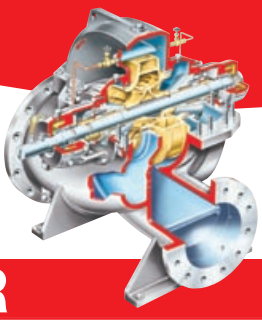
FLOWSERVE

LNN, LNNV & LNNC

Size Up to 14 in Discharge (350 mm) Centrifugal Pumps

MAINTENANCE CHECKLIST



⚠DANGER

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

Specific requirements apply relating to the product certification, permit or conformity; refer to the Conformity Document provided with the equipment especially when changing parts, e.g., changing a seal.

Operating Limits

Pumped Liquid Temperature Limits[1]	-20 to +140°C (-4 to +284°F)
Maximum Ambient Temperature[2]	-20 to +40°C (-4 to +104°F)
Maximum Soft Solids in Suspension	Up to 3% by volume (depending on pump size)
Maximum Pump Speed	Refer to the nameplate

[1] Special construction may be required above 80°C (176°F).
[2] Ambient temperature higher than 40°C (104°F) requires engineering approval.

Pump Lubricants

	Oil	Splash / Force Feed / Purge Oil Mist Lubrication		
Bearing Lubrication	Viscosity cSt @ 40°C	32	32	68
	Oil temperature range[3]	-5 to 65°C (23 to 149°F)	-5 to 78°C (23 to 172°F)	-5 to 80°C (23 to 176°F)
	Designation to ISO 3448 and DIN51524 part 2	ISO VG 32 32 HLP	ISO VG 46 46 HLP	ISO VG 68 68 HLP
Oil Companies and Lubricants	BP Castrol[4]	Energol HLP-HM 32	Energol HLP-HM 46	Energol HLP-HM 68
	ESSO[4]	NUTO HP 32	NUTO HP 46	NUTO HP 68
	ELF/Total[4]	ELFOLNA DS 32 Azolla ZS 32	ELFOLNA DS 46 Azolla ZS 46	ELFOLNA DS 68 Azolla ZS 68
	LSC (for oil mist)	LSO 32 (Synthetic oil)	LSO 46 (Synthetic oil)	LSO 68 (Synthetic oil)
	ExxonMobil[4]	Mobil DTE 24	Mobil DTE 25	Mobil DTE 26
	Q8[4]	Q8 Haydn 32	Q8 Haydn 46	Q8 Haydn 68
	Shell[4]	Shell Tellus 32	Shell Tellus 46	Shell Tellus 68
	Chevron Texaco[4]	Rando HD 32	Rando HD 46	Rando HD 68
	Wintershall (BASF Group)[4]	Wiolan HS32	Wiolan HS46	Wiolan HS68
	Fuchs[4]	Renolin CL 32	Renolin CL 46	Renolin CL 68

[3] It normally takes two hours for bearing temperature to stabilize and the final temperature will depend on the ambient, r/min, pumpage temperature and pump size. Some oils have a very low pour point and good viscosity index which extend the minimum temperature capability of the oil. Always check the grade capability when the ambient is less than -5°C (23°F).

[4] Use LSC for oil mist. Oil parameters provide: a flash point > 166°C (331°F); a density > 0.87 @ 15°C (59°F); and a pour point of -10°C (14°F) or lower.

Oil Lubricated Bearings

Pumping Liquid Temp Limit[5]	Bearing/Oil Temp Rise Less Than[6]
80°C (176°F)	40°C (104°F)
110°C (230°F)	50°C (122°F)
140°C (284°F)	60°C (140°F)

[5] Maximum ambient of 40°C (104°F).
[6] A continuously rising temperature, or an abrupt rise, indicates a fault.

Recommended Grease Lubricants[9]

Grease Grade	NLGI 2[7]	NLGI 3[8]
Temp. range °C (°F)	-20 to +100 (-4 to +212)	-20 to +100 (-4 to +212)
Designation Acc. to DIN	KP2K-25	KP3K-20
BP	Energrease LS-EP2	Energrease LS-EP3
Elf	Multis EP2	Multis EP3
Fuchs	RENOLIT EP2	RENOLIT EP3
Esso	Beacon EP2	Beacon EP3
Mobil	Mobilux EP2	Mobilux EP3
Q8	Rembrandt EP2	Rembrandt EP3
Shell	Alvania EP2	Alvania EP2
Texaco	Multifak EP2	Multifak EP3
SKF	LGEP 2	

[7] NLGI 2 is an alternative grease and is not to be mixed with other grades.
[8] Standard pre-packed grease for fitted antifriction bearings.
[9] Grease Lubricated Bearings: For most operating conditions high-quality grease having a lithium soap base and NLGI consistency of No. 2 or No. 3 is recommended. The drop point should exceed 175°C (350°F).

Relubrication Intervals

Regreasing Via Grease Nipples	≤ 2000 hours (depends on severity of application)
Grease Change	≤ 4000 hours (depends on severity of application)
Oil Change	4000 hours or at least every 6 months[10]

[10] Oil levels need not be checked if pump is supplied with a constant level oiler, but regular checks need to be made on those pumps that are fitted with a sight glass.

Recommended Fill Quantities[11]

Size (LNN, LNNV and LNNC)	Top-up Grease, g (oz)		Approx. Oil Capacity, Both Type of Bearings liter (fl. oz.)
	Single Row Ball Bearing	Angular Contact Thrust Bearing Double	
200-LNN-300	8 (0.28)	16 (0.56)	0.37 (12.5)
200-LNN-325			
200-LNN-375			
200-LNN-400	12 (0.42)	24 (0.84)	0.48 (16.2)
200-LNN-475			
200-LNN-500			
250-LNN-325			
250-LNN-375			
300-LNN-325			
200-LNN-525	15 (0.53)	30 (1.06)	0.60 (20.3)
200-LNN-600			
250-LNN-475			
250-LNN-600			
300-LNN-475			
300-LNN-500			
300-LNN-575			
350-LNN-375			
300-LNN-600	21 (0.74)	42 (1.48)	0.68 (23.0)
300-LNN-625			
350-LNN-475			
350-LNN-575			
350-LNN-725			
300-LNN-750	34 (1.2)	68 (2.4)	2.00 (67.6)
350-LNN-900			

[11] Where the pump is lubricated by oil mist, the amount of oil mist supplied (m^3/h) is normally calculated to be at least the bearing bore diameter (mm) times the number of bearing rows divided by 25. The oil mist should consist of at least 0.025 - 0.04% oil content. The pressure in the bearing housing must not exceed 0.01 bar (0.15 psi).

Vibration Velocity[12]

Vibration Velocity – Unfiltered		Horizontal Pumps mm/s (in/s) r.m.s.	Vertical Pumps mm/s (in/s) r.m.s.
Normal	N	≤ 5.6 (0.22)	≤ 7.1 (0.28)
Alarm	N x 1.25	≤ 7.1 (0.28)	≤ 9.0 (0.35)
Shutdown trip	N x 2.0	≤ 11.2 (0.44)	≤ 14.2 (0.56)

[12] Normal vibration level can be lower depending on sizes/applications. Alarm (1.25) and shutdown trip (2.0) multiplier remain the same.

Stop/Start Frequency

Motor Rating kW (hp)	Max. Stop/Starts Per Hour
Up to 15 (20)	15
Between 15 (20) and 90 (120)	10
90 (120) to 150 (200)	6
Above 150 (200)	Refer

Fastener Torques

Bolt Size	Torque, Nm (lb - ft)	
	Pump Feet Fasteners	All Other Fasteners
M 16 (5/8 in)	170 (125)	84 (62)
M 20 (3/4 in)	340 (250)	165 (120)
M 24 (7/8 in)	590 (435)	285 (210)
M 27 (1 in)	770 (570)	375 (275)
M 30 (1 1/8 in)	1100 (810)	540 (400)
M 36 (1 3/8 in)	1840 (1350)	900 (660)
M 42 (1 5/8 in)	2000 (1475)	1410 (1040)
M 48 (1 7/8 in)	2240 (1650)	2060 (1500)

Impeller Clearance Settings[13, 14, 15, 16]

Pump Size	Nominal Wear Ring Diameter mm (in)	Mean Radial Wear Ring Clearance mm (in)
200-LNN-300	215 (8.5)	0.3 (0.012)
200-LNN-325	240 (9.5)	
200-LNN-375	215 (8.5)	
200-LNN-400	240 (9.5)	
200-LNN-475		
200-LNN-500	215 (8.5)	
200-LNN-525	240 (9.5)	
200-LNN-600		
250-LNN-325		
250-LNN-375	264 (10.4)	
250-LNN-475		
250-LNN-600		
300-LNN-325	300 (11.8)	
300-LNN-475	330 (13.0)	
300-LNN-500	300 (11.8)	
300-LNN-575	350 (13.8)	
300-LNN-600	300 (11.8)	
300-LNN-625	330 (13.0)	
300-LNN-750		
350-LNN-375		
350-LNN-475	380 (15.0)	
350-LNN-575		
350-LNN-725		
350-LNN-900		

[13] Replace rings when radial clearances double to 0.6 mm (0.024 in), depending on pump size.

[14] The above clearances are typically applicable for CI/DCI casing and bronze impeller construction (typically a non-galling combination).

[15] Clearances for non-metallic wear rings are smaller, typically 50-65% of those for the standard metallic rings shown above.

[16] Clearances for SS/duplex/super duplex casing and impeller construction (typically a galling combination) are wider, typically 50-65% more than those for the standard metallic rings shown above.

Bearing Specs

Size (LNN, LNNV[17, 18] and LNNC)	Single Row Ball Bearing	Angular Contact Thrust Bearing (Heavy Duty)
200-LNN-300	6209	7209
200-LNN-325		
200-LNN-375		
200-LNN-400	6212	7212
200-LNN-475		
200-LNN-500		
250-LNN-325		
250-LNN-375		
300-LNN-325		
200-LNN-525	6214	7214
200-LNN-600		
250-LNN-475		
250-LNN-600		
300-LNN-475		
300-LNN-500		
300-LNN-575		
350-LNN-375		
300-LNN-600	6217	7217
300-LNN-625		
350-LNN-475		
350-LNN-575		
350-LNN-725		
300-LNN-750	6221	7221
350-LNN-900		

[17] LNNV pumps are supplied with a pair of double angular contact thrust bearings at upper bearing location and product lubricated sleeve bearings at the bottom.

[18] On LNNV, it is recommended that the bottom lubricated bearing is renewed at a diametrical clearance of 0.5 mm (0.02 in)

Alignment

Align the pump and motor shaft to within 0.05 to 0.10 mm (0.002 to 0.004 in) TIR in parallel and 0.05 mm (0.002 0in) per 100 mm (4 in) of coupling flange diameter as TIR angular misalignment.

LNN products are manufactured in: Arnage (France), Newark (U.K.), Taneytown, MD (USA), Rio de Janeiro (Brazil) and Coimbatore (India).

USA and Canada
Flowserve Corporation
5215 North O'Connor Blvd.
Suite 2300
Irving, Texas 75039-5421 USA
Telephone: +1 937 890 5839

Europe, Middle East, Africa
Flowserve Corporation
Parallelweg 13
4878 AH Etten-Leur
The Netherlands
Telephone: +31 76 502 8100

Latin America
Flowserve Corporation
Martín Rodriguez 4460
B1644CGN-Victoria-San Fernando
Buenos Aires, Argentina
Telephone: +54 11 4006 8700
Telefax: +54 11 4714 1610

Asia Pacific
Flowserve Pte. Ltd.
10 Tuas Loop
Singapore 637345
Telephone: +65 6771 0600
Telefax: +65 6779 4607

For sales and product information, go to www.flowserve.com

FPD-1420 (E) December 2010 © Flowserve Corporation