



FOUR STROKE OUTBOARD PETROL ENGINE HOMOLOGATION FILE

International Homologation File Number: 00533A			
Homologation Valid from:		2016	Expiry: 2026
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, 31-34
Date Approved for Use	2022 May 01	Approved by	
Change Detail		Page No.	
Date Approved for Use		Approved by	

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.



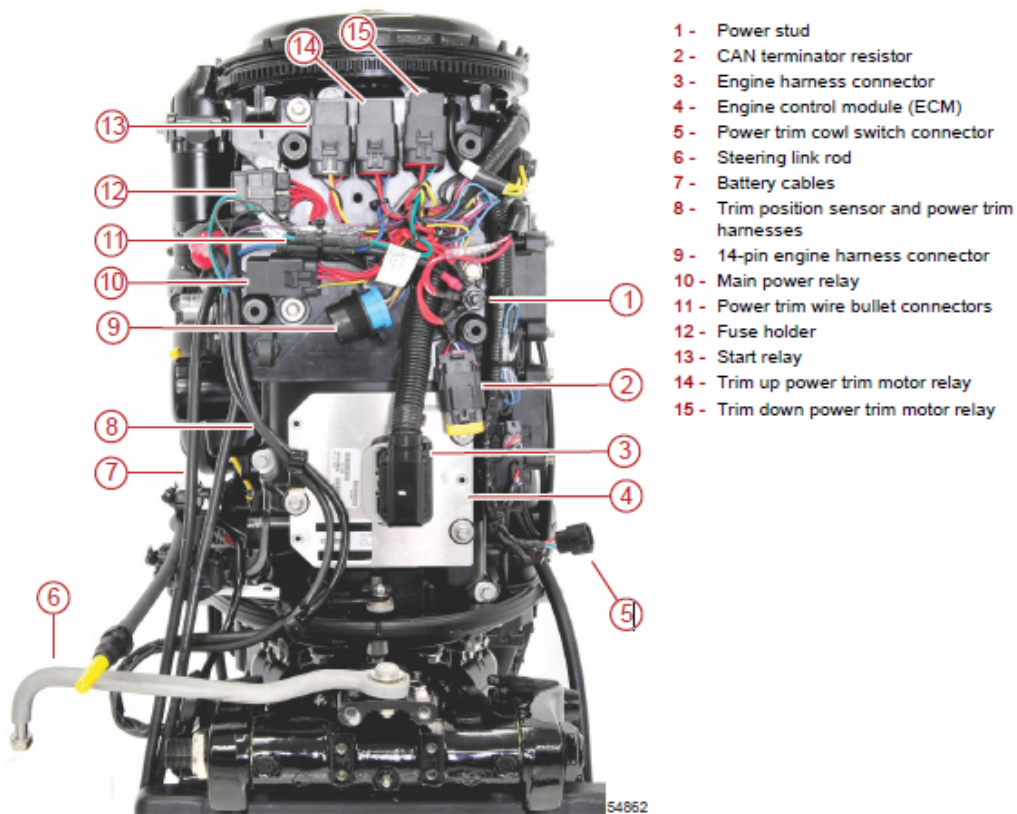
Ghost picture of the complete engine, 45° from the front at the port side.



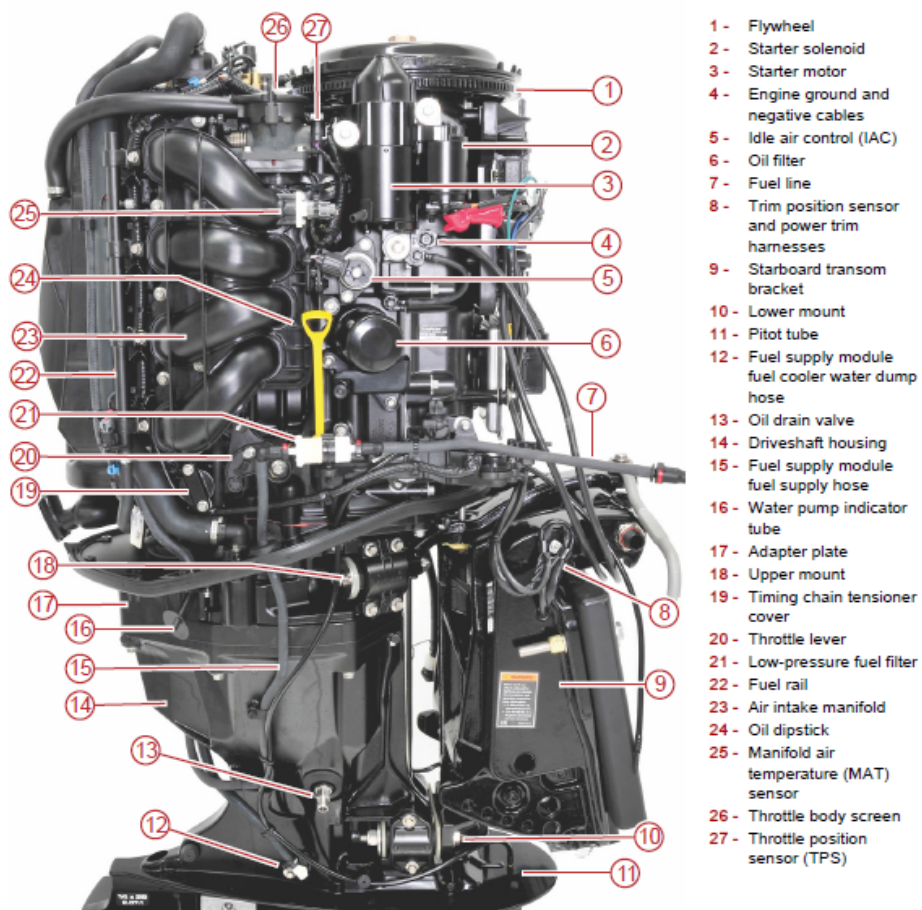
Ghost picture of the complete engine, 45° from the front at the starboard side.



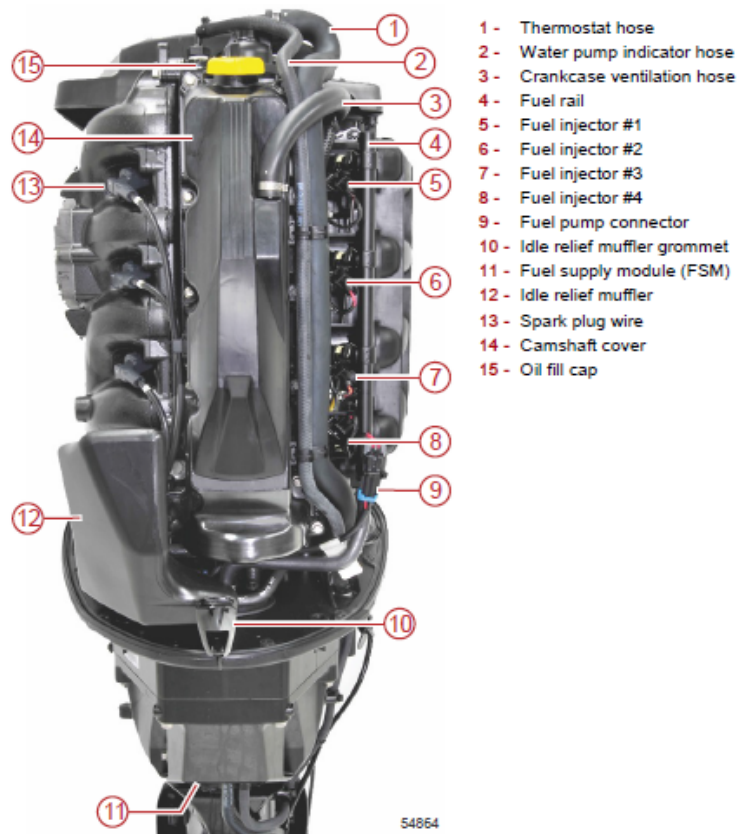
Front view of lay out.



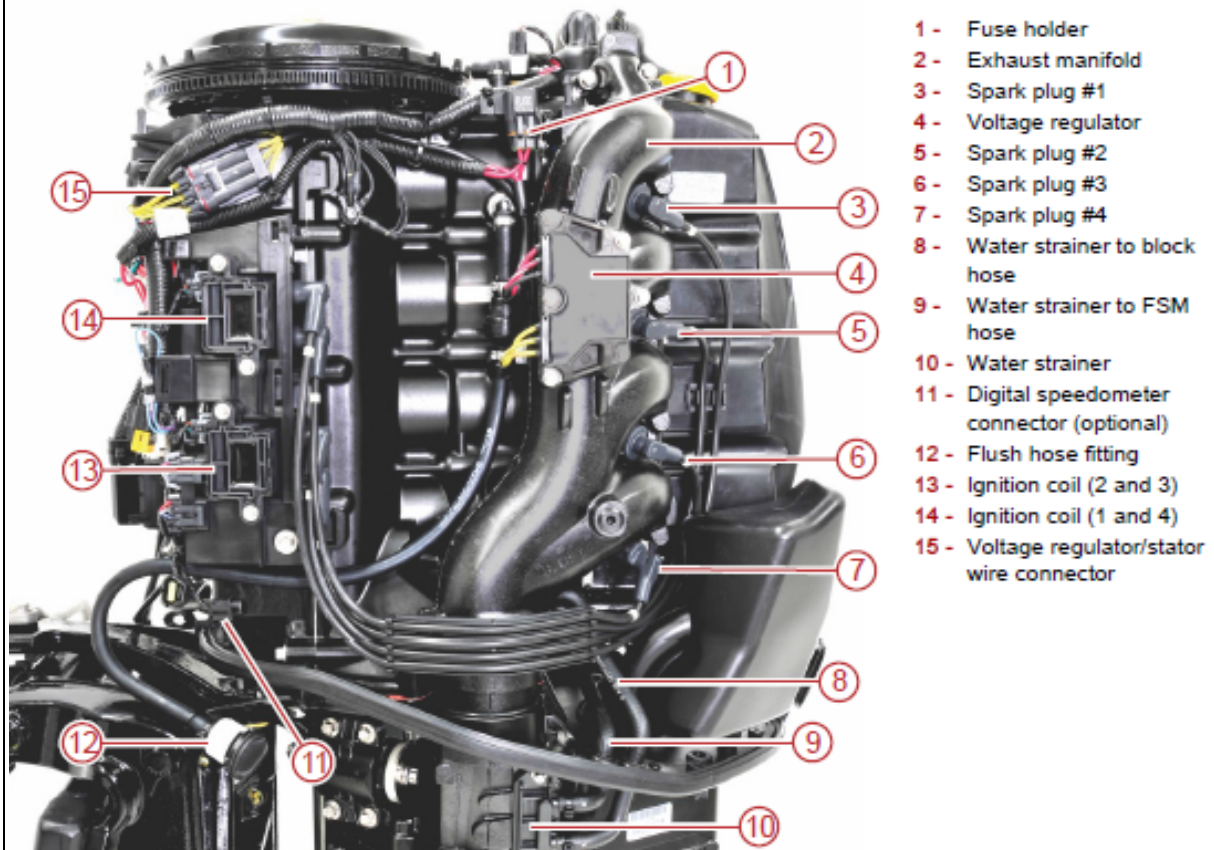
Starboard view of lay out.



Aft view of lay out.



Port view of lay out.



Top view.

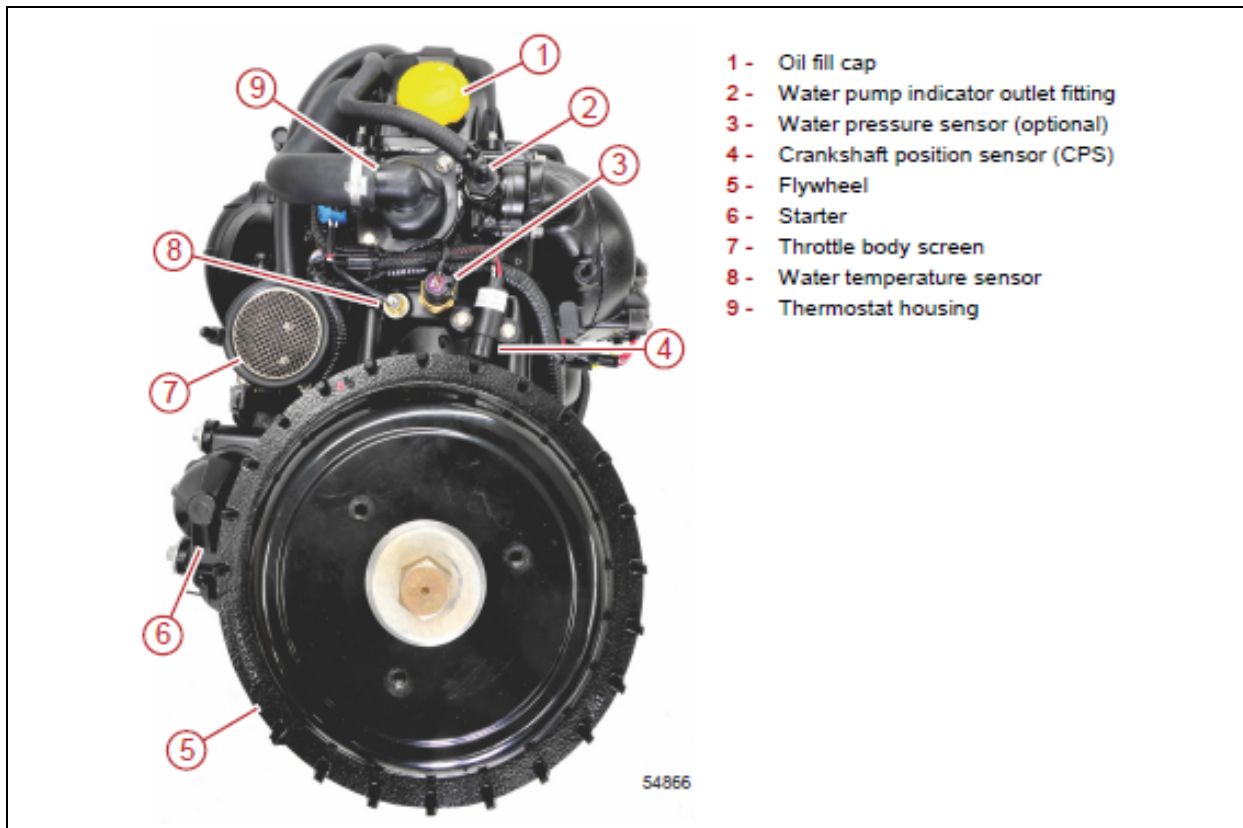


Photo without top cover, 45° from the front at the port side.



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



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

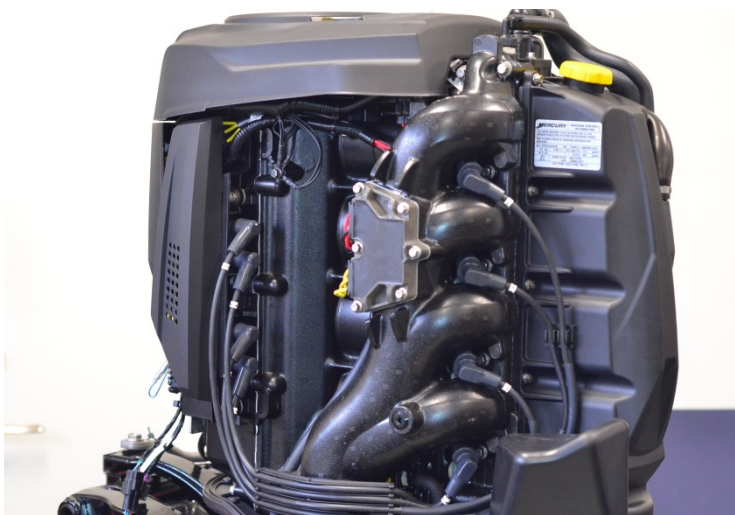
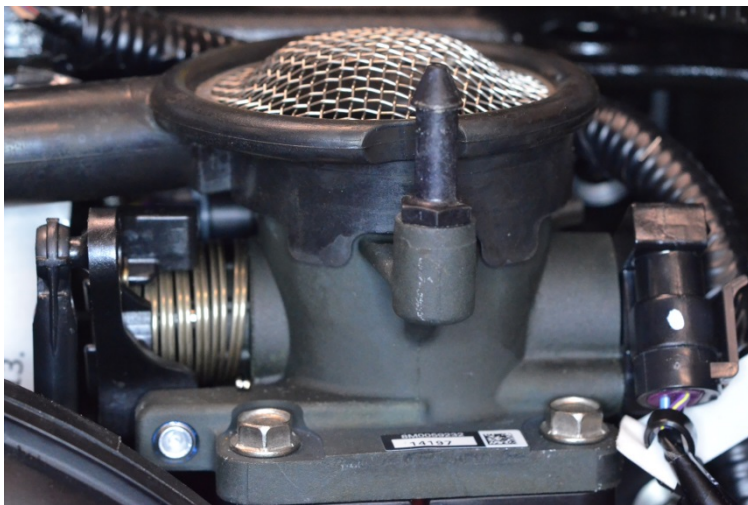


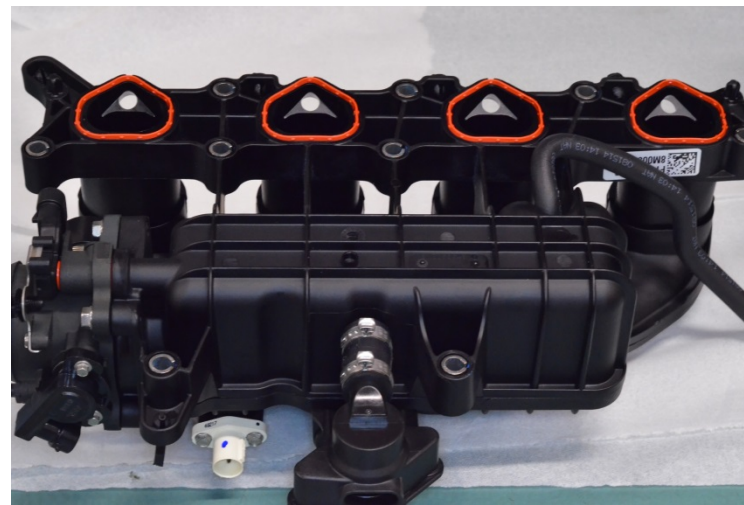
Photo without top cover, 45° from the rear at the starboard side.



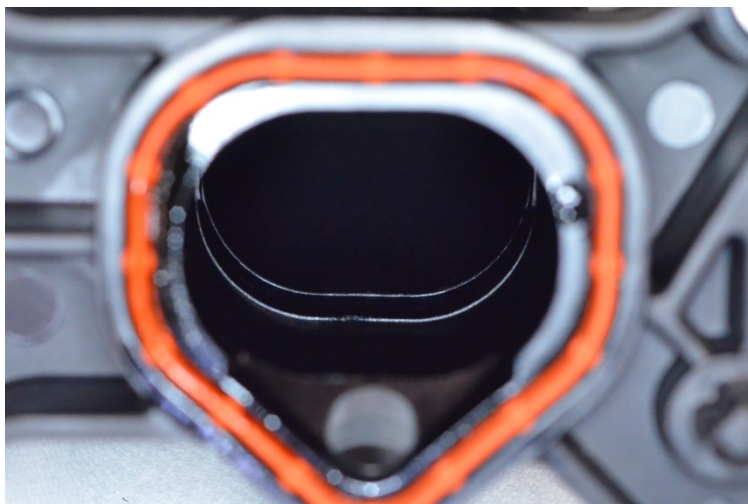
Intake mesh



Intake manifold



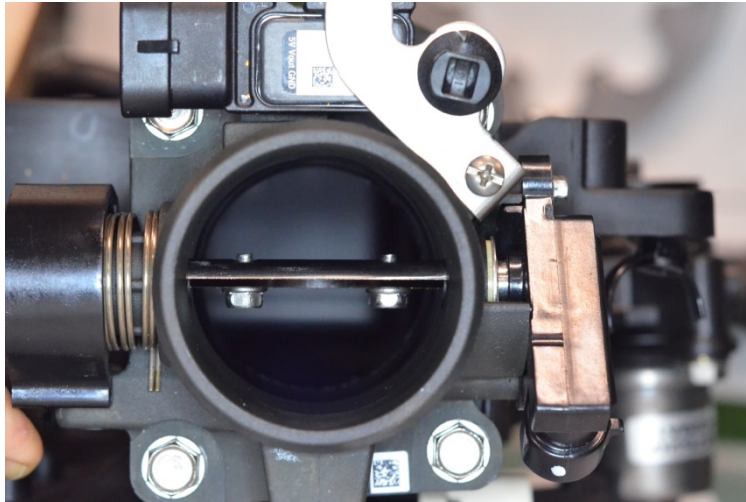
Intake manifold - Close up



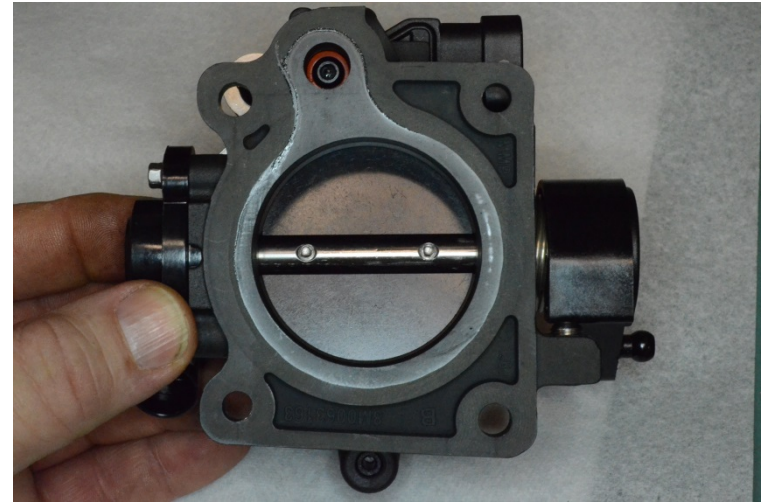
Intake manifold - Close up



Throttle house



Throttle house



Fuel Injector Rail



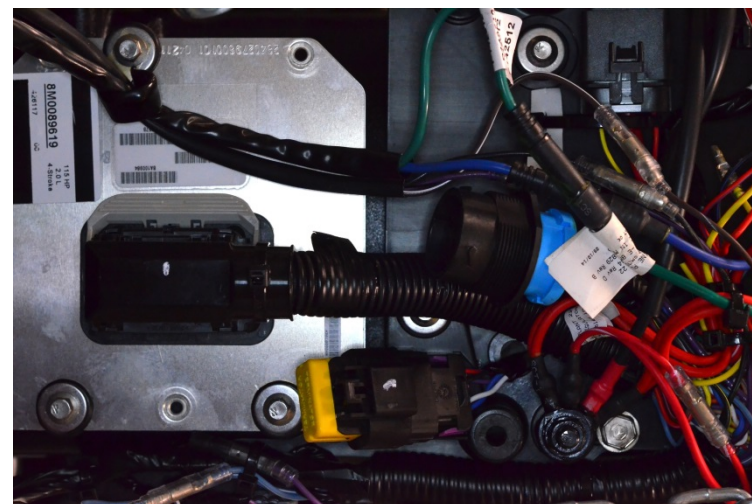
Fuel Injector - Close up



ECU box Front



ECU box connection



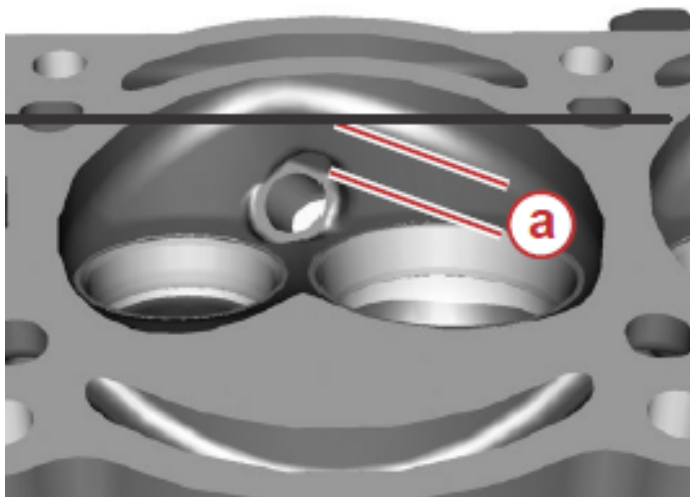
Cylinder head from the combustion chamber side



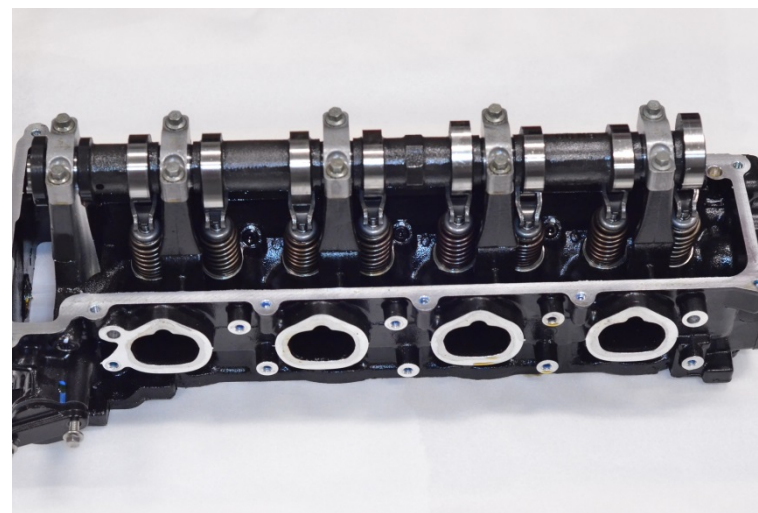
Combustion chamber



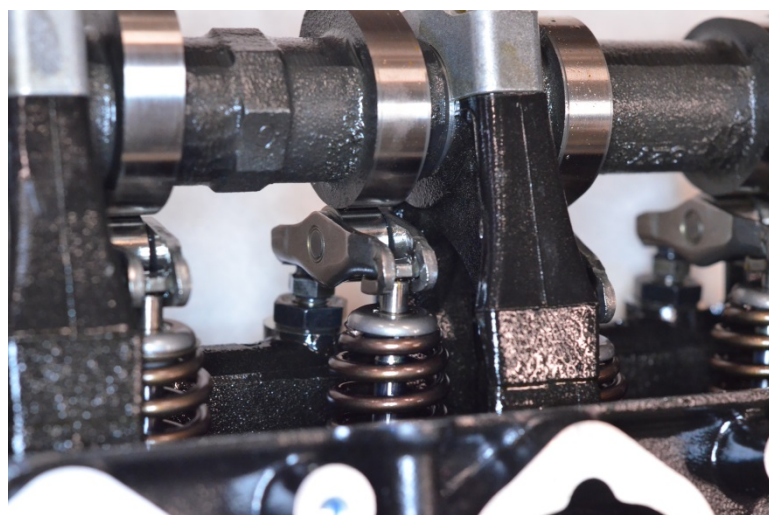
Combustion Chamber height a min 4.8 mm



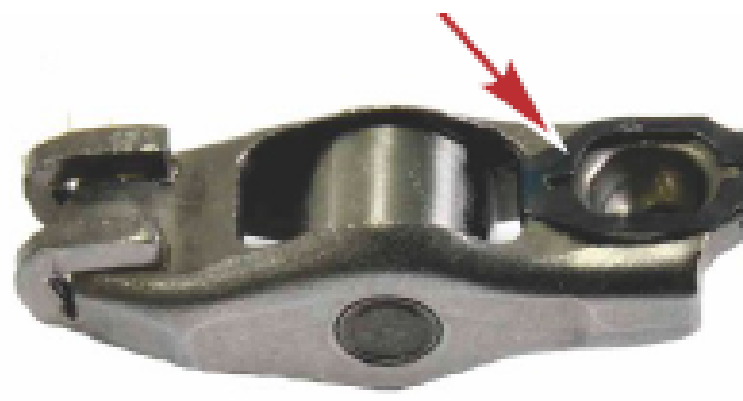
Cylinder head from the valve assembly side.



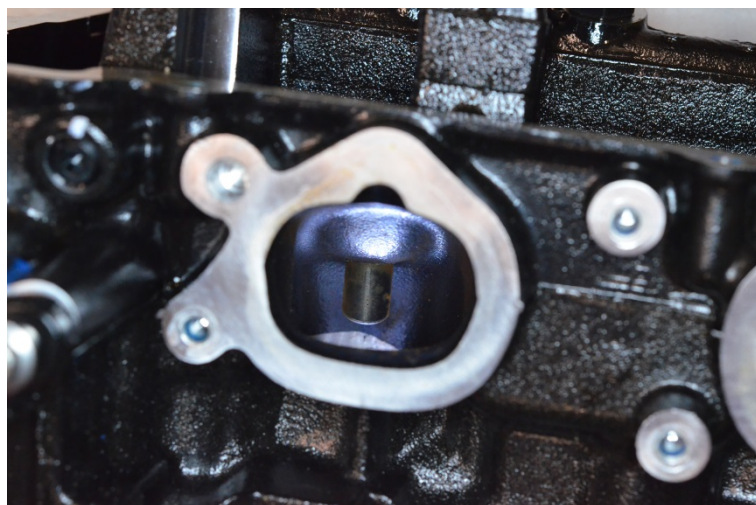
valve assembly close-up



Rocker arm



Cylinder head showing intake port.



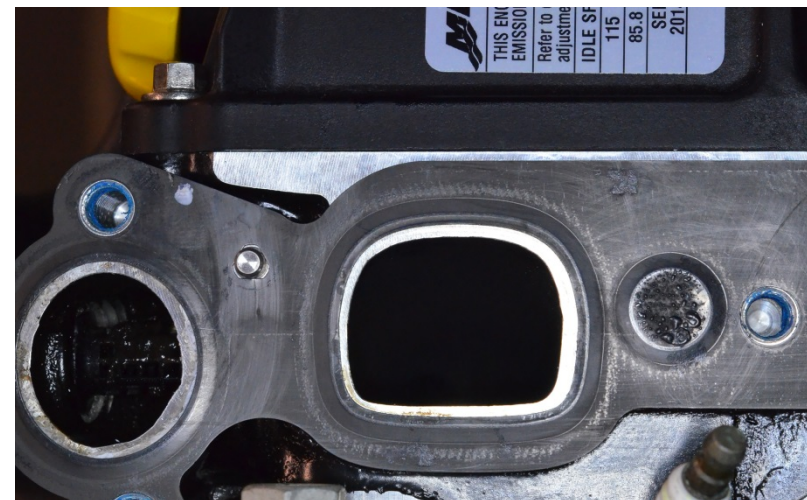
Cylinder head showing intake port



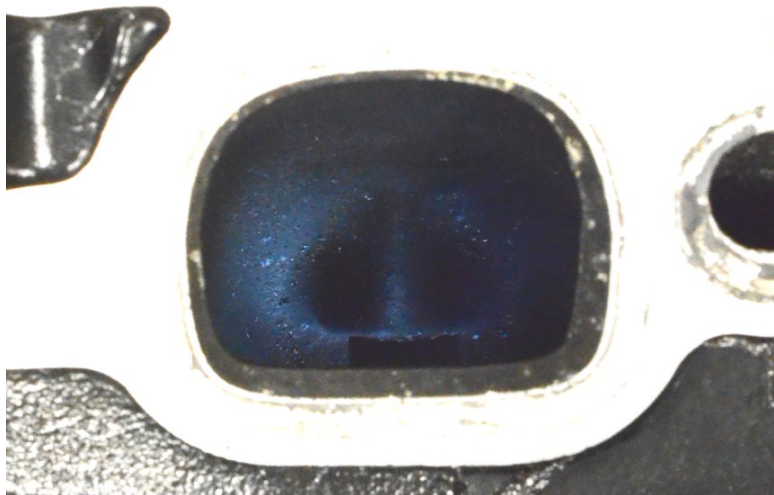
Cylinder head showing exhaust ports with gasket.



Cylinder head showing exhaust ports with gasket - detail



Cylinder head showing exhaust ports.



Cylinder head showing exhaust ports - detail



Valves



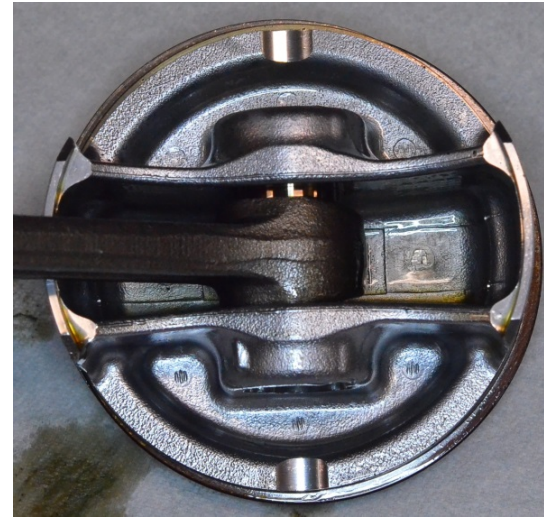
Spring with retainer



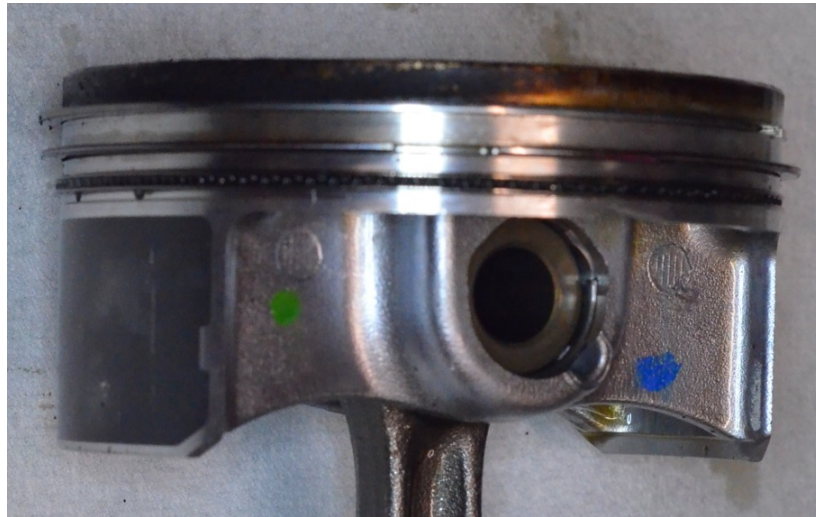
Piston viewed from the top



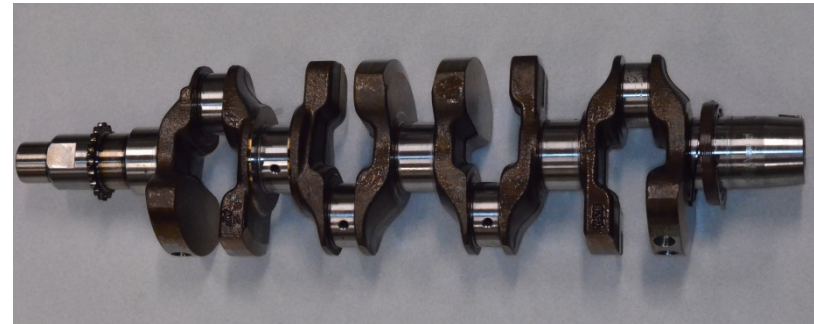
Piston viewed from the bottom



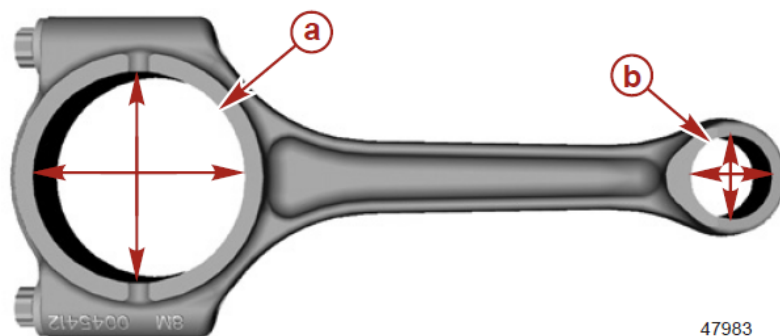
Piston, viewed 45° from the wrist pin.



Crankshaft.



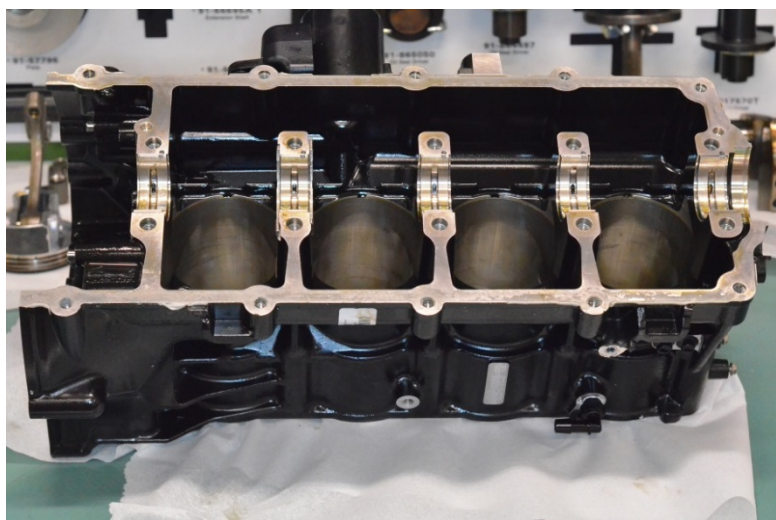
Connecting rod.



Connecting rod.



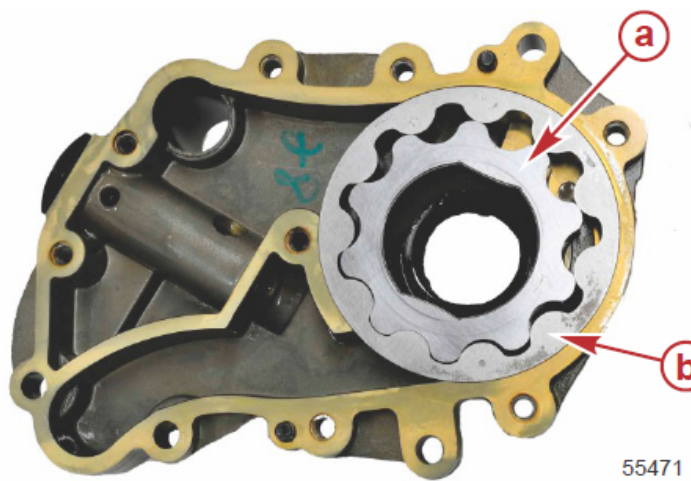
Cylinder block, viewed 45° from front port side.



Cylinder block, viewed 45° from rear, starboard side



Oil pump



Exhaust manifold



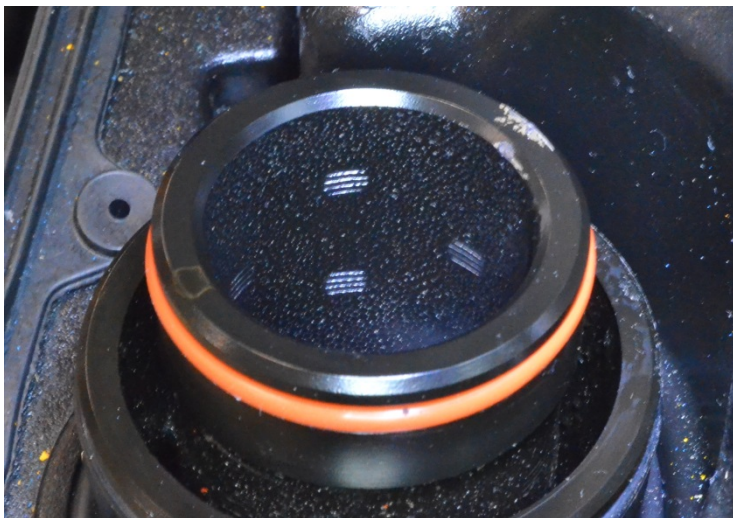
Exhaust manifold outlet



Exhaust pipe



Inlet exhaust pipe



Outlet exhaust pipe



Flywheel – viewed from top side



Flywheel – viewed from bottom side



Gear house 2.07



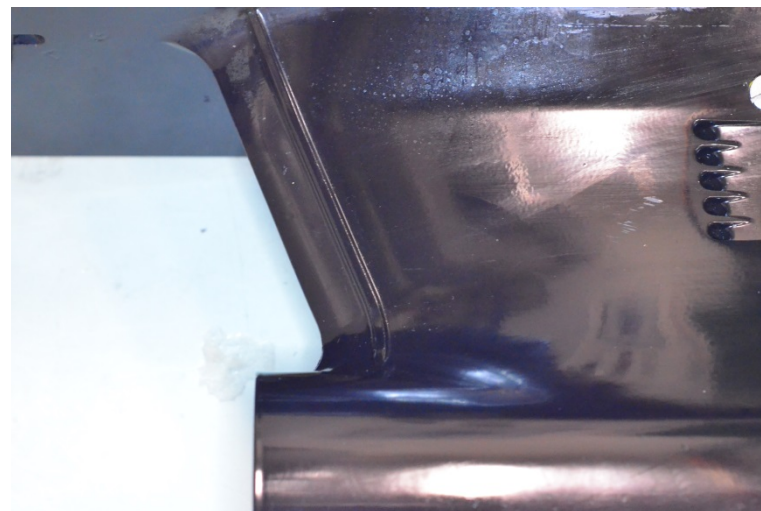
Gear house 2.07 – Gears and carrier



Gear house 2.07 Skeg



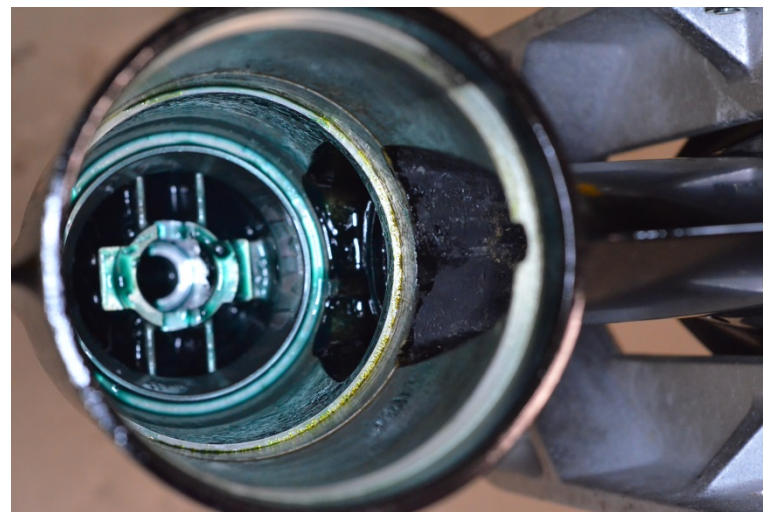
Gear house 2.07 - Close of strut



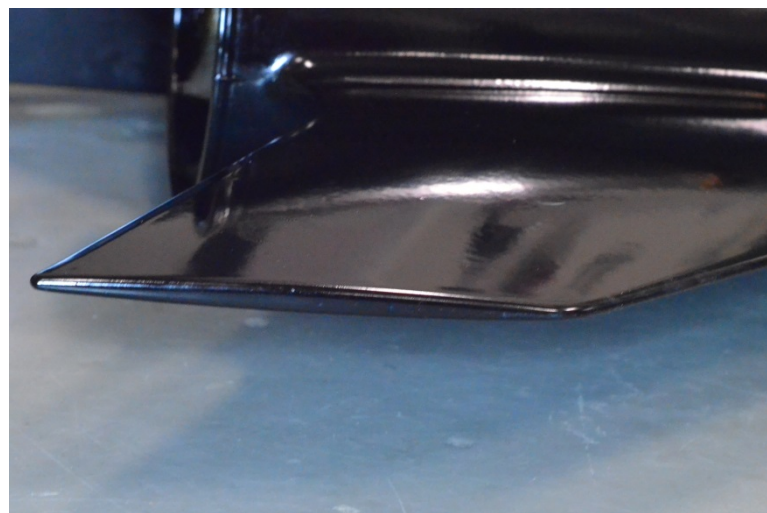
Gear house CT



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		320-380	kPa
Total number of injectors		4	Injectors
Diameter of throttle bore	max	49.96	mm

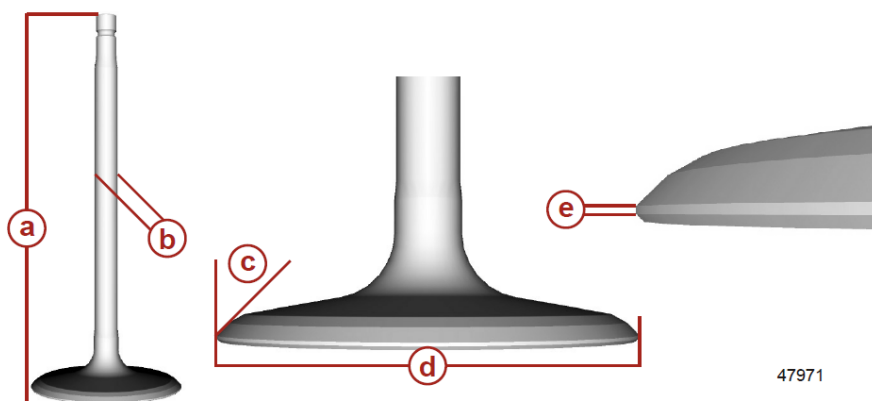
COOLING SYSTEM

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

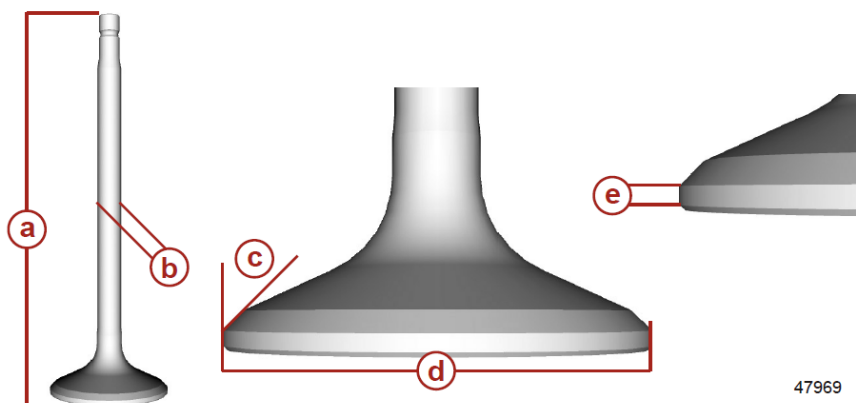
Intake valve

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.)



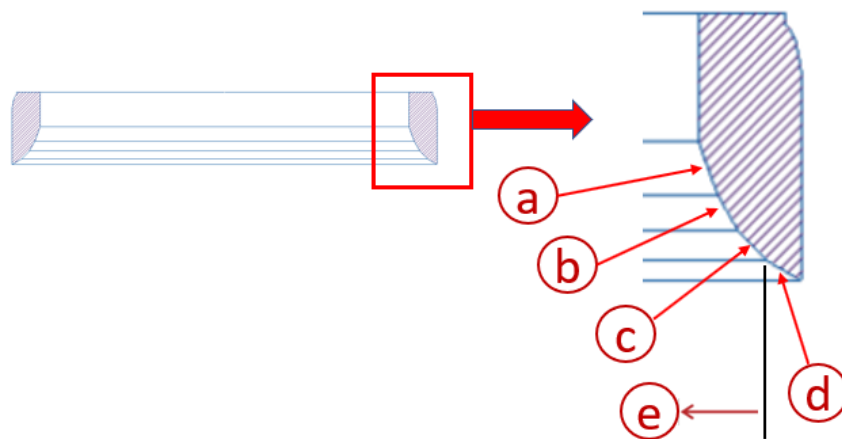
Exhaust valve

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.)



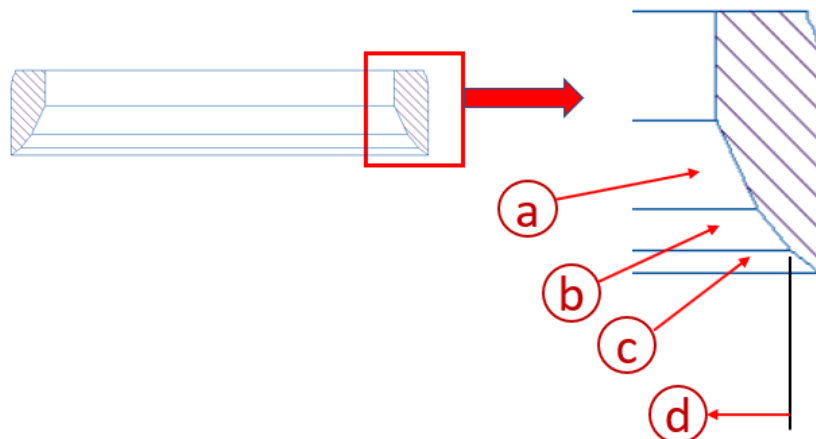
Intake valve seat

Intake Valve Seat Specifications		
Valve Seat	Surface (a) angle from valve axis	$14^{\circ} \pm 1^{\circ}$
	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 (c) width	$1 \pm 0.1 \text{ mm}$
	Diameter (e)	$\varnothing 44.65 \pm 0.1 \text{ mm}$



Exhaust valve seat

Exhaust Valve Seat Specifications		
Valve Seat	Surface (a) angle from valve axis	$25^{\circ} \pm 1^{\circ}$
	Surface (b) angle from valve axis	$39^{\circ} \pm 0.25^{\circ}$
	Surface (c) angle from valve axis	$53^{\circ} \pm 1^{\circ}$
	Surface (b) width	$1.5 \pm 0.1 \text{ mm}$
	Surface (c) width	$1.25 \pm 0.25 \text{ mm}$
	Diameter (d)	$\varnothing 34.39 \pm 0.1 \text{ mm}$



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

Brand:

NGK

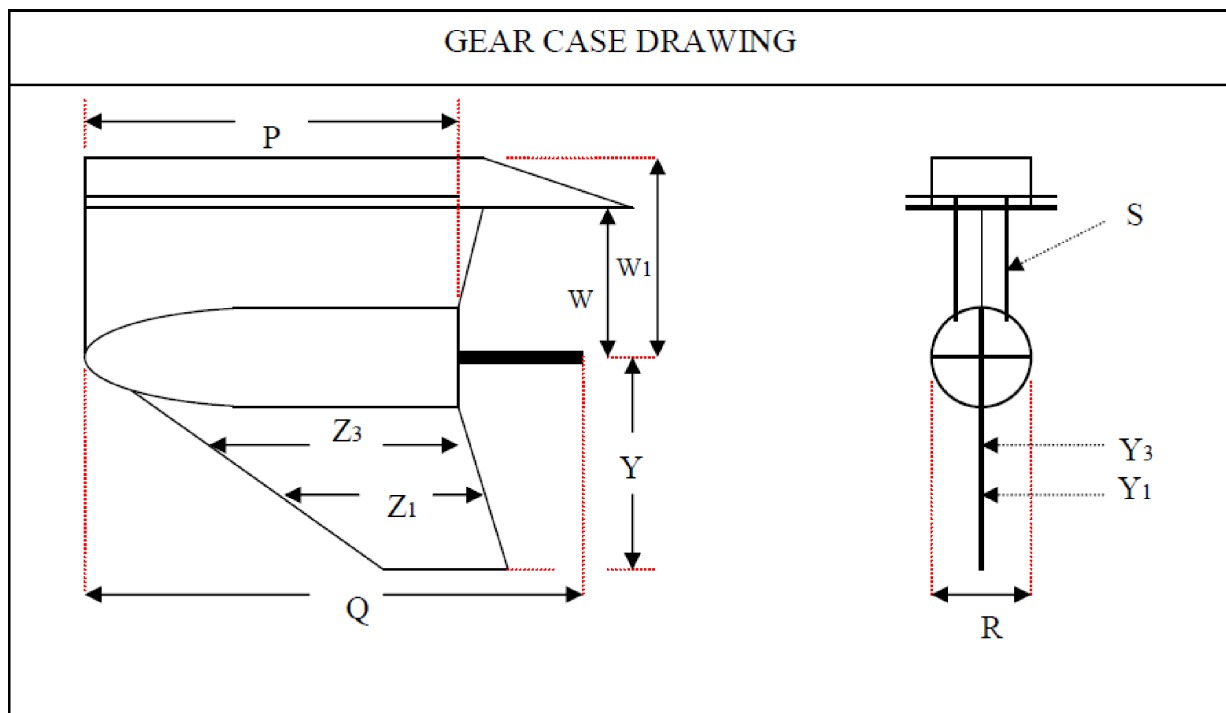
Model:

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

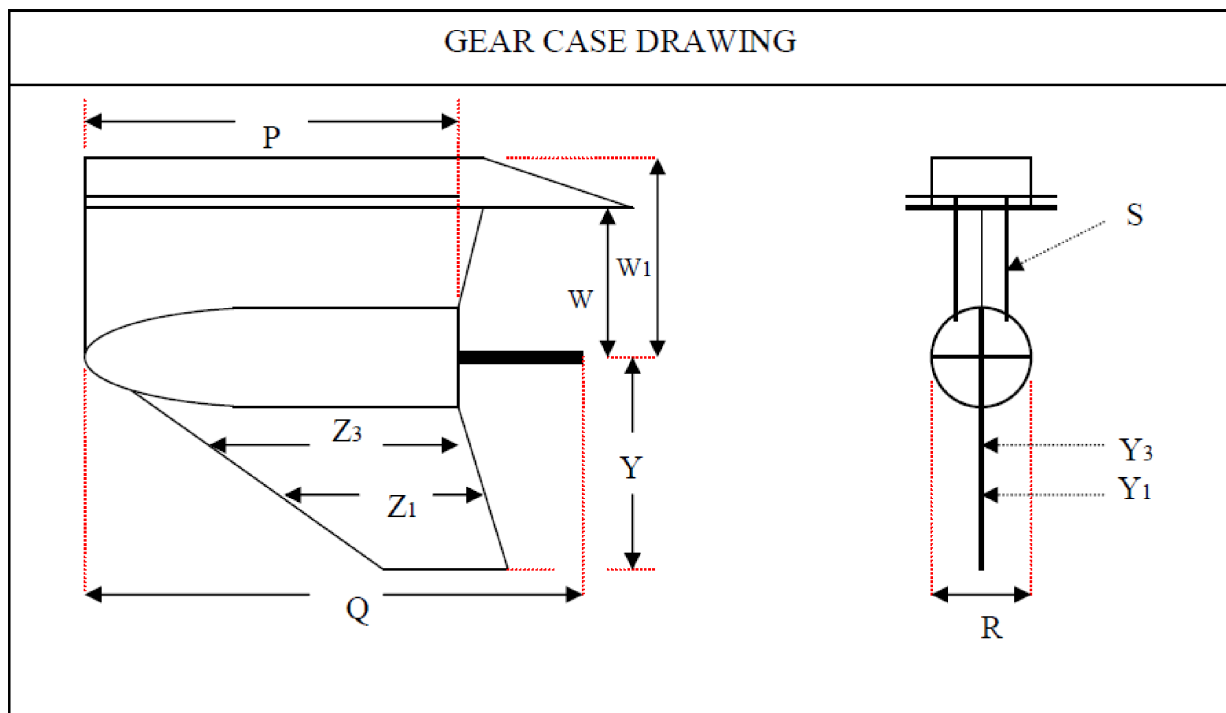
**UNDERWATER UNIT
Standard**

	Tolerance	Measurement	Unit
Gear Ratio		2.07 (14/29)	
P Longitudinal length of gearcase torpedo	+/- 5.0	338.5	mm
Q Longitudinal 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 above 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 Longitudinal length of gearcase torpedo	+/- 5.0	354.0	mm
Q Longitudinal 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 above 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

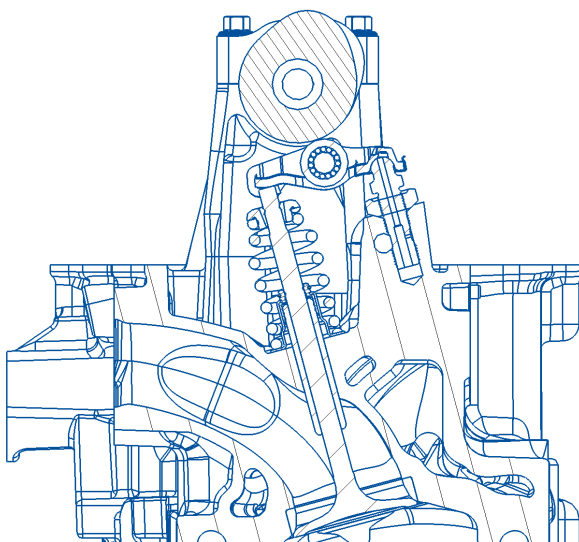
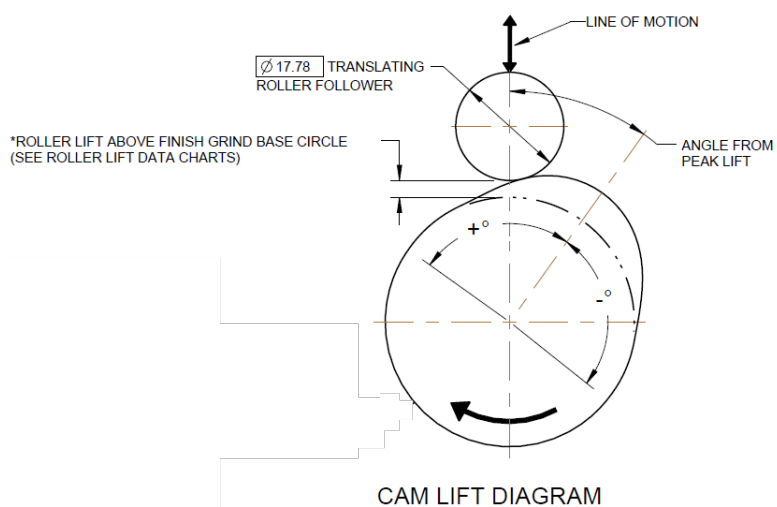
Modell	F115 std	F115 proXS
ECM over speed limiter	6150 rpm	6450 rpm
ECM software version	BDR15AAB01	BDR15AAB01
ECM calibration part number	8M0109812	8M0113383

Trimsystem

Alternative trim 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.



Attachment 1 - Camlift 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)
-76	0.00000	-90	0.00000
-75	0.02300	-89	0.01590
-74	0.05200	-88	0.03260
-73	0.08100	-87	0.04930
-72	0.11000	-86	0.06600
-71	0.13900	-85	0.08270
-70	0.16800	-84	0.09940
-69	0.19700	-83	0.11610
-68	0.22600	-82	0.13280
-67	0.25500	-81	0.14950
-66	0.28400	-80	0.16620

-65	0.31300		-79	0.18290
-64	0.34200		-78	0.19960
-63	0.37100		-77	0.21630
-62	0.40000		-76	0.23300
-61	0.42914		-75	0.24970
-60	0.46000		-74	0.26640
-59	0.49617		-73	0.28310
-58	0.54194		-72	0.29980
-57	0.60088		-71	0.31650
-56	0.67457		-70	0.33320
-55	0.76314		-69	0.34990
-54	0.86649		-68	0.36660
-53	0.98449		-67	0.38330
-52	1.11695		-66	0.40000
-51	1.26362		-65	0.41683
-50	1.42421		-64	0.43535
-49	1.59837		-63	0.45903
-48	1.78570		-62	0.49204
-47	1.98573		-61	0.53788
-46	2.19798		-60	0.59807
-45	2.42188		-59	0.67275
-44	2.65682		-58	0.76186
-43	2.90215		-57	0.86532
-42	3.15717		-56	0.98300
-41	3.42111		-55	1.11474
-40	3.69318		-54	1.26035
-39	3.97253		-53	1.41959
-38	4.25825		-52	1.59219
-37	4.54939		-51	1.77782
-36	4.84497		-50	1.97612
-35	5.14395		-49	2.18668
-34	5.44522		-48	2.40905
-33	5.74768		-47	2.64273
-32	6.05013		-46	2.88717
-31	6.35143		-45	3.14177
-30	6.65050		-44	3.40588
-29	6.94632		-43	3.67881
-28	7.23798		-42	3.95980
-27	7.52461		-41	4.24805
-26	7.80541		-40	4.54269
-25	8.07966		-39	4.84281
-24	8.34670		-38	5.14742
-23	8.60592		-37	5.45550
-22	8.85677		-36	5.76595
-21	9.09875		-35	6.07761
-20	9.33143		-34	6.38927
-19	9.55440		-33	6.69974
-18	9.76733		-32	7.00789
-17	9.96991		-31	7.31269
-16	10.16187		-30	7.61320
-15	10.34299		-29	7.90855
-14	10.51307		-28	8.19794
-13	10.67195		-27	8.48065
-12	10.81952		-26	8.75602
-11	10.95565		-25	9.02347
-10	11.08028		-24	9.28248
-9	11.19335		-23	9.53257
-8	11.29481		-22	9.77335
-7	11.38465		-21	10.00446

-6	11.46284		-20	10.22560
-5	11.52941		-19	10.43650
-4	11.58434		-18	10.63695
-3	11.62765		-17	10.82679
-2	11.65936		-16	11.00586
-1	11.67948		-15	11.17408
0	11.68802		-14	11.33138
1	11.68499		-13	11.47770
2	11.67037		-12	11.61303
3	11.64416		-11	11.73737
4	11.60635		-10	11.85075
5	11.55692		-9	11.95320
6	11.49586		-8	12.04476
7	11.42317		-7	12.12550
8	11.33884		-6	12.19547
9	11.24288		-5	12.25473
10	11.13532		-4	12.30336
11	11.01619		-3	12.34141
12	10.88556		-2	12.36893
13	10.74350		-1	12.38595
14	10.59011		0	12.39252
15	10.42554		1	12.38862
16	10.24992		2	12.37427
17	10.06347		3	12.34942
18	9.86639		4	12.31404
19	9.65897		5	12.26808
20	9.44149		6	12.21149
21	9.21432		7	12.14419
22	8.97784		8	12.06612
23	8.73250		9	11.97723
24	8.47878		10	11.87745
25	8.21725		11	11.76674
26	7.94850		12	11.64507
27	7.67320		13	11.51241
28	7.39207		14	11.36876
29	7.10592		15	11.21414
30	6.81560		16	11.04858
31	6.52203		17	10.87218
32	6.22624		18	10.68501
33	5.92929		19	10.48723
34	5.63234		20	10.27900
35	5.33655		21	10.06053
36	5.04303		22	9.83209
37	4.75282		23	9.59398
38	4.46690		24	9.34656
39	4.18619		25	9.09022
40	3.91156		26	8.82544
41	3.64381		27	8.55274
42	3.38370		28	8.27270
43	3.13192		29	7.98598
44	2.88911		30	7.69330
45	2.65588		31	7.39546
46	2.43276		32	7.09333
47	2.22025		33	6.78785
48	2.01880		34	6.48005
49	1.82880		35	6.17106
50	1.65062		36	5.86207
51	1.48457		37	5.55429
52	1.33092		38	5.24886

53	1.18989		39	4.94687
54	1.06169		40	4.64934
55	0.94647		41	4.35721
56	0.84434		42	4.07137
57	0.75539		43	3.79267
58	0.67966		44	3.52186
59	0.61705		45	3.25966
60	0.56615		46	3.00674
61	0.52378		47	2.76371
62	0.48612		48	2.53112
63	0.45000		49	2.30948
64	0.41400		50	2.09924
65	0.37800		51	1.90082
66	0.34200		52	1.71459
67	0.30600		53	1.54088
68	0.27000		54	1.37995
69	0.23400		55	1.23207
70	0.19800		56	1.09743
71	0.16200		57	0.97621
72	0.12600		58	0.86853
73	0.09000		59	0.77451
74	0.05400		60	0.69421
75	0.01800		61	0.62767
76	0.00000		62	0.57479
			63	0.53408
			64	0.50225
			65	0.47533
			66	0.45000
			67	0.42480
			68	0.39960
			69	0.37440
			70	0.34920
			71	0.32400
			72	0.29880
			73	0.27360
			74	0.24840
			75	0.22320
			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