
MERCURY DIESEL

TDI 4.2L Emission Documents



INTERNATIONAL MARITIME ORGANIZATION (IMO)

Technical File

and

Copy of United States

Environmental Protection Agency

(EPA) Statement of Compliance

MARINE DIESEL ENGINES

Base Engine TDI 4.2L 370

Mercury Diesel Models:

TDI 4.2L 370

TDI 4.2L 335

IMPORTANT: To comply with regulations this document must remain with the engine at all times.

54660

TDI 4.2L Technical File

Engine Family: EM9XW04.2TDI

1. Components, settings and operating values of the engine which influence its NOx emissions

Components:

Injector
Turbocharger
Charge air cooler
Electronic control module

Settings:

Injection Timing
Injection duration
Injection pressure
Status of turbocharging

Engine operating values:

Please refer to individual engine specifications

2. Full range of allowable adjustments or alternatives for the components of the engine

Adjustments:

No adjustments are allowed to the emission relevant settings.

Alternatives for the components:

Use only those component part numbers specified on the part number summary or equivalent as specified by Mercury Marine at the time of rebuild or repair.

3. Full record of the relevant engine's performance, including the engine's rated speed and rated power

Please see Appendix A.

4. On-board NOx verification procedures

To complete an engine parameter check, the following items must be verified by the surveyor:

- a. parameter "injection timing" and "fueling rate calibration"
confirm calibration by connecting the appropriate diagnostic device to the ECM
- b. parameter "injection nozzle"
verify injector part number
- c. parameter "turbocharger type and build"
verify turbocharger part number
- d. parameter "charge air cooler"
verify charge air cooler part number
- e. parameter "valve lash"
automatic valve lash compensation, self-regulating

54666

5. Copy of the Base Engine Test Report

Please see Appendix B.

6. Designation and restrictions for an engine which is a member of an engine group or engine family

Designation: These engines are for use in recreational marine propulsion applications only.
 Restriction: Must be installed in accordance with Mercury Marine installation guide/manual.

7. Specifications of spare parts/components which, when used in the engine, according to those specifications, will result in continued compliance of the engine with the NO_x emission limits

Identification numbers which should be checked within the scope of the On-Board NO_x verification procedures (section 4) are shown below.

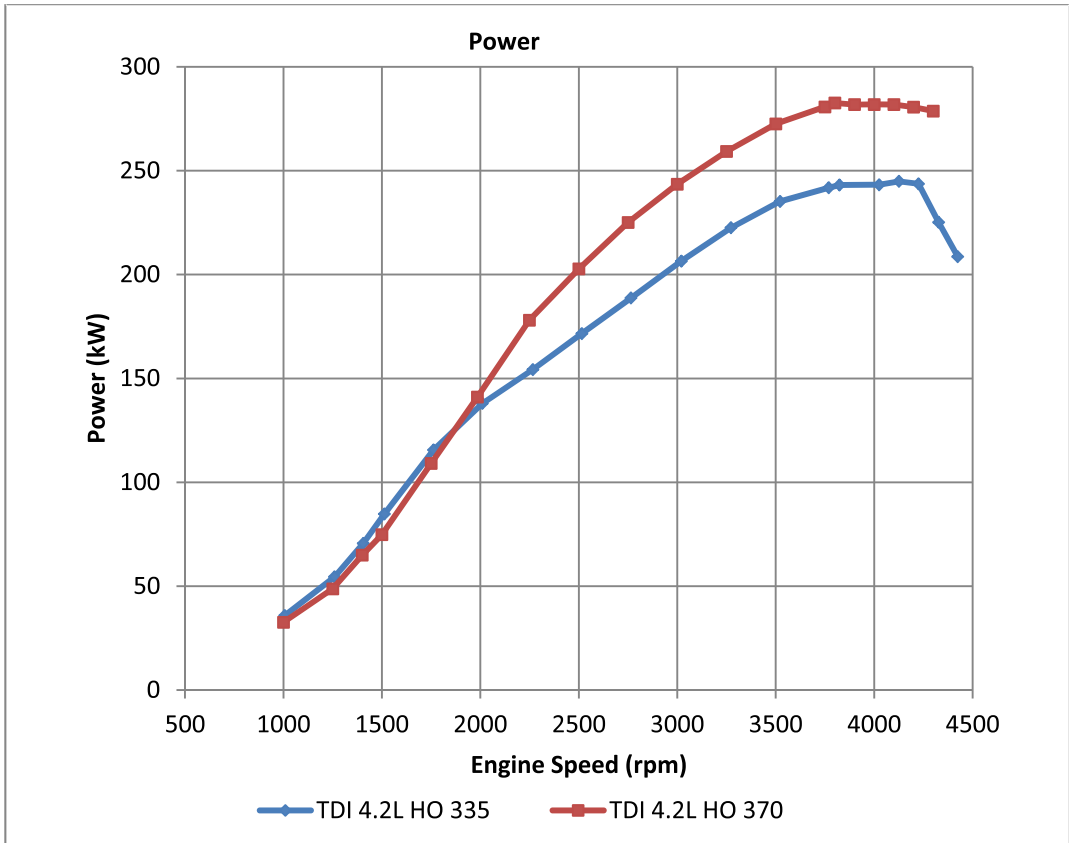
No. of Cyl.	Engine Code	Engine Rating (kW @ rpm)	Component Type	Identification number
8	TDI 4.2L 370	272 @ 4200 [TDI 4.2L HO 370]	Injector Pump	8M0083014
			Injector	8M0083015
			Turbocharger	8M0066790
			Charge Air Cooler/Aftercooler	8M6002218
			Electronic Control Module	8M0083016
			Speed Sensor	8M0066370
			Phase Sensor	8M0083022
			Coolant Temperature Sensor	8M0067235
			Fuel Temperature Sensor	8M0083023
			Air Pressure Sensor	8M0083024
			Temperature/Pressure Sensor	8M0066367
8	TDI 4.2L 335	246 @ 4200 [TDI 4.2L HO 335]	Same as engine code CEMA Except: Electronic Control Module	Same as engine code CEMA 8M0083019

8. EIAPP Certificate or statement of Voluntary Compliance (as applicable)

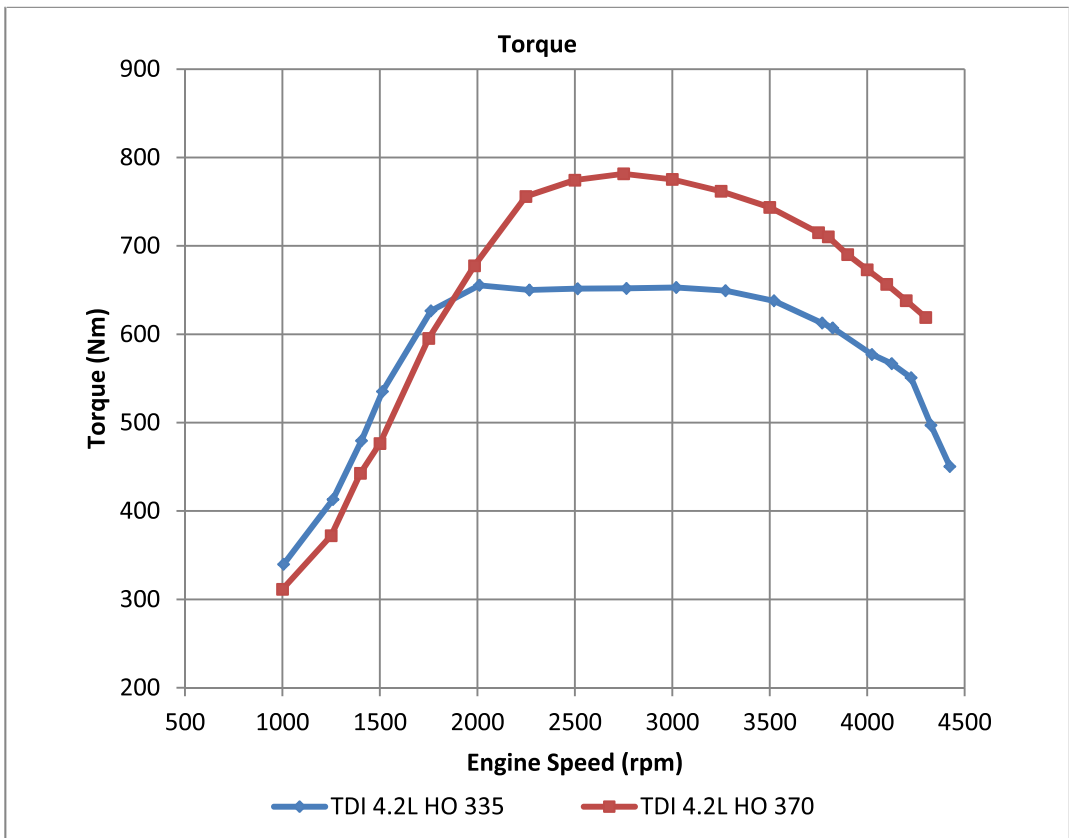
Please see Appendix C.

54667

Appendix A - Power/Torque Curves



54668



54669

Appendix B - Parent Engine Test Report

Engine:

Manufacturer	Mercury Marine		
Engine type	TDI 4.2L 370		
Family or group identification	EM9XW04.2TDI		
Serial number	CMC000201		
Rated speed	4200 rpm		
Rated power	272 kW		
Intermediate speed	N/A		
Maximum torque at intermediate speed	N/A		
Static injection timing	N/A		
Electronic injection control	no:	yes: x	
Variable injection timing	no:	yes: x	
Variable turbocharger geometry	no:	yes: x	
Bore	83 mm		
Stroke	95.5 mm		
Nominal compression ratio	16.4 : 1		
Cylinder number and configuration	Number: 8	V: X	In-Line:
Auxiliaries	N/A		

Specified ambient conditions:

Maximum seawater temperature	38 °C (100°F)
Maximum charge air temperature	55 °C (131°F)
Cooling system spec. intermediate cooler	Operating temperature 90° - 98° C (194-208° F)
Cooling system spec. charge air stages	Same temperature of incoming sea water
Low/high temperature Cooling system set points	Thermostat fully closed 67°C (152,6 °F), fully open @ 83°C (181,4 °F)
Maximum inlet depression	3 kPa
Maximum exhaust backpressure	65 kPa
Fuel specification	Grade 2-D diesel fuel
Fuel temperature	Minimum -5°C (23 °F), Maximum 50°C (122 °F) at fuel filter
Lubricating oil specification	SAE 5W-30

Application/Intended for:

Customer	Pleasure craft (planning hull)
Final application/installation, ship	N/A
Final application/installation, engine	Main: X Aux:

Emission test results

Cycle	ISO 8178-4 E5
NOx (g/kWh)	5.37
Date(s)	10 April, 2013
Test numbers	VA81287

54670

Engine family information / Group information (common specifications)	
Combustion cycle	Four stroke
Cooling medium	60 % Water, 40 % G12++
Cylinder configuration	V
Method of aspiration	Turbocharged with intercooler
Fuel type to be used on board	Grade 2D diesel fuel
Combustion chamber	Ref. VW 057.000.151.A
Valve port configuration	4 valves per cylinder (2 exh – 2 inlet)
Valve size and number	Ø 28.7 mm (inlet) – Ø 24.7 mm (exh.)
Fuel system type	Common Rail

Miscellaneous features	
Exhaust gas recirculation	N/A
Water injection/emulsion	N/A
Air injection	N/A
Charge cooling system	Yes
Exhaust after-treatment	N/A
Exhaust after-treatment type	N/A
Dual fuel	N/A

Engine family / group information (selection of parent engine for test-bed test)		
Family / group identification	EM9XW04.2TDI	
Method of pressure charging	Turbocharger + Intercooler	
Charge air cooling system	Air / Water	
Criteria of the selection (specify)	Highest NO _x emission	
Engine Model	TDI 4.2L 335	TDI 4.2L 370
Number of cylinders	8	8
Max. rated power per cylinder (kW)	30.8	34.9
Rated speed (rpm)	4200	4200
Selected parent engine	TDI 4.2L 370	
Application	Main Engine Pleasure Craft	

54671

**Test results for
ISO 8178-4 E5 (CI) duty cycle**

VW Antriebssysteme	Engine type: 4.2L 4V TDICR
Date: 10.04.2013	Engine-No.: CMC000201
Location of testing: VW Salzgitter	Bore / Stroke:
Test bench: VSZE01	Engine Displacement:
Test bench operator: Kazuschke	Numbers of cylinders: 8
Engineer: Papst	Operating method: 4 stroke
	Test-No.: va81287

Measuring point	Unit	1	2	3	4	5
Engine speed	[rpm]	4207	3827	3360	2642	650
Torque	[Nm]	609	510	387	245	3
Power	[kW]	268,48	204,56	136,13	67,91	0,20
G _{exh}	[kg/h]	1310,04	1026,79	760,69	461,78	82,74
CO _{korr}	[ppm]	171,7	180,8	247,1	301,5	392,1
HC	[ppm]	53,1	62,1	74,8	108,4	208,1
NOX _{korr}	[ppm]	928,3	828,1	484,7	280,6	102,8
CO _{mass} * WF	[g/h]	217,23	179,33	181,58	134,47	31,34
HC _{mass} * WF	[g/h]	33,30	30,57	27,26	23,99	8,25
NOX _{mass} * WF	[g/h]	1930,06	1349,34	585,09	205,66	13,49
P * WF	[kW]	21,48	26,59	23,14	21,73	0,06

54672

**Test results for
ISO 8178-4 E5 (CI) duty cycle**

<u>VW Antriebssysteme</u>	Engine type: <u>4.2L 4V TDICR</u>
Date: <u>10.04.2013</u>	Engine-No.: <u>CMC000201</u>
Location of testing: <u>VW Salzgitter</u>	Bore / Stroke:
Test bench: <u>VSZE01</u>	Engine Displacement:
Test bench operator: <u>Kazuschke</u>	Numbers of cylinders: <u>8</u>
Engineer: <u>Papst</u>	Operating method: <u>4 stroke</u>
	Test-No.: <u>va81287</u>

Test result	spec. Emisissions [g/kWh]	Emission Limits EPA [g/kWh]	DF
CO	1,333	5,00	
HC	0,230	-	
NOx	5,367	-	
HC+NOx	5,597	5,80	
CO ₂	755,516	-	
PM	0,074	0,15	

Test Result by carbon balance	spec. Emisissions [g/kWh]
CO	1,34
HC	0,23
NOx	5,34
CO ₂	754,34

Weighted test power [kW]	93
--------------------------	----

54673

Measured values

Manufacturer: <u>VW Antriebssysteme</u>	Engine type: <u>4.2L 4V TDICR</u>
Date: <u>10.04.2013</u>	Engine-No.: <u>CMC000201</u>
Location of testing: <u>VW Salzgitter</u>	Bore / Stroke:
Test bench: <u>VSZE01</u>	Engine Displacement:
Test bench operator: <u>Kazuschke</u>	Numbers of cylinders: <u>8</u>
Engineer: <u>Papst</u>	Operating method: <u>4 stroke</u>
	Test-No.: <u>va81287</u>

Measuring point	Unit	1	2	3	4	5
Engine speed	[rpm]	4206,9	3827,0	3359,6	2642,5	649,8
Engine power	[kW]	268,48	204,56	136,13	67,91	0,20
Barometric pressure	[mbar]	990,8	990,8	990,8	990,7	991,2
Ambient temperature	[°C]	29,6	28,8	28,0	26,4	25,6
rel. Humidity	[%]	25,0	27,1	29,1	31,7	40,0
Intake air temperature	[°C]	29,6	28,8	28,0	26,4	25,6
Charge-air temperature after comp.	[°C]	171,3	132,1	101,6	66,0	25,2
Charge-air temperature after CAC	[°C]	42,0	34,0	29,2	25,6	24,0
Exhaust gas temp. bef. turbine inlet	[°C]	677,8	574,5	522,6	405,0	87,6
Fuel temp. bef. HPP	[°C]	36,89	38,19	39	39,25	38,9
Coolant inlet temp.	[°C]	81,6	69,7	61,6	51,2	39,2
Coolant outlet temp.	[°C]	90,4	81,6	79,3	84,0	68,8
Oiltemperature	[°C]	134,5	123,6	112,5	100,3	77,1
Intake air pressure	[mbar]	-0,8	-0,7	-0,8	-0,8	-0,8
Charge-air pressure after comp.	[mbar]	1691,9	1198,3	811,7	404,3	0,7
Charge-air pressure after CAC	[mbar]	1588,3	1121,62	760,14	377,22	-4,71
Exhaust gas back pressure	[mbar]	645,5	363,4	193,1	65,7	1,8
Intake air mass flow	[kg/h]	1244,8	980,2	728,5	445,4	82,1
Fuel mass flow	[kg/h]	65,2	46,6	32,1	16,4	0,6

54674

Calculated values

Manufacturer: <u>VW Antriebssysteme</u>	Engine type: <u>4.2L 4V TDCR</u>
Date: <u>10.04.2013</u>	Engine-No.: <u>CMC000201</u>
Location of testing: <u>VW Salzgitter</u>	Bore / Stroke:
Test bench: <u>VSZE01</u>	Engine Displacement:
Test bench operator: <u>Kazuschke</u>	Numbers of cylinders: <u>8</u>
Engineer: <u>Papst</u>	Operating method: <u>4 stroke</u>
	Test-No.: <u>va81287</u>

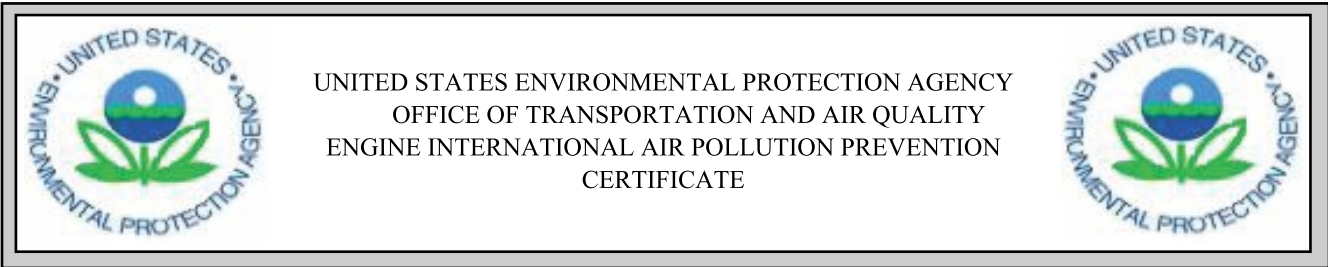
Measuring point	Unit	1	2	3	4	5
Power measured	[kW]	268,48	204,56	136,13	67,91	0,20
Engine power	[kW]	268,48	204,56	136,13	67,91	0,20
Barometric pressure	[mbar]	990,8	990,8	990,8	990,7	991,2
Test conditions fa	[1]	1,030	1,026	1,023	1,014	1,012
G _{Fuel}	[kg/h]	65,23	46,63	32,14	16,43	0,62
P _s	[hPa]	41,45	39,6	37,81	34,44	32,85
rel. Humidity	[%]	24,97	27,15	29,06	31,68	40,00
P _{st}	[hPa]	10,351	10,750	10,990	10,911	13,140
H _a	g W/kg A	6,5664	6,8223	6,9766	6,9267	8,3566
G _{AIRD}	[kg/h]	1236,69	973,52	723,5	442,29	81,44
G _{AIRW}	[kg/h]	1244,82	980,16	728,55	445,35	82,12
G _{EXH}	[kg/h]	1310,04	1026,79	760,69	461,78	82,74
K _{HDIES}	[1]	0,930	0,934	0,936	0,936	0,959
F _{FFH}	[1]	1,815	1,823	1,829	1,842	1,896
k _{w2}	[1]	0,010	0,011	0,011	0,011	0,013
k _{w,i,1}	[1]	0,894	0,902	0,908	0,921	0,972
CO _{koff}	[ppm]	171,7	180,8	247,1	301,5	392,1
CO _{2koff}	[%]	10,44	9,55	8,87	7,26	1,48
NOx _{koff}	[ppm]	928,3	828,1	484,7	280,6	102,8
HC	[ppm]	53,1	62,1	74,8	108,4	208,1
CO	[g/h]	217,2	179,3	181,6	134,5	31,3
CO ₂	[g/h]	207827,9	148958,1	102498,7	50909,2	1863,3
NOx	[g/h]	1930,06	1349,34	585,09	205,66	13,49
HC	[g/h]	33,30	30,57	27,26	23,99	8,25
WF	[1]	0,08	0,13	0,17	0,32	0,30
P * WF	[kW]	21,48	26,59	23,14	21,73	0,06
G _{Fuel} * WF	[g/h]	5218,38	6061,90	5463,85	5257,95	187,02
CO * WF	[g/h]	17,38	23,31	30,87	43,03	9,40
CO ₂ * WF	[g/h]	16626,23	19364,56	17424,78	16290,94	558,98
NOx * WF	[g/h]	154,40	175,41	99,47	65,81	4,05
HC * WF	[g/h]	2,66	3,97	4,63	7,68	2,47

54675

Measuring point	Unit	1	2	3	4	5
Brake spec. fuel cons.	[g/kWh]				G _{Fuel} [g/kWh]	238,58
Brake spec. emissions CO	[g/kWh]				CO [g/kWh]	1,33
Brake spec. emissions CO ₂	[g/kWh]				CO ₂ [g/kWh]	755,52
Brake spec. emissions NOx	[g/kWh]				NOx [g/kWh]	5,37
Brake spec. emissions HC	[g/kWh]				HC [g/kWh]	0,23

54676

Appendix C - EIAPP Certificate or Statement of Voluntary Compliance (as applicable)



Manufacturer: **MERCURY MARINE**
Engine Family: **EM9XW04.2TDI**
Certificate Number: **M9X-IMO-14-01.1**
Date Issued: **10/31/2013**

Byron J. Bunker, Director
Compliance Division
Office of Transportation and Air Quality

This is to certify that the manufacturer of the above mentioned marine diesel engine has provided information to the U.S. Environmental Protection Agency that demonstrates:

1. this engine has been tested in accordance with the requirements of the Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines, and,
2. the engine, its components, adjustable features, and Technical File, prior to the engine's installation and/or service on board a ship, fully comply with the applicable regulation 13 of Annex VI to MARPOL 73/78

This certificate is valid for the life of the engine subject to surveys in accordance with regulation 5 of Annex VI to MARPOL 73/78, installed in ships under the authority of this Government.

Issued at U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Washington, DC



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
 OFFICE OF TRANSPORTATION AND AIR QUALITY
 ENGINE INTERNATIONAL AIR POLLUTION PREVENTION
 CERTIFICATE



Page 2

This is to certify that this record is correct in all respects. Issued at U.S. Environmental Protection Agency, Office of Transportation and Air Quality Washington, DC

Byron J. Bunker, Director
 Compliance Division
 Office of Transportation and Air Quality

1. Particulars of the engine

1.1 Name & address of manufacturer:

**Mercury Marine
 W6250 Pioneer Road
 PO Box 1939
 Fond du Lac, WI 54936-1939**

1.8 Test cycle:

E5 Recreational

1.2 Place of engine build:

**Volkswagen Marine
 Industriestraße Nord, 38231
 Salzgitter, HS-2/2, Brieffach 7366
 Germany**

1.9 Rated Power(kW) & Speed(RPM):

272 4200

1.3 Date of engine build:

04/15/2011

1.10 Engine certificate number:

M9X-IMO-14-01.1

1.4 Place of pre-certification survey:

**Volkswagen Marine
 Industriestraße Nord, 38231
 Salzgitter, HS-2/2, Brieffach 7366
 Germany**

1.11 Test fuel:

Distillate Diesel [94.108(a)(1)]

1.5 Date of pre-certification survey:

04/10/2013

1.12 NOx reducing device?:

No

1.6 Engine family:

EM9XW04.2TDI

1.13 Applicable NOx Emission Limit(g/kW-hr):

7.7

1.7 Models:

**Mercury Diesel TDI 4.2L 370
 Mercury Diesel TDI 4.2L 335**

1.14 Engine NOx Emission Value(g/kW-hr):

5.37

2 Particulars of the Technical File:

2.1 Technical File number:

TDI 4.2L IMO Technical File

2.2 NOx verification number:

TDI 4.2L IMO Technical File

Products of Mercury Marine
W6250 Pioneer Road
Fond du Lac, WI 54936-1939

© MERCURY MARINE. All rights reserved. Reproduction in whole or in part without permission is prohibited. Alpha, Axis, Bravo One, Bravo Two, Bravo Three, Circle M with Waves Logo, K-planes, Mariner, MerCathode, MerCruiser, Mercury, Mercury with Waves Logo, Mercury Marine, Mercury Precision Parts, Mercury Propellers, Mercury Racing, MotorGuide, OptiMax, Quicksilver, SeaCore, Skyhook, SmartCraft, Sport-Jet, Verado, VesselView, Zero Effort, Zeus, #1 On the Water and We're Driven to Win are registered trademarks of Brunswick Corporation. Pro XS is a trademark of Brunswick Corporation. Mercury Product Protection is a registered service mark of Brunswick Corporation.