



## LR, LRV, LLR and LR-S Pumps

### ► Maintenance Checklist

## **⚠ DANGER**

Read User Instructions **before** installing, operating or maintaining this pump.  
Copies available from Flowserve pump representatives.

### Recommended Lubricants:

- Mineral Oil:** Quality mineral oil with foam inhibitors.  
BP Castrol Energol HLP-HM 46 ISO VG 46
- Synthetic Oil:** Some synthetic lubricants require Viton® O-rings.  
Royal Purple avoids this change.
- Grease:** Horizontal – Energrease LS-EP3 (or compatible)  
In-Line – Lithium Complex with mineral oil

### Relubrication Intervals<sup>1</sup>

Lubricant	External Housing Temperature		
	Under 65°C (149°F)	65°C to 78°C (149°F to 172°F)	78°C to 80°C (172°F to 176°F)
Mineral Oil	6 mo	3 mo	3 mo
Synthetic Oil	18 mo	18 mo	18 mo
Grease	6 mo	3 mo	3 mo

1. Assuming good maintenance and operation practices and no contamination.

### Maximum External Housing Temperature

Lubrication	Temperature
Oil Bath	82°C (180°F)
Oil Mist	82°C (180°F)
Grease	95°C (204°F)

### Recommended Temperature Range of Fluid Pumped<sup>2</sup>

Pump Type	Temperatures
LR LRV LLR	-30°C to 125°C (-20°F to 250°F)
LR-S	-30°C to 150°C (-20°F to 300°F)

2. These are minimum and maximum temperatures and may vary with casing material and working pressure.

**For sales and product information, go to [www.flowserve.com](http://www.flowserve.com)**

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LR series pumps are manufactured in: Chesapeake, VA (USA), Coimbatore (India) and Newark (U.K.).

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**Oil Viscosity Grades**

Max. Temperature	ISO VG	Min. Visc. Index
Up to 65°C (149°F)	32	95
Up to 78°C (172°F)	46	95
Up to 80°C (176°F)	68	95

**Amount of Oil Required**

Pump Size	Approx. Oil Capacity, Both Bearings, L (fl oz)
1.5LLR-7	0.16 (5.4)
1.5LLR-10	
2LLR-9	
2LLR-11	0.19 (6.4)
3LLR-11	
4LLR-11	
2.5LR10	0.16 (5.4)
2.5LR-13	0.17 (5.8)
3LR-9	0.16 (5.4)
3LR-12	
4LR-10	
4LR-11	0.17 (5.8)
4LR-12	
4LR-14	
5LR-10	0.16 (5.4)
5LR-13	0.17 (5.8)
5LR-15	0.19 (6.4)
5LR-19	
6LR-10	
6LR-13	0.19 (6.4)
6LR-16	
6LR-18	
6LR-18S	0.21 (7.1)
6LR-18S	0.47 (15.9)
8LR-12	0.19 (6.4)
8LR-14	
8LR-18S	
8LR-20	0.21 (7.1)
8LR-23S	0.47 (15.9)
10LR-14	0.21 (7.1)
10LR-14S	0.47 (15.9)
10LR-16	0.21 (7.1)
10LR-17	0.28 (9.5)
10LR-18	
10LR-18S	
12LR-14S	0.47 (15.9)

**Impeller Clearance Settings<sup>3</sup>**

Pump Size	Mean Radial Wear Ring Clearance, mm (in)
1.5LLR-7	0.19 (0.007)
1.5LLR-10	
2LLR-9	
2LLR-11	0.22 (0.009)
3LLR-11	
4LLR-11	
2.5LR-10	0.19 (0.007)
2.5LR-13	0.22 (0.009)
3LR-9	
3LR-12	
4LR-10	
4LR-11	
4LR-12	
4LR-14	
5LR-10	
5LR-13	
5LR-15	
5LR-19	
6LR-10	0.13 (0.005)
6LR-13	
6LR-16	
6LR-18	0.22 (0.009)
6LR-18S	
8LR-12	
8LR-14	0.13 (0.005)
8LR-18S	0.22 (0.009)
8LR-20	0.13 (0.005)
8LR-23S	0.22 (0.009)
10LR-14	0.13 (0.005)
10LR-14S	0.22 (0.009)
10LR-16	0.13 (0.005)
10LR-17	
10LR-18	
10LR-18S	0.22 (0.009)
12LR-14S	

3. Settings are based at room temperature.

## Alignment

Align pump and motor shaft to within 0.05 mm (0.002 in) TIR parallel and 0.05 mm (0.002 in) per 100 mm (4 in) of coupling flange diameter TIR angular.

## Vibration

Maximum vibration level 5.6 mm/s (0.22 in/s) RMS, measured at bearing housing.

## Impeller Balance Requirements

Single plane spin balance to G6.3 standard.

## Seal Flush Requirements

- Pressure: 0.7-1.0 bar (10-15 psi) minimum differential across seal faces
- Flow rate: 4-8 lpm (1-2 US gpm)

## Recommended Bolt Torques<sup>4</sup>

Description	Thread Size	Torque Nm (lb-ft)
Bearing Cover Bolts	¼ UNC	5 (4)
	⅜ UNC	19 (15)
Bearing Bracket Bolts	½ UNC	49 (36)
Split Casing Bolts	½ UNC	49 (36)
	⅝ UNC	97 (72)
	¾ UNC	178 (131)
	⅞ UNC	279 (206)
Mounting Foot Bolts	M16	170 (125)
	M20	340 (250)
	M24	590 (435)

4. Values given are for lubricated or PTFE coated threads. For non-lubricated threads, increase values by 25%.

## Shaft Data

Maximum shaft deflection at stuffing box face	0.051 mm (0.002 in)
Maximum shaft run out at stuffing box face	0.025 mm (0.001 in)

## Bearing Size (SKF)

Pump Size	Outboard	Inboard
1.5LLR-7	7305BECB x 2	6305
1.5LLR-10		
2LLR-9		
2LLR-11	7406BECB x 2	6308
3LLR-11		
4LLR-11		
2.5LR-10	3305C3	6305
2.5.5LR-13	6306	6306
3LR-9	6305	6305
3LR-12		
4LR-10		
4LR-11	6306	6306
4LR-12	6305	6305
4LR-14	6306	6306
5LR-10	6305	6305
5LR-13	6306	6306
5LR-15	6406	6308
5LR-19		
6LR-10	6305	6305
6LR-13	6406	6308
6LR-16		
6LR-18	6309	6211
6LR-18S	6211	6211
8LR-12	6406	6308
8LR-14		
8LR-18S	6213	6213
8LR-20	6309	6211
8LR-23S	6213	6213
10LR-14	6309	6211
10LR-14S	6211	6211
10LR-16	6309	6211
10LR-17	6213	6213
10LR-18		
10LR-18S		
12LR-14S	6211	6211

Pump Sizes	Outboard Bearing, mm (in)					
	Bearing	Shaft	Fit	Bearing	Housing	Fit
1.5LLR7, 1.5LLR10, 2LLR9, 2.5LR10, 3LR9, 3LR12, 4LR10, 4LR12, 5LR10, 6LR10,	25.0000 (0.9843)	25.0088 (0.9846)	-0.0168 (-0.0007)	62.0000 (2.4409)	62.0166 (2.4416)	0.0276 (0.0011)
	24.9920 (0.9839)	24.9987 (0.9842)	0.0013 (0.0001)	61.9890 (2.4405)	62.0039 (2.4411)	0.0039 (0.0002)
2LLR11, 3LLR11, 4LLR11, 2.5LR13, 4LR11, 4LR14, 5LR13, 5LR15, 5LR19, 6LR13, 6LR16, 8LR12, 8LR14	30.0000 (1.1811)	30.0076 (1.1814)	-0.0176 (-0.0007)	9.0000 (0.3543)	90.0227 (3.5442)	0.0357 (0.0014)
	29.9900 (1.1807)	29.9974 (1.1810)	0.0026 (0.0001)	89.9870 (3.5428)	90.0100 (3.5437)	0.0100 (0.0004)
6LR18, 8LR20, 10LR14, 10LR16	45.0000 (1.7717)	45.0088 (1.7720)	-0.0188 (-0.0007)	100.0000 (3.9370)	100.0176 (3.9377)	0.0306 (0.0012)
	44.9900 (1.7713)	44.9986 (1.7716)	0.0014 (0.0001)	99.9870 (3.9365)	100.0049 (3.9372)	0.0049 (0.0002)
6LR18S, 10LR14S, 12LR14S	55.0000 (2.1654)	55.0088 (2.1657)	-0.0208 (-0.0008)	100.0000 (3.9370)	100.0176 (3.9377)	0.0306 (0.0012)
	54.9880 (2.1649)	54.9986 (2.1653)	0.0014 (0.0001)	99.9870 (3.9365)	100.0049 (3.9372)	0.0049 (0.0002)
8LR18S, 8LR23S, 10LR17, 10LR18	65.0000 (2.5591)	65.0088 (2.5594)	-0.0208 (-0.0008)	120.0000 (4.7244)	120.0175 (4.7251)	0.0325 (0.0013)
	64.9880 (2.5586)	64.9961 (2.5589)	0.0039 (0.0002)	119.9850 (4.7238)	120.0023 (4.7245)	0.0023 (0.0001)

Pump Sizes	Inboard Bearing, mm (in)					
	Bearing	Shaft	Fit	Bearing	Housing	Fit
1.5LLR7, 1.5LLR10, 2LLR9, 2.5LR10, 3LR9, 3LR12, 4LR10, 4LR12, 5LR10, 6LR10,	25.0000 (0.9843)	25.0088 (0.9846)	-0.0168 (-0.0007)	62.0000 (2.4409)	62.0166 (2.4416)	0.0276 (0.0011)
	24.9920 (0.9839)	24.9987 (0.9842)	0.0013 (0.0001)	61.9890 (2.4405)	62.0039 (2.4411)	0.0039 (0.0002)
2LLR11, 3LLR11, 4LLR11, 2.5LR13, 4LR11, 4LR14, 5LR13, 5LR15, 5LR19, 6LR13, 6LR16, 8LR12, 8LR14	40.0000 (1.5748)	40.0075 (1.5751)	-0.0175 (-0.0007)	90.0000 (3.5433)	90.0227 (3.5442)	0.0357 (0.0014)
	39.9900 (1.5744)	39.9974 (1.5747)	0.0026 (0.0001)	89.9870 (3.5428)	90.0100 (3.5437)	0.0100 (0.0004)
6LR18, 8LR20, 10LR14, 10LR16	55.0000 (2.1654)	55.0088 (2.1657)	-0.0208 (-0.0008)	100.0000 (3.9370)	100.0176 (3.9377)	0.0306 (0.0012)
	54.9880 (2.1649)	54.9986 (2.1653)	0.0014 (0.0001)	99.9870 (3.9365)	100.0049 (3.9372)	0.0049 (0.0002)
6LR18S, 10LR14S, 12LR14S	55.0000 (2.1654)	55.0088 (2.1657)	-0.0208 (-0.0008)	100.0000 (3.9370)	100.0176 (3.9377)	0.0306 (0.0012)
	54.9880 (2.1649)	54.9986 (2.1653)	0.0014 (0.0001)	99.9870 (3.9365)	100.0049 (3.9372)	0.0049 (0.0002)
8LR18S, 8LR23S, 10LR17, 10LR18	65.0000 (2.5591)	65.0088 (2.5594)	-0.0208 (-0.0008)	120.0000 (4.7244)	120.0175 (4.7251)	0.0325 (0.0013)
	64.9880 (2.5586)	64.9961 (2.5589)	0.0039 (0.0002)	119.9850 (4.7238)	120.0023 (4.7245)	0.0023 (0.0001)