859	72.85	44.47	342.0	2.52	15.18		
5L	17.7	1947	1947	68.92	40.52	338.9	2.30	16.43		
5L	18.4	2025	2025	65.57	37.16	335.3	2.11	17.65		
6L	18.4	1492	2025	55.42	27.01	283.4	1.53	17.80		
6L	18.5	1500	2036	55.39	26.98	284.8	1.53	17.95		
6L	19.3	1566	2124	55.18	26.75	296.0	1.52	19.16		
6L	20.1	1631	2213	54.97	26.52	307.2	1.50	20.39		
6L	20.9	1696	2301	54.75	26.29	318.2	1.49	21.66		
6L	21.7	1761	2390	54.53	26.05	329.1	1.48	22.88		
6L	22.5	1827	2478	53.53	25.03	335.0	1.42	23.86		
6L	23.3	1892	2567	51.39	22.88	333.1	1.30	25.17		
6L	24.1	1957	2655	49.28	20.75	330.4	1.18	26.09		
6L	24.9	2022	2744	47.22	18.67	327.2	1.06	27.39		
6L	25.0	2025	2747	47.15	18.60	327.1	1.05	27.42		
7L	25.0	1755	2747	46.58	18.03	323.2	1.02	28.60		
7L	25.7	1810	2832	46.16	17.59	330.2	1.00	29.80		
7L	26.6	1866	2921	44.53	15.94	328.5	0.90	31.06		
7L	27.4	1923	3009	42.89	14.28	326.0	0.81	32.66		
7L	28.2	1980	3098	41.26	12.62	322.8	0.71	34.32		
7L	29.0	2036	3186	39.70	11.04	319.5	0.63	35.92		
7L	29.8	2093	3275	38.19	9.51	315.9	0.54	37.78		
7L	29.9	2100	3286	38.00	9.31	315.4	0.53	38.08		Governed
7L	30.6	2149	3363	20.71	-7.99	175.9	-0.45	38.06		
7L	31.4	2206	3452	0.85	-27.88	7.4	-1.58	37.98		
7L	31.4	2208	3456	0.00	-28.73	0.0	-1.63	37.98		

Full Throttle, Manual Hold (7.6269 Ratio) (1C-1L)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	2.040	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)	Match Point	
1C!	0.0	1668	0	914.71	886.47	0.0	58.07	391.91		
1C!	0.8	1803	89	792.78	764.53	177.2	48.05	210.90		
1C!	1.2	1893	136	687.27	659.02	235.5	40.24	140.70	70 Percent	
1C!	1.6	1978	175	602.47	574.23	265.7	34.40	101.82	80 Percent	
1C!	1.6	1984	177	597.56	569.32	267.1	34.07	99.98		
1C!	1.7	2013	190	570.30	542.05	273.6	32.27	91.11		
1L!	1.7	1449	190	573.13	544.89	275.0	32.45	17.97		
1L	2.4	2025	266	489.45	461.20	328.2	27.07	26.03		
1L	2.5	2100	275	466.78	438.53	324.6	25.65	27.20	Governed	
1L	2.6	2214	290	-2.66	-30.90	-1.9	-1.75	20.51		

Full Throttle, Manual Hold (3.5102 Ratio) (2C-2L)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	2.040	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)	Match Point	
2C	0.0	1668	0	425.43	397.19	0.0	23.09	391.91		
2C	0.8	1707	89	402.04	373.80	89.9	21.67	294.09		
2C	1.6	1788	177	374.98	346.73	167.6	20.03	219.74		
2C	2.4	1866	266	334.82	306.58	224.5	17.64	154.04		
2C	2.7	1893	295	320.74	292.49	238.8	16.80	136.78	70 Percent	
2C	3.2	1953	354	293.05	264.80	262.0	15.17	107.22		
2C	3.3	1958	359	290.79	262.55	263.6	15.04	105.11		
2L	3.3	1260	359	269.86	241.61	244.7	13.82	10.82		
2L	4.0	1553	443	266.75	238.50	298.1	13.64	13.94		
2L	4.8	1864	531	253.69	225.44	340.2	12.88	17.17		
2L	5.4	2100	598	218.95	190.69	330.8	10.87	19.81	Governed	
2L	5.6	2175	620	75.47	47.21	118.1	2.68	17.91		
2L	5.7	2214	631	-0.32	-28.57	-0.5	-1.62	16.84		

Full Throttle, Automatic Upshifts (2C-3C-3L-4L-5L-6L-7L)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	1.030	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)	Match Point	
2C	0.0	1668	0	214.80	186.56	0.0	10.63	391.91		
2C	1.6	1707	89	202.87	174.63	90.7	9.94	293.26		
2C	3.2	1790	179	189.02	160.77	169.0	9.15	218.48		
2C	4.8	1868	268	168.40	140.15	225.8	7.96	152.44		
2C	5.3	1893	295	161.94	133.68	238.8	7.60	136.78	70 Percent	
2C	6.4	1956	358	147.16	118.90	263.2	6.75	105.74		
2C	6.8	1978	380	142.14	113.88	269.8	6.46	96.98	80 Percent	
2C	8.0	2052	447	126.71	98.44	283.2	5.59	78.14		
2C	8.1	2053	448	126.49	98.22	283.4	5.57	77.93	85 Percent	
2C	8.1	2054	449	126.25	97.97	283.5	5.56	77.69		
3C	8.1	1849	449	95.43	67.16	214.3	3.81	166.35		
3C	9.7	1889	536	88.83	60.55	238.3	3.43	137.44		
3C	11.3	1938	626	82.59	54.29	258.5	3.08	111.97		
3C	12.9	1987	715	76.59	48.26	273.9	2.74	91.82		
3C	13.3	2000	738	75.08	46.75	277.1	2.65	87.51		
3L	13.3	1407	738	74.06	45.73	273.4	2.59	10.33		
3L	14.5	1533	804	73.69	45.34	296.5	2.57	11.42		
3L	16.1	1704	894	73.13	44.75	326.9	2.54	12.98		
3L	17.7	1874	983	69.67	41.27	342.6	2.34	14.25		
3L	19.1	2024	1062	63.46	35.03	337.1	1.99	15.59		
4L	19.1	1518	1062	55.43	27.01	294.4	1.53	10.35		
4L	19.3	1533	1073	55.39	26.96	297.1	1.53	10.49		
4L	20.9	1660	1162	55.06	26.60	320.0	1.51	11.72		
4L	22.5	1788	1251	54.70	26.20	342.3	1.48	13.02		
4L	24.1	1916	1341	50.98	22.45	341.8	1.27	14.16		
4L	25.5	2025	1417	47.59	19.02	337.3	1.08	15.33		
5L	25.5	1417	1417	38.93	10.37	275.9	0.59	9.64		
5L	25.7	1430	1430	38.91	10.34	278.3	0.59	9.79		
5L	27.4	1519	1519	38.73	10.11	294.3	0.57	10.91		
5L	29.0	1609	1609	38.53	9.88	310.1	0.56	12.11		
5L	30.6	1698	1698	38.34	9.63	325.6	0.55	13.30		
5L	32.2	1788	1788	38.14	9.38	341.0	0.53	14.50		
5L	33.8	1877	1877	36.37	7.56	341.5	0.43	15.52		
5L	35.4	1966	1966	34.37	5.51	338.0	0.31	16.73		
5L	36.5	2025	2025	33.11	4.20	335.3	0.24	17.65		
6L	36.5	1492	2025	27.98	-0.92	283.4	-0.05	17.80		
6L	37.0	1515	2056	27.94	-0.98	287.3	-0.06	18.22		
6L	38.6	1581	2145	27.84	-1.15	298.6	-0.06	19.45		
6L	40.2	1647	2234	27.73	-1.32	309.9	-0.07	20.69		
6L	41.8	1713	2324	27.61	-1.49	321.0	-0.08	21.97		
6L	43.5	1779	2413	27.50	-1.68	331.9	-0.09	23.22		
6L	45.1	1844	2503	26.73	-2.52	334.6	-0.14	24.11		
6L	46.7	1910	2592	25.64	-3.68	332.5	-0.21	25.47		
6L	48.3	1976	2681	24.57	-4.83	329.5	-0.27	26.51		
6L	49.5	2025	2747	23.80	-5.65	327.1	-0.32	27.42		
7L	49.5	1755	2747	23.52	-5.93	323.2	-0.34	28.60		
7L	49.9	1771	2771	23.50	-5.98	325.6	-0.34	28.96		
7L	51.5	1828	2860	23.05	-6.51	329.7	-0.37	30.10		
7L	53.1	1885	2950	22.22	-7.42	327.7	-0.42	31.67		
7L	54.7	1942	3039	21.38	-8.34	325.0	-0.47	33.11		
7L	56.3	1999	3128	20.55	-9.27	321.5	-0.53	35.11		
7L	57.9	2056	3218	19.78	-10.13	318.3	-0.57	36.49		
7L	59.2	2100	3286	19.19	-10.79	315.4	-0.61	38.08	Governed	
7L	59.5	2113	3307	16.85	-13.15	278.6	-0.75	38.08		
7L	61.2	2170	3396	6.72	-23.37	114.2	-1.32	38.04		
7L	62.2	2208	3456	0.00	-30.16	0.0	-1.71	37.98		

Full Throttle, Manual Hold (7.6269 Ratio) (1C-1L)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	1.030	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)	Match Point	
1C	0.0	1668	0	461.84	433.60	0.0	25.34	391.91		
1C	1.6	1805	89	399.51	371.26	178.6	21.51	209.22		
1C	2.4	1893	136	347.00	318.76	235.5	18.36	140.70	70 Percent	
1C	3.1	1978	175	304.19	275.94	265.7	15.83	101.82	80 Percent	
1C	3.2	1987	179	299.89	271.64	268.1	15.57	98.66		
1C	3.4	2013	190	287.94	259.70	273.6	14.87	91.11		
1L	3.4	1449	190	289.37	261.13	275.0	14.96	17.97		
1L	4.8	2045	268	244.08	215.83	327.3	12.32	26.21		
1L	5.0	2100	275	235.68	207.42	324.6	11.83	27.20	Governed	
1L	5.2	2214	290	-1.18	-29.43	-1.7	-1.67	20.51		

Full Throttle, Manual Hold (3.5102 Ratio) (2C-2L)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	1.030	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)	Match Point	
2C	0.0	1668	0	214.80	186.56	0.0	10.63	391.91		
2C	1.6	1707	89	202.87	174.63	90.7	9.94	293.26		
2C	3.2	1790	179	189.02	160.77	169.0	9.15	218.48		
2C	4.8	1868	268	168.40	140.15	225.8	7.96	152.44		
2C	5.3	1893	295	161.94	133.68	238.8	7.60	136.78	70 Percent	
2C	6.4	1956	358	147.16	118.90	263.2	6.75	105.74		
2C	6.5	1958	359	146.82	118.56	263.6	6.73	105.11		
2L	6.5	1260	359	136.25	107.99	244.7	6.13	10.82		
2L	8.0	1569	447	134.59	106.31	300.8	6.03	14.12		
2L	9.7	1882	536	126.67	98.39	339.8	5.58	17.46		
2L	10.8	2100	598	110.55	82.25	330.8	4.66	19.81	Governed	
2L	11.3	2196	626	17.43	-10.88	54.5	-0.62	17.34		
2L	11.4	2214	631	0.00	-28.31	0.0	-1.60	16.85		

Full Throttle, Reverse Performance (Standard 4.801 Ratio) (R1C-R1C)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	2.040	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)	Match Point	
R1C!	0.0	1668	0	567.49	539.25	0.0	32.08	391.91		
R1C	0.8	1734	89	526.66	498.42	117.7	29.43	267.05		
R1C	1.6	1847	177	466.59	438.34	208.6	25.64	173.15		
R1C	2.0	1893	216	431.24	402.99	234.7	23.45	141.59	70 Percent	
R1C	2.4	1962	266	388.86	360.62	260.8	20.87	108.35		
R1C	2.5	1978	277	379.04	350.79	265.6	20.28	101.99	80 Percent	
R1C	3.0	2053	327	337.73	309.48	279.3	17.81	82.77	85 Percent	
R1C	3.2	2093	354	316.77	288.52	283.2	16.57	76.43		
R1C	3.3	2100	358	313.05	284.80	283.4	16.35	75.90	Governed	
R1C	4.0	2192	443	57.17	28.92	63.9	1.64	19.48		
R1C	4.1	2214	456	-0.23	-28.48	-0.3	-1.61	15.52		

Full Throttle, Reverse Performance (Optional 17.120 Ratio - LRTP Required) (R2C-R2C)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	2.040	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)		Match Point
R2C!	0.0	1668	0	2015.39	1987.15	0.0	999.00	391.91		
R2C!	0.5	1893	60	1533.16	1504.92	234.0	163.12	142.47		70 Percent
R2C!	0.7	1978	78	1347.94	1319.70	264.8	112.57	102.90		80 Percent
R2C!	0.8	2035	89	1235.57	1207.32	276.2	93.75	87.20		
R2C!	0.8	2053	92	1201.33	1173.09	278.5	88.94	83.65		85 Percent
R2C!	0.9	2100	101	1113.75	1085.51	282.7	77.98	76.72		Governed
R2C	1.2	2217	128	-19.82	-48.06	-6.4	-2.72	14.40		

Full Throttle, Reverse Performance (Standard 4.801 Ratio) (R1C-R1C)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	1.030	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)	Match Point	
R1C	0.0	1668	0	286.53	258.29	0.0	14.79	391.91		
R1C	1.6	1735	89	265.68	237.43	118.8	13.57	266.04		
R1C	3.2	1849	179	234.77	206.52	209.9	11.78	171.57		
R1C	3.9	1893	216	217.73	189.48	234.7	10.80	141.59	70 Percent	
R1C	4.8	1965	268	195.25	167.00	261.9	9.50	106.91		
R1C	5.0	1978	277	191.38	163.12	265.6	9.28	101.99	80 Percent	
R1C	5.9	2053	327	170.52	142.26	279.3	8.09	82.77	85 Percent	
R1C	6.4	2098	358	158.47	130.21	283.4	7.40	76.00		
R1C	6.5	2100	358	158.06	129.80	283.4	7.37	75.90	Governed	
R1C	8.0	2199	447	19.65	-8.63	43.9	-0.49	17.89		
R1C	8.2	2214	456	0.00	-28.27	0.0	-1.60	15.53		

Full Throttle, Reverse Performance (Optional 17.120 Ratio - LRTP Required) (R2C-R2C)

Engine Fan		Air Conditioning		Engine Power		Vehicle Parameters		Axle Ratio	Auxiliary Gearing Ratio	
On		Off		Standard Power Curve		Standard		16.140	1.030	
Gear Range	Vehicle Speed (km/h)	Engine Speed (rpm)	Output Speed (rpm)	Tractive Effort (kN)	Drawbar Pull (kN)	Wheel Power Available (kW)	Net Grade (%)	Transmission Heat Rejection (kW)	Match Point	
R2C!	0.0	1668	0	1017.57	989.33	0.0	67.67	391.91		
R2C!	1.1	1893	60	774.10	745.85	234.0	46.62	142.47	70 Percent	
R2C!	1.4	1978	78	680.58	652.33	264.8	39.77	102.90	80 Percent	
R2C!	1.6	2040	89	619.05	590.80	276.7	35.52	86.32		
R2C!	1.7	2053	92	606.55	578.31	278.5	34.68	83.65	85 Percent	
R2C!	1.8	2100	101	562.33	534.09	282.7	31.74	76.72	Governed	
R2C	2.3	2215	128	-1.47	-29.71	-0.9	-1.68	14.61		