

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F. Larsen

January 1996

Test 1646/1: Buhler Versatile 2210 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 1646/1: Buhler Versatile 2210 Diesel" (1996). *Nebraska Tractor Tests*. 359.

<https://digitalcommons.unl.edu/tractormuseumlit/359>

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 1646/1-NEBRASKA SUMMARY 221A

BUHLER VERSATILE 2210 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—1103 rpm)					
212.4 (158.4)	2100	11.64 (44.60)	0.388 (0.236)	18.25 (3.60)	
Standard Power Take-off Speed (1000 rpm)					
224.5 (167.4)	1902	11.77 (44.55)	0.372 (0.226)	19.09 (3.76)	
Maximum Power (2 hours)					
224.6 (167.5)	1824	11.63 (44.03)	0.367 (0.223)	19.31 (3.80)	

VARYING POWER AND FUEL CONSUMPTION

212.4 (158.4)	2100	11.64 (44.60)	0.388 (0.236)	18.25 (3.60)	Air temperature
187.6 (139.9)	2183	10.66 (40.34)	0.403 (0.245)	17.61 (3.47)	68°F (20°C)
143.0 (106.6)	2217	8.48 (32.11)	0.421 (0.256)	16.85 (3.32)	Relative humidity
96.7 (72.1)	2249	6.41 (24.25)	0.470 (0.286)	15.09 (2.97)	78%
48.9 (36.5)	2278	4.39 (16.63)	0.636 (0.387)	11.14 (2.20)	Barometer
4.3 (3.2)	2300	2.79 (10.55)	4.667 (2.839)	1.52 (0.30)	28.80" Hg (97.54 kPa)

Maximum Torque - 783.6 lb.-ft. (1062.5 Nm) at 1330 rpm
Maximum Torque Rise - 47.5%
Torque rise at 1700 engine rpm - 28%

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									
191.6 (142.9)	11460 (50.98)	6.27 (10.09)	2101	2.8	0.436 (0.265)	16.26 (3.20)	185 (85)	75 (24)	29.00 (98.22)
75% of Pull at Maximum Power—9th Gear									
152.3 (113.6)	8605 (38.27)	6.64 (10.69)	2205	1.9	0.457 (0.278)	15.53 (3.06)	185 (85)	75 (24)	29.00 (98.22)
50% of Pull at Maximum Power—9th Gear									
103.8 (77.4)	5727 (25.47)	6.80 (10.94)	2240	1.1	0.521 (0.317)	13.60 (2.68)	184 (84)	75 (24)	29.00 (98.22)
75% of Pull at Reduced Engine Speed—10th Gear									
152.1 (113.4)	8600 (38.25)	6.63 (10.67)	1882	1.8	0.441 (0.268)	16.12 (3.18)	185 (85)	75 (24)	29.00 (98.22)
50% of Pull at Reduced Engine Speed—10th Gear									
104.9 (78.2)	5760 (25.63)	6.83 (10.98)	1921	1.0	0.480 (0.292)	14.77 (2.91)	184 (84)	75 (24)	29.00 (98.22)

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.** VB586878 **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.** D407840 **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** 19460 lb (8827 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)
164.0 (122.3)	17390 (77.36)	3.54 (5.69)	2136	12.3	6th Gear 0.501 (0.305)	14.13 (2.78)	189 (87)	81 (27)	29.16 (98.75)
178.9 (133.4)	17115 (76.13)	3.92 (6.31)	1991	11.3	7th Gear 0.477 (0.290)	14.87 (2.93)	190 (88)	81 (27)	29.16 (98.75)
192.3 (143.4)	15915 (70.80)	4.53 (7.29)	1829	5.6	8th Gear 0.447 (0.272)	15.84 (3.12)	189 (87)	75 (24)	29.20 (98.89)
202.1 (150.7)	14065 (62.57)	5.39 (8.67)	1826	3.9	9th Gear 0.422 (0.257)	16.76 (3.30)	189 (87)	75 (24)	29.00 (98.22)
200.8 (149.7)	11890 (52.88)	6.33 (10.19)	1824	3.3	10th Gear 0.431 (0.262)	16.49 (3.25)	189 (87)	75 (24)	29.20 (98.89)

REPAIRS AND ADJUSTMENTS: No repairs or adjustments

NOTE: The data on this summary was obtained from OECD report 1646/1 conducted on the New Holland 8970 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. **1646/1** Nebraska Summary 221A, 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	76.0
Bystander	--

TIRES, BALLAST AND WEIGHT

	With Ballast	Without Ballast
Rear Tires -No., size, ply & psi (kPa)	Four 20.8R42; **,10 (69)	Two 20.8R42; **,20 (138)
Ballast - Duals (total)	1950 lb (884 kg)	None
- Cast Iron (total)	3415 lb (1550 kg)	None
Front Tires -No., size, ply & psi (kPa)	Two 16.9R30; **,21 (144)	Two 16.9R30; **,12 (83)
Ballast - Liquid (total)	None	None
- Cast Iron (total)	2610 lb (1183 kg)	None
Height of Drawbar	19.7 in (500 mm)	19.5 in (495 mm)
Static Weight with operator - Rear	18155 lb (8236 kg)	13095 lb (5939 kg)
- Front	9445 lb (4283 kg)	6530 lb (2963 kg)
- Total	27600 lb (12519 kg)	19625 lb (8902 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—9th Gear									
189.5 (141.3)	11265 (50.11)	6.31 (10.15)	2101	1.6	0.441 (0.268)	16.09 (3.17)	190 (88)	80 (26)	29.18 (98.83)
75% of Pull at Maximum Power—9th Gear									
145.0 (108.1)	8160 (36.29)	6.66 (10.72)	2205	1.0	0.473 (0.288)	14.97 (2.95)	185 (85)	81 (27)	29.19 (98.84)
50% of Pull at Maximum Power—9th Gear									
98.8 (73.6)	5440 (24.19)	6.81 (10.96)	2242	0.4	0.533 (0.324)	13.30 (2.62)	185 (85)	81 (27)	29.19 (98.84)
75% of Pull at Reduced Engine Speed—10th Gear									
144.7 (107.9)	8160 (36.30)	6.65 (10.70)	1879	0.8	0.447 (0.272)	15.89 (3.13)	189 (87)	81 (27)	29.19 (98.84)
50% of Pull at Reduced Engine Speed—10th Gear									
98.6 (73.5)	5445 (24.22)	6.79 (10.93)	1912	0.4	0.488 (0.297)	14.52 (2.86)	185 (85)	81 (27)	29.19 (98.84)
MAXIMUM POWER IN SELECTED GEARS									
4th Gear									
172.2 (128.4)	28010 (124.60)	2.31 (3.71)	2001	15.0	0.492 (0.299)	14.42 (2.84)	186 (86)	72 (22)	29.19 (98.83)
5th Gear									
195.1 (145.5)	26945 (119.87)	2.72 (4.37)	1826	7.2	0.441 (0.268)	16.09 (3.17)	184 (84)	72 (22)	29.19 (98.85)
6th Gear									
192.3 (143.4)	22190 (98.71)	3.25 (5.23)	1823	4.8	0.444 (0.270)	15.96 (3.14)	190 (88)	81 (27)	29.19 (98.84)
7th Gear									
195.8 (146.0)	18845 (83.83)	3.90 (6.27)	1826	3.3	0.434 (0.264)	16.34 (3.22)	192 (89)	81 (27)	29.19 (98.84)
8th Gear									
199.3 (148.6)	16115 (71.69)	4.64 (7.46)	1825	2.5	0.425 (0.259)	16.68 (3.29)	189 (87)	80 (26)	29.18 (98.83)
9th Gear									
200.5 (149.5)	13795 (61.37)	5.45 (8.77)	1824	2.0	0.422 (0.257)	16.76 (3.30)	190 (88)	80 (26)	29.18 (98.83)
10th Gear									
196.5 (146.5)	11490 (51.11)	6.41 (10.32)	1825	1.5	0.432 (0.263)	16.46 (3.23)	190 (88)	80 (26)	29.18 (98.83)

THREE POINT HITCH PERFORMANCE (OECD Static Test)

CATEGORY: II

Quick Attach: None

Maximum Force Exerted

Through Whole Range: 14815 lbs (65.9 kN) (4 1/2" lift cylinders)

i) Opening pressure of relief valve: NA

Sustained pressure of the open relief valve: 2785 psi (192 bar)

ii) Pump delivery rate at minimum pressure: 33.5 GPM (126.8 l/min)

iii) Pump delivery rate at maximum

hydraulic power: 30.9 GPM (116.9 l/min)

Delivery pressure: 2350 psi (162 bar)

Power: 42.3 HP (31.6 kW)

THREE POINT HITCH PERFORMANCE

Observed Maximum Pressure psi.(bar)	2785(192)
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 1/2" lift cylinders)

Hitch point distance to ground level in. (mm)	8.0 (203)	15.4 (390)	23.2 (590)	31.1 (790)	35.0 (890)
Lift force on frame lb	17760	18200	18560	18040	17050
" " " " " " (kN)	(79.0)	(81.0)	(82.6)	(80.3)	(75.8)

ASAE Static Test—System pressure 2700 psi (186 Bar) (4 1/2" 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	19120	19590	19980	19420	18360
" " " " " " (kN)	(85.1)	(87.2)	(88.9)	(86.4)	(81.7)

HITCH DIMENSIONS AS TESTED—NO LOAD

	OECD test		SAE test	
	inch	mm	inch	mm
A	29.8	758	27.2	690
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	38.9	989	38.0	964
R	34.1	867	34.6	880

