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INTRODUCTION

This publication is a combined manual covering all models of the Lotus Europa. The front part deals with the features which are peculiar to the Twin Cam and Special models, whereas the latter part of the manual covers the Series 1 and 2 models, and components fitted to Twin Cam and Special which are also fitted on Series 1 and 2 models.

TECHNICAL DATA.

DIMENSIONS

Wheelbase	233.7 cm. (92 in.)
Track - Front	135.8 cm. (53.5 in.)
- Rear	134.6 cm. (53 in.)
Overall - Length	400 cm. (157½ in.)
- Width	163.8 cm. (64½ in.)
- Height	107.9 cm. (42½ in.)
Ground Clearance (design)	15 cm. (6 in.)
Turning Circle	12.5 m. (41 ft.)
Weight (unladen)	686 kg. (1,513 lbs.)

CAPACITIES.

Engine Sump (including filter)	4 litres (7½ pts.; 9 U.S. pts.)
Transmission	1.75 litres (3 pts.; 3.6 U.S. pts.)
Coolant (with heater)	10.8 litres (19 pts.; 22.8 U.S. pts.)
Fuel	56 litres (12.5 gall.; 15 U.S. gall.)

ENGINE.

General

Number of cylinders	4
Capacity	1558 cc. (95.06 cu. in.)
Stroke	72.746 mm. (2.864 in.)
Bore - Grade 1	82.550/82.558 mm. (3.2500/3.2503 in.)
- Grade 2	82.558/82.565 mm. (3.2503/3.2506 in.)
- Grade 3	82.565/82.573 mm. (3.2506/3.2509 in.)
- Grade 4	82.573/82.580 mm. (3.2509/3.2512 in.)
Compression - Ratio - Europa TC (All Territories)	9.5 : 1
- Europa Special (UK & Export)	10.3 : 1
- Europa Special (N. America)	9.5 : 1
- Pressure at sea level (All models, all Territories)	In excess of 11.248 kg.cm.sq. (160 lbs.sq.in.) Each cylinder within 1.41 kg.cm.sq. (20 lbs.sq.in.) of each other.

Cylinder Head

Material	Aluminium
Gasket	Copper/asbestos
Valve timing - Inlet opens	26° B.T.D.C.
- Inlet closes	66° A.B.D.C.
- Exhaust opens	66° B.B.D.C.
- Exhaust closes	26° A.T.D.C.
Angle of valve seats and faces	45°
Valves:	
Head diameter - Inlet - Europa TC (UK & Export)	38.760/38.862 mm. (1.526/1.530 in.)
- Europa TC (N.America)	39.624/39.776 mm. (1.560/1.566 in.)
- Europa Special (All Territories)	39.624/39.776 mm. (1.560/1.566 in.)
- Exhaust (All models, all Territories)	33.553/33.655 mm. (1.321/1.325 in.)
Stem diameter - Inlet and Exhaust	7.874/7.899 mm. (.310/.311 in.)
Stem clearance in guide - Inlet	.007/.058 mm. (.0003/.0023 in.)
- Exhaust	.063/.076 mm. (.0025/.0030 in.)
Clearance (cold) - Inlet	.127/.177 mm. (.005/.007 in.)
- Exhaust	.228/.279 mm. (.009/.011 in.)
Valve Springs:	
Type	Dual
Free length - Inner	28.70 mm. (1.130 in.)
- Outer	36.83 mm. (1.450 in.)
Rate - Inner @ 23.4 mm. (.92 in.)	5.6 kg. (12.4 lbs.)
- Inner @ 14.7 mm. (.58 in.)	15.2 kg. (33.5 lbs.)
- Outer @ 29.7 mm. (1.17 in.)	20.4 kg. (45.0 lbs.)
- Outer @ 21.1 mm. (.83 in.)	49.4 kg. (109 lbs.)
Valve guides:	
Length - Inlet	36.608 mm. (1.520 in.)
- Exhaust	37.592 mm. (1.480 in.)
External diameter - Std.	12.700/12.713 mm. (.500/.5005 in.)
- O/size	12.852/12.865 mm. (.5060/.5065 in.)
Interference fit (all)	.0127/.0381 mm. (.0005/.0015 in.)
Fitted height above cylinder head	8.128 mm. (.320 in.)
Internal diameter (all) ream after fitting	7.907/7.932 mm. (.3113/3123 in.)

Bore in cylinder head - Std.

12.674/12.687 mm. (.499/.4995 in.)

- O/size

12.872/12.839 mm. (.505/.5055 in.)

Camshafts

Journal diameter

25.4/25.413 mm. (1.000/1.0005 in.)

End float

.076/.254 mm. (.003/.010 in.)

Bearings - Number

5

- Type

Steel backed white metal

- Running clearance

.013/.050 mm. (.0005/.002 in.)

Cam followers:

Bore in head

34.925/34.940 mm. (1.375/1.3756 in.)

Outside diameter

34.904/34.912 mm. (1.3742/1.3745 in.)

Follower to head clearance

.013/.036 mm. (.0005/.0014 in.)

Jackshaft

Bearings - Number

3

- Type

Steel backed white metal

- Length - Front

19.05 mm. (.75 in.)

- Centre

16.26 mm. (.64 in.)

- Rear

19.05 mm. (.75 in.)

- Running clearance

.025/.050 mm. (.001/.002 in.)

Journal diameter

39.624/39.637 mm. (1.560/1.5605 in.)

End float

.063/.190 mm. (.0025/.0075 in.)

Crankshaft

Balance

Within 14.42 gr. cm. (2 oz. in.)

Diameter - Main journals

53.987/54.000 mm. (2.1255/2.1260 in.)

- Crankpin

49.199/49.211 mm. (1.9370/1.9375 in.)

End float - Dimension

.076/.203 mm. (.003/.008 in.)

- Controlled by

Thrust washers on centre main bearing

Bearings - Number

5

- Type

Steel backed, lead bronze with lead overlay

- Running clearance

.038/.076 mm. (.0015/.0030 in.)

Maximum undersize for re-grind

.762 mm. (.03 in.)

Flywheel

Maximum run out (lateral)

.101 mm. (.004 in.)

Starter ring gear - Run out - Lateral

.406 mm. (.016 in.)

- Radial

.152 mm. (.006 in.)

Connecting Rod

Type	'H' Section
Material	Steel forging
Distance between centres	12.19/12.24 cm. (4.799/4.801 in.)
Bearings - Type	Steel backed, lead bronze with lead overlay
- Running clearance	.013/.513 mm. (.0005/.0022 in.)
- End float on crankpin	.101/.254 mm. (.004/.010 in.)
Small end bore (bushed):	
Grade 'A' (silver)	20.635/20.637 mm. (.8124/.8125 in.)
Grade 'B' (green)	20.637/20.642 mm. (.8125/.8127 in.)
<u>Gudgeon (piston) pin</u>	
Type	Floating
Location	Circlips
Diameter - Grade 'A'	20.627/20.628 mm. (.8121/.8122 in.)
- Grade 'B'	20.628/20.632 mm. (.8122/.8123 in.)
Class of fit	Finger push fit
<u>Piston</u>	
Type	Solid skirt
Material	Tin plated aluminium alloy
Length	68.250 mm. (2.687 in.)
Compression Height	39.014/39.065 mm. (1.536/1.538 in.)
Maximum permissible weight variation per set	4 grammes
Rings - Compression	2
- Oil control	1
Diameter - Grade 1	82.466/82.474 mm. (3.2467/3.2470 in.)
- Grade 2	82.474/82.481 mm. (3.2470/3.2473 in.)
- Grade 3	82.481/82.489 mm. (3.2473/3.2476 in.)
- Grade 4	82.489/82.497 mm. (3.2476/3.2379 in.)
Piston clearance in cylinder bore	.076/.091 mm. (.0030/.0036 in.)
Gudgeon pin bore offset	1.016 mm. (.04 in.) towards thrust face
Ring gap (fitted) - Compression	.229/.356 mm. (.009/.014 in.)
- Oil control	.254/.508 mm. (.010/.020 in.)

Piston ring to groove clearance:

- Compression
- Oil control

.041/.091mm. (.0016/.0036 in.)

.046/.097 mm. (.0018/.0038 in.)

LUBRICATION SYSTEM

Pump: - Type.

Drive.

Eccentric Lobe

Gear on Jackshaft

Inner and outer rotor clearance

.15 mm. (.006 in.) Maximum

Inner and outer rotor float

.13 mm. (.005 in.) Maximum

Outer rotor to housing clearance

.25 mm. (.010 in.) Maximum

Normal pressure (hot)

2.4/2.8 kg. cm. sq. (35/40 lbs. in. sq.)

Filter

Full flow (throw away cannister)

FUEL SYSTEM

Pump - Operation

Lever by eccentric on Jackshaft

- Pressure

.087/.176 kg. cm. sq. (1.25/2.5 lbs. in. sq)

Air cleaner type

Paper element, dry

Carburetter - Type and number

Dellorto 40 DHLA, two

- Slow running speed

800 r.p.m.

- Settings:

Choke

30 mm.

Main jet

115

Main air corrector jet

.160

Slow running jet

50

Slow running air corrector jet

7850 - 2

Pump jet

8083.40

Starter jet

70

Main emulsion tube

7772 - 1

Starter emulsion tube

7482 - 1

Needle valve

7180 - 15

Air trumpet length

4.44 cm. (1.75 in.)

Carburetter - Type and number
- Slow running speed
Settings:
Needle
Spring colour
Damper oil

Zenith-Stromberg 175 CD 2SE
800/900r.p.m.
B.1G
Light blue
SAE 20W/50

IGNITION SYSTEM

Type	Coil and distributor
Firing Order	1,3,4,2,
No 1 Cylinder	Nearest to front of car
Ignition advance control	Fully automatic
Ignition timing (static):	
Dellorto Carburetters	12° B.T.D.C.
Zenith-Stromberg Carburetters	5° B.T.D.C.
Coil	Lucas LA.12
Sparking plugs - Type	Champion N7Y
- Gap	.584/.635 mm. (.023/.025 in.)

*The above ignition setting may need SLIGHT alteration to meet local fuel requirements.

Distributor

Type	23 D.4
Direction of rotation (from above)	Anti-clockwise
Drive	Gear on jackshaft
Contact breaker gap	.35/.40 mm. (.014/.016 in.)
Contact lever spring tension	.51/.68 kg. (18/24 oz.)
Firing angles	0°, 90°, 180°, 270° ± 1°
Cam dwell angle	60° ± 3°
Despatch no. - Dellorto carbs.	41189
- Zenith-Stromberg carbs.	41225 when suction retard capsule fitted

Centrifugal advance (All distributors)

Crankshaft r.p.m.

Crankshaft degrees B.T.D.C. (Add static setting)

Below 1,000	No advance
1,250	2.4
1,500	4.6
1,750	6.8
2,000	9.2
2,250	11.6
2,500	14.0 Maximum advance

COOLING SYSTEM.

Type	Centrifugal pump and fan
Radiator cap relief valve pressure	.49 kg.cm.sq. (7 lbs.in.sq.)
Thermostat nominal opening temperature	78° C.
Alternator belt tension at top	9.52 mm. (.375 in.)
Impeller vanes to water pump housing clearance	.508/.762 mm. (.020/.030 in.)

CLUTCH

Make and Type	Borg and Beck, diaphragm spring
Operation	Cable
Driven plate diameter	21.59 mm. (8½ in.)
Free movement of withdrawal lever	4.318 mm. (.170 in.)

TRANSMISSION.

Type	4 forward speeds and reverse	
Bearings - Mainshaft	Taper rollers	
- Secondary gear cluster	Taper rollers	
Bearings - Adjustment	See section 'F' (Transmission)	
Gear ratios:	<u>4 speed</u>	<u>5 speed</u>
- O/D (5th.)	N/A	0.87 : 1
- 4th.	1.03 : 1	1.21 : 1
- 3rd.	1.48 : 1	1.61 : 1
- 2nd.	2.25 : 1	2.33 : 1
- 1st.	3.61 : 1	3.61 : 1
Reverse	3.08 : 1	3.08 : 1
Final drive - Type	Hypoid gear	
- Bearings - Pinion	Taper rollers	
- Diff./crown wheel	Taper rollers	
Drive shaft end-float	.050/.076 mm. (.002/.004 in.)	

Bearings adjustment - Pinion bearing pre-load

- Crown wheel/pinion

Number of teeth - Crown wheel

- Pinion

Speedometer gears :

Type 336 & 352 gearbox

(4 speed)

Type 365 gearbox

(5 speed)

Final drive ratio - 4 speed

- 5 speed

Overall ratios:

- O/D (5th.)

- 4th.

- 3rd.

- 2nd.

- 1 st.

- Reverse

Driving Gear

6 teeth

(X046 F 6049Z)

9 teeth

(A074 F 6111Z)

4 speed

N/A

3.666 : 1

5.268 : 1

8.010 : 1

12.851 : 1

10.964 : 1

See Section 'F' (Transmission)

.127/.254 mm. (.005/.010 in) backlash

32 } Type 336/352

9 } gearbox

34 } Type 365

9 } gearbox

Driven Gear

12 teeth

(X046 F 6108Z)

19 teeth

(A074 F 6136Z)

3.56 : 1

3.78 : 1

5 speed

3.289 : 1

4.574 : 1

6.086 : 1

8.807 : 1

13.646 : 1

11.642 : 1

STEERING

Type

Steering angles - Camber

- Castor

- Swivel pin inclination

Toe in

Condition for checking toe in

Rack and Pinion

0° to ± 30'

2° 30' ± 30'

9° ± 30'

4.8 mm. (3/16 in.) to 1.6mm.(1/16 in)

15 cm. (6 in.) ground clearance at
bottom of chassis closing plate.

FRONT SUSPENSION.

Type

Spring - Number of coils

- Wire diameter

- Length - Free

- Fitted

- Rate

Front hub end float

Independent

13.5

10.16 mm. (.40 in.)

31.77 cm. (12.51 in.)

20.01 cm. (7.88 in.)

1.33 kg.m. (116 lbs. in.)

.05/.10 mm. (.002/.004 in.)

REAR SUSPENSION.

Type	Independent
Spring - Number of coils	19.6
- Wire diameter	8.23 mm. (.324 in.)
- Length - Free	42.54 cm. (16.75 in.)
- Fitted	25.04 cm. (9.86 in.)
- Rate	.865 kg.m. (75 lbs. in.)
Wheel camber	1° Negative ± 30'
Toe - in	6.35 mm. (¼ in.) to 3.18 mm. (1/8 in.)

BRAKES.

Make and type	Girling hydraulic (servo assisted)
Front brakes - Disc diameter	24.76 cm. (9.75 in.)
- Pads material	Ferodo FER .2430 F
- Total disc run out	.10 mm. (.004 in.)
Rear Brakes - Drum diameter and width - T/C	20.3cm. (8 in.) x 31.75mm.(1.25 in.)
- Special	20.3cm. (8 in.) x 38.10mm.(1.50 in.)
- Lining material	Don.242
Handbrake type	Mechanical on rear only

WHEELS AND TYRES.

Wheel - Type	Pressed steel - bolt on
- Size	4½J
Tyres - Type	Dunlop SP Sport with tubes
- Size	155 X HR13
- Pressure (cold):	
<u>At speeds BELOW 160 k.p.h. (100 m.p.h.)</u>	<u>At sustained speeds ABOVE 160k.p.h.</u> (100m.p.h.)
Front 1.27 kg.cm.sq. (18 lbs.in.sq.)	1.69kg.cm.sq. (24lbs.in.sq.)
Rear 1.97 kg.cm.sq. (28 lbs.in.sq.)	2.39 kg.cm.sq. (34 lbs.in.sq.)

NOTE

It is not necessary to increase the tyre pressures for any reason other than those given.

* When inner tubes are fitted, it is essential that these are of the correct type for radial ply tyres.

Optional Wheels and Tyres.

Wheel - Type	Alloy - Bolt on
- Size	5½J X 13
- Nuts, torque loading	5.53 - 6.22 kg.m.(40-45 lbs.ft.)

Tyres - Type

Firestone Cavalino 'wide oval'

- Size

175/185 x 13

- Pressure (cold):

At speeds BELOW 160 k.p.h. (100 m.p.h.)

1.125 kg. cm.² (16 lbs. in.²)

1.828 kg. cm.² (26 lbs. in.²)

At sustained speeds ABOVE 160 kph (100 mph)

1.547 kg. cm.² (22 lbs in.²)

2.250 kg. cm.² (32 lbs.in.²)

NOTE

It is not necessary to increase the tyre pressures for any reason other than those given.

ELECTRICAL EQUIPMENT

Battery

Type

Exide 6 VTA 29L

Capacity

39 amp. hr. @ 20 hr. rating

Voltage and polarity

12 volt Negative earth

Fuses

Quantity

4; 35 amp

Alternator

Type

AC Delco DN 460

Maximum output

35 amp @ 3,600 r.p.m.

Earth polarity

Negative

Number of poles

14

Stator phases

3

Starter

Type

Lucas M.35 J

Drive

'SB' (inboard)

Brush tension

.80 kg. (28 ozs.)

Light running current

65 amp @ 8,000/10,000 r.p.m.

Lock torque

.97 kg. m. (7 lbs. ft.) @ 350/375 amp

Lamp bulbs (all 12 volts)

Headlamp - RHD

410 (45/40W) with 989 (6W) pilot

- LHD

410 (45/40W) with 989 (6W) pilot

- France

411 (45/40W) yellow with 989 (6W) pilot

- North America

Sealed beam unit

Front and rear indicators	382 (21W)
Indicator repeater	501 (5W capless)
Stop and tail lamps	380 (21/6W)
Rear number plate lamp	254 (6W festoon)
Reverse lamp	273 (21W festoon)
Interior lamp	254 (6W festoon)
Panel (instrument) lamps	987 (2.4W)
Warning lamps	987 (2.4W)

TORQUE LOADING FIGURES

<u>ENGINE</u>	<u>kg. m.</u>	<u>lbs. ft.</u>
Cylinder head (tighten cold)	8.29 - 8.98	60 - 65
Cylinder head to front cover	1.38 - 2.07	10 - 15
Sparking plugs	3.31 - 3.87	24 - 28
Camshafts - Bearing caps	1.24	9
- Sprockets	3.45 - 4.14	25 - 30
Crankshaft - Main bearing caps	7.60 - 8.29	55 - 60
- Connecting rod (big-end) caps	6.08 - 6.36	44 - 46
- Pulley	3.31 - 3.87	24 - 28
Flywheel	6.22 - 6.91	45 - 50
Front timing cover ¼" (UNF & UNC)	.69 - .96	5 - 7
5/16" (UNF & UNC)	1.38 - 2.07	10 - 15
- Back plate to cylinder block	.83 - 1.10	6 - 8
Timing chain tensioner - Sprocket pin	5.53 - 6.22	40 - 45
- Retaining bolt	6.22 - 6.91	45 - 50
- Pivot pin	5.53 - 6.22	40 - 45
Jackshaft - Sprocket	.65 - 2.07	12 - 15
- Thrust plate	.69 - .96	5 - 7
Oil filter centre bolt	1.65 - 2.07	12 - 15
Oil pump to cylinder block	1.65 - 2.07	12 - 15
Oil sump to cylinder block	.83 - 1.10	6 - 8
Oil sump drain plug	2.76 - 3.45	20 - 25
Fuel pump to cylinder block	1.65 - 2.07	12 - 15
Exhaust manifolds to cylinder head	1.65 - 2.07	12 - 15
Rear oil seal carrier (crankshaft) to cyl. block	1.65 - 2.07	12 - 15
Generator to mounting bracket	2.07 - 2.48	15 - 18
Carburettor trumpet nuts	1.10	8
Engine mounting bracket to engine	2.48	18

<u>CLUTCH</u>	<u>kg. m.</u>	<u>lbs. ft.</u>
Clutch housing to gearbox	5.53 - 6.22	40 - 45
Clutch assembly to flywheel	1.65 - 2.07	12 - 15
<u>TRANSMISSION.</u>		
Gearbox casing (halves)	See Section 'F'	
Differential case to crown wheel	See Section 'F'	
Differential bearing adjusting nuts	2.07	15
Pinion bearing nut	11.75	85
Speedometer drive worm	See Section 'F'	
Reverse selector pivot	See Section 'F'	
Side cover plates	2.07	15
Gearbox mounting bracket to chassis	4.83	35
<u>FRONT SUSPENSION & STEERING</u>		
Stub axle retaining nut	8.98 - 10.36	65 - 75
Ball joint - To vertical link	5.25 - 5.80	38 - 42
- To upper wishbone	1.65 - 2.07	12 - 15
Lower wishbone - To trunnion *	4.83	35
- To damper *	6.91	50
Inner wishbone retaining nut *	6.91	50
Caliper mounting plate to hub	3.04 - 3.73	22 - 27
Steering arm to vertical link	3.04 - 3.73	22 - 27
Steering tie rod ball joint	3.59 - 3.87	26 - 28
Steering tie rod adaptor	6.91	50
Steering unit mounting clamps to chassis	1.38	10
Steering column impact clamp	3.59 - 4.42	26 - 32
* Tighten with suspension in static ride condition		
<u>REAR SUSPENSION.</u>		
Lower link and damper to bearing housing	7.60	55
Lower link to clutch housing	5.53	40
Lower link mounting bracket to transmission	1.65	12

	<u>kg. m.</u>	<u>lbs. ft.</u>
Bearing housing to radius arm	2.48	18
Radius arm front mounting bolt	4.83	35
Rear damper top mounting	5.53	40
<u>HUBS</u>		
Rear hub to outboard drive shaft*	20.70	150
Brake disc to front hub	3.04 - 3.73	22 - 27
Front hub to spindle nut **	.69 - .83	5 - 6

*Assemble with Loctite '35'. A rotational free play NOT EXCEEDING .127 mm (.005 in.) between the hub and shaft measured at the wheel stud MUST be used for LEFT HAND hubs.

**Tighten nut to this torque loading while rotating the hub to ensure bedding of taper rollers.

Slacken nut 'one flat', then insert split pin.

BRAKE HYDRAULIC SYSTEM CONNECTIONS

3/8 in UNF female (bundy and hose connection)	1.10 - 1.38	8 - 10
3/8 in UNF male (bundy to master cylinder, multi-ways etc.)	.69 - .96	5 - 7
7/16 in. UNF male	1.93 - 2.90	14 - 21
3/8 in. bore servo bundy (5/8 in. male)	1.65 - 2.07	12 - 15
Stop lamp switch	1.65 - 2.07	12 - 15
Brake hose to banjo	1.65 - 2.07	12 - 15
7/16 in. UNF female (bundy to reservoir)	1.65 - 1.93	12 - 14

Torque Wrenches

Torque wrenches in daily use should be checked at intervals not exceeding 3 months to ensure that accuracy is maintained.

GENERAL NUTS AND BOLTS

1/4 in. UNF and UNC	.69 - .96	5 - 7
5/16 in. UNF and UNC	1.65 - 2.07	12 - 15
3/8 in. UNC	2.35 - 3.04	17 - 22
3/8 in. UNF	3.04 - 3.73	22 - 27
7/16 in. UNC	4.14 - 4.85	30 - 35
7/16 in. UNF	5.53 - 6.22	40 - 45
1/2 in. UNC	6.22 - 6.91	45 - 50
1/2 in. UNF	6.91 - 8.29	50 - 60
9/16 in. UNC	8.29 - 9.68	60 - 70
9/16 in. UNF	8.98 - 10.36	65 - 75
5/8 in. UNC	10.36 - 11.75	75 - 85
5/8 in. UNF	13.82 - 15.20	110 - 110