FOUR STROKE STERNDRIVE PETROL ENGINE HOMOLOGATION FILE

International Homologation File Number:		**00538**
Homologation Valid from:	**2021**	**Expiry: 31 December 2031**
Valid for the following classes:	**Offshore Class 1**	
Manufacturer:	**Mercury Marine**	
Engine Model:	**Mercury Racing 1100 Competition**	
Number Manufactured:	**>700 ALL QC4 MODELS**	
At the date:	**Dec 31, 2020**	
Certified by the National Authority of:		
At the date:		
UIM Homologation Group Inspector:	Mikael Lundblad	
At the date:		
UIM Certification Approval:	**Union Internationale Motonautique**	
At the date:		
Running Production Changes		
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PICTURES

Engine, 45° from the front at the starboard side.

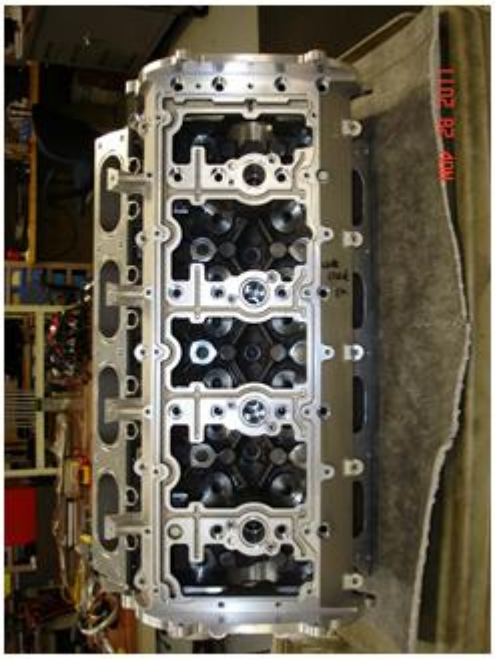
Engine, 45° from the rear at the port side.

Cylinder block 45° from the front at the starboard side.

Cylinder block 45° from the rear at the port side.

Cylinder head from the combustion chamber side

Cylinder head from the valve assembly side

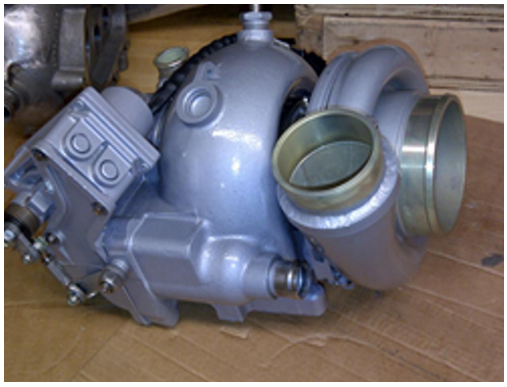


Flywheel and drive plate

Connecting rod and bearing shells

Piston viewed 45° from the wrist pin


Crankshaft


Turbocharger Assembly Garrett Model GT4294


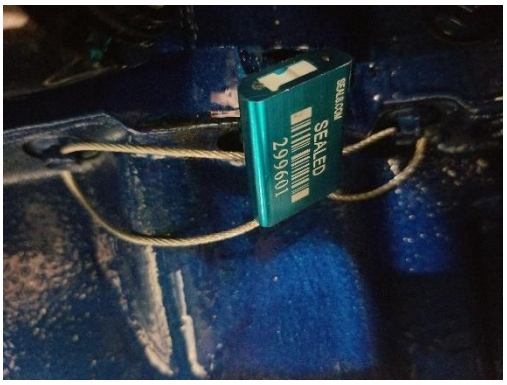
Center Housing Rotating Assembly (CHRA) Part Number


Throttle and Idle Air Bypass

Valve Springs

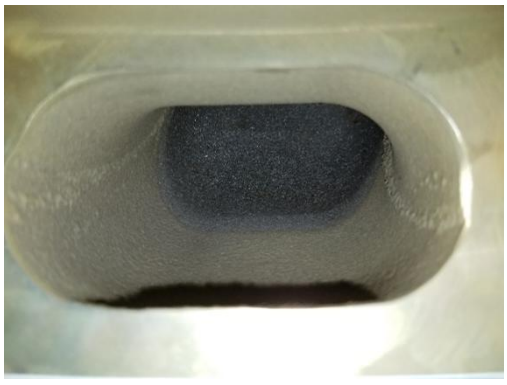
Exhaust Valve

Intake Valve

Anti-tamper Seal: Front Cover to Intake Manifold	Anti-tamper Seal: Oil Pan to Block (port-aft)
	

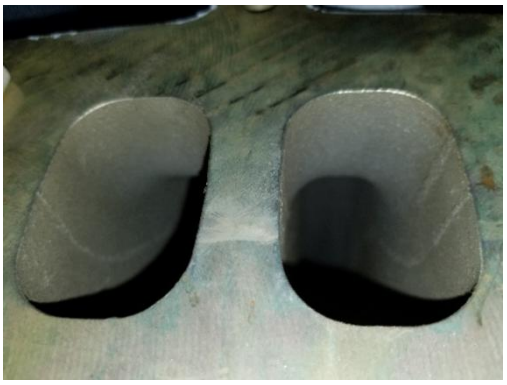
Cylinder Head Intake Port


Cylinder Head Exhaust Port


Exhaust Manifold Port – Cylinder Head Flange


Intake Manifold Port – Cylinder Head Flange


Turbocharger Exhaust Inlet


Exhaust Riser to Turbocharger Ports


Exhaust Manifold to Riser Ports


MEASUREMENTS

ENGINE FUEL

Type:	**Gasoline**	
Minimum octane required:	**89**	AKI
	95	RON

ENGINE TYPE

Number of cylinders:	**8**	Cylinders
Cylinder arrangement:	**V (90°)**	

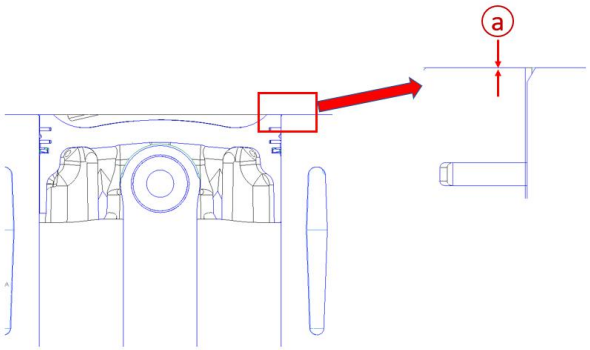
ENGINE BLOCK	Tolerance	Measurement	Unit
Bore	+0.25 -0.1	**116.0**	mm
Stroke	+/- 0.05	**107.0**	mm
Capacity per cylinder	max	**1 136**	cc
Total Capacity	max	**9 089**	cc
Cylinder block material		**A356-T6 Aluminium**	
Cylinder liner material		**Hard coating**	
Distance from crankshaft centreline to cylinder block deck face.	+/- 0.10	**250.0**	mm

CYLINDER HEAD	Tolerance	Measurement	Unit
Cylinder head material		**A356-T6 Aluminium**	
Volume of combustion chamber (without volume of spark plug hole)	min	**107**	cc
Compression ratio	nom	**7.8**	
Thickness of cylinder head (Head deck to cam deck)	+/- 0.20	**176.75**	mm
Inlet Port:			
Port dimensions	+/- 0.50	**94 x 47**	mm
Internal diameter of valve seat insert	+/- 0.20	**42.85**	mm
Surface finish of port		**Cast**	
Exhaust Port:			
Port dimensions	+/- 0.50	**70 x 38**	mm
Internal diameter of valve seat insert	+/- 0.20	**31.86**	mm
Surface finish of port		**Cast**	

Inlet Valves:			
Diameter of stem	+/- 0.010	**7.875**	mm
Diameter of head	+/- 0.15	**48.00**	mm
Overall length of inlet valve (tip to gage line)	+/- 0.10	**136.78**	mm
Exhaust Valves:			
Diameter of stem	+/- 0.01	**7.86**	mm
Diameter of head	+/- 0.15	**38.00**	
Overall length of exhaust valve (tip to gage line)	+/- 0.1	**130.9**	mm
Valve Springs (Dual Spring Type):			
Diameter of wire (outer)	max	**3.790**	mm
Inside diameter of coil (outer)	min	**22.9**	mm
Diameter of wire (inner)	max	**2.901**	mm
Inside diameter of coil (inner)	min	**17.2**	mm
Free length	+/- 0.5	**53.3**	mm
CAMSHAFT/SHAFTS	Tolerance	Measurement	Unit
Inlet:			
Tappet clearance for checking timing	+/- 0.050	**0.51**	mm
Total valve lift (at nominal lash)	+/- 0.10	**13.02**	mm
Total (duration) inlet opening angle (measured at flywheel in degrees at 1,0 mm valve lift at specified valve lash)	+/- 5°	**228**	degrees
Duration inlet opening angle 3mm under max valve lift (measured at flywheel in degrees)	+/- 2°	**104**	degrees
Base circle diameter of lobe	+/- 0.1	**38.0**	mm
Cam shaft lobe height (from centerline)	+/- 0.05	**29.15**	mm
Exhaust:			
Tappet clearance for checking timing	+/- 0.050	**0.690**	mm
Total valve lift (at nominal lash)	+/- 0.10	**13.54**	mm
Total (duration) exhaust opening angle (measured at flywheel in degrees at 1,0 mm valve lift at specified valve lash)	+/- 5°	**232**	degrees
Duration inlet opening angle 3mm under max valve lift (measured at flywheel in degrees)	+/- 2°	**104**	degrees
Base circle diameter of lobe	+/- 0.1	**38.0**	mm
Cam shaft lobe height	+/- 0.05	**29.63**	mm

PISTONS

Material of piston		**Aluminum**	
Type and thickness of rings	Square Taper Faced Napier Oil Control	**1.50** **1.50** **2.80**	mm mm mm
Piston crown height above head deck at top dead center (a)	max	**0.15**	mm



CONNECTING ROD	Tolerance	Measurement	Unit
Length of rod from big end to small end (centre to centre)	+/- 0.06	**163.50**	mm

CRANKSHAFT	Measurement	Unit
Number of main bearing journals	**5**	
Diameter of main bearing journals	**69.812-69.800**	mm
Diameter of connecting rod journals	**55.867-55.855**	mm
Surface finish of crankshaft	**Fully machined**	

TYPE OF BEARINGS

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

FUEL INJECTION	Tolerance	Measurement	Unit
Make		**Weldon**	
Fuel pressure at idle	max	**420**	kPa
Total number of injectors		**16**	Injectors
Diameter of throttle bore	max	**80.0**	mm
Diameter of idle air bypass	max	**5.4**	mm

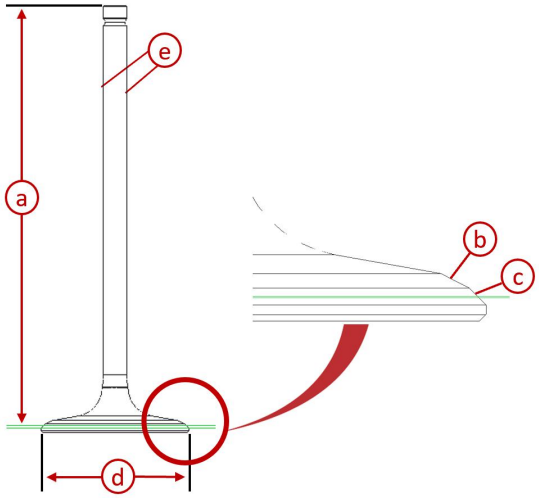
COOLING SYSTEM

Type	**Long Block: Closed (glycol) with heat exchangers** **Exhaust: sea water cooled**
Method	**Thermostat controlled**
Pumps	**Sea Water Pump: 3-stage, 8-vane rubber impellers** **Circulation Pump: 8-vane aluminum impeller**
Thermostat start opening temperature	**80** °C
Thermostat fully opened	**87** °C

VALVE INSPECTION

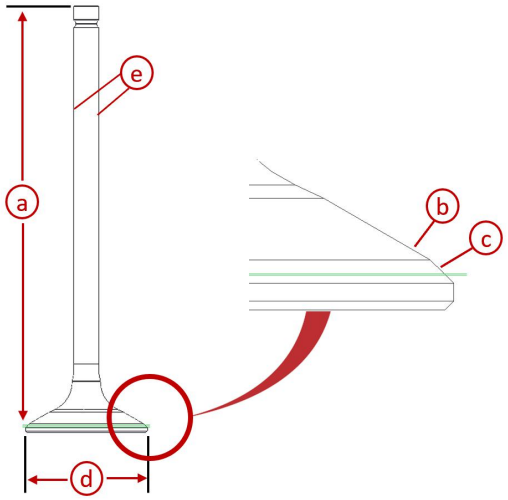
Intake valve

Intake Valve Specifications		
Intake valve Ø46.79 Gage	Height (a)	136.78 ± 0.1 mm
	Valve stem diameter (e)	7.875 ± 0.01 mm
	Valve face angle (b)	27°
	Valve face angle (c)	45°
	Outside diameter (d)	48.0 ± 0.15 mm



Exhaust valve

Exhaust Valve Specifications		
Exhaust valve Ø36.96 Gage	Height (a)	130.9 ± 0.1 mm
	Valve stem diameter (e)	7.86 ± 0.01 mm
	Valve face angle (b)	30°
	Valve face angle (c)	45°
	Outside diameter (d)	38.0 ± 0.15 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)
Key-up (engine not running)	Within 5% of barometric pressure

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	**R7437-9**

WEIGHTS	Tolerance	Measurement	Unit
Camshaft (lightest of 4)	min	**2 500**	g
Piston (with rings and clips)	min	**639**	g
Piston Pin	min	**180**	g
Connecting Rod (with bearings and bolts)	min	**840**	g
Crankshaft	min	**28 250**	g
Flywheel (bare)	min	**4 030**	g
Damper	min	**7 202**	g
Drive Plate	min	**5 090**	g

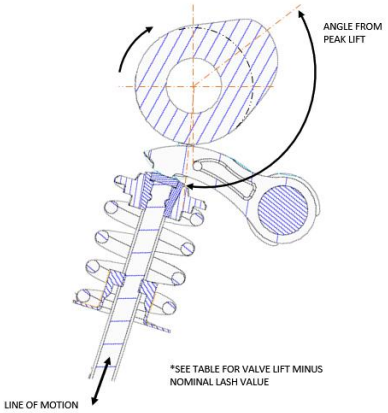
NOTES

Inspection of ECM

Model	1100 Competition
ECM over speed limiter*	6850 rpm
ECM software versions	MR17p0AAM_011_QC4_1100_P_001 MR19p0XAS_011_1100Comp

*Note, to minimize shock loads on the drive system, the over speed limiter is progressive – i.e. not all cylinders are cut at 6,600 rpm. Instantaneous spikes over this speed are possible, for example, if the prop completely exits the water.

Attachment 1 - Camlift measurement



Valve Lift Table (in Cam angle) at Nominal Lash				
INTAKE (INT#1 Lobe Index Timing @ Max Lift: 104 degrees in Crank ATDC)			EXHAUST (EXH#1 Lobe Index Timing @ Max Lift: 114 degrees in Crank BTDC)	
Cam Angle	Valve Lift [mm]		Cam Angle	Valve Lift [mm]
-72	0		-72	0
-70	0		-70	0
-68	0.014		-68	0.067
-66	0.084		-66	0.141
-64	0.161		-64	0.249
-62	0.287		-62	0.430
-60	0.491		-60	0.699
-58	0.785		-58	1.057
-56	1.168		-56	1.500
-54	1.631		-54	2.015
-52	2.162		-52	2.589
-50	2.745		-50	3.207
-48	3.368		-48	3.857
-46	4.016		-46	4.525
-44	4.678		-44	5.201
-42	5.342		-42	5.875
-40	6.001		-40	6.539
-38	6.646		-38	7.188
-36	7.272		-36	7.815
-34	7.874		-34	8.418
-32	8.449		-32	8.992
-30	8.994		-30	9.536
-28	9.508		-28	10.048
-26	9.989		-26	10.527
-24	10.435		-24	10.971
-22	10.846		-22	11.381
-20	11.222		-20	11.755
-18	11.563		-18	12.094
-16	11.868		-16	12.397

-14	12.137		-14	12.664
-12	12.370		-12	12.896
-10	12.567		-10	13.093
-8	12.729		-8	13.253
-6	12.854		-6	13.378
-4	12.944		-4	13.467
-2	12.998		-2	13.521
0	13.016		0	13.539
2	12.998		2	13.521
4	12.944		4	13.467
6	12.854		6	13.378
8	12.729		8	13.253
10	12.567		10	13.093
12	12.370		12	12.896
14	12.137		14	12.664
16	11.868		16	12.397
18	11.563		18	12.094
20	11.222		20	11.755
22	10.846		22	11.380
24	10.435		24	10.971
26	9.989		26	10.527
28	9.508		28	10.048
30	8.994		30	9.536
32	8.449		32	8.992
34	7.874		34	8.418
36	7.271		36	7.815
38	6.645		38	7.188
40	6.001		40	6.539
42	5.342		42	5.875
44	4.678		44	5.201
46	4.016		46	4.525
48	3.368		48	3.857
50	2.745		50	3.207
52	2.162		52	2.589
54	1.631		54	2.015
56	1.168		56	1.500
58	0.785		58	1.057
60	0.491		60	0.699
62	0.287		62	0.430
64	0.161		64	0.249
66	0.084		66	0.141
68	0.014		68	0.067
70	0		70	0
72	0		72	0

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