

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F.
Larsen

2020

Test 2217: Kubota M8-181

Nebraska Tractor Test Laboratory

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](#)

Laboratory, Nebraska Tractor Test, "Test 2217: Kubota M8-181" (2020). *Nebraska Tractor Tests*. 3420.
<https://digitalcommons.unl.edu/tractormuseumlit/3420>

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.

NEBRASKA OECD TRACTOR TEST 2217-SUMMARY 1164

KUBOTA M8-181 DIESEL

30 SPEED

POWER TAKE-OFF PERFORMANCE

Power HP (kW)	Crank shaft speed rpm	Diesel Consumption		D.E.F. Consumption		Mean Atmospheric Conditions
		Gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Gal/hr (l/h)	
MAXIMUM POWER AND FUEL CONSUMPTION						
Rated Engine Speed—(PTO speed—1053 rpm)						
163.60 (122.00)	2101	9.71 (36.75)	0.415 (0.253)	16.85 (3.32)	0.87 (3.31)	Fuel used during active exhaust regeneration-0.42 gal (1.61 l) (see note 1, p.2)
Standard Power Take-off Speed (1000 rpm)						
167.00 (124.53)	1996	9.60 (36.33)	0.402 (0.245)	17.40 (3.43)	0.87 (3.30)	
Maximum Power(1 hour)						
169.73 (126.56)	1900	9.54 (36.12)	0.393 (0.239)	17.79 (3.50)	0.91 (3.46)	

VARYING POWER AND FUEL CONSUMPTION

163.60 (122.00)	2101	9.71 (36.75)	0.415 (0.253)	16.85 (3.32)	0.87 (3.31)	Air temperature
142.62 (106.35)	2161	8.90 (33.67)	0.436 (0.265)	16.03 (3.16)	0.66 (2.49)	74°F (23°C)
108.33 (80.78)	2193	7.46 (28.24)	0.482 (0.293)	14.52 (2.86)	0.41 (1.54)	Relative humidity
73.27 (54.64)	2210	5.67 (21.88)	0.552 (0.336)	12.68 (2.50)	0.31 (1.16)	67%
37.11 (27.68)	2238	4.13 (15.62)	0.778 (0.473)	8.99 (1.77)	0.22 (0.83)	Barometer
1.34 (1.00)	2258	2.60 (9.83)	13.556 (8.246)	0.52 (0.10)	0.15 (0.57)	28.54" Hg (96.64 kPa)

Maximum torque - 560 lb.-ft. (759 Nm) at 1400 rpm

Maximum torque rise - 36.9%

Torque rise at 1680 engine rpm - 30%

Power increase at 1900 engine rpm - 3.7%

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)	D.E.F. Consumption lb/hp.hr (kg/kW.h)	Temp. °F(°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)	
Power at Rated Engine Speed—10th (C1) Gear										
158.26 (118.01)	11488 (51.10)	5.17 (8.31)	2100	3.6	0.439 (0.267)	15.94 (3.14)	0.053 (0.032)	187 (86)	67 (19)	28.74 (97.32)
75% of Pull at Rated Engine Speed—10th (C1) Gear										
123.50 (92.09)	8610 (38.30)	5.38 (8.66)	2172	3.0	0.477 (0.290)	14.67 (2.89)	0.049 (0.030)	184 (84)	77 (25)	28.73 (97.29)
50% of Pull at Rated Engine Speed—10th (C1) Gear										
84.23 (62.81)	5756 (25.60)	5.49 (8.84)	2200	2.1	0.547 (0.333)	12.78 (2.52)	0.053 (0.033)	182 (83)	77 (25)	28.73 (97.29)
75% of Pull at Reduced Engine Speed—14th (C3) Gear										
123.24 (91.90)	8593 (38.22)	5.38 (8.65)	1564	3.1	0.419 (0.255)	16.69 (3.29)	0.051 (0.031)	194 (90)	77 (25)	28.73 (97.29)
50% of Pull at Reduced Engine Speed—14th (C3) Gear										
84.46 (62.98)	5773 (25.68)	5.49 (8.84)	1581	2.0	0.463 (0.282)	15.11 (2.98)	0.048 (0.029)	189 (87)	78 (26)	28.73 (97.29)

Location of tests: Nebraska Tractor Test Laboratory, University of Nebraska, Lincoln, Nebraska 68583-0832

Dates of tests: June 22 - 25, 2020

Manufacturer: Buhler Versatile, 1260 Clarence Ave Winnipeg, Manitoba, Canada R3T 1T2

CONSUMABLE FLUIDS, OIL and TIME: Fuel No. 2 Diesel **Specific gravity converted to 60°/60°F (15°/15°C)** 0.8402 **Fuel weight** 6.996 lbs/gal (0.838 kg/l) **Diesel Exhaust Fluid (DEF)** 32% aqueous urea solution **DEF weight** 9.071 lbs/gal (1.087 kg/l) **Oil SAE 15W40 API service classification** CK-4 **Transmission and hydraulic lubricant** Kubota Super UDT2 fluid **Front axle lubricant** Kubota Super UDT2 fluid **Total time engine was operated:** 20.5 hours

ENGINE: Make Cummins **Diesel Type** six cylinder vertical with turbocharger, air to air intercooler and D.E.F.(diesel exhaust fluid) exhaust treatment **Serial No.***74497640* **Crankshaft** lengthwise **Rated engine speed** 2100 **Bore and stroke** 4.213" x 4.882" (107.0 mm x 124.0 mm) **Compression ratio** 17.3 to 1 **Displacement** 408 cu in (6690 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 paper element and prestrainer **Fuel cooler** radiator for pump return fuel **Exhaust** DOC (diesel oxidation catalyst), SCR (selective catalyst reduction) and regenerative DPF (diesel particulate filter) integrated within a vertical muffler **Cooling medium temperature control** thermostat and variable speed fan

ENGINE OPERATING PARAMETERS: Fuel rate: 66.0 - 71.3 lb/h (29.9 - 32.3 kg/h) **High idle:** 2240 - 2280 rpm **Turbo boost:** nominal 15.7 - 17.9 psi (108 - 123 kPa) as measured 16.2 psi (112 kPa)

CHASSIS: Type front wheel assist with duals **Serial No.***BVWFW210AKA580027* **Tread width** rear 61.0" (1550 mm) to 128.0" (3250 mm) front 61.0" (1550 mm) to 88.0" (2235 mm) **Wheelbase** 114.0" (2896 mm) **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial (6) range operator controlled power shift **Nominal travel speeds mph (km/h)** first 1.98 (3.19) second 2.34 (3.76) third 2.76 (4.44) fourth 3.25 (5.23) fifth 3.55 (5.71) sixth 3.84 (6.18) seventh 4.18 (6.72) eighth 4.52 (7.28) ninth 4.93 (7.94) tenth 5.34 (8.60) eleventh 5.81 (9.35) twelfth 6.29 (10.13) thirteenth 6.87 (11.06) fourteenth 7.43 (11.96) fifteenth 8.09 (13.02) sixteenth 8.76 (14.09) seventeenth 9.92 (15.96) eighteenth 10.35 (16.66) nineteenth 11.68 (18.79) twentieth 12.19 (19.62) twenty-first 13.79 (22.19)

DRAWBAR PERFORMANCE

UNBALLASTED - FRONT DRIVE ENGAGED - 2100 ENGINE RPM MAXIMUM POWER IN SELECTED GEARS

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)	D.E.F. Consumption lb/hp.hr (kg/kW.h)	Temp. °F(°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
1st(A1) Gear										
105.58 (78.73)	21975 (97.75)	1.80 (2.90)	2181	12.9	0.520 (0.317)	13.44 (2.65)	0.050 (0.031)	184 (84)	71 (21)	28.68 (97.12)
2nd(A2) Gear										
122.01 (90.98)	20836 (92.68)	2.20 (3.54)	2170	10.2	0.492 (0.299)	14.23 (2.80)	0.049 (0.030)	184 (84)	71 (21)	28.68 (97.12)
3rd(A3) Gear										
140.15 (104.51)	20155 (89.65)	2.61 (4.20)	2158	8.6	0.468 (0.285)	14.96 (2.95)	0.050 (0.031)	185 (85)	73 (23)	28.69 (97.14)
4th(A4) Gear										
155.91 (116.26)	19375 (86.18)	3.02 (4.86)	2102	7.6	0.452 (0.275)	15.48 (3.05)	0.053 (0.032)	187 (86)	73 (23)	28.69 (97.14)
5th(B1) Gear										
157.49 (117.44)	17700 (78.73)	3.34 (5.38)	2100	6.2	0.446 (0.271)	15.69 (3.09)	0.052 (0.031)	188 (87)	75 (24)	28.68 (97.12)
6th(A5) Gear										
155.40 (115.88)	15952 (70.96)	3.65 (5.87)	2100	5.1	0.451 (0.274)	15.51 (3.06)	0.054 (0.033)	187 (86)	71 (21)	28.74 (97.32)
7th(B2) Gear										
157.46 (117.42)	14804 (65.85)	3.99 (6.42)	2100	4.7	0.445 (0.271)	15.72 (3.10)	0.056 (0.034)	188 (87)	72 (22)	28.73 (97.29)
8th(A6) Gear										
153.43 (114.41)	13212 (58.77)	4.35 (7.00)	2100	4.1	0.454 (0.276)	15.40 (3.03)	0.055 (0.033)	189 (87)	63 (17)	28.74 (97.32)
9th(B3) Gear										
158.51 (118.20)	12497 (55.59)	4.76 (7.66)	2100	3.9	0.438 (0.267)	15.97 (3.15)	0.053 (0.032)	187 (86)	65 (18)	28.74 (97.32)
10th(C1) Gear										
158.26 (118.01)	11488 (51.10)	5.17 (8.31)	2100	3.6	0.439 (0.267)	15.94 (3.14)	0.053 (0.032)	187 (86)	67 (19)	28.74 (97.32)
11th(B4) Gear										
157.81 (117.68)	10508 (46.74)	5.63 (9.06)	2100	3.2	0.446 (0.271)	15.69 (3.09)	0.056 (0.034)	188 (87)	74 (23)	28.77 (97.43)
12th(C2) Gear										
155.99 (116.32)	9564 (42.54)	6.12 (9.85)	2100	2.9	0.453 (0.275)	15.45 (3.04)	0.056 (0.034)	189 (87)	73 (23)	28.78 (97.46)
13th(B5) Gear										
151.41 (112.90)	8483 (37.73)	6.69 (10.77)	2100	2.7	0.464 (0.282)	15.07 (2.97)	0.058 (0.035)	189 (87)	74 (23)	28.77 (97.43)
14th(C3) Gear										
155.95 (116.29)	8065 (35.87)	7.25 (11.67)	2100	2.5	0.451 (0.274)	15.51 (3.06)	0.056 (0.034)	190 (88)	72 (22)	28.78 (97.46)
15th(B6) Gear										
147.98 (110.35)	7013 (31.20)	7.91 (12.73)	2100	2.3	0.474 (0.288)	14.77 (2.91)	0.060 (0.036)	191 (88)	74 (23)	28.77 (97.43)
16th(C4) Gear										
151.70 (113.12)	6638 (29.53)	8.57 (13.79)	2100	2.2	0.464 (0.282)	15.07 (2.97)	0.059 (0.036)	192 (89)	75 (24)	28.77 (97.43)

Horizontal distances of drawbar hitch point behind rear wheel axis - 34.8"(883 mm), 40.6"(1032 mm)

TIRES AND WEIGHT

Rear Tires - No., size, ply & psi(kPa)
Front Tires - No., size, ply & psi(kPa)
Height of Drawbar
Static Weight with operator - Rear
 - Front
 - Total

Tested Without Ballast

Four 480/80R46;***;10(70)
 Two 380/85R34;***;17(115)
 20.0 in (510 mm)
 13995 lb (6348 kg)
 8095 lb (3672 kg)
 22090 lb (10020 kg)

twenty-second 16.24 (26.13) twenty-third 19.20 (30.90) twenty-fourth 19.76 (31.80) twenty-fifth 22.62 (36.40) twenty-sixth 23.27 (37.45) twenty-seventh 24.86 (40.00) twenty-eighth 24.86 (40.00) twenty-ninth 24.86 (40.00) thirtieth 24.86 (40.00) electronically limited reverse 2.17 (3.49), 3.01 (4.85), 3.88 (6.24), 4.20 (6.76), 5.39 (8.68), 5.84 (9.40), 7.51 (12.09), 8.12 (13.07), 10.84 (17.44), 11.32 (18.21), 15.07 (24.25), 16.78 (27.00), 16.78 (27.00), 16.78 (27.00), 16.78 (27.00) electronically limited **Clutch** wet multiple disc hydraulically actuated by foot pedal **Brakes** wet multiple disc hydraulically operated by two foot pedals that can be locked together **Steering** hydrostatic **Power take-off** 1000 rpm at 1995 engine rpm, Economy PTO 1000 rpm at 1600 engine rpm **Unladen tractor mass** 21915 lb (9940 kg)

NOTE 1: The manufacturer declares that the average time between active regenerations is 50 hours.

NOTE 2: The performance figures on this report are the result of replacing the electronic engine control module of the Kubota M8-201 with the Kubota M8-181 module.

REPAIRS AND ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with official OECD, SAE and Nebraska test procedures. The manufacturer's claim of a gain of 25 hp (19 kW) from engine speed 2100 rpm (180 hp (134 kW)) to 1900 rpm 205 hp(153 kW) was not verified. The manufacturers remote hydraulic flow claim of 31 GPM (118 l/min) with standard pump was not verified. This tractor fell 2.8% short of meeting the manufacturer's remote hydraulic claim of 47 GPM (178 l/min) at 2250 rpm and 2.5% short of meeting the claim of 44 GPM(166 l/min) at 2100 engine rpm. The performance figures on this report were taken from a test conducted under the OECD Code 2 test procedure.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **2217**, Nebraska Summary 1164, November 9, 2020.

Roger M. Hoy
 Director

M.F. Kocher
 P.J. Jasa
 J.D. Luck
 Board of Tractor Test Engineers

DRAWBAR PERFORMANCE
UNBALLASTED - FRONT DRIVE ENGAGED - 2000 ENGINE RPM
MAXIMUM POWER IN SELECTED GEARS

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank- shaft speed rpm	Slip %	Fuel Consumption lb/hp.hr (kg/kWh)	Hp.hr/gal (kW.h/l)	D.E.F. Consumption lb/hp.hr (kg/kWh)	Temp. °F(°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
1st(A1) Gear										
105.01 (78.31)	21951 (97.64)	1.79 (2.88)	2181	13.2	0.523 (0.318)	13.37 (2.63)	0.050 (0.030)	184 (84)	70 (21)	28.68 (97.12)
2nd(A2) Gear										
121.99 (90.96)	20828 (92.65)	2.20 (3.54)	2170	10.4	0.492 (0.299)	14.22 (2.80)	0.050 (0.031)	184 (84)	71 (22)	28.68 (97.12)
3rd(A3) Gear										
140.09 (104.47)	20155 (89.65)	2.61 (4.20)	2158	8.7	0.468 (0.285)	14.93 (2.94)	0.050 (0.030)	185 (85)	72 (22)	28.68 (97.12)
4th(A4) Gear										
157.06 (117.12)	19992 (88.93)	2.95 (4.75)	2073	8.4	0.453 (0.276)	15.44 (3.04)	0.055 (0.033)	188 (86)	75 (24)	28.68 (97.12)
5th(B1) Gear										
164.67 (122.79)	19581 (87.10)	3.16 (5.08)	2024	8.1	0.443 (0.269)	15.80 (3.11)	0.056 (0.034)	191 (88)	76 (24)	28.68 (97.12)
6th(A5) Gear										
168.32 (125.51)	18401 (81.85)	3.43 (5.52)	2000	6.5	0.440 (0.268)	15.90 (3.13)	0.059 (0.036)	189 (87)	71 (22)	28.74 (97.32)
7th(B2) Gear										
171.23 (127.69)	17088 (76.01)	3.76 (6.05)	2000	5.7	0.431 (0.262)	16.24 (3.20)	0.058 (0.036)	190 (88)	73 (23)	28.73 (97.29)
8th(A6) Gear										
169.70 (126.54)	15459 (68.76)	4.12 (6.63)	2000	4.8	0.434 (0.264)	16.12 (3.18)	0.056 (0.034)	189 (87)	64 (18)	28.74 (97.32)
9th(B3) Gear										
175.30 (130.72)	14608 (64.98)	4.50 (7.24)	2000	4.5	0.422 (0.257)	16.58 (3.27)	0.056 (0.034)	189 (87)	66 (19)	28.74 (97.32)
10th(C1) Gear										
175.19 (130.64)	13431 (59.74)	4.89 (7.87)	2000	4.2	0.422 (0.256)	16.59 (3.27)	0.057 (0.034)	190 (88)	68 (20)	28.74 (97.32)
11th(B4) Gear										
172.34 (128.51)	12106 (53.85)	5.34 (8.59)	2000	3.9	0.430 (0.261)	16.29 (3.21)	0.057 (0.035)	190 (88)	74 (23)	28.77 (97.43)
12th(C2) Gear										
170.88 (127.42)	11046 (49.14)	5.80 (9.33)	2000	3.3	0.433 (0.263)	16.16 (3.18)	0.060 (0.036)	192 (89)	73 (23)	28.78 (97.46)
13th(B5) Gear										
167.26 (124.72)	9874 (43.92)	6.35 (10.22)	2000	3.0	0.440 (0.268)	15.89 (3.13)	0.060 (0.036)	192 (89)	74 (23)	28.77 (97.43)
14th(C3) Gear										
171.17 (127.64)	9328 (41.49)	6.88 (11.07)	2000	2.9	0.431 (0.262)	16.22 (3.19)	0.059 (0.036)	193 (89)	72 (22)	28.78 (97.46)
15th(B6) Gear										
163.34 (121.80)	8150 (36.25)	7.52 (12.09)	2000	2.6	0.449 (0.273)	15.56 (3.07)	0.062 (0.038)	194 (90)	75 (24)	28.77 (97.43)
16th(C4) Gear										
167.59 (124.97)	7721 (34.34)	8.14 (13.10)	2000	2.4	0.440 (0.267)	15.91 (3.13)	0.061 (0.037)	194 (90)	75 (24)	28.77 (97.43)

Lugging ability in 14th(C3) gear

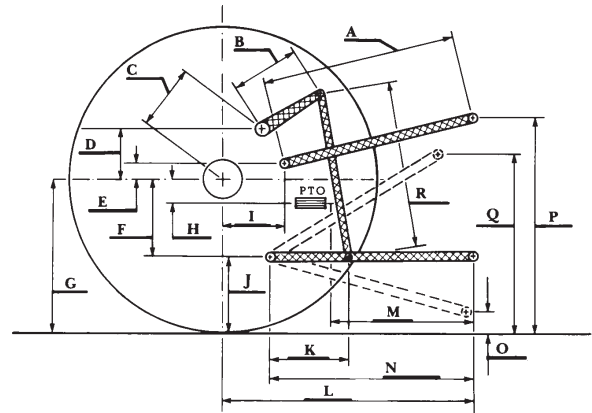
Crankshaft speed rpm	2099	2000	1901	1799	1600	1400	1199	1100
Pull-lbs (kN)	7970 (35.45)	9314 (41.43)	9538 (42.43)	9983 (44.41)	10496 (46.69)	10621 (47.24)	10262 (45.65)	9674 (43.03)
Increase in pull%	0	17	20	25	32	33	29	21
Power-Hp (kW)	154.11 (114.92)	170.98 (127.50)	166.27 (123.99)	164.57 (122.72)	153.63 (114.56)	135.96 (101.39)	112.58 (83.95)	97.53 (72.73)
Speed-mph (km/h)	7.25 (11.67)	6.88 (11.07)	6.54 (10.53)	6.18 (9.95)	5.49 (8.84)	4.80 (7.72)	4.11 (6.61)	3.78 (6.08)
Slip%	2.5	2.8	2.9	3.0	3.2	3.3	3.1	3.0

HYDRAULIC PERFORMANCE

CATEGORY: 3	
Quick Attach: None	
OECD Static test	
	<u>lift cylinders</u>
Maximum force exerted through whole range:	13930 lbs (62.0 kN) 2 x 100 mm
i) Maximum observed pressure:	2899 psi (200 bar)
	three outlet sets combined
ii) Pump delivery rate at minimum pressure:	42.9 GPM (162.3 l/min) (2100 engine rpm)
	45.7 GPM (173.0 l/min) (2240 engine rpm)
iii) Pump delivery rate at maximum	
hydraulic power:	42.5 GPM (161.1 l/min)
Delivery pressure:	2757 psi (190 bar)
Power:	68.4 HP (51.0 kW)
	single outlet set
ii) Pump delivery rate at minimum pressure	
and rated engine speed:	32.2 GPM (121.9 l/min)
iii) Pump delivery rate at maximum	
hydraulic power:	32.0 GPM (121.3 l/min)
Delivery pressure:	2536 psi (175 bar)
Power:	47.4 HP (35.4 kW)

HITCH DIMENSIONS AS TESTED—NO LOAD

	inch	mm
A	30.5	775
B	12.9	328
C	19.4	492
D	17.5	445
E	11.5	292
F	9.1	230
G	36.4	925
H	9.8	249
I	16.1	408
J	27.3	695
K	19.1	485
L	46.5	1181
M	25.1	638
N	38.6	981
O	9.1	230
P	54.3	1380
Q	39.6	1005
R	33.5	850



TRACTOR SOUND LEVEL WITH CAB	Front Wheel Drive	
	Engaged dB(A)	Disengaged dB(A)
At no load in 8th (A6) gear	73.9	70.9
Bystander in 24th (E1) gear	73.9	79.0

RECOMMENDED CITATION FORMAT:

NTTL.(2020). Nebraska OECD tractor test 2217 for Kubota M8-181 Diesel.

Lincoln, NE:Nebraska Tractor Test Laboratory. Retrieved from <http://tractortestlab.unl.edu>



KUBOTA M8-181 DIESEL

Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln