

Racing Version - Lotus Elan S.2 Specifications

Introduction

The standard Lotus Elan as produced by Lotus Cars Limited is a production high performance luxury sports car designed to give the owner value on a price/performance basis hitherto unequalled in the small capacity market. It is not suitable for racing. Many of our customers, however, like to take advantage of the outstanding performance, road holding and braking customary with our cars and use them for competition. Because of this, Lotus Components Limited, the company within the Lotus Group who build all Lotus racing cars, have produced a Lotus Elan competition model, the specification of which is listed below. This specification should however, be read in conjunction with the standard specification for the Lotus Elan as we have endeavoured to show here the major difference in the competition version.

Engine

The standard 105 b.h.p. version of the Lotus Elan engine is modified by the Owen Organisation/BRM Division to give 150 b.h.p. minimum at 6500 r.p.m. This is achieved by stripping the engine, boring it out to 1594 cc. (97.4 cu. ins.) bore 83.5 mm. (3.288") stroke 72.75 mm. (2.864") and reassembling to racing specifications, including balancing, polishing and modifying the cylinder head. Torque figure for the racing unit is 125 lbs./ft. at 5000 r.p.m. Although many of the standard components are retained in the engine (crankshaft, main bearing caps, etc.) special semi-slipper type racing pistons with two Dykes type compression rings and one oil control ring, modified camshafts, special forged connecting rods, racing valve springs and Vandervell lead Indium steel backed bearings are fitted. All engines delivered for the racing version of the Lotus Elan are run-in on the bench and tested to see if they are giving the minimum required output. After testing they are stripped for inspection and after the final build are delivered to Lotus Components Limited. No engine which is faulted on inspection after test is delivered until it has been re-tested. BRM specification for this engine is 84 Phase III.

Gearbox

Light alloy bell housing and gearbox tail shaft replace the standard cast iron units. Special rear gearbox mounting. Four speed and reverse close ratio all synchromesh gearbox.

Front suspension

To provide the car with a lower ride level, special competition front wishbones which are adjustable for camber settings, replace the standard Lotus Elan parts and are used in conjunction with competition adjustable shock absorbers and springs. A front anti roll bar of thicker diameter than the standard is also incorporated as are competition hubs suitable for the racing wheels.

Rear Suspension

To provide the necessary camber and toe-in adjustment, a special rear wishbone with a threaded spherical bearing at its inboard end is fitted to magnesium hub carriers which in turn are mounted on competition shock absorbers and springs. Special rear hubs used in conjunction with the racing wheels. Heavy duty roller spline drive shafts with universal joints replace the standard fixed length drive shafts and rubber couplings.

Brakes

Light alloy calipers mounted on a special caliper carriers are used in conjunction with a special disc on the front wheels, the rear brakes remaining the same as those fitted to the standard Lotus Elan. Special racing pads (Ferodo DS.11) are used. A dual brake master cylinder system is fitted to allow an adjustable braking ratio to front and rear wheels. Racing heavy duty fluid is used in the system.

Rear Axle

A light alloy differential nose-piece replaces the standard cast iron unit and is used in a magnesium differential carrier incorporating a 3.9:1 ratio with limited slip differential. The differential is fitted with an oil cooler operated by an electrical pump. Optional ratios are 4.1:1, 4.44:1 and 3.55:1.

Steering

The Lotus Elan rack and pinion steering is used and a leather covered steering wheel is fitted (13" diam) to the standard column.

Wheels and Tyres

The standard pressed steel wheels are replaced by pin drive knock on cast magnesium wheels (6.0" front 6.0" rear rim width 13" diameter) which are secured by three-eared knock on nuts. The wheels are fitted with Dunlop R7 covers and tubes sizes 550 x 13 front 600 x 13 rear.

Oil System

Wet sump system with special Lotus adaptor casting feeding a light alloy oil cooler. An auxiliary oil pressure warning lamp is fitted.

Fuel System

Twin Weber 45 DCOE carburettors fitted with special chokes and jets. Mechanical fuel pump replaced with light weight Bendix electrical fuel pump. Long range fuel tank and quick release filler cap available at extra cost £27-10-00.

Exhaust System

Large bore four branch tuned length exhaust system fitted with silencer.

Body

Light weight glassfibre monolithic one piece body fitted with hard top. Full range of body colours available. Light weight glassfibre bucket seats. Full American specification triangulated roll over bar fitted behind driver's seat.

Electrical System

Standard battery replaced with light weight racing Varley battery mounted behind passenger's seat. Standard vacuum operated headlamps replaced with small diameter units shrouded by perspex covers.

Cooling System

The standard copper radiator is replaced with a light alloy unit and a separate aluminium header tank is incorporated in the system.

Note 1

Lotus Components Limited in accordance with their progressive policy, reserve the right to change the racing specification

Note 2

Attention is drawn to the following excerpt of the Company's standard warranty conditions. No claim under the Warranty will be accepted by The Company if after delivery, goods sold and supplied are used in connection with motor racing or any motoring competitions.

Additional Pertinent Information

1) 19.06 m.p.h. per 1000 r.p.m. 3.9:1 ratio 600 x 13 R7 tyres giving 807 revs. per mile = max. speed @ 7000 r.p.m. 133.4 m.p.h.

2) 18.13 m.p.h. per 1000 r.p.m. 4.1:1 ratio 600 x 13 R7 tyres giving 807 revs. per mile = max. speed @ 7000 r.p.m. 126.9 m.p.h.

3) 16.74 m.p.h. per 1000 r.p.m. 4.44:1 ratio 550 x 13 R7 tyres giving 807 revs. per mile = max. speed @ 7000 r.p.m. 117.1 m.p.h.

Price

Ex works in component form £2,260

Assembled for export only ex works £2,360

Rear Axle

The car should be driven gently, initially, for as far as practical in order to run in the rear axle; if the axle is not run in it will rapidly become noisy and wear out prematurely. Recommended oil - Esso AL. 1763.

Inspect the limited slip diff. regularly - by its very function it cannot be expected to last forever.

Engine

BRM Type 84 (see separate schedule)

Clutch

Borg and Beck 8" diaphragm type

Gearbox

Ford with aluminium alloy bell housing and tailshaft housing. Special rear engine mounting to suit.

<u>Ratios</u>	<u>Standard</u>	<u>Alternatives</u>
1st	2.509	3.543
2nd	1.640	2.396 or 2.040
3rd	1.230	1.412
4th	1.000	1.000
Reverse	2.807	3.960

Recommended oil : Esso GP.80 or equivalent

Final Drive

Aluminium alloy differential carrier in magnesium housing fitted with limited slip differential.

Alternative ratios: 4.43 4.12 3.90 (standard)

Speed at 7000 rpm in top: 117 mph. 126 mph. 133 mph.

Recommended oil: Esso AL.1763

Calculated when fitted with 600 x 13 tyre (807 revs. per mile)

If the unit is stripped, care should be taken to see that the correct thickness of gasket is used.

Drive Shafts

The frictionless roller splines which make up the drive shafts on this car are manufactured to very fine tolerances and the dust seals should be kept in perfect condition and the shafts checked for grease at least twice a season. Care should be taken when dismantling to avoid loss of any of the rollers.

NB. If the car is raced in wet conditions the drive shafts should be dismantled immediately afterwards, repacked with grease and the felt seal replaced.

Suspension

The suspension should be set at the running ground clearance of 5"

Camber	front	1 degree negative
	rear	2 degrees negative

Toe-in	front	1/8" total
	rear	3/8" total

Dampers	front	18 clicks from soft
	rear	non adjustable

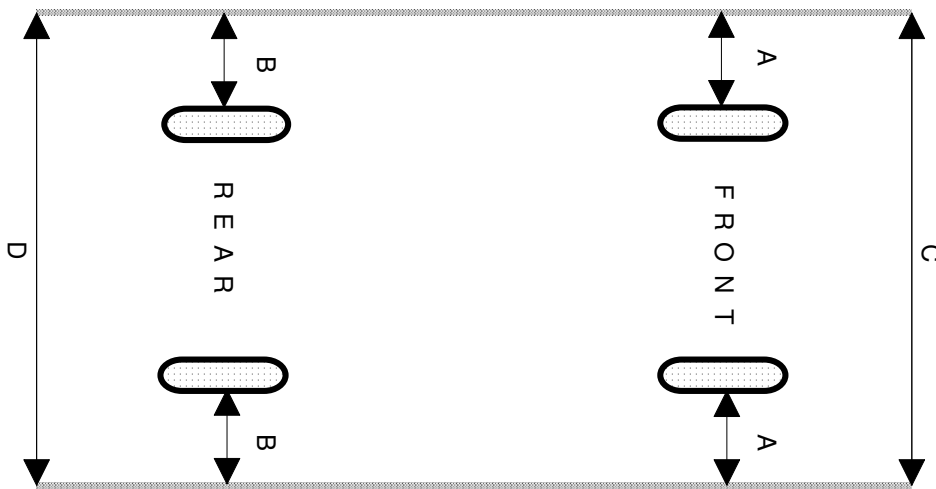
Tyre pressure	front	32 lbs./sq. in cold
	rear	32 lbs./sq. in cold

Castor	front	3 degrees
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The toe-in at the front should also be checked with the car in the full bump and full rebound positions. It is permissible to have up to 1/8" more toe -in on rebound than bump. Variations greater than above can be corrected by adjusting the spacers under the steering rack clamps.

Raising the rack by 1/16" on one side will produce about 3/32" more toe -in on the rebound than bump on that side.

Wheel alignment may be carried out as follows:



Set two bars at hub height, one at either side of the car, so that C and D are equal and A equals A and B equals B, then set front and rear wheels as follows:

Front: 1/16" toe in at each wheel measured on the rim
at the side wall with the steering wheel central

Rear: 3/16" on each wheel measured as above

Rose Bearings

These should be cleaned, checked and regreased at regular intervals as they are inclined to pick up grit and subsequently seize.

Wheels

Magnesium knock-on wheels of 6" rim width

The left hand threaded hubs should be fitted on the right hand side of the car. To ensure that the wheel does not loosen, the friction between the nut and the hub should be greater than the friction between the nut and the wheel. The threads, therefore, should be kept dry and the core on the nut lightly coated with molybdenum disulphide.

Tyres

5.50 x 13 R6 front

6.00 x 13 R6 rear

Brakes

The master cylinders are 5/8" bore, the front calipers are Girling Type AR and the rear calipers are Girling Type 10/12 HP.

Care should be taken to see that the flexible brake pipes have a free run (particularly near the rear wheel). The run of the pipe can be altered by rotating the inboard end of the flexible pipe before tightening.

Brake Pads

The pad material used is Ferodo DS11

The braking system is fitted with twin master cylinders, both cylinders being 5/8" bore. The two master cylinder push rods are connected by an adjustable balance bar to enable adjustment of ratio between front and rear to be obtained.

To adjust balance bar:

NOTE: Do not carry out adjustment to braking ratio until the pads have become properly bedded.

- a) Slacken both nuts at ends of balance bar
- b) Screw the balance bar in or out as needed half or one turn

NOTE: Adjustment is very sensitive.

- c) Re-tighten the nuts at each end

Cooling System

An aluminium radiator block is used with a remote header tank. The radiator is of very light construction and great care should be taken when handling it. Particular care should be taken to ensure the bottom take off does not touch the body when the radiator is fixed otherwise the side tank will squash and leak. The radiator is mounted at a small angle when viewed from the front to give clearance between the inlet and the bonnet lid.

B.R.M. MODIFIED - PHASE 111 - LOTUS TWIN CAM ENGINE

This engine is basically the most used on the production Lotus Cortina but modified by B.R.M. Engine Development Division of Rubery Owen & Co. Ltd. to give a minimum of 155 b.h.p.

IT IS VITAL TO QUOTE THE ENGINE NUMBER WHEN ORDERING SPARES

OVERALL SPECIFICATION

Capacity	1594 c.c.	(97.4 cu in.)
Bore	83.5 mm	(3.288 in.)
Stroke	72.5 mm	(2.864 in.)
Compression ratio	12:1	
B.H.P.	155 minimum at 6750/7000 r.p.m.	
Maximum torque	134 lbs.ft. at 5,500	r.p.m.
Maximum B.m.e.p.	207 p.s.i. at 5,500	r.p.m.
Maximum safe r.p.m.	7,000 continuous	
	7,300 intermittent	

CYLINDER HEAD

Cast aluminium twin overhead camshaft with hemispherical head
Valves set at an inclined angle of 54 degrees
Modified inlet and exhaust parts with valve guides and spring platforms machined to accept special springs with high lift camshaft. Camshaft drive by 3/8" pitch - chain with spring loaded jockey tensioner unit on one side of engine and rubber damper on the opposite side.

MAIN AND BIG END BEARINGS

Vandervell Lead Indium Bearings. Steel backed.

PISTONS AND CONNECTING RODS

Fully forged slipper type with 1" dia. Gudgeon Pin
Squish deck clearance 0.005"
Three piston rings comprising: 1 Dykes - 1 Plain compression and 1 special spring backed oil control.
Diametral skirt clearance 0.004"/0.006"
Ring gaps 0.016"/0.021"
Forged steel B.R.M. connecting rod - with high duty bolts

VALVES

B.R.M. inlet valve, (B.2744) - larger diameter with new head profile
Inlet valve 1.5625" dia. 5/16" stem, 45 degree seat angle, Metl. EN52.
Exhaust valve 1.320" dia. 5/16" stem, 45 degree seat angle, Metl. EN59.

VALVE SPRINGS

Special B.R.M. racing springs to B.R.M. specification
Outer A.7004 free length 1.400 in.
Inner A.7005 free length 1.426 in.

VALVE TIMING

Inlet valve opens	54 degrees B.T.D.C.) Based on tappet clearances of
Inlet valve closes	82 degrees A.B.D.C.) 0.009" Exhaust 0.006" Inlet
Exhaust valve opens	72 degrees B.B.D.C.) and using 0.002" shim foil for
Exhaust valve closes	54 degrees A.T.D.C.) timing

LUBRICATION SYSTEM

Wet sump engine with standard Ford oil pump and oil cooler fitted with high rate oil pressure relief spring.

IGNITION SYSTEM

Coil ignition firing order: 1 3 4 2
Centrifugal ignition advance, giving 24 degrees (crankshaft) advance
Standard contact breaker points 18 - 24 oz. spring
Static ignition setting B.T.D.C.) This may be changed during
Contact breaker gap 0.012") dynamometer running.

CARBURETTORS

Fitted with special flexible spacers, do not over tighten

Make	Weber
Type	45DCOE13
Number	2
Choke size	36mm
Main jets	140
Air corrector jets	16A
Slow running jets	45 F9
Pump jets	60
Emulsion tubes	F 16

N.B. Jets are often changed during dynamometer running and may differ from the above.

OIL - SHELL SAE 30

Pressure at running speed	55 - 65 psi
Maximum oil temperature	110 degrees C
Optimum water temperature	70 degrees C

TAPPET CLEARANCE - COLD

Inlet	0.006 in.
Exhaust	0.009 in.

SPARK PLUGS - CHAMPION N57R

FUEL - 100 Octane Petrol

Supplied with Bendix high pressure type pump

BOLT TIGHTENING TORQUES

Cylinder Head Bolts	60 lb.ft)	
Main bearing cap bolts	55-60 lb.ft)	
Big end cap bolts	40 lb.ft)	
Camshaft bearing cap nuts	12 lb.ft)	With threads oiled
Flywheel to crankshaft bolts	45-50 lb.ft)	
Camshaft sprocket bolts	25-30 lb.ft)	

Note

In the early days of production of the Elan S1, Lotus subcontracted the fibreglass body Moulding to S. Bourne & Co (Plastics) Ltd. These bodies had a small plate that measured $7/8'' \times 1 \frac{3}{4}''$ attached to the bulkhead in the engine bay. This plate was stamped with a moulding number that matched the chassis number.