

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

---

Nebraska Tractor Tests

Tractor Test and Power Museum, The Lester F.  
Larsen

---

2008

## Nebraska Summary: S656 Challenger MT645C SCR

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, "Nebraska Summary: S656 Challenger MT645C SCR" (2008). *Nebraska Tractor Tests*. 3153.

<https://digitalcommons.unl.edu/tractormuseumlit/3153>

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 2496–NEBRASKA SUMMARY 656

## CHALLENGER MT645C DIESEL TECHSTAR TRANSMISSION E3 SCR ENGINE TECHNOLOGY

### 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—1081 rpm)</b>					
212.7 (158.6)	2200	11.57 (43.80)	0.380 (0.231)	18.38 (3.62)	
<b>Standard Power Take-off Speed(1000 rpm)</b>					
232.9 (173.7)	2035	12.15 (45.99)	0.363 (0.221)	19.17 (3.78)	
<b>Maximum Power (1 hour)</b>					
242.3 (180.7)	1850	12.15 (45.99)	0.350 (0.213)	19.95 (3.93)	

### VARYING POWER AND FUEL CONSUMPTION

212.7 (158.6)	2200	11.57 (43.80)	0.380 (0.231)	18.38 (3.62)	Air temperature
182.5 (136.1)	2222	10.18 (38.55)	0.389 (0.237)	17.92 (3.53)	70°F (21°C)
137.6 (102.6)	2234	8.23 (31.15)	0.418 (0.254)	16.72 (3.29)	Relative humidity
92.1 (68.7)	2242	6.30 (23.84)	0.477 (0.290)	14.62 (2.88)	52%
46.1 (34.4)	2250	4.42 (16.74)	0.667 (0.406)	10.46 (2.06)	Barometer
--	2260	2.62 (9.91)	--	--	29.8" Hg (101.0 kPa)

Maximum Torque - 811 lb.-ft. (1100 Nm) at 1400 rpm  
 Maximum Torque Rise - 59.9%  
 Torque rise at 1800 engine rpm - 38%  
 Power increase at 1850 engine rpm - 13.9%

### 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—Turtle 7.5</b>									
180.1 (134.3)	14275 (63.50)	4.73 (7.61)	2200	1.9	0.449 (0.273)	15.53 (3.06)	178 (81)	54 (12)	29.2 (98.8)
<b>75% of Pull at Maximum Power—Turtle 7.5</b>									
137.7 (102.7)	10700 (47.60)	4.83 (7.76)	2225	1.1	0.473 (0.288)	14.72 (2.90)	180 (82)	54 (12)	29.2 (98.8)
<b>50% of Pull at Maximum Power—Turtle 7.5</b>									
92.5 (69.0)	7100 (31.58)	4.89 (7.87)	2233	0.7	0.547 (0.333)	12.74 (2.51)	169 (76)	52 (11)	29.2 (98.8)
<b>75% of Pull at Reduced Engine Speed—Turtle 9</b>									
138.4 (103.2)	10705 (47.62)	4.85 (7.80)	1950	1.1	0.445 (0.271)	15.68 (3.09)	165 (74)	54 (12)	29.2 (98.8)
<b>50% of Pull at Reduced Engine Speed—Turtle 9</b>									
92.7 (69.1)	7130 (31.72)	4.87 (7.84)	1934	0.7	0.496 (0.302)	14.06 (2.77)	163 (73)	54 (12)	29.2 (98.8)

**Location of tests:** DLG - Test Centre, Technology and Farm inputs, Max-Eyth-Weg 1, D-64823 Gross-Umstadt, Germany

**Dates of tests:** October 2008 - February 2009.

**Manufacturer:** AGCO S.A. ZA n2 BP 60307, Avenue Blaise Pascal, 60026 Beauvais, France

**FUEL and OIL:** Fuel No. 2 Diesel Specific gravity converted to 60°/60°F (15°/15°C) 0.838 Fuel weight 6.97 lbs/gal (0.8359 kg/l) Oil SAE 10W40 API service classification CI4 Transmission and hydraulic lubricant BP STOU 10W/40 Front axle lubricant SAE 85W90 API GL5

**ENGINE:** Make Sisu Diesel Type six cylinder vertical with turbocharger, air to air intercooler and SCR technology Serial No. T00767 Crankshaft lengthwise Rated engine speed 2200 Bore and stroke 4.370" x 5.709" (111.0 mm x 145.0 mm) Compression ratio 16.7 to 1 Displacement 513 cu in (8419 ml) Starting system 12 volt Lubrication pressure Air cleaner two paper elements 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 Muffler vertical Cooling medium temperature control thermostat and variable speed fan

**CHASSIS:** Type front wheel assist with duals Serial No. T007901 Tread width rear 60.0" (1525 mm) to 101.8" (2585 mm) front 60.8" (1545 mm) to 89.2" (2265 mm) Wheelbase 122.2" (3105 mm) Hydraulic control system direct engine drive Transmission CVT. A combination of mechanical and hydrostatic sections allow an infinite speed adjustment within the ranges noted. The transmission has two mechanical ranges. Nominal travel speeds mph (km/h) forward: Low range 0-17 (0-28), high range 0-25 (0-40) reverse: Low range 0-10 (0-16), high range 0-24 (0-38) Clutch a foot pedal controls the hydrostatic oil flow Brakes multiple wet disc hydraulically operated by two foot pedals that can be locked together Steering hydrostatic Power take-off 540 rpm at 2038 engine rpm or 1000 rpm at 2033 engine rpm Unladen tractor mass 25795 lb (11700 kg)

## DRAWBAR PERFORMANCE

### (Unballasted - Front Drive Engaged) MAXIMUM POWER AT SELECTED SPEEDS

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)
Turtle 5									
173.0 (129.0)	26505 (117.90)	2.45 (3.94)	2029	14.7	0.492 (0.299)	14.17 (2.79)	153 (67)	52 (11)	29.7 (100.5)
Turtle 6									
188.1 (140.3)	26045 (115.85)	2.71 (4.36)	1849	10.7	0.450 (0.274)	15.48 (3.05)	172 (78)	52 (11)	29.7 (100.5)
Turtle 7.5									
204.2 (152.3)	19235 (85.57)	3.98 (6.41)	1850	3.8	0.418 (0.254)	16.70 (3.29)	179 (82)	63 (17)	29.7 (100.7)
Turtle 9									
205.2 (153.0)	17665 (78.59)	4.36 (7.01)	1851	2.8	0.414 (0.252)	16.85 (3.32)	174 (79)	63 (17)	29.8 (100.8)
Turtle 11									
203.3 (151.6)	12915 (57.46)	5.90 (9.50)	1851	1.7	0.418 (0.254)	16.70 (3.29)	172 (78)	61 (16)	29.8 (100.8)
Turtle 13									
199.7 (148.9)	11020 (49.02)	6.79 (10.93)	1850	1.7	0.425 (0.259)	16.40 (3.23)	160 (71)	52 (11)	29.9 (101.1)
Turtle 15									
199.2 (148.5)	9605 (42.72)	7.78 (12.52)	1852	1.0	0.427 (0.260)	16.34 (3.22)	176 (80)	54 (12)	29.8 (100.9)
Turtle 17									
196.8 (146.8)	8310 (36.97)	8.88 (14.29)	1852	1.0	0.432 (0.263)	16.14 (3.18)	178 (81)	52 (11)	29.8 (100.9)
Rabbit 7.5									
194.0 (144.7)	18560 (82.56)	3.92 (6.31)	1851	3.1	0.439 (0.267)	15.89 (3.13)	158 (70)	48 (9)	29.2 (98.8)
Rabbit 9									
197.9 (147.6)	16560 (73.66)	4.48 (7.21)	1850	2.5	0.431 (0.262)	16.19 (3.19)	172 (78)	48 (9)	29.2 (98.8)
Rabbit 11									
202.7 (151.1)	13510 (60.09)	5.63 (9.06)	1852	1.8	0.420 (0.255)	16.61 (3.27)	176 (80)	48 (9)	29.2 (98.8)
Rabbit 13									
203.4 (151.7)	11395 (50.68)	6.69 (10.77)	1852	1.4	0.419 (0.255)	16.65 (3.28)	174 (79)	48 (9)	29.2 (98.8)
Rabbit 15									
203.1 (151.4)	9805 (43.62)	7.77 (12.50)	1851	1.2	0.419 (0.255)	16.65 (3.28)	180 (82)	48 (9)	29.2 (98.8)
Rabbit 17									
202.2 (150.8)	8625 (38.37)	8.79 (14.15)	1855	1.0	0.422 (0.256)	16.55 (3.26)	180 (82)	48 (9)	29.2 (98.8)

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

**NOTE 1:** This tractor injects D.E.F. (Diesel exhaust fluid/Urea) into the exhaust system. This rate was measured at a maximum of 3% of the diesel fuel consumption.

**NOTE 2:** The data on this summary was obtained from OECD report 2496 conducted on the Massey Ferguson 8650 Diesel.

**REMARKS:** All test results were determined from observed data obtained in accordance with official OECD test procedures. This tractor did not meet the manufacturer's claim of 15% power bulge. 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. **2496**, Nebraska Summary 656, December 8, 2009.

Roger M. Hoy  
Director

M.F. Kocher  
V.I. Adamchuk  
J.A. Smith  
Board of Tractor Test Engineers

TRACTOR SOUND LEVEL WITH CAB	dB(A)
At no load in Turtle - 4.6 mph (7.5 km/h) - no load	71.0
Bystander	---

TIRES, BALLAST AND WEIGHT	With Ballast	Without Ballast
<b>Rear Tires</b> - No., size, ply & psi(kPa)	Four 480/80R46;***;10(70)	Four 480/80R46;***;9(65)
<b>Ballast</b> - Fluid (total)	None	None
- Cast Iron (total)	None	None
<b>Front Tires</b> - No., size, ply & psi(kPa)	Four 420/90R30;***;10(70)	Two 420/90R30;***;9(60)
<b>Ballast</b> - Duals (total)	1170 lb (530 kg)	None
- Cast Iron (total)	None	None
<b>Height of Drawbar</b>	19.5 in (500 mm)	19.5 in (500 mm)
<b>Static Weight with operator</b> - Rear	15280 lb (6930 kg)	15280 lb (6930 kg)
- Front	11850 lb (5375 kg)	10680 lb (4845 kg)
- Total	27130 lb(12305 kg)	25960 lb(11775 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)	Fuel Consumption Hp.hr/gal (kW.h/l)	Temp. °F (°C) cool- ing med	Air dry bulb	Barom. inch Hg (kPa)
<b>Maximum Power—Turtle 7.5</b>									
175.9 (131.2)	13705 (60.95)	4.81 (7.75)	2200	2.6	0.458 (0.279)	15.23 (3.00)	167 (75)	43 (6)	29.0 (98.1)
<b>75% of Pull at Maximum Power—Turtle 7.5</b>									
135.0 (100.7)	10270 (45.69)	4.93 (7.93)	2221	2.2	0.490 (0.298)	14.24 (2.81)	163 (73)	43 (6)	29.0 (98.1)
<b>50% of Pull at Maximum Power—Turtle 7.5</b>									
91.2 (68.0)	6830 (30.38)	5.01 (8.06)	2231	1.6	0.566 (0.344)	12.33 (2.43)	154 (68)	43 (6)	29.0 (98.1)
<b>75% of Pull at Reduced Engine Speed—Turtle 9</b>									
134.8 (100.5)	10270 (45.68)	4.92 (7.92)	1872	2.0	0.449 (0.273)	15.53 (3.06)	151 (66)	43 (6)	29.0 (98.1)
<b>50% of Pull at Reduced Engine Speed—Turtle 9</b>									
91.0 (67.8)	6825 (30.36)	5.00 (8.04)	1880	1.5	0.503 (0.306)	13.86 (2.73)	153 (67)	45 (7)	29.0 (98.1)
<b>MAXIMUM POWER AT SELECTED SPEEDS</b>									
Turtle 5									
179.4 (133.8)	27890 (124.06)	2.41 (3.88)	1882	15.1	0.475 (0.289)	14.67 (2.89)	160 (71)	43 (6)	29.0 (98.1)
Turtle 6									
198.1 (147.7)	24615 (109.49)	3.02 (4.86)	1851	7.4	0.429 (0.261)	16.24 (3.20)	165 (74)	43 (6)	29.0 (98.1)
Turtle 7.5									
204.5 (152.5)	19835 (88.23)	3.87 (6.22)	1851	4.3	0.416 (0.253)	16.75 (3.30)	167 (75)	43 (6)	29.0 (98.1)
Turtle 9									
204.9 (152.8)	16130 (71.75)	4.76 (7.67)	1851	2.9	0.415 (0.253)	16.80 (3.31)	163 (73)	43 (6)	29.0 (98.1)
Turtle 11									
202.1 (150.7)	13035 (57.99)	5.81 (9.35)	1851	2.4	0.422 (0.256)	16.55 (3.26)	162 (72)	43 (6)	29.0 (98.2)
Turtle 13									
199.3 (148.6)	10850 (48.27)	6.89 (11.08)	1852	2.0	0.426 (0.259)	16.35 (3.22)	162 (72)	43 (6)	29.0 (98.2)
Turtle 15									
195.2 (145.6)	9260 (41.18)	7.90 (12.72)	1854	1.7	0.436 (0.265)	15.99 (3.15)	167 (75)	43 (6)	29.0 (98.2)
Turtle 17									
192.7 (143.7)	8125 (36.15)	8.89 (14.31)	1855	1.6	0.442 (0.269)	15.79 (3.11)	167 (75)	43 (6)	29.0 (98.1)
Rabbit 7.5									
187.1 (139.5)	19390 (86.26)	3.62 (5.82)	1850	4.4	0.454 (0.276)	15.35 (3.02)	162 (72)	37 (3)	29.0 (98.1)
Rabbit 9									
197.4 (147.2)	15915 (70.78)	4.65 (7.49)	1851	3.2	0.431 (0.262)	16.19 (3.19)	162 (72)	37 (3)	29.0 (98.1)
Rabbit 11									
200.1 (149.2)	13240 (58.89)	5.67 (9.12)	1851	2.5	0.426 (0.259)	16.35 (3.22)	163 (73)	39 (4)	29.0 (98.1)
Rabbit 13									
200.4 (149.4)	11080 (49.28)	6.79 (10.92)	1852	2.1	0.425 (0.259)	16.40 (3.23)	167 (75)	39 (4)	29.0 (98.1)
Rabbit 15									
199.0 (148.4)	9370 (41.69)	7.96 (12.82)	1851	2.0	0.428 (0.260)	16.29 (3.21)	162 (72)	39 (4)	29.0 (98.1)
Rabbit 17									
195.7 (145.9)	8215 (36.55)	8.93 (14.37)	1853	1.8	0.435 (0.265)	16.04 (3.16)	163 (73)	39 (4)	29.0 (98.1)

## HYDRAULIC PERFORMANCE

CATEGORY: IVN

Quick Attach: No

OECD Static test

Maximum force exerted through whole range: 24590 lbs (109.4 kN)

i) Sustained pressure at compensator cutoff: 3190 psi (220 bar)  
**three outlet sets combined**

ii) Pump delivery rate at minimum pressure and rated engine speed: 51.0 GPM (193.2 l/min)

iii) Pump delivery rate at maximum hydraulic power: 46.8 GPM (177.1 l/min)

Delivery pressure: 2770 psi (191 bar)

Power: 75.6 HP (56.4 kW)

**single outlet set**

ii) Pump delivery rate at minimum pressure and rated engine speed: 27.9 GPM (105.5 l/min)

iii) Pump delivery rate at maximum hydraulic power: 26.1 GPM (98.9 l/min)

Delivery pressure: 2655 psi (183 bar)

Power: 40.5 HP (30.2 kW)

### HITCH DIMENSIONS AS TESTED—NO LOAD

	inch	mm
A	35.8	910
B	14.6	370
C	19.1	484
D	15.9	405
E	15.6	395
F	13.0	330
G	36.4	925
H	2.0	50
I	16.5	420
J	23.4	595
K	28.7	730
L	52.4	1330
M	29.8	757
N	42.9	1090
O	9.1	230
P	50.4	1280
Q	38.7	983
R	37.0	940

