FOUR STROKE OUTBOARD PETROL ENGINE HOMOLOGATION FILE

International Homologation File Number: 00533B			
Homologation Valid from:	**2016**	**Expiry: 2029dec31**	
Valid for the following classes:	**CIRCUIT: OFFSHORE: 3A, 3B**		
Manufacturer:	**Mercury Marine**		
Engine Model:	**Mercury F115, Mariner F115 Mercury F115 proXS**		
Number Manufactured:	**500+**		
At the date:	**1 March 2016**		
Certified by the National Authority of:	**Sweden (SVERA)**		
At the date:	**29 March 2016**		
UIM Homologation Group Inspector:	**Mikael Lundblad**		
At the date:	**29 March 2016**		
UIM Certification Approval:	**Union Internationale Motonautique**		
At the date:	**29 March 2016**		
Running Production Changes			
Change Detail	Valve lift corrected, trim system added, Spark plug	Page No.	22, 30-34
Date Approved for Use	2022 May 01	Approved by	
Change Detail	Adjust fuel pressure, Allowing facsimile cowling	Page No.	23, 30
Date Approved for Use	2026 July 07	Approved by	

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PICTURES

Photo of the complete engine, 45° from the front at the port side.

Photo of the complete engine, 45° from the front at the starboard side.

Photo of the complete engine, 45° from the rear at the port side.

Photo of the complete engine, 45° from the rear at the starboard side.

PICTURES

Photo of the complete engine, 45° from the back at the port side.

Photo of the complete engine, 45° from the front at the starboard side.

Photo of the complete engine, from the rear Command Thrust version.

Photo of the complete engine, from the rear Command Thrust version.

PICTURES

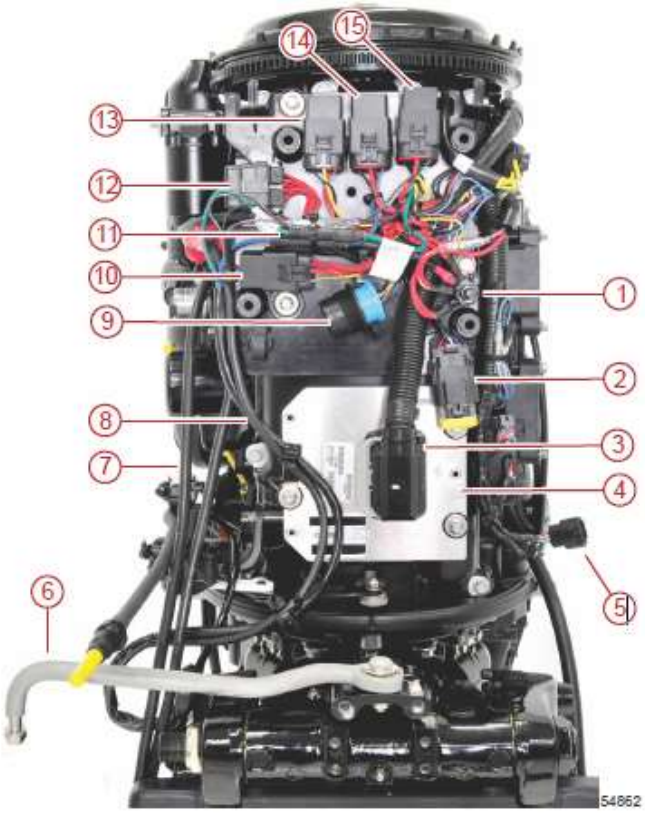
Photo of the complete engine, 45° from the back at the port side.

Photo of the complete engine, 45° from the back at the starboard side.

Ghost picture of the complete engine, 45° from the front at the port side.

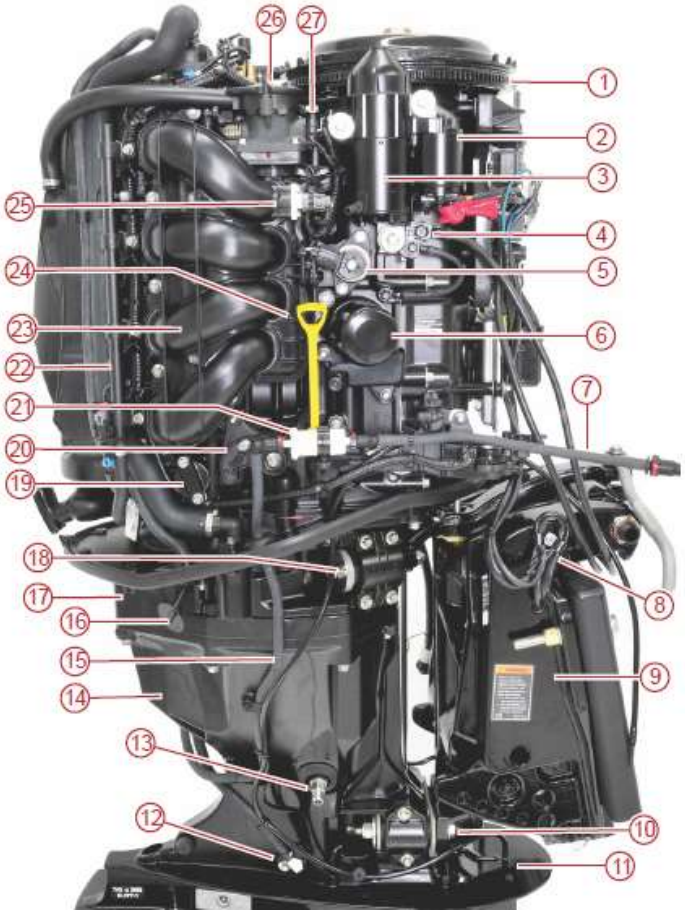
Ghost picture of the complete engine, 45° from the front at the starboard side.

Front view of lay out.



1 - Power stud
2 - CAN terminator resistor
3 - Engine harness connector
4 - Engine control module (ECM)
5 - Power trim cowl switch connector
6 - Steering link rod
7 - Battery cables
8 - Trim position sensor and power trim harnesses
9 - 14-pin engine harness connector
10 - Main power relay
11 - Power trim wire bullet connectors
12 - Fuse holder
13 - Start relay
14 - Trim up power trim motor relay
15 - Trim down power trim motor relay

Starboard view of lay out.

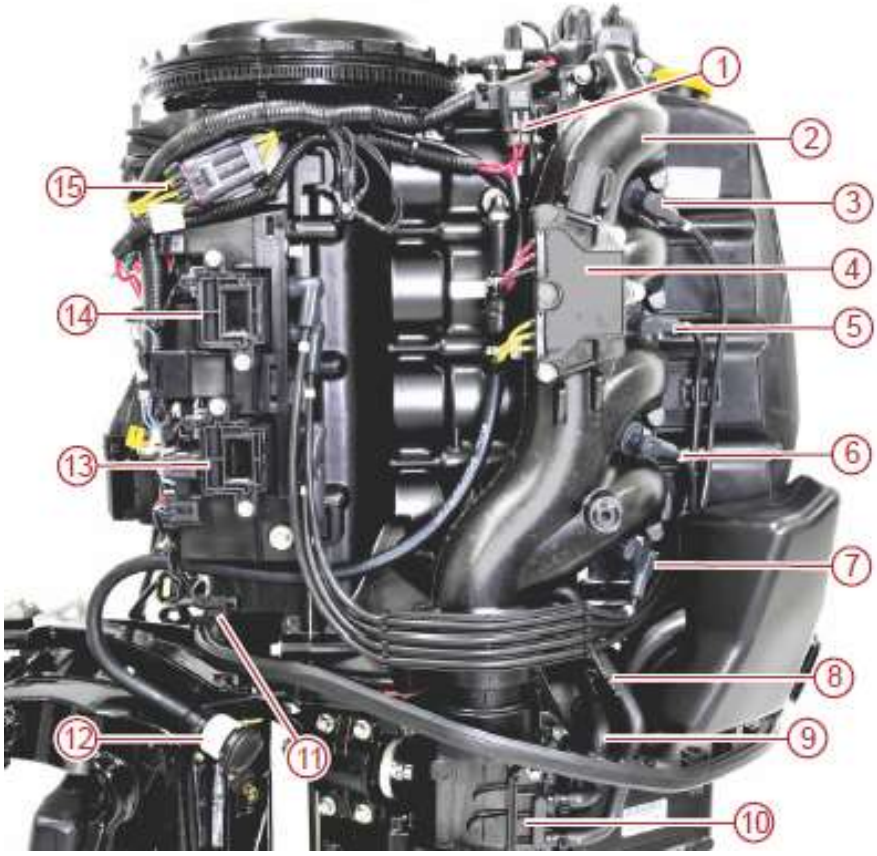


1 - Flywheel
2 - Starter solenoid
3 - Starter motor
4 - Engine ground and negative cables
5 - Idle air control (IAC)
6 - Oil filter
7 - Fuel line
8 - Trim position sensor and power trim harnesses
9 - Starboard transom bracket
10 - Lower mount
11 - Pitot tube
12 - Fuel supply module fuel cooler water dump hose
13 - Oil drain valve
14 - Driveshaft housing
15 - Fuel supply module fuel supply hose
16 - Water pump indicator tube
17 - Adapter plate
18 - Upper mount
19 - Timing chain tensioner cover
20 - Throttle lever
21 - Low-pressure fuel filter
22 - Fuel rail
23 - Air intake manifold
24 - Oil dipstick
25 - Manifold air temperature (MAT) sensor
26 - Throttle body screen
27 - Throttle position sensor (TPS)

Aft view of lay out.

1 - Thermostat hose
2 - Water pump indicator hose
3 - Crankcase ventilation hose
4 - Fuel rail
5 - Fuel injector #1
6 - Fuel injector #2
7 - Fuel injector #3
8 - Fuel injector #4
9 - Fuel pump connector
10 - Idle relief muffler grommet
11 - Fuel supply module (FSM)
12 - Idle relief muffler
13 - Spark plug wire
14 - Camshaft cover
15 - Oil fill cap

Port view of lay out.



1 - Fuse holder
2 - Exhaust manifold
3 - Spark plug #1
4 - Voltage regulator
5 - Spark plug #2
6 - Spark plug #3
7 - Spark plug #4
8 - Water strainer to block hose
9 - Water strainer to FSM hose
10 - Water strainer
11 - Digital speedometer connector (optional)
12 - Flush hose fitting
13 - Ignition coil (2 and 3)
14 - Ignition coil (1 and 4)
15 - Voltage regulator/stator wire connector

Top view.

1 - Oil fill cap
2 - Water pump indicator outlet fitting
3 - Water pressure sensor (optional)
4 - Crankshaft position sensor (CPS)
5 - Flywheel
6 - Starter
7 - Throttle body screen
8 - Water temperature sensor
9 - Thermostat housing

Photo without top cover, 45° from the front at the port side.

Photo without top cover, 45° from the front at the starboard side.

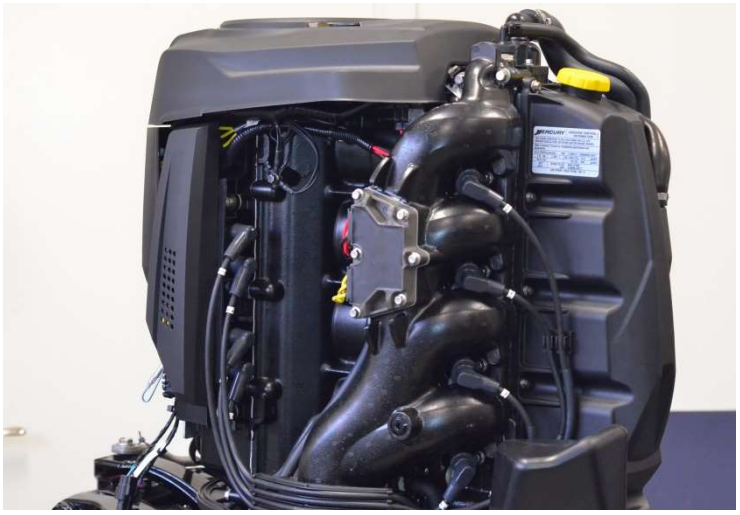


Photo without top cover, 45° from the rear at the port side

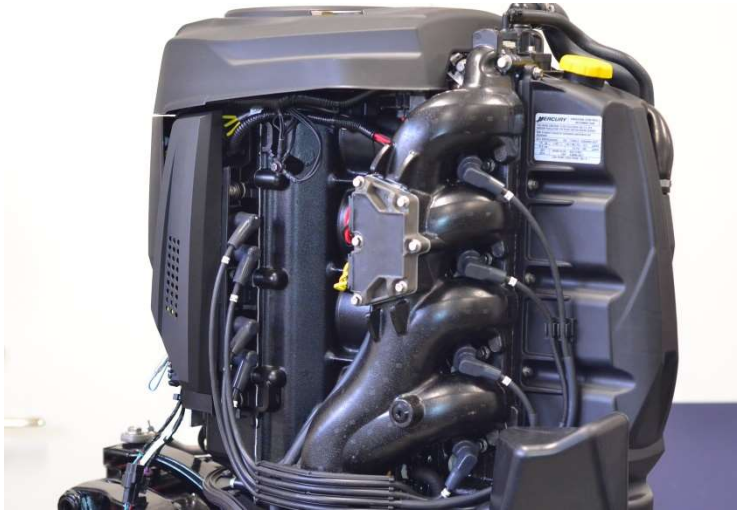
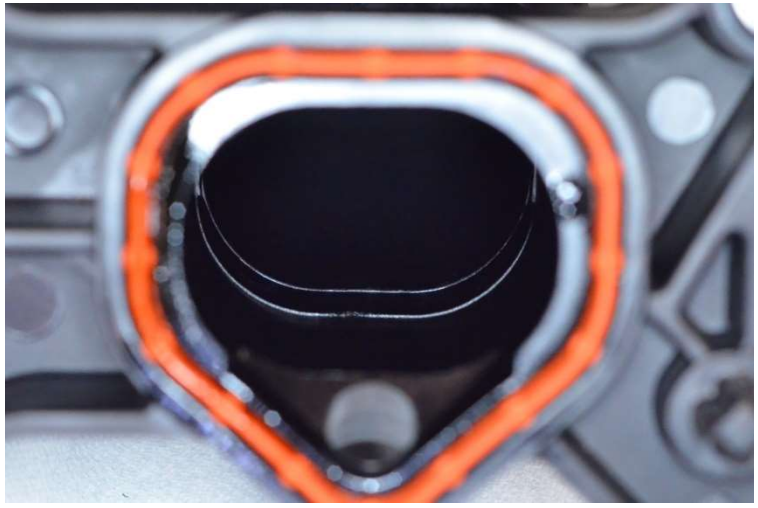


Photo without top cover, 45° from the rear at the starboard side.

Intake mesh

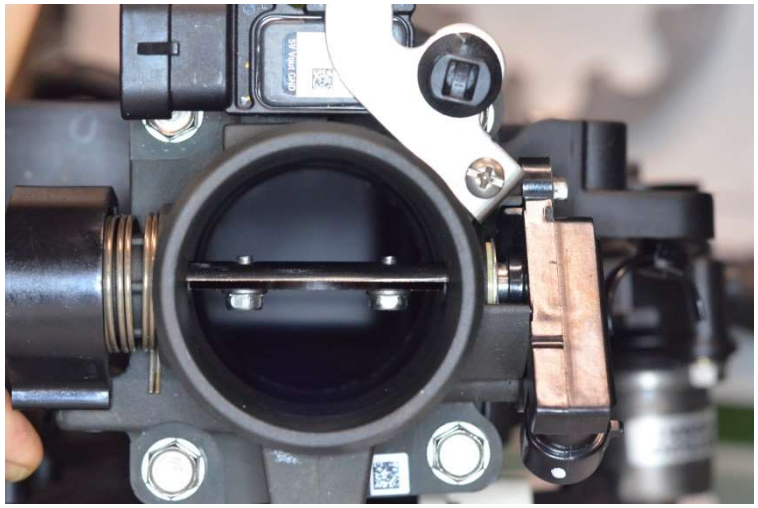
Intake manifold

Intake manifold - Close up

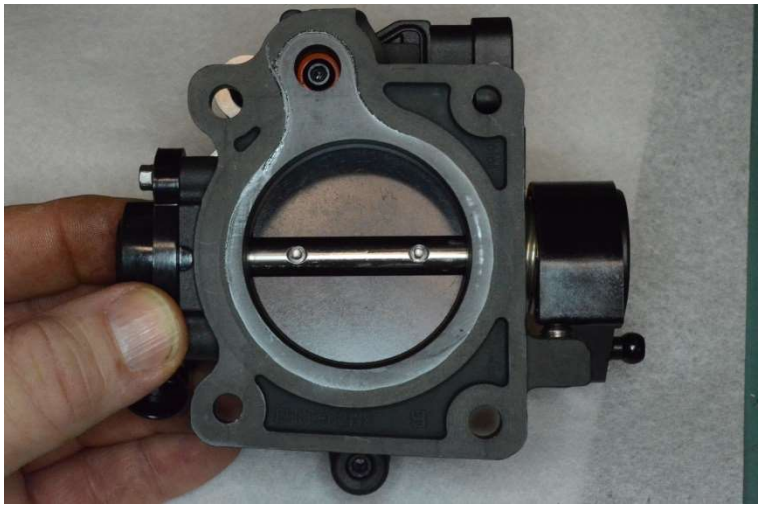


Intake manifold - Close up

Throttle house

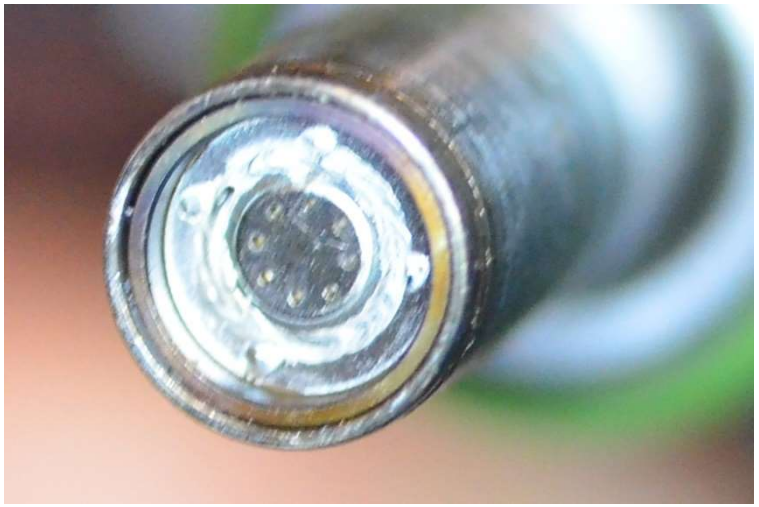


Throttle house



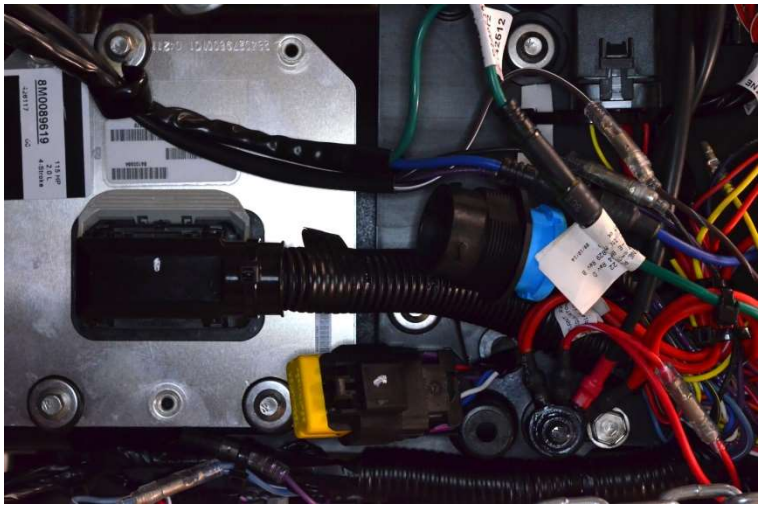
Fuel Injector Rail

Fuel Injector - Close up



ECU box Front

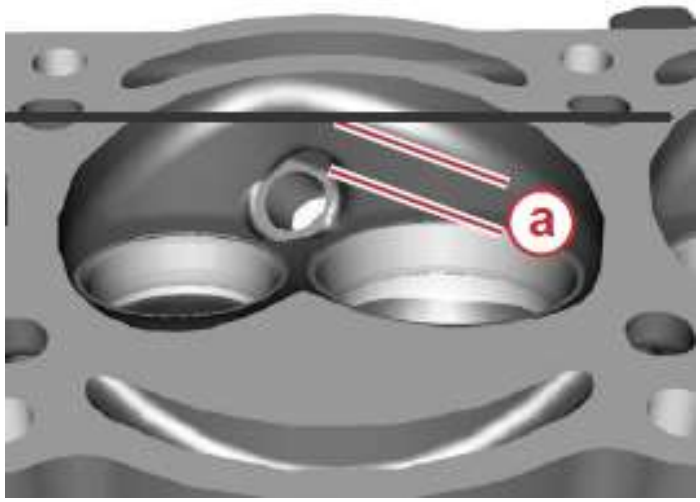
ECU box connection



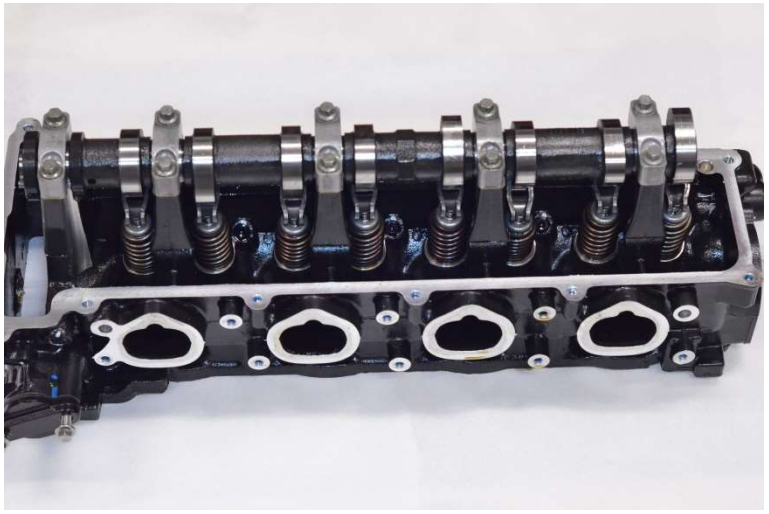
Cylinder head from the combustion chamber side

Combustion chamber

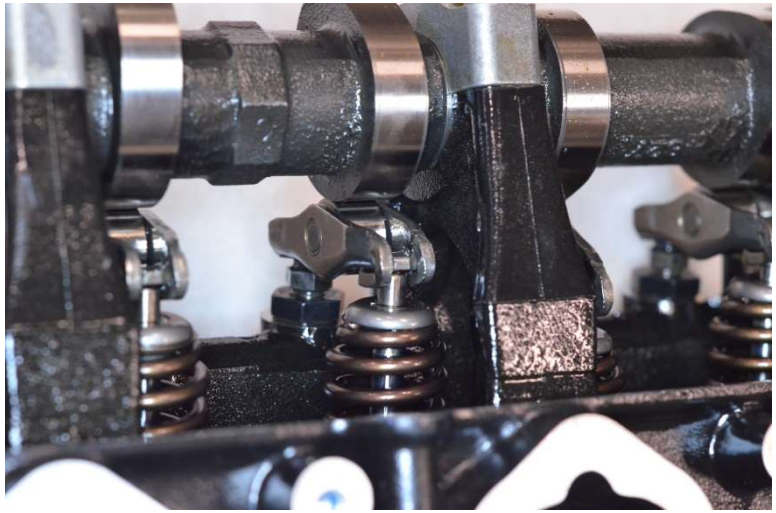
Combustion Chamber height *a* min 4.8 mm



Cylinder head from the valve assembly side.



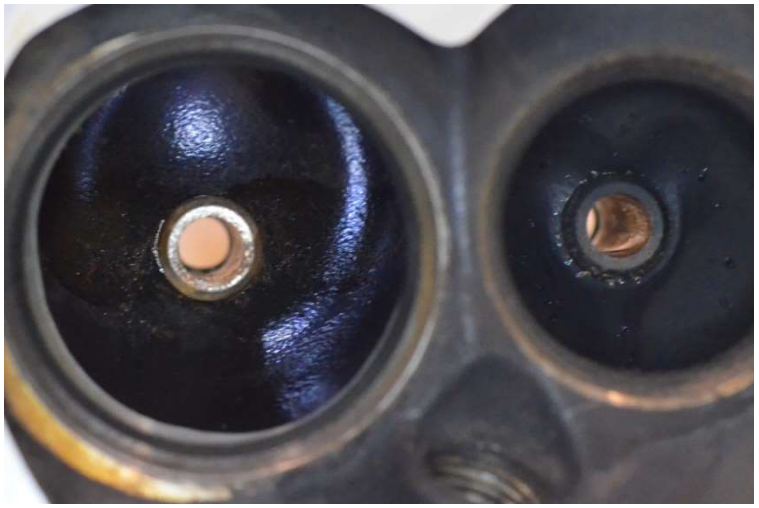
valve assembly close-up



Rocker arm

Cylinder head showing intake port.

Cylinder head showing intake port



Cylinder head showing exhaust ports with gasket.

Cylinder head showing exhaust ports with gasket - detail

Cylinder head showing exhaust ports.

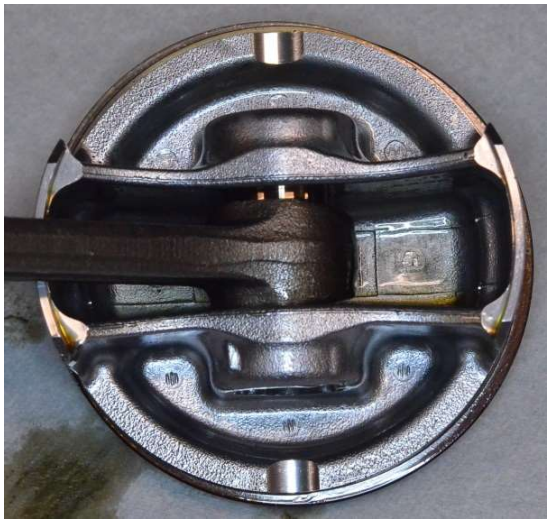
Cylinder head showing exhaust ports - detail

Valves

Spring with retainer

Piston viewed from the top

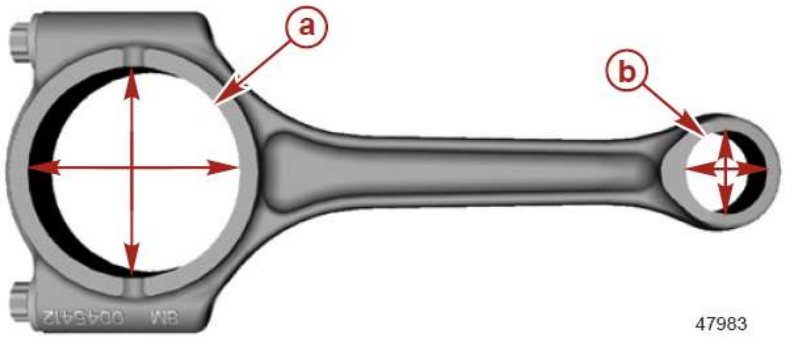
Piston viewed from the bottom



Piston, viewed 45° from the wrist pin.

Crankshaft.

Connecting rod.



Connecting rod.

Cylinder block, viewed 45° from front port side.

Cylinder block, viewed 45° from rear, starboart side

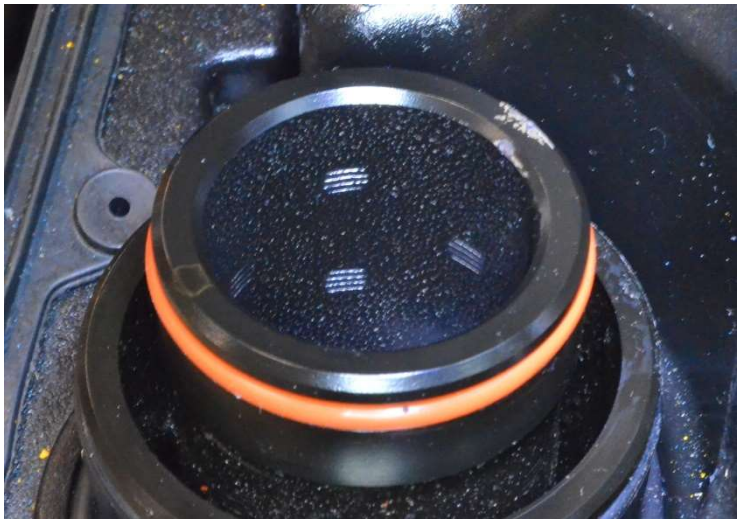
Oil pump

Exhaust manifold

Exhaust manifold outlet

Exhaust pipe

Inlet exhaust pipe



Outlet exhaust pipe

Flywheel – viewed from top side

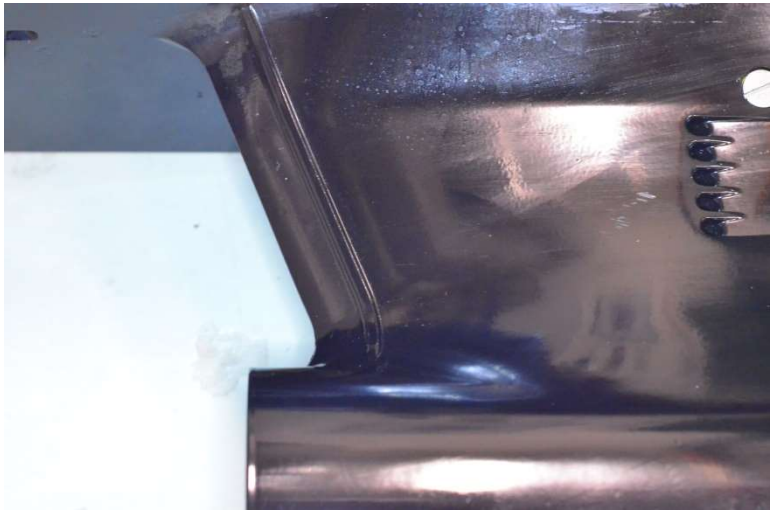
Flywheel – viewed from bottom side

Gear house 2.07

Gear house 2.07 – Gears and carrier

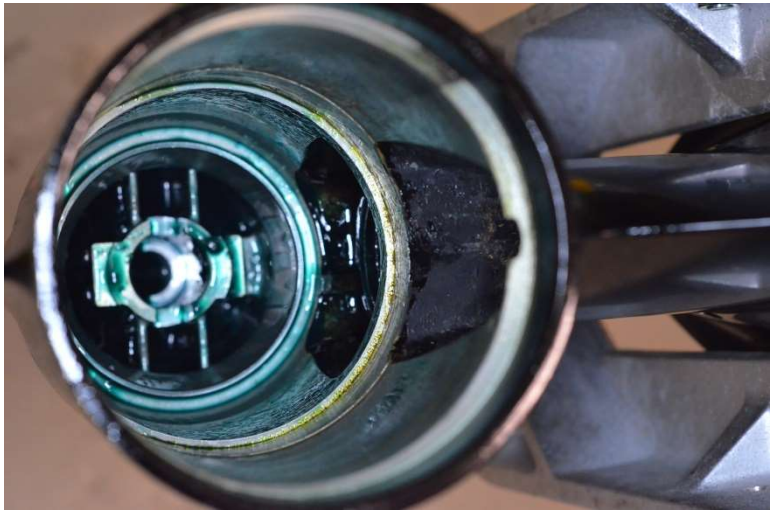
Gear house 2.07 Skeg

Gear house 2.07 - Close of strut



Gear house CT

Gear house CT - Exhaust



Gear house CT Skeg

Gear house CT – gear and carrier

MEASUREMENTS

ENGINE FUEL

Type:	**Gasoline**	
Minimum octane required:	**90**	RON

ENGINE TYPE

Number of cylinders:	**4**	Cylinders
Cylinder arrangement:	**In-line**	

ENGINE BLOCK	Tolerance	Measurement	Unit
Bore	+/- 0.10	**90.00**	mm
Stroke	+/- 0.10	**81.00**	mm
Capacity per cylinder	max	**517.0**	cc
Total Capacity	max	**2 068**	cc
Cylinder block material		**XK360.2-T5 Aluminium**	
Cylinder liner material		**Grey iron**	
Distance from crankshaft centreline to cylinder block deck face.	+/- 0.50	**193.0**	mm

CYLINDER HEAD	Tolerance	Measurement	Unit
Cylinder head material		**A356-T6 Aluminium**	
Volume of combustion chamber (without volume of spark plug hole)	min	**47.9**	cc
Compression ratio	max	**10.37**	
Thickness of cylinder head	+/- 0.20	**99.0**	mm
Inlet Port:			
Size of port at cylinder head/manifold face	max	**44.0**	mm
Internal diameter of valve seat insert	+/- 0.20	**39.30**	mm
Surface finish of port		**Cast**	
Exhaust Port:			
Size of port at cylinder head/manifold face	max	**34.3x26.8**	mm
Internal diameter of valve seat insert	+/- 0.20	**36.00**	mm
Surface finish of port		**Cast**	

Inlet Valves:			
Diameter of stem	+/- 0.008	**6.97**	mm
Diameter of head	+/- 0.1	**45.20**	mm
Overall length of inlet valve	+/- 0.25	**121.96**	mm
Exhaust Valves:			
Diameter of stem	+/- 0.008	**6.96**	mm
Diameter of head	+/- 0.1	**35.0**	
Overall length of exhaust valve	+/- 0.25	**122.44**	mm
Valve Springs:			
Diameter of wire	max	**3.95**	mm
Inside diameter of coil	min	**17.0**	mm
Free length	+/- 0.5	**54.62**	mm
Number of working turns	+/- 0.5	**6**	turns

CAMSHAFT/SHAFTS	Tolerance	Measurement	Unit
Inlet:			
Tappet clearance for checking timing	+/- 0.025	**0.075**	mm
Total valve lift	+/- 0.10	**11.69**	mm
Total (duration) inlet opening angle (measured at flywheel in degrees at 1,0 mm valve lift at specified valve lash)	+/- 5°	**208**	degrees
Duration inlet opening angle 3mm under max valve lift (measured at flywheel in degrees)	+/- 2°	**92**	degrees
Base circle diameter of lobe	+/- 0.02	**41.60**	mm
Cam shaft lobe height	+/- 0.05	**47.55**	mm
Exhaust:			
Tappet clearance for checking timing	+/- 0.02	**0.150**	mm
Total valve lift	+/- 0.10	**12.39**	mm
Total (duration) exhaust opening angle (measured at flywheel in degrees at 1,0 mm valve lift at specified valve lash)	+/- 5°	**216**	degrees
Duration inlet opening angle 3mm under max valve lift (measured at flywheel in degrees)	+/- 2°	**94**	degrees
Base circle diameter of lobe	+/- 0.02	**41.60**	mm
Cam shaft lobe height	+/- 0.05	**47.205**	mm

PISTONS

Material of piston		**Aluminium**	
Type and thickness of rings	Square	**1.00**	mm
	Taper Faced Napier	**1.00**	mm
	Oil scraper	**2.00**	mm

CONNECTING ROD

	Tolerance	Measurement	Unit
Length of rod from big end to small end (centre to centre)	+/- 0.025	**126.0**	mm

CRANKSHAFT

		Measurement	Unit
Number of main bearing journals		**5**	
Diameter of main bearing journals		**47.985-48.001**	mm
Diameter of connecting rod journals		**43.984-44.000**	mm
Surface finish of crankshaft		**Shot peened**	

TYPE OF BEARINGS

Piston Pin		**Floating**	
Connecting Rod journal		**Plain**	
Main journal		**Plain**	

FUEL INJECTION

	Tolerance	Measurement	Unit
Make		**Walbro**	
Type of pump, model no.		**Gerotor, FGB-19**	
Fuel pressure at idle		**approx 280-310**	kPa
Fuel pressure no running (B)		**320-390**	kPa
Total number of injectors		**4**	Injectors
Diameter of throttle bore	max	**49.96**	mm

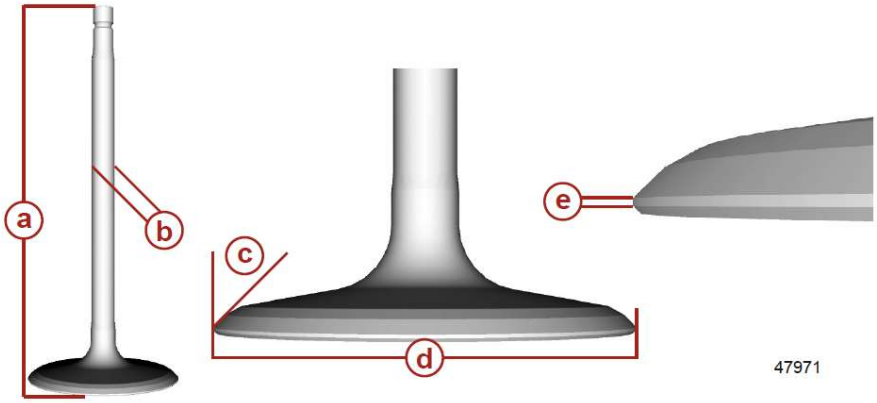
COOLING SYSTEM

Type	**Raw water cooled**	
Method	**Thermostat controlled**	
Pump	**Rubber impeller vane pump**	
Number of impeller blades	**6**	
Thermostat start opening temperature	**46-52**	°C
Thermostat fully opened	**66**	°C

VALVE INSPECTION

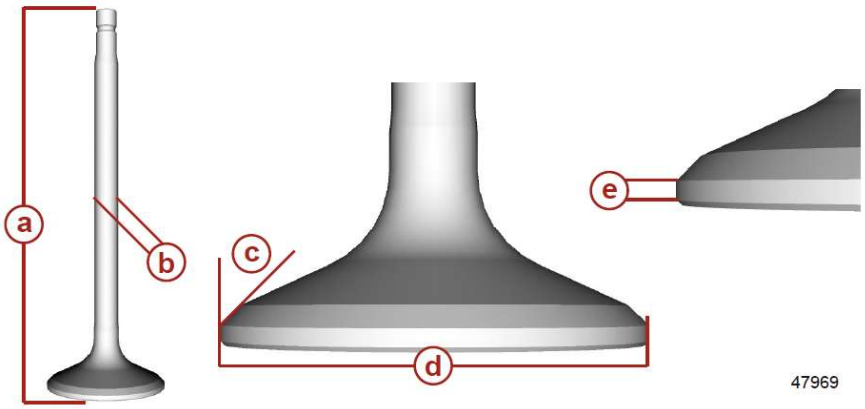
Intake valve

Intake Valve Specifications		
Intake valve	Height (a)	121.96 ± 0.25 mm (4.8016 ± 0.01 in.)
	Valve stem diameter (b)	6.97 ± 0.008 (0.2744 ± 0.0003 in.)
	Valve face angle (c)	45°
	Outside diameter (d)	45.2 ± 0.1 mm (1.780 ± 0.004 in.)
	Valve margin width (e)	0.875 ± 0.2 mm (0.0345 ± 0.0078 in.)
	Valve stem service limit runout (measured at valve face)	0.03 mm (0.0012 in.)



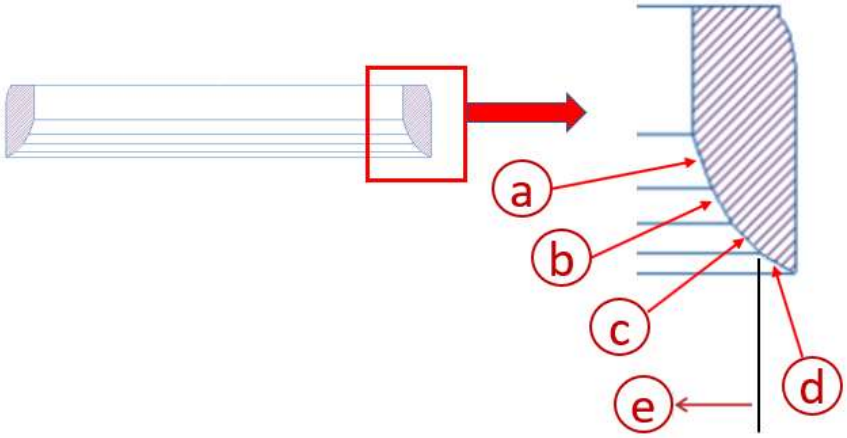
Exhaust valve

Exhaust Valve Specifications		
Exhaust valve	Height (a)	122.44 ± 0.25 mm (4.8204 ± 0.01 in.)
	Valve stem diameter (b)	6.96 ± 0.008 mm (0.2740 ± 0.0003 in.)
	Valve face angle (c)	40°
	Outside diameter (d)	35 ± 0.1 mm (1.378 ± 0.004 in.)
	Valve margin width (e)	1.45 ± 0.2 mm (0.0571 ± 0.0078 in.)
	Valve stem service limit runout (measured at valve face)	0.03 mm (0.0012 in.)



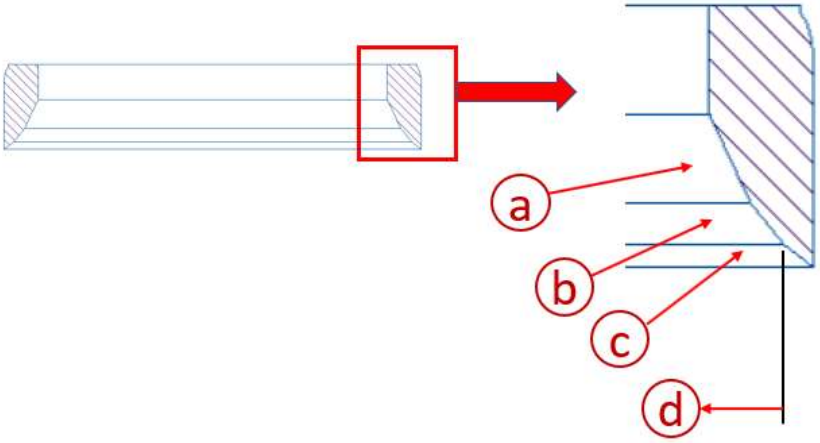
Intake valve seat

Intake Valve Seat Specifications		
Valve Seat	Surface (a) angle from valve axis	14°± 1°
	Surface (b) angle from valve axis	30°± 1°
	Surface (c) angle from valve axis	44°± 0.25°
	Surface (d) angle from valve axis	60°± 1°
	Surface (c) width	1 ± 0.1 mm
	Diameter (e)	Ø44.65 ± 0.1 mm



Exhaust valve seat

Exhaust Valve Seat Specifications		
Valve Seat	Surface (a) angle from valve axis	25°± 1°
	Surface (b) angle from valve axis	39°± 0.25°
	Surface (c) angle from valve axis	53°± 1°
	Surface (b) width	1.5 ± 0.1 mm
	Surface (c) width	1.25 ± 0.25 mm
	Diameter (d)	Ø34.39 ± 0.1 mm



SENSOR TESTS

Cylinderblock coolant sensor

Meter Test Leads		Temperature	Reading
Red	Black		
Pin B (tan/black)	Pin A (black/orange)	0 °C ± 1.14 (32 °F ± 2.1)	32.6 kΩ
		25 °C ± 1.14 (77 °F ± 2.1)	10.0 kΩ
		50 °C ± 1.50 (122 °F ± 2.7)	3.6 kΩ
		100 °C ± 2.36 (212 °F ± 4.2)	678.0 Ω

Manifold Absolute Pressure Sensor

Manifold Absolute Pressure (MAP) Sensor Readings	
At idle (neutral)	34–40 kPa (4.9–5.8 psi)
At wide-open throttle	93.5–98.5 kPa (13.5–14.2 psi)

Manifold Air Temperature Sensor

Meter Test Leads		Temperature	Reading
Red	Black		
Pin A (tan)	Pin B (black/orange)	0 °C (32 °F)	6.5 kΩ ± 5%
		15 °C (59 °F)	3.2 kΩ ± 5%
		25 °C (77 °F)	2.1 kΩ ± 5%
		100 °C (212 °F)	0.15 kΩ ± 5%

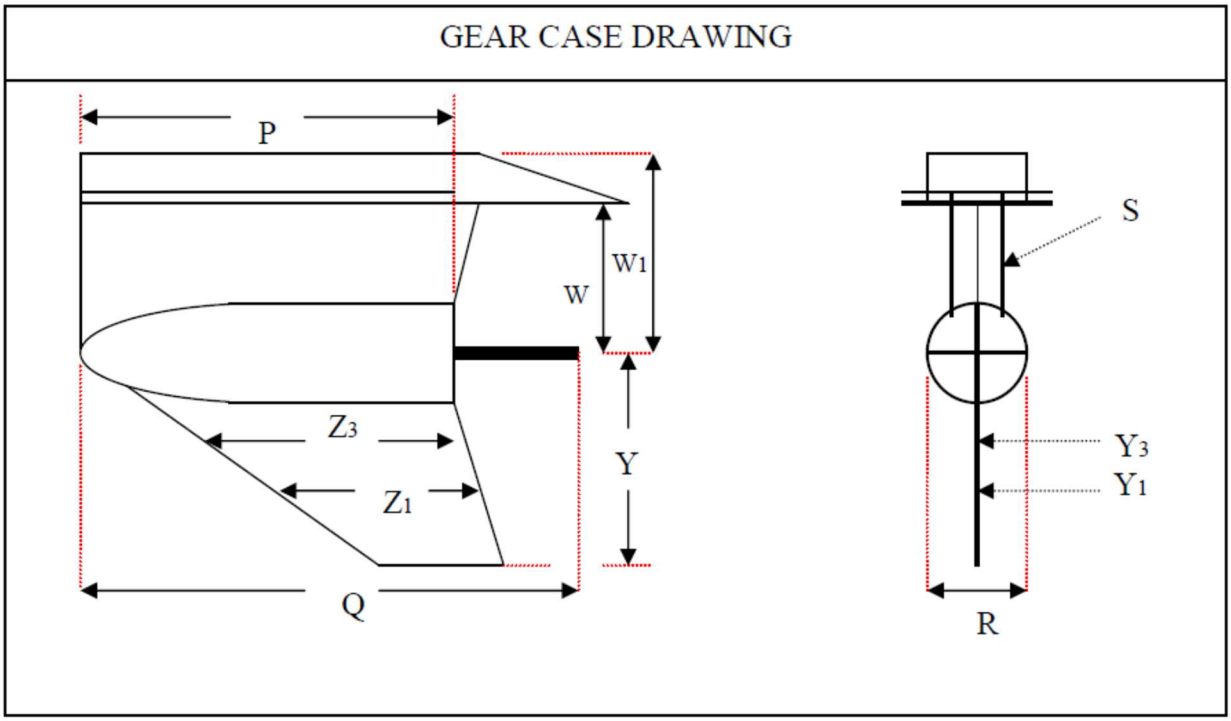
SPARK PLUG (A)

Brand: **NGK**

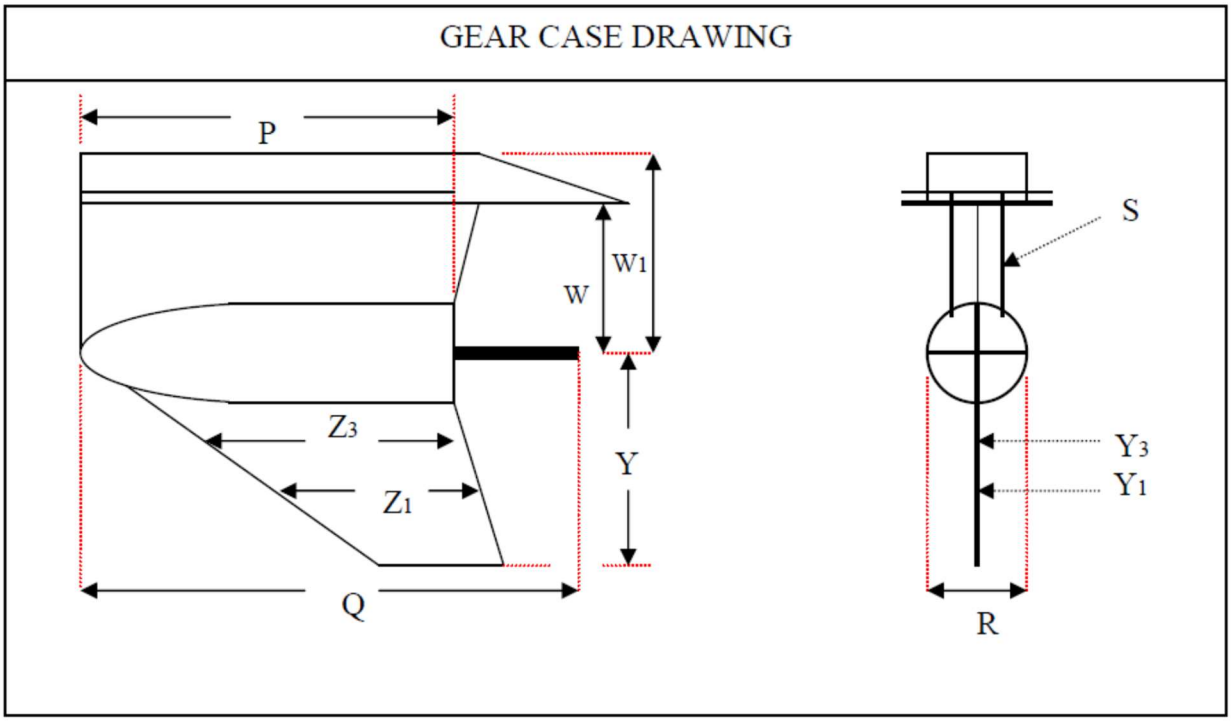
Model: **ZFR5F**

WEIGHTS	Tolerance	Measurement	Unit
Inlet valve (bare)	min	**69.0**	g
Exhaust valve (bare)	min	**65.0**	g
Inlet rocker arm	min	**49.0**	g
Exhaust rocker arm	min	**49.0**	g
Valve spring	min	**49.0**	g
Inlet/ Exhaust camshaft	min	**2 035**	g
Piston (with rings)	min	**288.0**	g
Piston Pin	min	**70.0**	g
Connecting Rod (with bearings)	min	**385.0**	g
Crankshaft	min	**13 000**	g
Flywheel (bare)	min	**6 000**	g

UNDERWATER UNIT **Standard**	Tolerance	Measurement	Unit
Gear Ratio		**2.07 (14/29)**	
P Longtitudinal length of gearcase torpedo	+/- 5.0	**338.5**	mm
Q Longtitudinal dimension of gearcase including propeller shaft	max	**505.0**	mm
R Transverse dimension of gearcase	min	**115.0**	mm
S Thickness of strut	min	**50.0**	mm
Z1 Skeg chord length, 25mm above bottom	+/- 5.0	**112.0**	mm
Z3 Skeg chord length, 75mm abobe bottom	+/- 5.0	**166.0**	mm
W1 Distance from propeller shaft to upper flange	+/- 5.0	**243.0**	mm
W Distance from propeller shaft to anti-ventilation plate	+/- 5.0	**194.0**	mm
Y1 Thickness of skeg, 25mm above bottom	min	**5.6**	mm
Y3 Thickness of skeg, 75mm above bottom	min	**9.0**	mm
Y Skeg depth from propeller shaft	+/- 5.0	**222.0**	mm



UNDERWATER UNIT **Command Thrust**	Tolerance	Measurement	Unit
Gear Ratio		**2.38 (13/31)**	
P Longtitudinal length of gearcase torpedo	+/- 5.0	**354.0**	mm
Q Longtitudinal dimension of gearcase including propeller shaft	max	**501.0**	mm
R Transverse dimension of gearcase	min	**123.0**	mm
S Thickness of strut	min	**45.0**	mm
Z1 Skeg chord length, 25mm above bottom	+/- 5.0	**137.0**	mm
Z3 Skeg chord length, 75mm abobe bottom	+/- 5.0	**183.0**	mm
W1 Distance from propeller shaft to upper flange	+/- 5.0	**289.0**	mm
W Distance from propeller shaft to anti-ventilation plate	+/- 5.0	**211.0**	mm
Y1 Thickness of skeg, 25mm above bottom	min	**6.8**	mm
Y3 Thickness of skeg, 75mm above bottom	min	**9.1**	mm
Y Skeg depth from propeller shaft	+/- 5.0	**224.0**	mm



FOUR STROKE OUTBOARD
PETROL ENGINE

NOTES

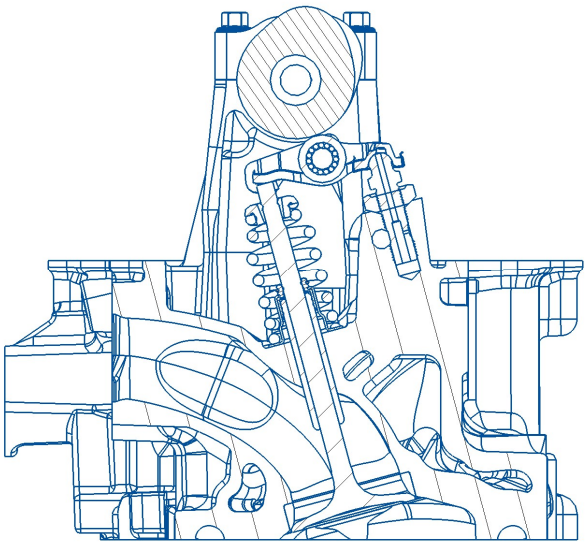
Inspection of ECM

Modell	F115 std	F115 proXS
ECM over speed limiter	6150 rpm	6450 rpm
ECM software version	BDR15AAB01	BDR15AAB01
ECM calibration part number	8M0109812	8M0113383

Trimsystem (A)
Alternative powertrim system is Mercury tri ram part number kit 8M0157031 SWIVL BRKT KIT or equivalent in place of the stock assembly to improve durability in rough water conditions.

Cowling (B)
Cowlings may be either Mercury OEM as shipped or may be a lightweight facsimile of the production cowling. External latches may be added or replacing original latches. Mercury decals must appear with contrasting color on any substituted cowling in a manner similar to Mercury OEM cowlings. Rear air inlets must remain, with identical location and cross-sectional area

Attachment 1 – Valve lift measurement



Valve Lift Table (in Cam angle)				
INTAKE (IN#1 Lobe Index Timing @ Max Lift: 121 degree in Crank ATDC)			EXHAUST (EX#1 Lobe Index Timing @ Max Lift: 118 degree in Crank BTDC)	
Cam Angle	Valve Lift (mm)		Cam Angle	Valve Lift (mm)
			-90	0.00000
			-89	0.01590
			-88	0.03260
			-87	0.04930
			-86	0.06600
			-85	0.08270
			-84	0.09940
			-83	0.11610
			-82	0.13280
			-81	0.14950
			-80	0.16620
			-79	0.18290
			-78	0.19960
			-77	0.21630
-76	0.00000		-76	0.23300
-75	0.02300		-75	0.24970
-74	0.05200		-74	0.26640
-73	0.08100		-73	0.28310
-72	0.11000		-72	0.29980
-71	0.13900		-71	0.31650
-70	0.16800		-70	0.33320
-69	0.19700		-69	0.34990
-68	0.22600		-68	0.36660
-67	0.25500		-67	0.38330
-66	0.28400		-66	0.40000

-65	0.31300		-65	0.41683
-64	0.34200		-64	0.43535
-63	0.37100		-63	0.45903
-62	0.40000		-62	0.49204
-61	0.42914		-61	0.53788
-60	0.46000		-60	0.59807
-59	0.49617		-59	0.67275
-58	0.54194		-58	0.76186
-57	0.60088		-57	0.86532
-56	0.67457		-56	0.98300
-55	0.76314		-55	1.11474
-54	0.86649		-54	1.26035
-53	0.98449		-53	1.41959
-52	1.11695		-52	1.59219
-51	1.26362		-51	1.77782
-50	1.42421		-50	1.97612
-49	1.59837		-49	2.18668
-48	1.78570		-48	2.40905
-47	1.98573		-47	2.64273
-46	2.19798		-46	2.88717
-45	2.42188		-45	3.14177
-44	2.65682		-44	3.40588
-43	2.90215		-43	3.67881
-42	3.15717		-42	3.95980
-41	3.42111		-41	4.24805
-40	3.69318		-40	4.54269
-39	3.97253		-39	4.84281
-38	4.25825		-38	5.14742
-37	4.54939		-37	5.45550
-36	4.84497		-36	5.76595
-35	5.14395		-35	6.07761
-34	5.44522		-34	6.38927
-33	5.74768		-33	6.69974
-32	6.05013		-32	7.00789
-31	6.35143		-31	7.31269
-30	6.65050		-30	7.61320
-29	6.94632		-29	7.90855
-28	7.23798		-28	8.19794
-27	7.52461		-27	8.48065
-26	7.80541		-26	8.75602
-25	8.07966		-25	9.02347
-24	8.34670		-24	9.28248
-23	8.60592		-23	9.53257
-22	8.85677		-22	9.77335
-21	9.09875		-21	10.00446
-20	9.33143		-20	10.22560
-19	9.55440		-19	10.43650
-18	9.76733		-18	10.63695
-17	9.96991		-17	10.82679
-16	10.16187		-16	11.00586
-15	10.34299		-15	11.17408
-14	10.51307		-14	11.33138
-13	10.67195		-13	11.47770
-12	10.81952		-12	11.61303
-11	10.95565		-11	11.73737
-10	11.08028		-10	11.85075
-9	11.19335		-9	11.95320

-8	11.29481		-8	12.04476
-7	11.38465		-7	12.12550
-6	11.46284		-6	12.19547
-5	11.52941		-5	12.25473
-4	11.58434		-4	12.30336
-3	11.62765		-3	12.34141
-2	11.65936		-2	12.36893
-1	11.67948		-1	12.38595
0	**11.68802**		**0**	**12.39252**
1	11.68499		1	12.38862
2	11.67037		2	12.37427
3	11.64416		3	12.34942
4	11.60635		4	12.31404
5	11.55692		5	12.26808
6	11.49586		6	12.21149
7	11.42317		7	12.14419
8	11.33884		8	12.06612
9	11.24288		9	11.97723
10	11.13532		10	11.87745
11	11.01619		11	11.76674
12	10.88556		12	11.64507
13	10.74350		13	11.51241
14	10.59011		14	11.36876
15	10.42554		15	11.21414
16	10.24992		16	11.04858
17	10.06347		17	10.87218
18	9.86639		18	10.68501
19	9.65897		19	10.48723
20	9.44149		20	10.27900
21	9.21432		21	10.06053
22	8.97784		22	9.83209
23	8.73250		23	9.59398
24	8.47878		24	9.34656
25	8.21725		25	9.09022
26	7.94850		26	8.82544
27	7.67320		27	8.55274
28	7.39207		28	8.27270
29	7.10592		29	7.98598
30	6.81560		30	7.69330
31	6.52203		31	7.39546
32	6.22624		32	7.09333
33	5.92929		33	6.78785
34	5.63234		34	6.48005
35	5.33655		35	6.17106
36	5.04303		36	5.86207
37	4.75282		37	5.55429
38	4.46690		38	5.24886
39	4.18619		39	4.94687
40	3.91156		40	4.64934
41	3.64381		41	4.35721
42	3.38370		42	4.07137
43	3.13192		43	3.79267
44	2.88911		44	3.52186
45	2.65588		45	3.25966
46	2.43276		46	3.00674
47	2.22025		47	2.76371
48	2.01880		48	2.53112

49	1.82880		49	2.30948
50	1.65062		50	2.09924
51	1.48457		51	1.90082
52	1.33092		52	1.71459
53	1.18989		53	1.54088
54	1.06169		54	1.37995
55	0.94647		55	1.23207
56	0.84434		56	1.09743
57	0.75539		57	0.97621
58	0.67966		58	0.86853
59	0.61705		59	0.77451
60	0.56615		60	0.69421
61	0.52378		61	0.62767
62	0.48612		62	0.57479
63	0.45000		63	0.53408
64	0.41400		64	0.50225
65	0.37800		65	0.47533
66	0.34200		66	0.45000
67	0.30600		67	0.42480
68	0.27000		68	0.39960
69	0.23400		69	0.37440
70	0.19800		70	0.34920
71	0.16200		71	0.32400
72	0.12600		72	0.29880
73	0.09000		73	0.27360
74	0.05400		74	0.24840
75	0.01800		75	0.22320
76	0.00000		76	0.19800
			77	0.17280
			78	0.14760
			79	0.12240
			80	0.09720
			81	0.07200
			82	0.04680
			83	0.02160
			84	0.00000

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