



FOUR STROKE OUTBOARD PETROL ENGINE HOMOLOGATION FILE

International Homologation File Number:		00544
Homologation Valid from:	2025	Expiry: 2035 Dec 31
Valid for the following classes:	CIRCUIT Formula 2, S2	
Manufacturer:	Mercury Marine	
Engine Model:	Mercury Racing 250 APX	
Number Manufactured:	>600 225 engines	
At the date:	2020 January 1	
Certified by the National Authority of:		
At the date:		
UIM Homologation Group Inspector:	Mikael Lundblad	
At the date:	2025 Feb 07	
UIM Certification Approval:	Union Internationale Motonautique	
At the date:	2025 Feb 07	
Running Production Changes		
Change Detail		Page No.
Date Approved for Use		Approved by
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Date Approved for Use		Approved by

PICTURES

Photo of the complete engine from the port side.



Photo of the complete engine from 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,
from the rear.



Photo of the engine without top cowl, 45°
from the rear at the port side.



Photo of the engine without top cowl, 45°
from the rear at the starboard side.



Photo without engine covers, port side



Photo without engine covers, stbd side



Photo without engine covers, top-front



Photo without engine covers, rear



Midsection assembly and gearcase, stbd side



Midsection assembly and gearcase, port side



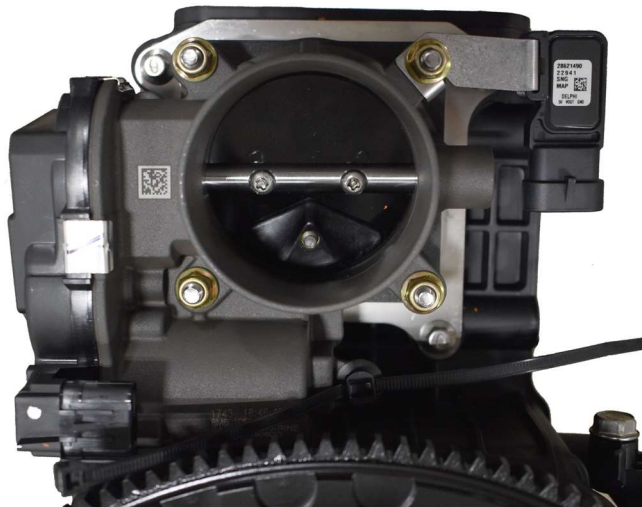
Midsection assembly and gearcase, aft side



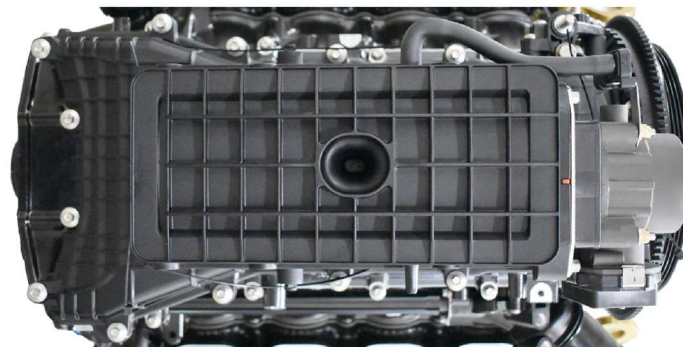
Cross-section of midsection assembly



Throttle and intake manifold - TOP



Throttle and intake manifold - Front



Throttle and intake manifold - Side



Throttle and intake manifold - Inside



Port intake runners - Outside



Starboard intake runners - inside



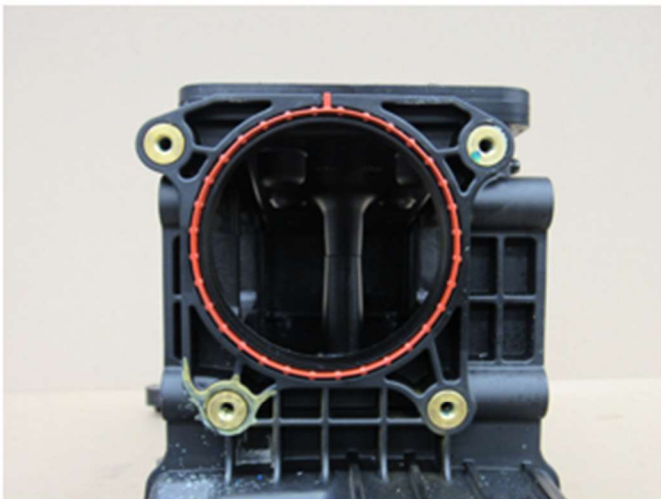
Starboard intake runners - Outside



Intake manifold throttle adapter



Intake manifold without throttle adapter



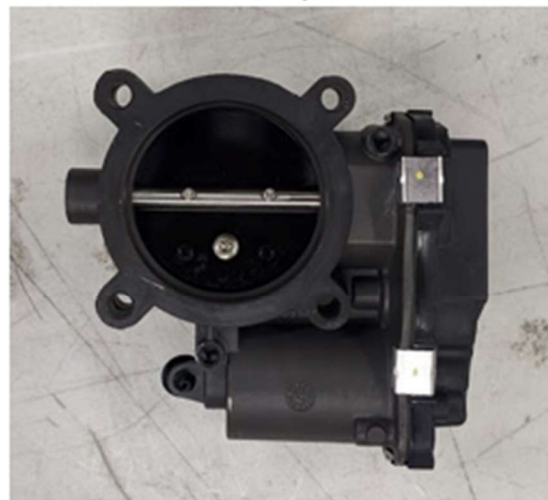
Intake manifold port outlet



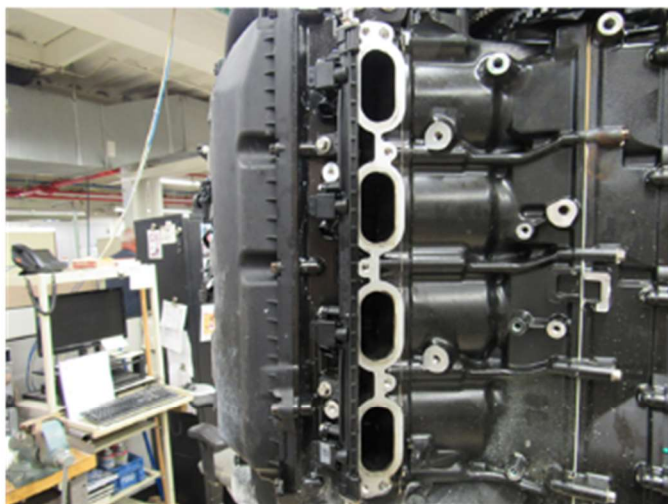
Throttle body – inlet side



Throttle body – outlet side



Fuel rail on engine (stbd side)



Fuel injector tip



Engine control unit (ECU) – connector side



ECU on-engine – under port intake runners



Cylinder head (port) from combustion chamber side



Cylinder head (starboard) from combustion chamber side



Combustion chamber

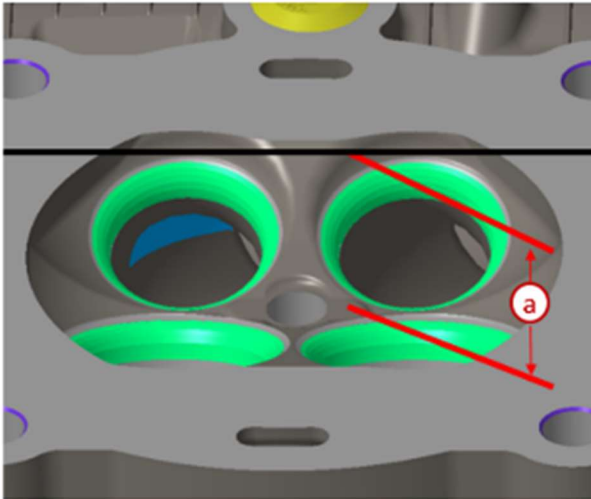


Combustion chamber without valves



Note: clean-up around port throat is variable due to casting tolerance

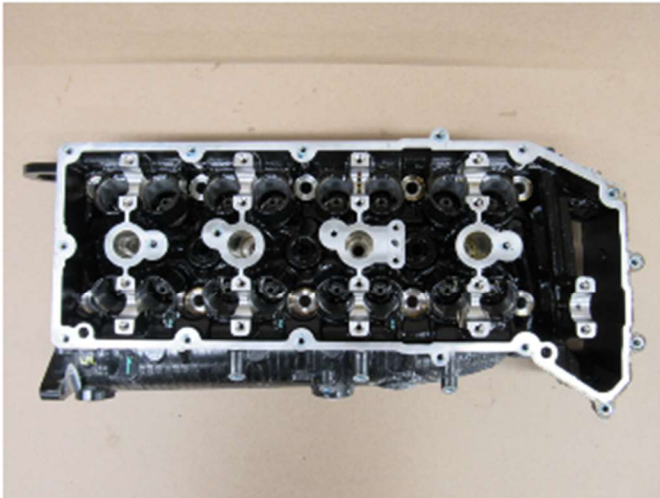
Combustion chamber height a min 14.0 mm



Cylinder head (port) from the valvetrain side



Cylinder head (starboard) from the valvetrain side



Valvetrain – close-up



Cylinder head showing intake port



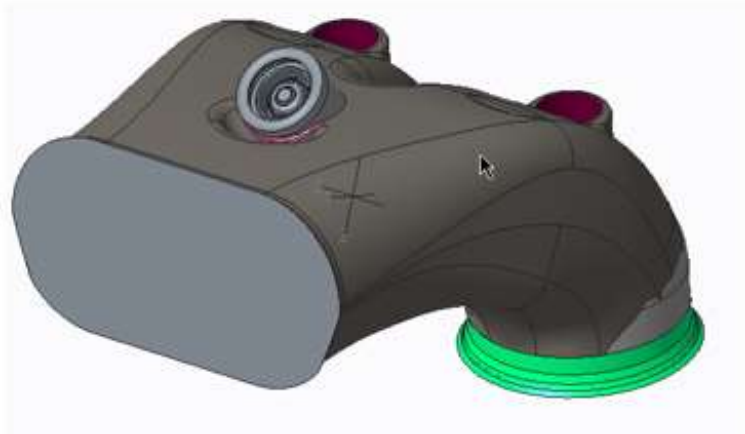
Exhaust outlet – port cylinder head



Exhaust outlet – starboard cylinder head



Intake port core from manifold flange to intake valves, including valve stems; maximum volume = 152 cc



Intake (left) and exhaust (right) valves



Valve spring with keys and retainer



Intake (left) and exhaust (right) valves



Piston viewed from top



Piston and rod assembly



Piston viewed 45° from wrist pin



Piston viewed from bottom



Connecting rod



Cylinder block from port deck side



Cylinder block from starboard deck side



Crankshaft



Cylinder block from crankshaft side



Engine oil main galley - No oil cooler



Exhaust manifold



Lower exhaust pipe inlet



Exhaust manifold inlet and outlet



Lower exhaust outlet



Flywheel bottom (L) and top (R)



Oil pump without cover



Anti-tamper device, crankcase cover



Anti-tamper device, port valve cover



Anti-tamper device, starboard valve cover



MEASUREMENTS

ENGINE FUEL

Type:	Gasoline
Minimum octane required:	95 RON

ENGINE TYPE

Number of cylinders:	8 Cylinders
Cylinder arrangement:	Vee (64°)

ENGINE BLOCK

	Tolerance	Measurement	Unit
Bore	+/- 0.10	92.00	mm
Stroke	+/- 0.10	86.00	mm
Capacity per cylinder	max	573.6	cc
Total Capacity	max	4 589	cc
Cylinder block material		XK360.2-T5 Aluminium	
Cylinder liner material		Grey iron	
Distance from crankshaft centreline to cylinder block deck face.	+/- 0.10	210.0	mm

CYLINDER HEAD

	Tolerance	Measurement	Unit
Cylinder head material		A356-T6 Aluminium	
Volume of combustion chamber (without volume of spark plug hole)	min	51.9	cc
Compression ratio	nom	9.9	
Thickness of cylinder head	+/- 0.20	96.0	mm
Inlet Port:			
Size of port at cylinder head/manifold face	max	30 x 60	mm
Internal diameter of valve seat insert	+/- 0.20	33.1	mm
Surface finish of port		+Cast	
Exhaust Port:			
Size of port at cylinder head/manifold face	max	N/A	mm
Internal diameter of valve seat insert	+/- 0.20	26.1	mm
Surface finish of port		Cast	

Inlet Valves:

Diameter of stem	+/- 0.008	5.4725	mm
Diameter of head	+/- 0.1	37.00	mm
Overall length of inlet valve	+/- 0.25	88.49	mm

Exhaust Valves:

Diameter of stem	+/- 0.008	5.464	mm
Diameter of head	+/- 0.1	31.0	
Overall length of exhaust valve	+/- 0.25	87.67	mm

Valve Springs:

Diameter of wire	max	2.925	mm
Inside diameter of coil	min	17.5	mm
Free length	+/- 0.5	46.1	mm
Number of working turns	+/- 0.5	6.1	turns

CAMSHAFT/SHAFTS

Tolerance Measurement Unit

Inlet:

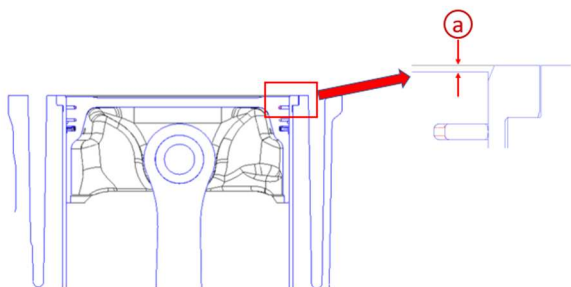
Tappet clearance for checking timing	+/- 0.050	0.175	mm
Total valve lift (at nominal lash)	+/- 0.10	7.89	mm
Total (duration) inlet opening angle (measured at flywheel in degrees at 1,0 mm valve lift at specified valve lash)	+/- 5°	194	degrees
Duration inlet opening angle 3mm under max valve lift (measured at flywheel in degrees)	+/- 2°	120	Degrees
Base circle diameter of lobe	+/- 0.02	35.00	Mm
Cam shaft lobe height	+/- 0.05	43.07	Mm

Exhaust:

Tappet clearance for checking timing	+/- 0.050	0.350	mm
Total valve lift (at nominal lash)	+/- 0.10	8.89	mm
Total (duration) exhaust opening angle (measured at flywheel in degrees at 1,0 mm valve lift at specified valve lash)	+/- 5°	204	degrees
Duration inlet opening angle 3mm under max valve lift (measured at flywheel in degrees)	+/- 2°	120	degrees
Base circle diameter of lobe	+/- 0.02	35.00	mm
Cam shaft lobe height	+/- 0.05	44.24	mm

PISTONS

Material of piston		Aluminium	
Type and thickness of rings	Square	1.20	mm
	Taper Faced Napier	1.00	mm
	Oil Control	2.00	mm
Piston crown height from head deck at top dead center (a)	min	0.30	mm

**CONNECTING ROD**

Tolerance Measurement Unit

Length of rod from big end to small end (centre to centre)	+/- 0.05	140.5	mm
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CRANKSHAFT

Measurement Unit

Number of main bearing journals	5	
Diameter of main bearing journals	59.984-60.000	mm
Diameter of connecting rod journals	53.984-54.000	mm
Surface finish of crankshaft	Primarily machined, with some as-forged	

TYPE OF BEARINGS

Piston Pin	Floating
Connecting Rod journal	Plain
Main journal	Plain

FUEL INJECTION

Tolerance Measurement Unit

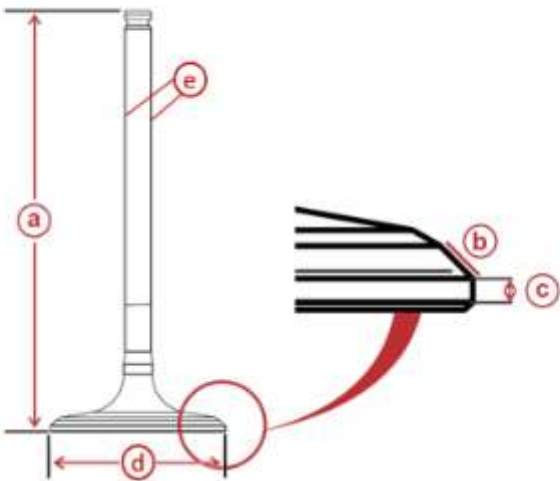
Make		Walbro	
Type of pump, model no.		Gerotor, FGB-29	
Fuel pressure at idle		approx 290-340	kPa
Fuel pressure no running		340-370	kPa
Total number of injectors		8	Injectors
Diameter of throttle bore	max	64.0	mm

COOLING SYSTEM

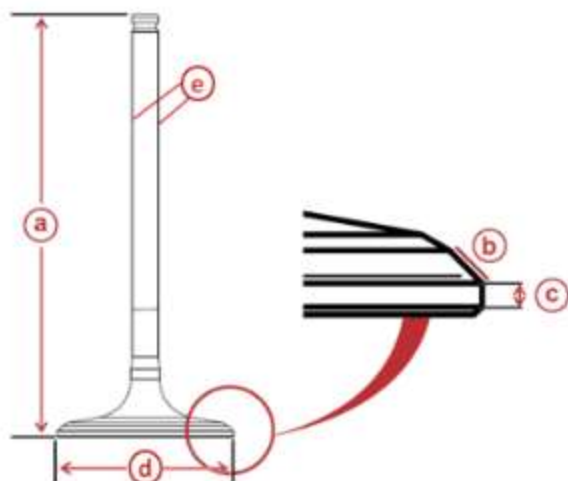
Type	Raw water cooled
Method	Thermostat controlled with pressure relief
Pump	Rubber impeller vane pump
Number of impeller blades	6
Thermostat start opening temperature	57-61 °C
Thermostat fully opened	77 °C

VALVE INSPECTION

Intake Valve Specifications		
Intake valve	Height (a)	88.49 ± 0.25 mm
	Valve stem diameter (e)	5.4645-5.4805 mm
	Valve face angle	45°
	Outside diameter (d)	37.0 ± 0.1 mm
	Valve margin width (c)	0.875 ± 0.2 mm
	Valve stem service limit runout (measured at valve face)	0.030 mm

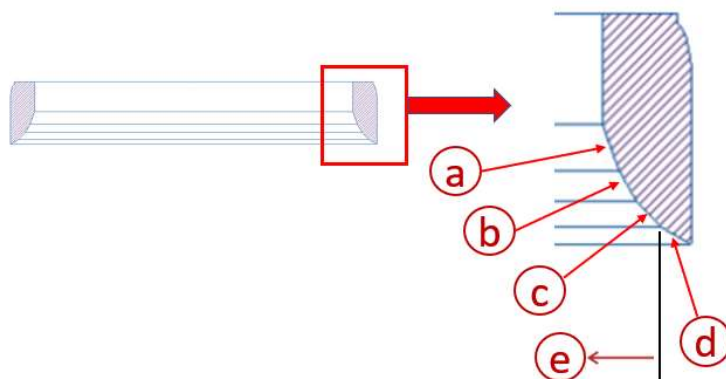


Exhaust Valve Specifications		
Exhaust valve	Height (a)	87.667 ± 0.25 mm
	Valve stem diameter (e)	5.456-5.472 mm
	Valve face angle	46°
	Outside diameter (d)	31.0 ± 0.1 mm
	Valve margin width (c)	1.331 ± 0.2 mm
	Valve stem service limit runout (measured at valve face)	0.030 mm

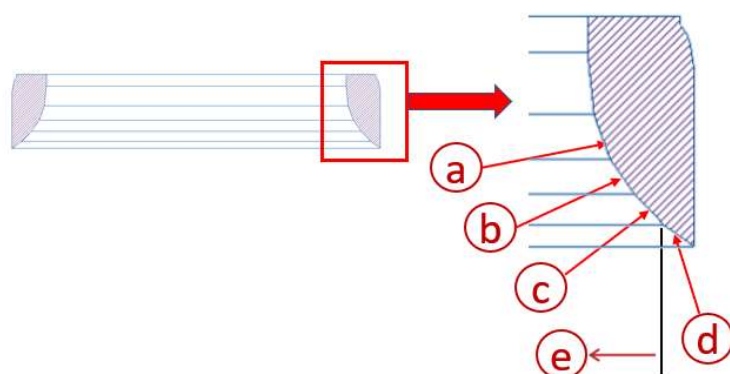


VALVE SEAT INSPECTION

Intake Valve Seat Specifications		
Valve Seat	Surface (a) angle from valve axis	$20^\circ \pm 1^\circ$
	Surface (b) angle from valve axis	$30^\circ \pm 1^\circ$
	Surface (c) angle from valve axis	$44^\circ \pm 0.25^\circ$
	Surface (d) angle from valve axis	$60^\circ \pm 1^\circ$
	Surface (b) width	1 ± 0.2 mm
	Surface (c) width	1 ± 0.1 mm
	Diameter (e)	$\varnothing 36.45 \pm 0.1$ mm



Exhaust Valve Seat Specifications		
Valve Seat	Surface (a) angle from valve axis	$20^{\circ} \pm 1^{\circ}$
	Surface (b) angle from valve axis	$35^{\circ} \pm 1^{\circ}$
	Surface (c) angle from valve axis	$44^{\circ} \pm 0.25^{\circ}$
	Surface (d) angle from valve axis	$55^{\circ} \pm 1^{\circ}$
	Surface (b) width	$1.2 \pm 0.2 \text{ mm}$
	Surface (c) width	$1.2 \pm 0.1 \text{ mm}$
	Diameter (e)	$\varnothing 30.4 \pm 0.1 \text{ mm}$



SENSOR TESTS

Cylinderblock coolant sensor

Meter Test Leads		Temperature	Reading (nominal)
Red	Black		
Pin A (black/orange)	Pin B (brown/black)	0 °C (32 °F)	32.6 kΩ
		20 °C (68 °F)	12.5 kΩ
		40 °C (104 °F)	5.3 kΩ
		65 °C (150 °F)	2.1 kΩ
		95 °C (203 °F)	786 Ω

Manifold Absolute Pressure Sensor

Manifold Absolute Pressure (MAP) Sensor Readings	
At idle (neutral)	35-48 kPa (5-7 psi)
At wide-open throttle	Within 15% of BARO

Manifold Air Temperature Sensor

Meter Test Leads		Temperature	Reading (nominal)
Red	Black		
Pin A (tan)	Pin B (black/orange)	0 °C (32 °F)	6.5 kΩ
		15 °C (59 °F)	3.2 kΩ
		25 °C (77 °F)	2.1 kΩ
		100 °C (212 °F)	150 Ω

SPARK PLUG

Brand

NGK

Model

LKAR7C-9

ENGINE GRAPHICS

The color of graphic items (1) and (2) may be modified as desired. All other graphics and components must remain as shown. Pattern files for items (1) and (2) are available from Mercury Racing upon request.

ENGINE COWLING

Cowling may be replaced or repaired by a facsimile of identical size and dimension. Finish must be black or exposed carbon fiber. Front air inlet and rear air exhaust vents must remain, with identical location and cross-sectional area. No additional air inlets, scoops, deflectors, or wings are to be added.



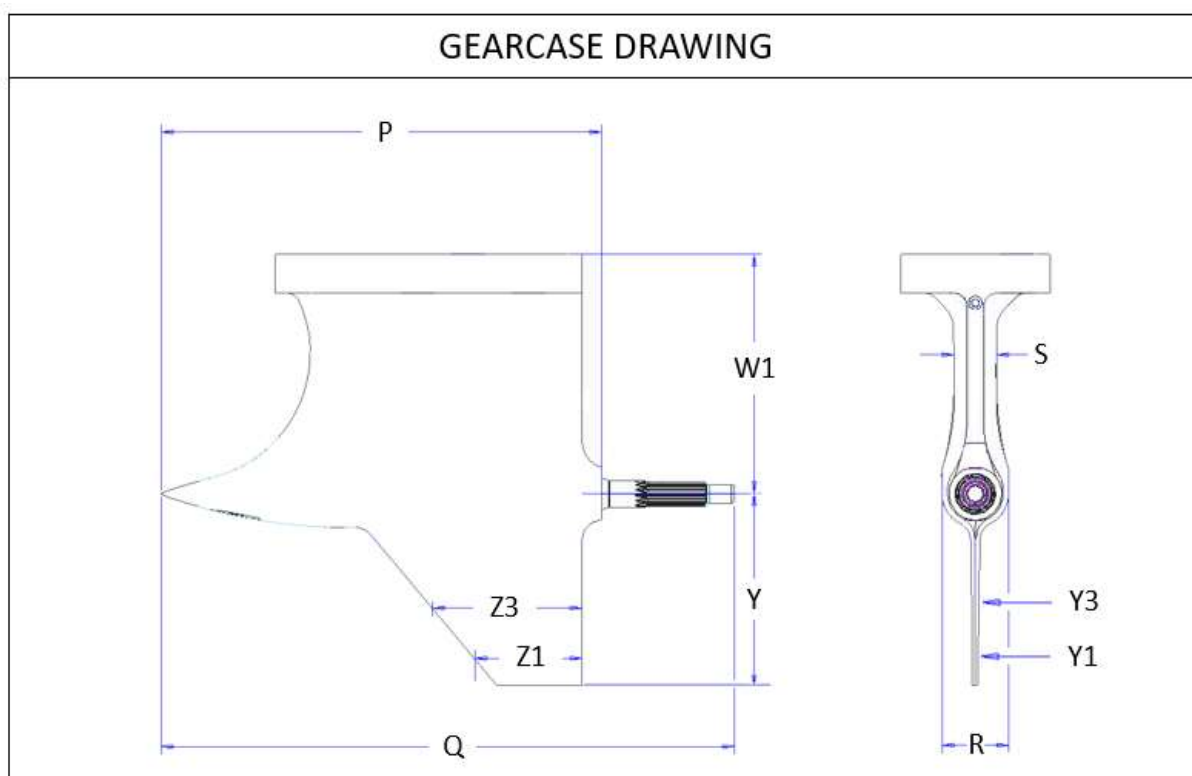
WEIGHTS	Tolerance	Measurement	Unit
Inlet valve (bare)	min	47	g
Exhaust valve (bare)	min	36	g
Valve spring	min	23.5	g
Inlet camshaft (port and stbd)	min	1 070	g
Exhaust camshaft (port)	min	1 350	g
Exhaust camshaft (stbd)	min	1 320	g
Piston (with rings)	min	291	g
Piston Pin	min	66.5	g
Connecting Rod (with bearings and bolts)	min	440	g
Crankshaft	min	15 310	g
Balance Shaft	min	1550	g
Flywheel (bare stock V8)	min	5780	g

OVERDRIVE RATIOS	Pinion	Driven Gear	Overall Ratio
0.818	22	18	0.927

UNDERWATER UNIT**OB IV SSM**

	Tolerance	Measurement	Unit
Gear Ratio		1.13 (15/17)	
P Longitudinal length of gearcase torpedo (B)	max	450	mm
Q Longitudinal dimension of gearcase including propeller shaft	max	575	mm
R Transverse dimension of gearcase	min	64.5	mm
S Thickness of strut	min	40.0	mm
Z1 Skeg chord length, 25mm above bottom	+/- 5 mm	111	mm
Z3 Skeg chord length, 75mm above bottom	+/- 5 mm	145	mm
W1 Distance from propeller shaft to upper flange	+/- 2 mm	238	mm
Y1 Thickness of skeg, 25mm above bottom*	min	5.3	mm
Y3 Thickness of skeg, 75mm above bottom*	min	6.8	mm
Y Skeg depth from propeller shaft*	+/- 5 mm	190	mm

**Gearcase skeg must conform to Mercury skeg template, part number 91-840671*



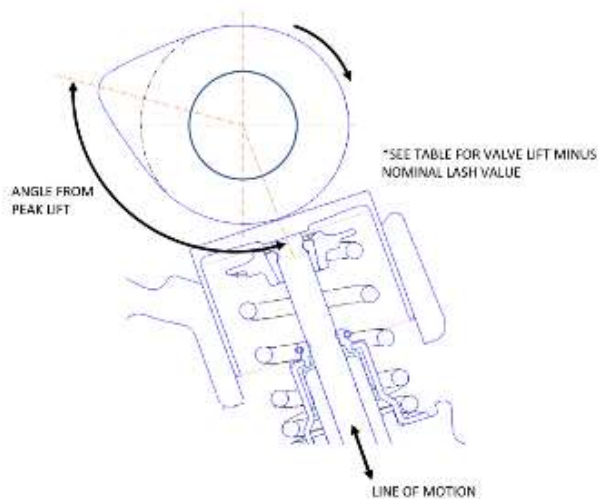
**FOUR STROKE OUTBOARD
PETROL ENGINE****NOTES**

Inspection of ECM

Model	250APX
ECM over speed limiter*	6800 rpm
ECM software version	Engine calibration can be verified via Mercury SpeedLink

*Note, over speed limiter indicates speed at which individual cylinders are cut. At 6,900 rpm all cylinders are cut. Instantaneous spikes over 6,900 rpm are possible if the prop completely exits the water (e.g. wave jump).

Attachment 1 - Camlift measurement



Valve Lift Table (in Cam angle) at Nominal Lash			
INTAKE (INT#1 Lobe Index Timing @ Max Lift: 110 degrees in Crank ATDC)		EXHAUST (EXH#1 Lobe Index Timing @ Max Lift: 110 degrees in Crank BTDC)	
Cam Angle	Valve Lift [mm]	Cam Angle	Valve Lift [mm]
-70	0.053		
-68	0.087		
-66	0.121		
-64	0.155	-64	0.007
-62	0.189	-62	0.041
-60	0.223	-60	0.075
-58	0.257	-58	0.121
-56	0.291	-56	0.224
-54	0.336	-54	0.431
-52	0.433	-52	0.759
-50	0.627	-50	1.184
-48	0.932	-48	1.667
-46	1.328	-46	2.170
-44	1.778	-44	2.674
-42	2.246	-42	3.176
-40	2.715	-40	3.673
-38	3.182	-38	4.160
-36	3.639	-36	4.631
-34	4.081	-34	5.082
-32	4.501	-32	5.510
-30	4.899	-30	5.913
-28	5.273	-28	6.292
-26	5.624	-26	6.646
-24	5.950	-24	6.975
-22	6.252	-22	7.278
-20	6.529	-20	7.556
-18	6.781	-18	7.808
-16	7.007	-16	8.033

-14	7.208		-14	8.233
-12	7.384		-12	8.406
-10	7.533		-10	8.553
-8	7.656		-8	8.673
-6	7.754		-6	8.766
-4	7.825		-4	8.833
-2	7.871		-2	8.873
0	7.890		0	8.887
2	7.884		2	8.873
4	7.851		4	8.833
6	7.793		6	8.766
8	7.708		8	8.673
10	7.598		10	8.553
12	7.461		12	8.406
14	7.299		14	8.233
16	7.111		16	8.033
18	6.897		18	7.808
20	6.658		20	7.556
22	6.394		22	7.278
24	6.104		24	6.975
26	5.790		26	6.646
28	5.452		28	6.292
30	5.089		30	5.913
32	4.703		32	5.510
34	4.294		34	5.082
36	3.862		36	4.631
38	3.412		38	4.160
40	2.949		40	3.673
42	2.481		42	3.176
44	2.011		44	2.674
46	1.548		46	2.170
48	1.120		48	1.667
50	0.766		50	1.184
52	0.516		52	0.759
54	0.375		54	0.431
56	0.310		56	0.224
58	0.274		58	0.121
60	0.240		60	0.075
62	0.206		62	0.041
64	0.172		64	0.007
66	0.138			
68	0.104			
70	0.070			
72	0.036			