



FOUR STROKE OUTBOARD PETROL ENGINE HOMOLOGATION FILE

International Homologation File Number:		00539B	
Homologation Valid from:	2021	Expiry: December 31, 2031	
Valid for the following classes:	CIRCUIT 1, S1	Formula	
Manufacturer:	Mercury Marine		
Engine Model:	Mercury Racing 360 APX		
Number Manufactured:	>600 300R engines		
At the date:	January 1, 2020		
Certified by the National Authority of:			
At the date:			
UIM Homologation Group Inspector:	Mikael Lundblad		
At the date:	July 15, 2021		
UIM Certification Approval:	Union Internationale Motonautique		
At the date:	July 15, 2021		
Running Production Changes			
Change Detail	Gear ratio add, ECM info	Page No.	26, 28
Date Approved for Use	2024-06-15	Approved by	
Change Detail	Intake manifold, Camshaft, Valve spring, Throttle house, Fly wheel, ECM	Page No.	
Date Approved for Use	2025-05-28	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



Intake runners - inside

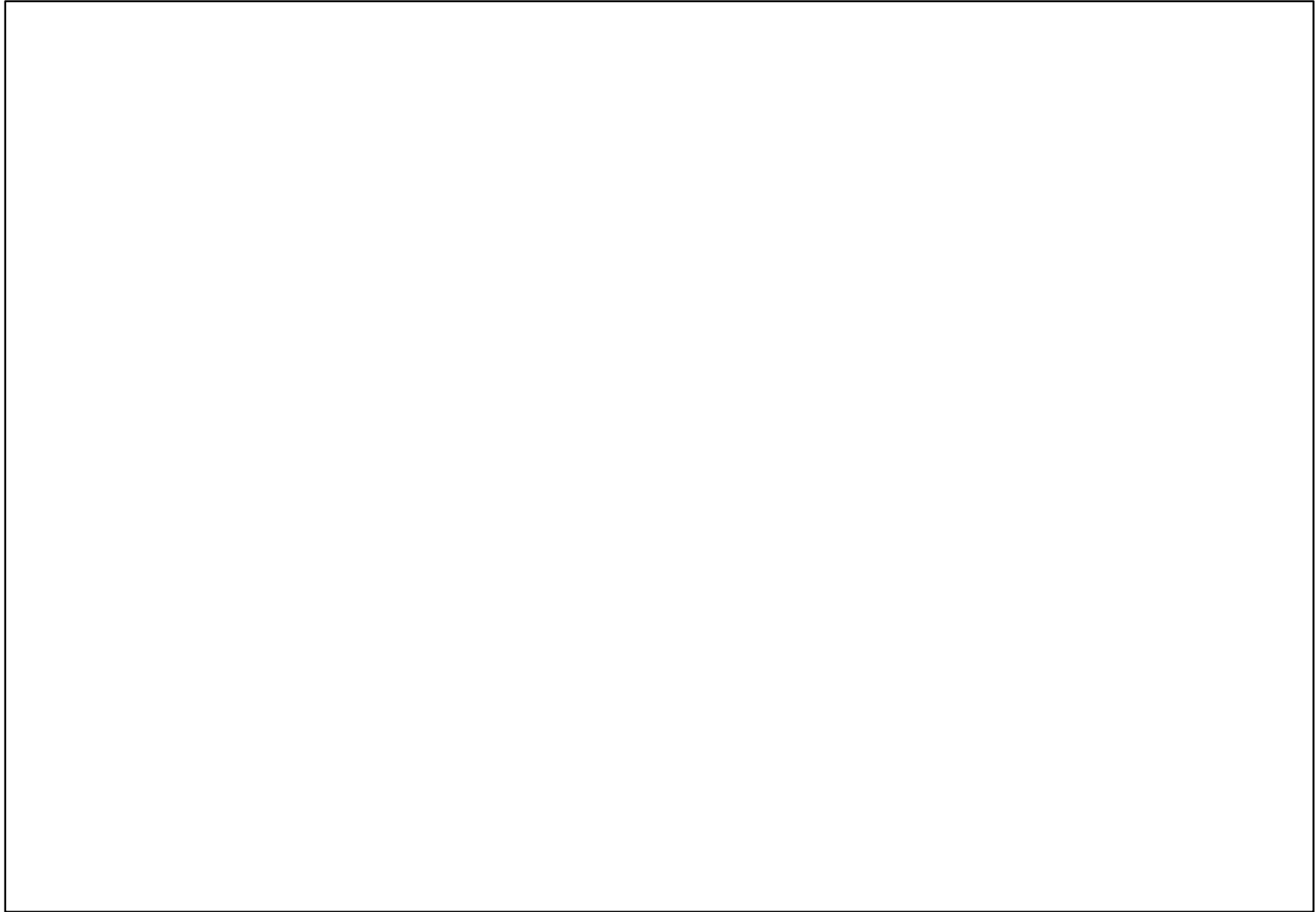


Intake runners - outside



Intake manifold port outlet





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

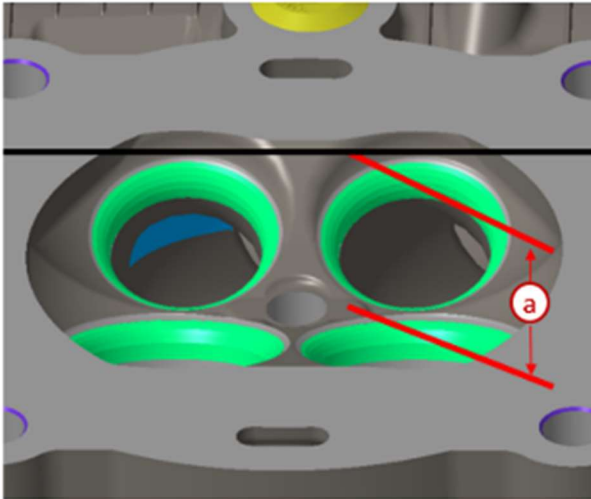


Combustion chamber without valves



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

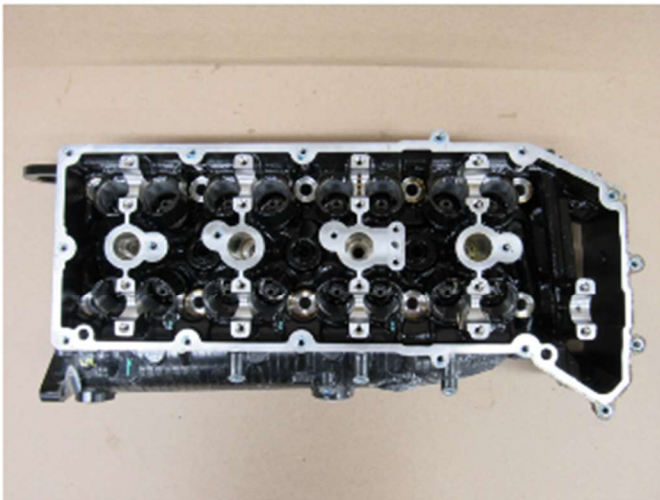
Combustion chamber height a min 14.0 mm



Cylinder head (port) from the valvetrain side



Cylinder head (starboard) from the valvetrain side



Valvetrain – close-up



Cylinder head showing intake port



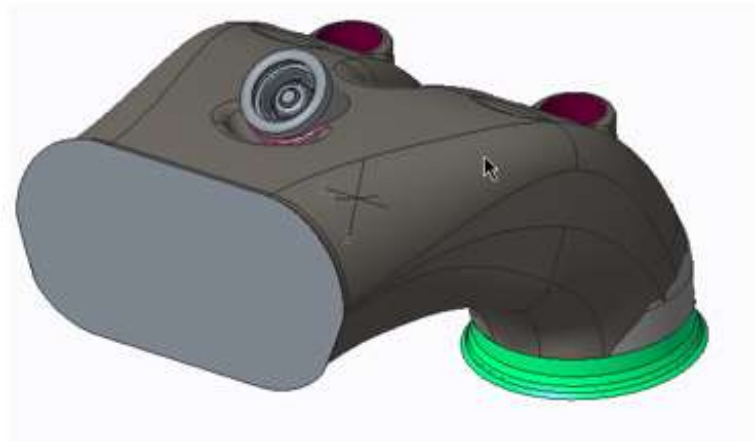
Exhaust outlet – port cylinder head



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



Oil cooler on-engine – under port intake runners



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:	V (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	10.9	
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
<i>Inside diameter of coil top</i>		12.9	mm
<i>Inside diameter of coil bottom</i>		17.7	mm
Free length	+/- 0.5	44.9	mm
Number of working turns	+/- 0.5	6.0	turns

CAMSHAFT/SHAFTS

Tolerance Measurement Unit

Inlet:

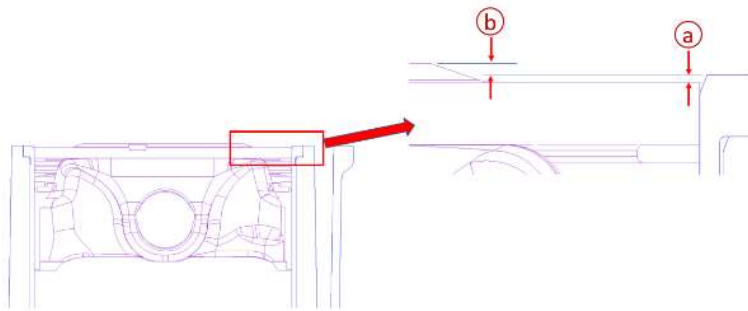
Tappet clearance for checking timing	+/- 0.050	0.175	mm
Total valve lift (at nominal lash)	+/- 0.10	9.24	mm
Total (duration) inlet opening angle (measured at flywheel in degrees at 1,0 mm valve lift at specified valve lash)	+/- 5°	210	degrees
Duration inlet opening angle 3mm under max valve lift (measured at flywheel in degrees)	+/- 2°	124	Degrees
Base circle diameter of lobe	+/- 0.02	35.00	Mm
Cam shaft lobe height	+/- 0.05	44.24	Mm

Exhaust:

Tappet clearance for checking timing	+/- 0.050	0.350	mm
Total valve lift (at nominal lash)	+/- 0.10	9.50	mm
Total (duration) exhaust opening angle (measured at flywheel in degrees at 1,0 mm valve lift at specified valve lash)	+/- 5°	214	degrees
Duration inlet opening angle 3mm under max valve lift (measured at flywheel in degrees)	+/- 2°	128	degrees
Base circle diameter of lobe	+/- 0.02	35.00	mm
Cam shaft lobe height	+/- 0.05	44.50	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 depth <i>below</i> head deck at top dead center, edge (a)	min	0.30	mm
Piston crown height <i>above</i> head deck at top dead center, center (b)	max	0.94	mm

**CONNECTING ROD**

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

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

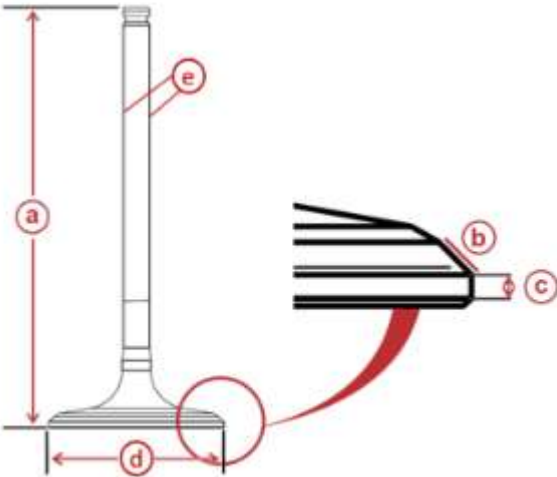
	Tolerance	Measurement	Unit
Make		Walbro	
Type of pump, model no.		Gerotor, FGB-29	
Fuel pressure at idle		approx 290-340	kPa
Fuel pressure no running		340-370	kPa
Total number of injectors		8	Injectors
Diameter of throttle bore	max	92.0	mm

COOLING SYSTEM

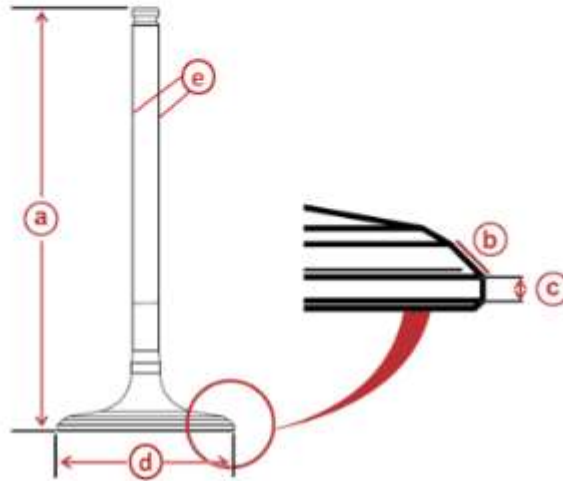
Type	Raw water cooled
Method	Thermostat controlled with pressure relief
Pump	Rubber impeller vane pump
Number of impeller blades	6
Thermostat start opening temperature	57-61 °C
Thermostat fully opened	77 °C

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

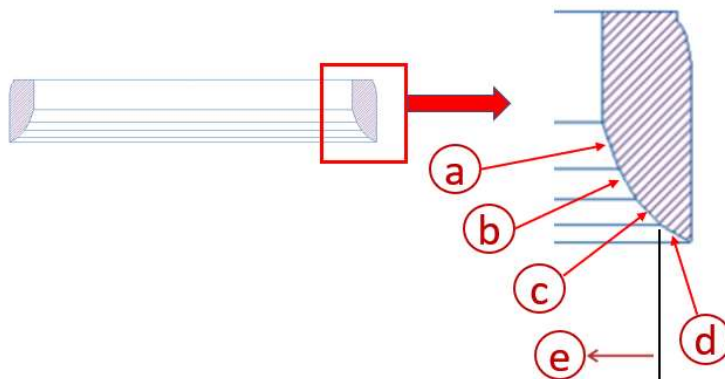


Exhaust Valve Specifications		
Exhaust valve	Height (a)	87.667 ± 0.25 mm
	Valve stem diameter (e)	5.456-5.472 mm
	Valve face angle	46°
	Outside diameter (d)	31.0 ± 0.1 mm
	Valve margin width (c)	1.331 ± 0.2 mm
	Valve stem service limit runout (measured at valve face)	0.030 mm

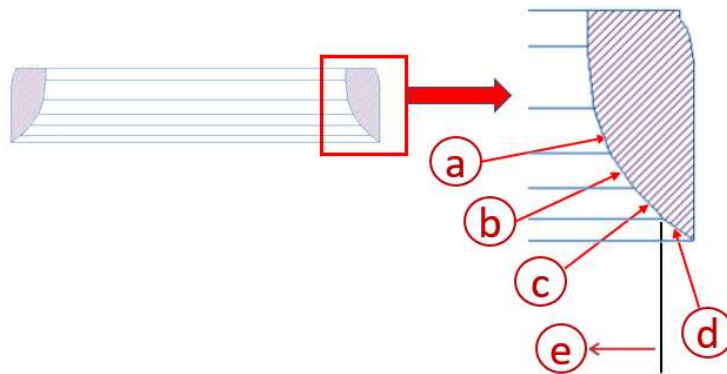


VALVE SEAT INSPECTION

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.



WEIGHTS	Tolerance	Measurement	Unit
Inlet valve (bare)	min	47	g
Exhaust valve (bare)	min	36	g
Valve spring	min	24.0	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	305	g
Piston Pin	min	66.5	g
Connecting Rod (with bearings and bolts)	min	440	g
Crankshaft	min	15 310	g
Flywheel (bare)	min	5 780	g

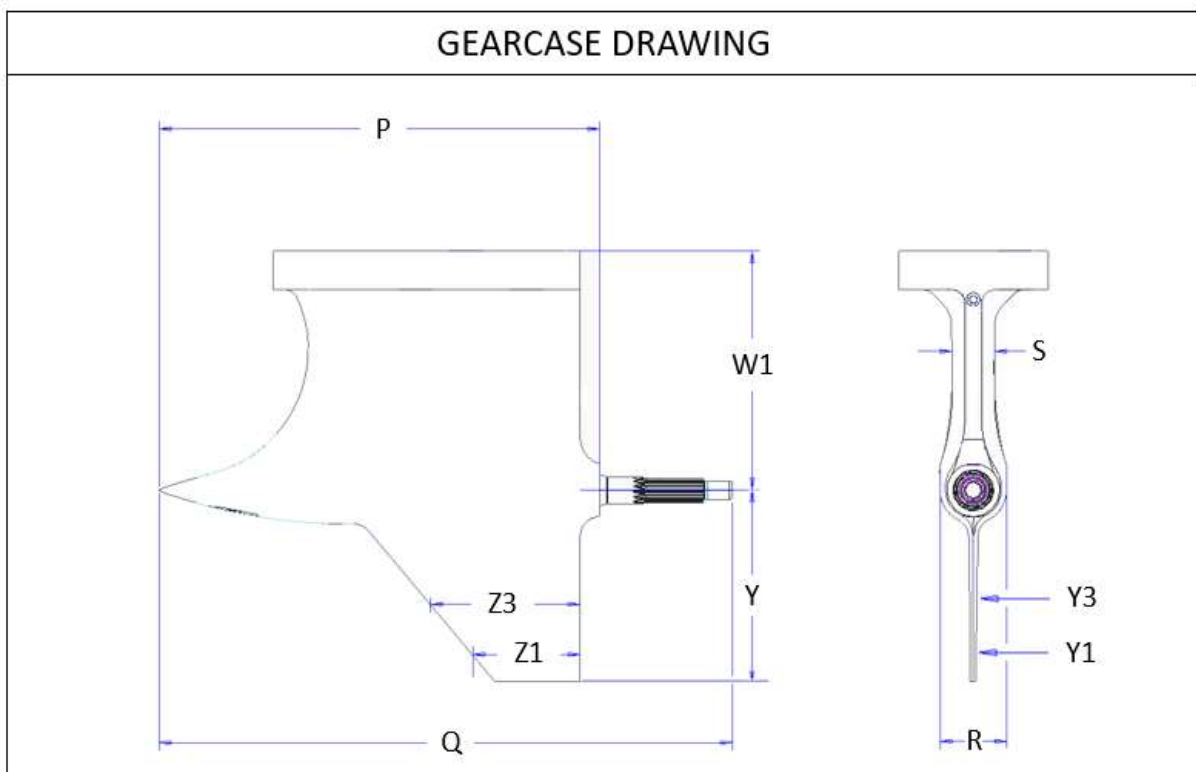
OVERDRIVE RATIOS	Pinion	Driven Gear	Overall Ratio
0.818	22	18	0.927
0.786	28	22	0.890
0.765	34	26	0.867
0.739	23	17	0.838
0.724	29	21	0.821
0.714	35	25	0.810
0.667	30	20	0.756

Note: Final gear ratio and number of combinations allowed for racing to be defined after proper test in racing condition.

UNDERWATER UNIT**OB IV SSM**

	Tolerance	Measurement	Unit
Gear Ratio		1.13 (15/17)	
P Longitudinal length of gear case torpedo (B)	max	450	mm
Q Longitudinal dimension of gear case including propeller shaft	max	575	mm
R Transverse dimension of gear case	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

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



**FOUR STROKE OUTBOARD
PETROL ENGINE**

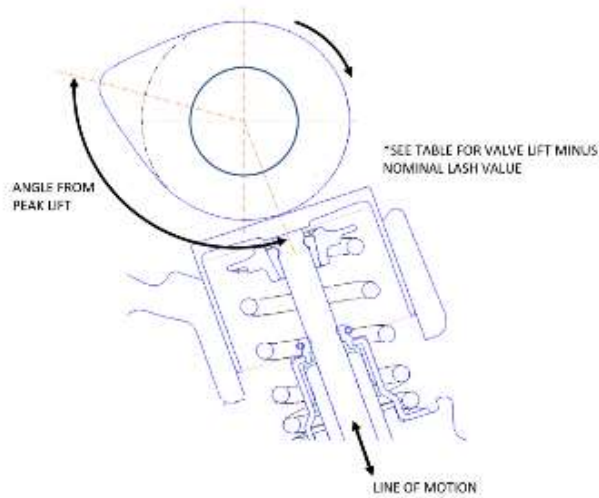
NOTES

Inspection of ECM

Model	360APX
ECM over speed limiter*	7800 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 7 800 rpm all cylinders are cut. Instantaneous spikes over 8 000 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: 122 degrees in Crank ATDC)		EXHAUST (EXH#1 Lobe Index Timing @ Max Lift: 105 degrees in Crank BTDC)	
Cam Angle	Valve Lift [mm]	Cam Angle	Valve Lift [mm]
-72	0.221		
-70	0.255		
-68	0.289		
-66	0.323		
-64	0.357	-64	0.382
-62	0.391	-62	0.416
-60	0.425	-60	0.457
-58	0.471	-58	0.530
-56	0.573	-56	0.677
-54	0.781	-54	0.924
-52	1.108	-52	1.276
-50	1.533	-50	1.711
-48	2.017	-48	2.196
-46	2.519	-46	2.700
-44	3.023	-44	3.205
-42	3.526	-42	3.709
-40	4.023	-40	4.208
-38	4.510	-38	4.698
-36	4.981	-36	5.173
-34	5.432	-34	5.628
-32	5.859	-32	6.060
-30	6.263	-30	6.470
-28	6.642	-28	6.855
-26	6.996	-26	7.215
-24	7.324	-24	7.550
-22	7.628	-22	7.859
-20	7.905	-20	8.142
-18	8.157	-18	8.399
-16	8.383	-16	8.629

-14	8.582		-14	8.833
-12	8.756		-12	9.009
-10	8.902		-10	9.159
-8	9.022		-8	9.281
-6	9.116		-6	9.377
-4	9.183		-4	9.445
-2	9.223		-2	9.486
0	9.236		0	9.500
2	9.223		2	9.486
4	9.183		4	9.445
6	9.116		6	9.377
8	9.022		8	9.281
10	8.902		10	9.159
12	8.756		12	9.009
14	8.582		14	8.833
16	8.383		16	8.629
18	8.157		18	8.399
20	7.905		20	8.142
22	7.628		22	7.859
24	7.324		24	7.550
26	6.996		26	7.215
28	6.642		28	6.855
30	6.263		30	6.470
32	5.859		32	6.060
34	5.432		34	5.628
36	4.981		36	5.173
38	4.510		38	4.698
40	4.023		40	4.208
42	3.526		42	3.709
44	3.023		44	3.205
46	2.519		46	2.700
48	2.017		48	2.196
50	1.533		50	1.711
52	1.108		52	1.276
54	0.781		54	0.924
56	0.573		56	0.677
58	0.471		58	0.530
60	0.425		60	0.456
62	0.391		62	0.416
64	0.357		64	0.382
66	0.323			
68	0.289			
70	0.255			
72	0.221			

© (2024) Copyright by UIM - Union Internationale Motonautique. All rights reserved. No part of this document/publication may be reproduced, distributed, or transmitted in any form or by any means without the prior written consent of the UIM, except for the non-commercial use within the scope of authority of the UIM and its affiliated members.