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## Test 1648/1: Buhler Versatile 2160 Diesel

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# SUMMARY OF OECD TEST 1648/1-NEBRASKA SUMMARY 219A

## BUHLER VERSATILE 2160 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
<b>MAXIMUM POWER AND FUEL CONSUMPTION</b>					
<b>Rated Engine Speed—(PTO speed—1103 rpm)</b>					
164.8 (122.9)	2100	9.90 (37.47)	0.427 (0.260)	16.65 (3.28)	
<b>Standard Power Take-off Speed (1000 rpm)</b>					
179.4 (133.8)	1903	10.04 (38.01)	0.398 (0.242)	17.87 (3.52)	
<b>Maximum Power (2 hours)</b>					
185.9 (138.7)	1700	9.96 (37.71)	0.381 (0.232)	18.65 (3.67)	

VARYING POWER AND FUEL CONSUMPTION					
164.8 (122.9)	2100	9.90 (37.47)	0.427 (0.260)	16.65 (3.28)	Air temperature
145.6 (108.6)	2184	9.14 (34.59)	0.447 (0.272)	15.94 (3.14)	81°F (27°C)
110.8 (82.6)	2215	7.47 (28.27)	0.480 (0.292)	14.82 (2.92)	Relative humidity
75.1 (56.0)	2250	5.72 (21.66)	0.542 (0.330)	13.12 (2.58)	73%
38.0 (28.3)	2275	4.13 (15.62)	0.773 (0.471)	9.21 (1.82)	Barometer
3.1 (2.3)	2294	2.59 (9.82)	5.951 (3.620)	1.20 (0.24)	28.86" Hg (97.74 kPa)

Maximum Torque - 632.2 lb.-ft. (857.2 Nm) at 1380 rpm  
 Maximum Torque Rise - 53.4%  
 Torque rise at 1700 engine rpm - 39%

#### 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)
<b>Maximum Power—9th Gear</b>									
142.3 (106.1)	8440 (37.54)	6.32 (10.17)	2102	2.3	0.487 (0.296)	14.62 (2.88)	186 (86)	70 (21)	29.32 (99.29)
<b>75% of Pull at Maximum Power—9th Gear</b>									
111.4 (83.1)	6315 (28.09)	6.62 (10.65)	2187	1.8	0.539 (0.328)	13.20 (2.60)	185 (85)	70 (21)	29.32 (99.29)
<b>50% of Pull at Maximum Power—9th Gear</b>									
76.2 (56.8)	4225 (18.80)	6.76 (10.88)	2222	1.2	0.613 (0.373)	11.60 (2.29)	184 (84)	70 (21)	29.32 (99.29)
<b>75% of Pull at Reduced Engine Speed—10th Gear</b>									
111.6 (83.2)	6330 (28.15)	6.61 (10.64)	1865	1.6	0.467 (0.284)	15.23 (3.00)	185 (85)	75 (24)	29.31 (99.24)
<b>50% of Pull at Reduced Engine Speed—10th Gear</b>									
75.9 (56.6)	4225 (18.79)	6.74 (10.84)	1890	1.1	0.523 (0.318)	13.60 (2.68)	181 (83)	75 (24)	29.31 (99.24)

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

**Dates of Test:** July - August 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) 0.8544 Fuel weight 7.114 lbs/gal (0.8526 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. VH601084 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. D409192 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 19285 lb (8748 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)
140.8 (105.0)	18635 (82.89)	2.83 (4.56)	1764	15.0	6th Gear 0.508 (0.309)		185 (85)	68 (20)	29.32 (99.29)
158.1 (117.9)	16625 (73.96)	3.57 (5.74)	1702	5.9	7th Gear 0.446 (0.271)		186 (86)	68 (20)	29.32 (99.29)
160.4 (119.6)	14135 (62.87)	4.26 (6.85)	1702	5.0	8th Gear 0.439 (0.267)		186 (86)	68 (20)	29.32 (99.29)
163.9 (122.2)	12085 (53.76)	5.09 (8.18)	1701	3.1	9th Gear 0.432 (0.263)		185 (85)	68 (20)	29.32 (99.29)
162.5 (121.2)	10175 (45.26)	5.99 (9.64)	1702	2.3	10th Gear 0.434 (0.264)		185 (85)	68 (20)	29.32 (99.29)

**REPAIRS AND ADJUSTMENTS:** No repairs or adjustments

**NOTE:** The data on this summary was obtained from OECD report 1648/1 conducted on the New Holland 8770 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. **1648/1** Nebraska Summary 219A, 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	75.0
Bystander	--

**TIRES, BALLAST AND WEIGHT**

	With Ballast	Without Ballast
<b>Rear Tires</b> -No., size, ply & psi (kPa)	Four 20.8R42;**, 8 (55)	Two 20.8R42;**, 16 (110)
<b>Ballast</b> - Duals (total)	1950 lb (884 kg)	None
- Cast Iron (total)	185 lb (84 kg)	None
<b>Front Tires</b> -No., size, ply & psi (kPa)	Two 16.9R30;**, 16 (110)	Two 16.9R30;**, 12 (83)
<b>Ballast</b> - Liquid (total)	None	None
- Cast Iron (total)	745 lb (337 kg)	None
<b>Height of Drawbar</b>	19.5 in (495 mm)	19.7 in (500 mm)
<b>Static Weight with operator</b> - Rear	15015 lb (6810 kg)	13015 lb (5904 kg)
- Front	7315 lb (3318 kg)	6435 lb (2919 kg)
- Total	22330 lb (10128 kg)	19450 lb (8823 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 Consumption 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)
<b>Maximum Power—8th Gear</b>									
141.6 (105.6)	9930 (44.17)	5.35 (8.61)	2100	2.6	0.489 (0.298)	14.52 (2.86)	187 (86)	77 (25)	29.11 (98.59)
<b>75% of Pull at Maximum Power—8th Gear</b>									
111.2 (82.9)	7445 (33.11)	5.60 (9.01)	2190	2.1	0.542 (0.330)	13.12 (2.59)	185 (85)	77 (25)	29.11 (98.59)
<b>50% of Pull at Maximum Power—8th Gear</b>									
75.7 (56.4)	4960 (22.06)	5.72 (9.21)	2226	1.7	0.620 (0.377)	11.47 (2.26)	185 (85)	77 (25)	29.11 (98.59)
<b>75% of Pull at Reduced Engine Speed—9th Gear</b>									
110.6 (82.4)	7440 (33.09)	5.57 (8.97)	1846	1.3	0.477 (0.290)	14.92 (2.94)	187 (86)	77 (25)	29.11 (98.59)
<b>50% of Pull at Reduced Engine Speed—9th Gear</b>									
75.6 (56.4)	4960 (22.07)	5.72 (9.20)	1884	0.8	0.534 (0.325)	13.33 (2.63)	183 (84)	77 (25)	29.11 (98.59)
<b>MAXIMUM POWER IN SELECTED GEARS</b>									
4th Gear									
134.2 (100.1)	22915 (101.92)	2.20 (3.53)	1900	15.0	0.536 (0.326)	13.27 (2.61)	187 (86)	77 (25)	29.13 (98.65)
5th Gear									
150.9 (112.5)	20980 (93.32)	2.70 (4.34)	1800	6.6	0.469 (0.285)	15.18 (2.99)	187 (87)	77 (25)	29.13 (98.65)
6th Gear									
156.0 (116.3)	19170 (85.28)	3.05 (4.91)	1698	4.4	0.452 (0.275)	15.74 (3.10)	185 (85)	77 (25)	29.11 (98.59)
7th Gear									
158.8 (118.4)	16345 (72.70)	3.64 (5.86)	1698	3.1	0.447 (0.272)	15.89 (3.13)	187 (86)	77 (25)	29.11 (98.59)
8th Gear									
160.1 (119.4)	13930 (61.96)	4.31 (6.94)	1700	2.9	0.444 (0.270)	16.04 (3.16)	187 (86)	77 (25)	29.11 (98.59)
9th Gear									
158.6 (118.3)	11660 (51.86)	5.10 (8.21)	1703	2.0	0.444 (0.270)	16.01 (3.15)	187 (86)	79 (26)	29.13 (98.64)
10th Gear									
157.2 (117.2)	9840 (43.76)	5.99 (9.64)	1701	1.5	0.446 (0.271)	15.99 (3.15)	187 (86)	79 (26)	29.13 (98.64)

### THREE POINT HITCH PERFORMANCE (OECD Static Test)

CATEGORY: II

Quick Attach: None

Maximum Force Exerted

Through Whole Range: 12140 lbs (54.0 kN) (4" 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: 33.3 GPM (126.1 l/min)
- iii) Pump delivery rate at maximum
  - hydraulic power: 30.1 GPM (114.1 l/min)
  - Delivery pressure: 2410 psi (166 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" lift cylinders)

Hitch point distance to ground level in. (mm)	8.0 (203)	15.4 (390)	23.2 (590)	31.1 (790)	35.7 (908)
Lift force on frame lb	15940	14640	14930	14660	13130
" " " " " " (kN)	(70.9)	(65.1)	(66.4)	(65.2)	(58.4)

#### 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)	35.7 (908)
Lift force on frame lb	17160	15760	16070	15780	14140
" " " " " " (kN)	(76.3)	(70.1)	(71.5)	(70.2)	(62.9)

### HITCH DIMENSIONS AS TESTED—NO LOAD

	OECD test		SAE test	
	inch	mm	inch	mm
A	30.0	763	28.0	711
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	39.0	992	38.4	975
R	34.6	880	34.9	887

