

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

January 1996

Test 1647/1: Buhler Versatile 2180 Diesel

Nebraska Tractor Test Lab

University of Nebraska-Lincoln, tractortestlab@unl.edu

Follow this and additional works at: <https://digitalcommons.unl.edu/tractormuseumlit>



Part of the [Energy Systems Commons](#), [History of Science, Technology, and Medicine Commons](#), [Other Mechanical Engineering Commons](#), [Physical Sciences and Mathematics Commons](#), [Science and Mathematics Education Commons](#), and the [United States History Commons](#)

Nebraska Tractor Test Lab, "Test 1647/1: Buhler Versatile 2180 Diesel" (1996). *Nebraska Tractor Tests*. 358.

<https://digitalcommons.unl.edu/tractormuseumlit/358>

This Article is brought to you for free and open access by the Tractor Test and Power Museum, The Lester F. Larsen at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Tractor Tests by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

SUMMARY OF OECD TEST 1647/1-NEBRASKA SUMMARY 220A

BUHLER VERSATILE 2180 DIESEL

16 SPEED

POWER TAKE-OFF PERFORMANCE

Power HP (kW)	Crank shaft speed rpm	Gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Mean Atmospheric Conditions
MAXIMUM POWER AND FUEL CONSUMPTION					
Rated Engine Speed—(PTO speed—1104rpm)					
185.9 (138.6)	2100	10.05 (38.04)	0.383 (0.233)	18.49 (3.64)	
Standard Power Take-off Speed (1000 rpm)					
200.2 (149.3)	1903	10.23 (38.71)	0.362 (0.220)	19.58 (3.86)	
Maximum Power (2 hours)					
200.6 (149.6)	1677	10.04 (38.01)	0.355 (0.216)	19.98 (3.94)	

VARYING POWER AND FUEL CONSUMPTION

185.9 (138.6)	2100	10.05 (38.04)	0.383 (0.233)	18.49 (3.64)	Air temperature
163.7 (122.1)	2176	9.24 (34.99)	0.399 (0.243)	17.73 (3.49)	68°F (20°C)
124.8 (93.1)	2213	7.51 (28.41)	0.426 (0.259)	16.63 (3.28)	Relative humidity
84.4 (62.9)	2244	5.82 (22.05)	0.490 (0.298)	14.49 (2.85)	66%
42.8 (31.9)	2276	4.15 (15.71)	0.687 (0.418)	10.30 (2.03)	Barometer
4.8 (3.6)	2300	2.70 (10.22)	3.982 (2.422)	1.78 (0.35)	29.04" Hg (98.34 kPa)

Maximum Torque - 721.4 lb.-ft. (978.1 Nm) at 1370 rpm
Maximum Torque Rise - 55.2%
Torque rise at 1677 engine rpm - 35%

DRAWBAR PERFORMANCE

(Unballasted - Front Drive Engaged)

FUEL CONSUMPTION CHARACTERISTICS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp.°F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
Maximum Power—9th Gear									
166.3 (124.0)	9985 (44.42)	6.24 (10.05)	2099	2.7	0.442 (0.269)	16.04 (3.16)	186 (86)	62 (17)	29.20 (98.89)
75% of Pull at Maximum Power—9th Gear									
131.0 (97.7)	7475 (33.25)	6.57 (10.58)	2193	2.0	0.473 (0.288)	14.97 (2.95)	186 (86)	64 (18)	29.20 (98.89)
50% of Pull at Maximum Power—9th Gear									
89.3 (66.6)	4975 (22.12)	6.73 (10.84)	2231	1.3	0.538 (0.327)	13.20 (2.60)	184 (84)	64 (18)	29.20 (98.89)
75% of Pull at Reduced Engine Speed—10th Gear									
131.2 (97.8)	7495 (33.33)	6.56 (10.56)	1870	1.9	0.436 (0.265)	16.24 (3.20)	185 (85)	64 (18)	29.20 (98.89)
50% of Pull at Reduced Engine Speed—10th Gear									
90.0 (67.1)	5005 (22.26)	6.74 (10.85)	1909	1.2	0.487 (0.296)	14.57 (2.87)	181 (83)	64 (18)	29.20 (98.89)

Location of Test: Prairie Agricultural Machinery Institute (PAMI), Portage La Prairie, Manitoba, Canada

Dates of Test: May - July, 1996.

Manufacturer: Buhler Versatile Inc., 1260 Clarence Ave., Winnipeg, Manitoba, Canada R3C 4E8

FUEL and OIL: Fuel No. 2 Diesel **Specific gravity converted to 60°/60°F (15°/15°C)** 0.8520 **Fuel weight** 7.094 lbs/gal (0.8502 kg/l) **Oil SAE** 15W40 **API service classification** CF-4 **Transmission and hydraulic lubricant** ESN-M2C134 fluid **Front axle lubricant** ESN-M2C134 fluid

ENGINE: Make New Holland Diesel **Type** six cylinder vertical with turbocharger and air to air intercooler **Serial No.** VA588439 **Crankshaft** lengthwise **Rated engine speed** 2100 **Bore and stroke** 4.40" x 5.00" (111.8 mm x 127.0 mm) **Compression ratio** 17.5 to 1 **Displacement** 456 cu in (7480 ml) **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements and aspirator **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil **Fuel filter** one cartridge **Muffler** underhood **Exhaust** vertical **Cooling medium** **temperature control** thermostat and variable speed fan

CHASSIS: **Type** front wheel assist **Serial No.** D408517 **Tread width** rear 60.0" (1524 mm) to 124.0" (3150 mm) front 60.0" (1524 mm) to 88.0" (2235 mm) **Wheelbase** 122.6" (3115 mm) **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with full range operator controlled powershift **Nominal travel speeds mph (km/h)** first 1.77 (2.85) second 2.09 (3.37) third 2.45 (3.94) fourth 2.81 (4.52) fifth 3.32 (5.34) sixth 3.88 (6.24) seventh 4.57 (7.35) eighth 5.34 (8.59) ninth 6.31 (10.15) tenth 7.38 (11.88) eleventh 8.46 (13.61) twelfth 10.00 (16.09) thirteenth 11.69 (18.81) fourteenth 13.77 (22.16) fifteenth 16.27 (26.19) sixteenth 19.04 (30.64) reverse 2.39 (3.85), 2.83 (4.55), 3.31 (5.32), 3.79 (6.10), 4.47 (7.20), 5.24 (8.43), 6.16 (9.92), 7.29 (11.73), 8.53 (13.72) **Clutch** multiple wet disc electro-hydraulically operated by foot pedal **Brakes** multiple wet disc hydraulically actuated by two foot pedals that can be locked together **Steering** hydrostatic **Power take-off** 1000 rpm at 1903 engine rpm **Unladen tractor mass** 19040 lb (8636 kg)

DRAWBAR PERFORMANCE
(Unballasted - Front Drive Engaged)
MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel lb/hp.hr (kg/kW.h)	Consumption Hp.hr/gal (kW.h/l)	Temp.°F(°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
143.9 (107.3)	18550 (82.51)	2.91 (4.68)	2132	15.1	5th Gear 0.518 (0.315)	13.71 (2.70)	184 (84)	63 (17)	29.20 (98.88)
155.0 (115.6)	18415 (81.91)	3.16 (5.08)	1895	11.4	6th Gear 0.467 (0.284)	15.18 (2.99)	186 (86)	63 (17)	29.20 (98.88)
163.7 (122.1)	18400 (81.85)	3.34 (5.37)	1675	9.9	7th Gear 0.439 (0.267)	16.14 (3.18)	189 (87)	63 (17)	29.20 (98.88)
173.0 (129.0)	15790 (70.24)	4.11 (6.61)	1678	6.3	8th Gear 0.418 (0.254)	17.00 (3.35)	189 (87)	63 (17)	29.20 (98.89)
177.4 (132.3)	13490 (60.00)	4.93 (7.94)	1677	3.8	9th Gear 0.403 (0.245)	17.61 (3.47)	189 (87)	61 (16)	29.20 (98.89)
174.3 (130.0)	11230 (49.95)	5.82 (9.37)	1679	3.0	10th Gear 0.421 (0.256)	16.85 (3.32)	189 (87)	63 (17)	29.20 (98.89)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments

NOTE: The data on this summary was obtained from OECD report 1647/1 conducted on the New Holland 8870 Diesel.

REMARKS: All test results were determined from observed data obtained in accordance with official OECD test procedures. The optional hydraulic flow rate claim of 55.0 GPM (208 lpm) was not tested for verification. The performance figures on this summary were taken from a test conducted under the OECD Code II test procedure.

We, the undersigned, certify that this is a true summary of data from OECD Report No. **1647/1** Nebraska Summary 220A, September 1, 2004.

Leonard L. Bashford
Director

M.F. Kocher
V.I. Adamchuk
W.P. Campbell
Board of Tractor Test Engineers

TRACTOR SOUND LEVEL WITH CAB	dB(A)
At 75% load in 10th gear	74.5
Bystander	--

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires -No., size, ply & psi (kPa)	Four 20.8R42;**, 8 (55)	Two 20.8R42;**, 16 (110)
Ballast - Duals (total)	1950 lb (884 kg)	None
- Cast Iron (total)	1380 lb (627 kg)	None
Front Tires -No., size, ply & psi (kPa)	Two 16.9R30;**, 19 (131)	Two 16.9R30;**, 12 (83)
Ballast - Liquid (total)	None	None
- Cast Iron (total)	1595 lb (723 kg)	None
Height of Drawbar	19.6 in (497 mm)	19.6 in (499 mm)
Static Weight with operator - Rear	15740 lb (7140 kg)	12865 lb (5835 kg)
- Front	8390 lb (3805 kg)	6340 lb (2876 kg)
- Total	24130 lb (10945 kg)	19205 lb (8711 kg)

DRAWBAR PERFORMANCE
(Ballasted - Front Drive Engaged)
FUEL CONSUMPTION CHARACTERISTICS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel lb/hp.hr (kg/kW.h)	Consumption Hp.hr/gal (kW.h/l)	Temp.°F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
Maximum Power—8th Gear									
165.5 (123.4)	11720 (52.13)	5.30 (8.52)	2101	1.8	0.441 (0.268)	16.12 (3.18)	186 (86)	73 (23)	29.96 (98.08)
75% of Pull at Maximum Power—8th Gear									
129.8 (96.8)	8780 (39.05)	5.54 (8.92)	2188	1.4	0.482 (0.293)	14.72 (2.90)	186 (86)	82 (28)	28.95 (98.03)
50% of Pull at Maximum Power—8th Gear									
88.5 (66.0)	5865 (26.09)	5.66 (9.11)	2224	0.8	0.547 (0.333)	12.94 (2.55)	185 (85)	82 (28)	28.95 (98.03)
75% of Pull at Reduced Engine Speed—9th Gear									
130.3 (97.2)	8790 (39.09)	5.56 (8.95)	1858	1.4	0.436 (0.265)	16.26 (3.20)	186 (86)	82 (28)	28.95 (98.03)
50% of Pull at Reduced Engine Speed—9th Gear									
88.2 (65.8)	5845 (26.00)	5.66 (9.11)	1881	0.8	0.473 (0.288)	14.97 (2.95)	185 (85)	82 (25)	28.95 (98.03)
MAXIMUM POWER IN SELECTED GEARS									
148.0 (110.4)	25610 (113.91)	2.17 (3.49)	1889	14.9	4th Gear 0.492 (0.299)	14.42 (2.84)	190 (88)	82 (28)	28.96 (98.06)
163.5 (121.9)	24795 (110.29)	2.47 (3.98)	1676	7.4	5th Gear 0.447 (0.272)	15.84 (3.12)	189 (87)	73 (23)	29.00 (98.22)
171.5 (127.9)	21525 (95.75)	2.99 (4.81)	1679	4.6	6th Gear 0.421 (0.256)	16.82 (3.31)	190 (88)	73 (23)	29.00 (98.19)
176.6 (131.7)	18565 (82.59)	3.57 (5.74)	1677	3.1	7th Gear 0.408 (0.248)	17.41 (3.43)	190 (88)	73 (23)	29.00 (98.19)
178.1 (132.8)	15895 (70.71)	4.20 (6.76)	1679	2.6	8th Gear 0.406 (0.247)	17.45 (3.44)	190 (88)	73 (23)	29.00 (98.19)
177.4 (132.3)	13365 (59.46)	4.98 (8.01)	1676	2.2	9th Gear 0.408 (0.248)	17.37 (3.42)	190 (88)	73 (23)	29.00 (98.19)
176.7 (131.8)	11335 (50.41)	5.85 (9.41)	1675	1.7	10th Gear 0.409 (0.249)	17.31 (3.41)	189 (87)	73 (23)	29.00 (98.19)

THREE POINT HITCH PERFORMANCE (OECD Static Test)

CATEGORY: II

Quick Attach: None

Maximum Force Exerted

Through Whole Range: 11350 lbs (50.5 kN) (4" lift cylinders)

i) Opening pressure of relief valve: NA

Sustained pressure of the open relief valve: 2800 psi (193 bar)

ii) Pump delivery rate at minimum pressure: 33.7 GPM (127.6 l/min)

iii) Pump delivery rate at maximum

hydraulic power: 30.4 GPM (115.0 l/min)

Delivery pressure: 2420 psi (167 bar)

Power: 42.9 HP (32.0 kW)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi.(bar)	2800(193)
Location:	lift cylinder
Hydraulic oil temperature: °F (°C)	150(65)
Location:	hydraulic sump
Category:	III
Quick attach:	none

SAE Static Test—System pressure 2510 psi (173 Bar) (4" lift cylinders)

Hitch point distance to ground level in.(mm)	8.0(203)	15.4(390)	23.2(590)	31.1(790)	36.1(917)
Lift force on frame lb	14500	14430	14720	14680	12830
" " " " " (kN)	(64.5)	(64.2)	(65.5)	(65.3)	(57.1)

ASAE Static Test—System pressure 2700 psi (186 Bar) (4" lift cylinders)

Hitch point distance to ground level in.(mm)	8.0(203)	15.4(390)	23.2(590)	31.1(790)	36.1(917)
Lift force on frame lb	15570	15500	15810	15760	13780
" " " " " (kN)	(69.3)	(69.0)	(70.3)	(70.1)	(61.3)

HITCH DIMENSIONS AS TESTED—NO LOAD

	OECD test		SAE test	
	inch	mm	inch	mm
A	29.8	757	28.9	733
B	15.0	380	15.0	380
C	17.4	443	17.4	443
D	15.6	395	15.6	395
E	7.9	200	7.9	200
F	12.4	315	12.4	315
G	35.6	905	35.6	905
H	2.4	62	2.4	62
I	19.9	505	19.9	505
J	23.2	590	23.2	590
K	18.3	465	18.3	465
L	48.8	1240	48.8	1240
M	25.6	650	25.6	650
N	36.0	915	36.0	915
O	9.1	230	8.0	203
P	50.2	1275	45.3	1150
Q	39.1	993	38.1	968
R	34.4	873	35.0	890

