



Horizontal Split Cast Pumps LR Series



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LR Series

Overview

The LR line offers you a range of horizontal and vertical sizes with capacities to 2,840 m³/h (12,500 usgpm), heads 165 metres (550 feet), in sizes 2½" through 12".

Benefits: They provide a wider range of hydraulic coverage than other typical horizontal split-case pumps and end-suction designs. Split-case pumps minimise the effects of radial load by allowing the radial thrust to be shared equally by the bearings at each end of the shaft. This results in a much longer bearing life than end-suction designs where one bearing must support 2 times the radial load of the impeller. Split-case designs allow for balanced axial loading, high efficiency and low NPSH with double-suction closed impellers. Rugged, heavy-duty construction coupled with superior design features make this line of pumps very reliable. Low initial investment and high efficiency makes the overall cost very attractive.

Also, LR Type horizontal split-case pumps are designed to ensure ease of maintenance and parts interchangeability. This means additional savings from reduced downtime and minimum need for parts inventory.

The heart of the split-case line is the LR, single-stage, double-suction impeller design. Double-suction impellers offer two advantages: reduced NPSH requirements up to 30% and balanced axial thrust for longer bearing life. They are available in 12" to meet a broad range of application requirements.

Typical Industries Served:

- Process
- Building trades
- Fire protection
- Food
- Mining
- Steel
- Sugar
- Utilities
- Public works
- Petroleum
- Pharmaceutical
- Pipeline
- Agriculture
- Pulp and paper
- Rubber
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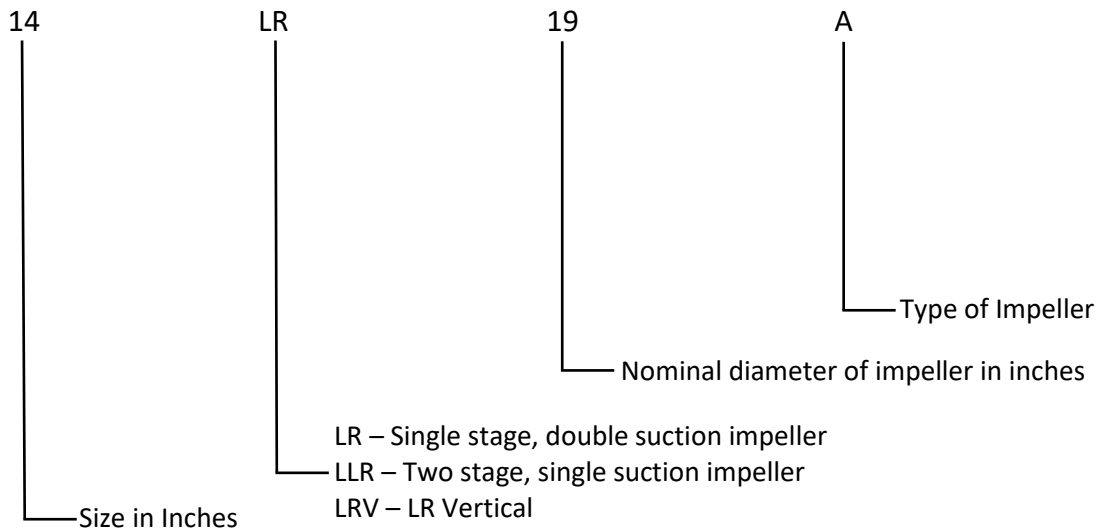


LR Series

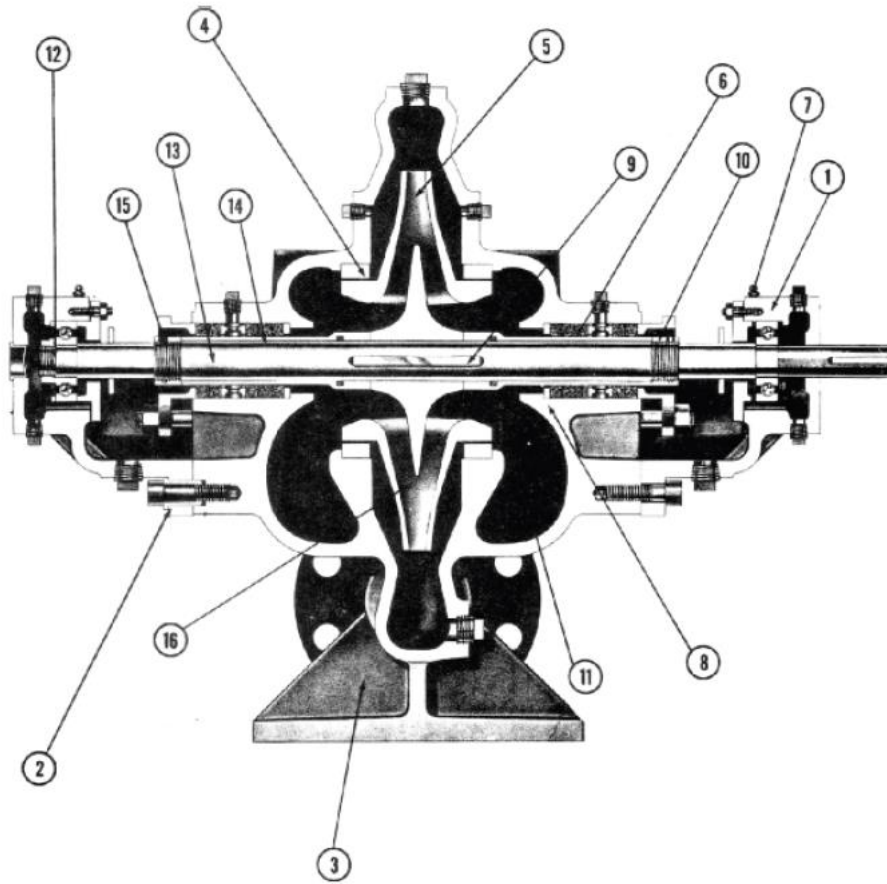
Sizes: 2½" to 12"
 Capacity: to 2,840 m³/h
 Heads: to 165 metres

A rugged and versatile, single stage, double suction and double volute axially horizontal split case pump built for sustained efficiency and economy.

Nomenclature

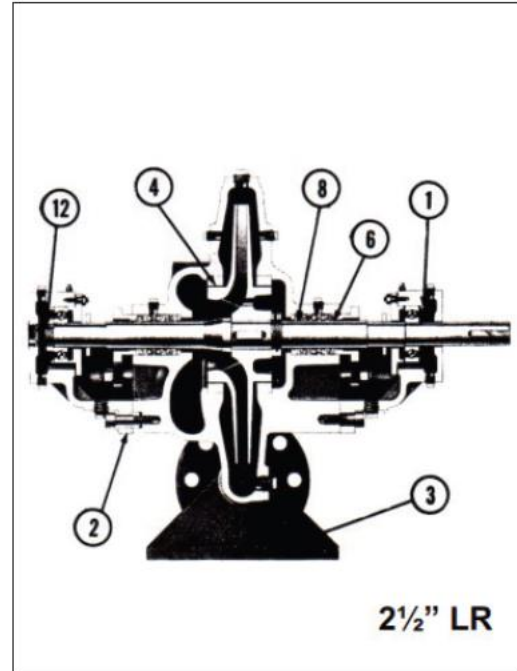
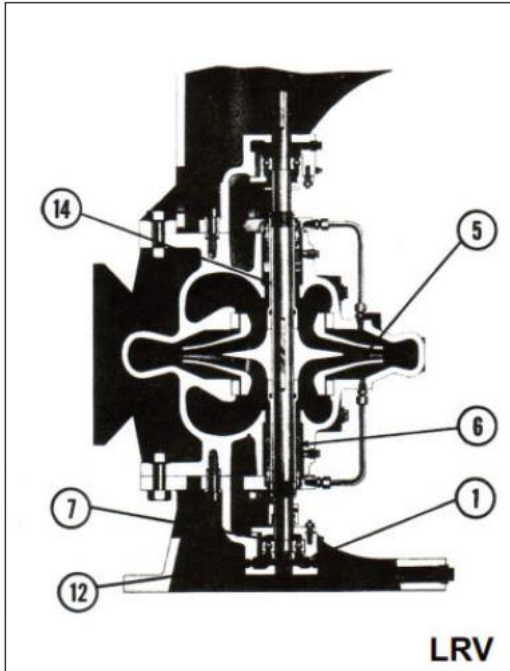


Construction Design and Features, LR Design



Applicable for LR sizes: 3" to 12"
Refer to next page for 2½" LR size

Construction Design and Features, LR Design



- 1 Separate Bearing Brackets
- 2 Straight Dowl Bushings
- 3 Mounting Feet Adjacent to Flanges
- 4 Heavy Duty Case Ring
- 5 Closed Impeller
- 6 Convertible Box
- 7 Oil or Grease Lubrication
- 8 Removable Stuffing Box Bushing
- 9 Shaft Sleeves Keyed to Shaft
- 10 Sleeve Locknuts External to Stuffing Box
- 11 'O' Ring Shaft Sleeve Seal
- 12 Bearing Locknut & Washer
- 13 Heat Treated Steel Shaft
- 14 Renewable Shaft Sleeves
- 15 Shaft Sleeve Nuts Set – Screwed to Shaft
- 16 High Efficiency, Low NPSH Impellers

Typical LR Pump Specifications

Casing

The casing shall be of the volute type and designed to produce a smooth flow with gradual changes in velocity. The casing shall be split on the horizontal centre line with the suction and discharge nozzles and casing feet cast integral with the lower casing half. The interior of the pump shall be easily inspected by removing the upper half of the casing. This shall be done without disturbing the pipe connections or pump alignment. The flanges between the halves will be sealed by a pre-cut gasket. The upper and lower halves of the casing shall be accurately located by the use of straight dowel pins to eliminate mismatch between the upper and lower halves which would impair both hydraulic and mechanical performance. The casing shall be hydro tested to one and one half times the working pressure; suction and discharge flanges shall contain drilled and tapped gauge connection. The casing shall be single volute type.

Impeller

The impeller shall be a double-suction enclosed type. It shall be hydraulically balanced by its inherent design. The impeller shall be firmly secured to the shaft by a key positioned by shaft sleeves, and both locked in place by shaft sleeve locknuts external to the stuffing box.

Renewable Case Rings

Renewable case rings shall be locked in place and protected against rotation by pins.

Impeller Rings

Securely held impeller.

Rings can be supplied as an option.

Stuffing Box Bushing

Pump Casing shall have a renewable stuffing box throat bushing

Shaft Sleeve

Renewable shaft sleeves shall be provided which extend through stuffing box. They shall be securely keyed and held in place with shaft nuts incorporating set screws for locking purposes. Shaft sleeves shall be provided and sealed with "O" rings at impeller end.

Shaft

The shaft shall be heat-treated steel, ground to accurate dimensions and polished to a smooth surface. The shaft shall have the same nominal diameter from one shaft sleeve locknut to the other to minimize fatigue failure due to stress concentration. The shaft sleeves shall protect the shaft at the stuffing box. The sleeves shall be secured in lateral position by external shaft nuts. The impeller keys shall extend into the hub of the shaft sleeves to prevent slippage between the shaft and the sleeves. Sealing to protect against leakage under the shaft sleeve shall be accomplished by the use of "O" Ring type seals, located at the keyed end between the sleeve and the shaft. Shaft shall be adequately sized and designed to minimize deflection. The maximum run-out of shaft at stuffing box face shall not exceed .002" at shut off.

Bearings

The bearings shall be single row, deep groove type ball bearings. They shall be designed and sized for at least 40000 hours calculated minimum L10 rated bearing life at shut off per ANSI B 3.15. Each bearing shall be capable of carrying both line and thrust type loads. The thrust bearings shall be securely held to the shaft by a bearing locknut and washer.

Bearing Brackets

The bearing brackets shall be separate/ integral from the pump casing and accurately machined and doweled to the casing. Oil or grease lubrication shall be provided. Grease gun fittings shall be standard on grease-lubricated pumps and a constant-level oiler shall be standard on oil lubricated pumps. Conversion from grease to oil shall be easily accomplished by simply removing the grease fittings and installing a constant-level oiler and vent. Pump design shall allow bearing to be removed without disturbing upper casing for inspection and replacement of bearings, mechanical seals, and shaft sleeves.

Packing-Mechanical Seals

As a standard, stuffing boxes shall be packed with the best quality graphite asbestos packing. Die-moulded packing shall be supplied and insure both a perfect seal and an easy installation. Mechanical seals shall be easily interchangeable with packing.

Casing Feet

The casing feet shall be integrally cast with the lower casing and be immediately adjacent to suction and discharge flanges in order to transmit and pipe strain loads to the base and foundation

Typical LR Design and Features

This section will clarify the superior strength and reliability of the LR line in comparison with designs of other conventional split-case pumps.

Bearing housing attachment to casing assures accurate rotor alignment

Misalignment of the rotor and casing can cause premature bearing failure, internal rubbing, packing or mechanical seal failure and result in costly downtime and loss of production.

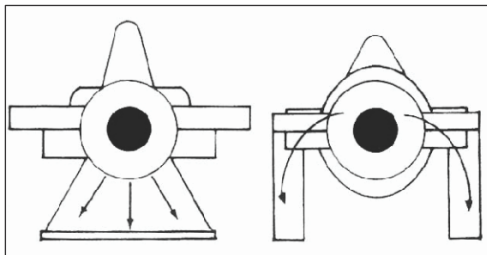
LR assures accurate alignment by use of precision-machined straight dowel bushings. Tap bolts firmly secure the separate bearing brackets which also form the bearing housing to the casing (see illustration A). This is far superior to rabbet-fit or tongue-in-groove mountings which sometimes include a "strap" bolted to the pump casing. Other designs are simply bolted to the frame without other type fitting.

LR uses the most modern boring methods available. All bearing bores and dowel bores are located within .001 inches! As an assembly, LR concentricity of bracket bores and the casing bore are held very close. This ability to machine with such preciseness, couples with dowel-bushing feature to align the bearing bracket, provides the greatest assurance of bearing-bracket and pump casing alignment.

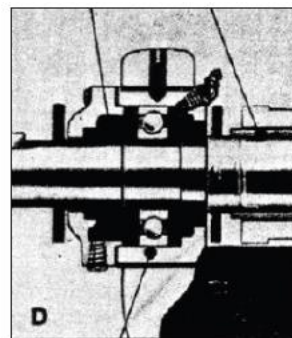
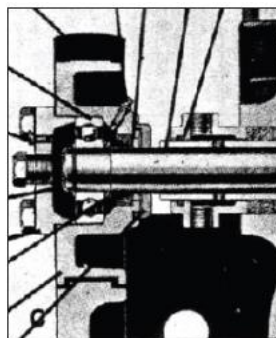
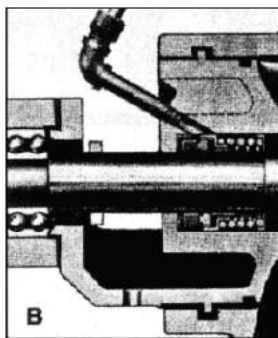
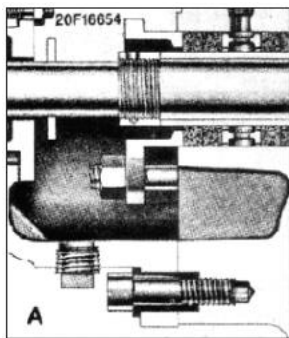
A look at other bearing-bracket-to-housing designs shows the following: B is cast integral with the stuffing box and positioned with only a rabbet fit. The stuffing box itself is tongue-in-groove to upper casing and sealed by "O" rings. This design requires the upper and lower casing halves to clamp together perfectly in order for the "O" ring seal to be effective. The bearing positioning is dependent upon three critical fits. C shows the tongue-in-groove design off the bottom of the casing secured with a bolt-on bearing cap. In D, the bearing housing is clamped to the lower casing extension with only a bolt-on bearing cap/ The use of a pin between bearing housing and bearing cap prevents the bearing housing from rotating.

Casing feet design assures long bearing life

With LR design (left below), the casing feet are mounted very close to the flanges. This allows for the immediate transmission of any pipe load through the feet and away from the upper casing – which minimizes the possibility of shifting and coupling misalignment causing premature bearing failure. Some designs (right below) use a separate mount under the bearing brackets. Pipe loads are thus transmitted through the pump flanges, suction and/or discharge, and through the pump casing shaft since the foot is only bolted under the bearing bracket.



Arrows depict the paths of pipe-strain transmission to pump feet. Location of pump feet on LR model (left) is more conducive to direct transmission in order to minimize problems with coupling alignment



In the LR pump shown in illustration A, bearing brackets are accurately aligned by straight dowel bushings. Tap bolts firmly secure brackets to the casing. Bearings and pre-machined dowel bores are located to .001 inches true position tolerance

Typical LR Design and Features

Shaft design and shaft-sleeve attachment minimize stress fatigue

The highest loads on a horizontal split-case pump shaft caused by radial hydraulic thrust occur at the impeller. Threads, undercuts, etc., in this shaft area can cause high-stress concentration. This results in fatigue failure of the shaft after a large number of stress reversals brought on by part load operation and radial deflection.

LR's shown in illustration E, maintain the same shaft diameter from one shaft sleeve locknut to the other—minimizing the potential of fatigue failure due to stress reversals. WPIL shaft sleeves are keyed to the shaft, and positioned and locked by the shaft-sleeve nuts at the outer end of the sleeve. Impeller alignment can be properly adjusted by turning the shaft-sleeve nuts in or out—a relatively easy maintenance feature. The shaft-sleeve threads are outside the “O” ring and external to the stuffing box, minimizing deterioration due to corrosion. Since both shaft sleeves as well as the impeller share the same key, a positive drive is assured on both sleeves. This design, in conjunction with removable bearing brackets, allows for most replacement seals to be installed without disrupting the upper casing half.

An alternative design shown in illustration F keys only one shaft sleeve. The shaft sleeves themselves are threaded to the shaft, in lieu of a separate sleeve locknut. The threaded area is in the wet-end assembly at the hub of the impeller. It is not external to the stuffing box which increases the danger of leakage corroding the threads—a messy maintenance problem since the threads are also located inside the “O” ring. This design is susceptible to shaft-stress fatigue failure. To accommodate opposite pump rotation, the complete rotating assembly must be disassembled and rebuilt, reversing the sleeves.

The design in illustration G, while using a sleeve driven through a key, has no threads for axial adjustment of the impeller! The shaft sleeves are locked on by snap rings, rigidly positioned to locate the impeller and requiring shims to adjust it. Gaskets in lieu of “O” rings are used to protect against leakage. There is also the potential for any hydraulic thrust transmitted through the sleeve to cause the snap ring to pop off the shaft, resulting in serious internal pump damage. The shaft is also stepped at the impeller hub and thus is susceptible to shaft-stress fatigue failure.

The design in illustration H has both sleeves keyed to the shaft and secured by a locknut screwed to the shaft. The shaft sleeve “O” ring is at the outboard end of the sleeve and leakage may occur at the impeller end. Corrosion under the sleeve is also a possibility. The shaft, because it is stepped at the impeller hub, is more likely to experience stress fatigue failure.

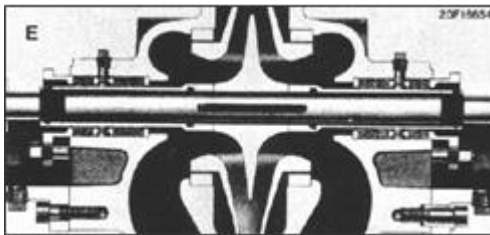


Illustration E

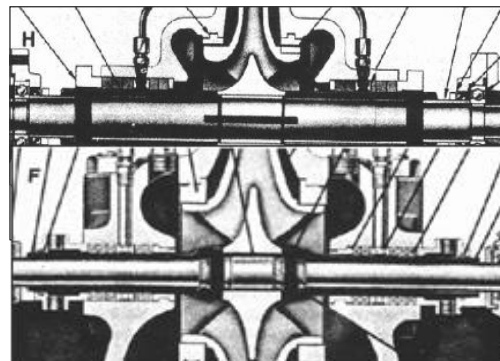


Illustration F

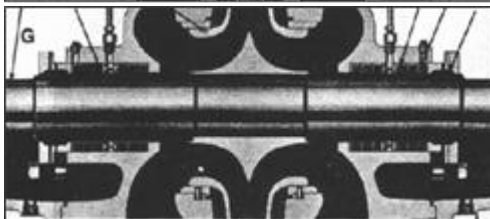


Illustration G

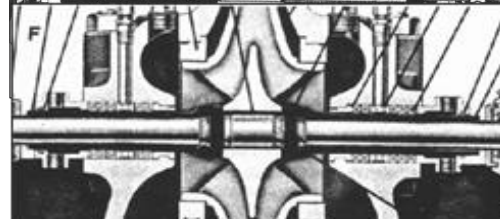


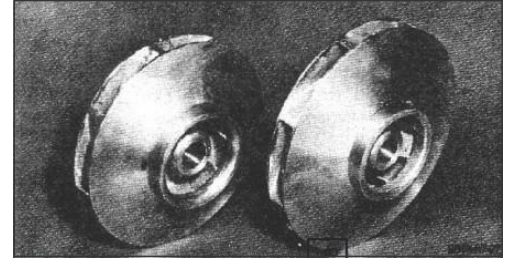
Illustration H

Typical LR Design and Features

A unique combination of design features leads to higher efficiencies and lower maintenance requirements.

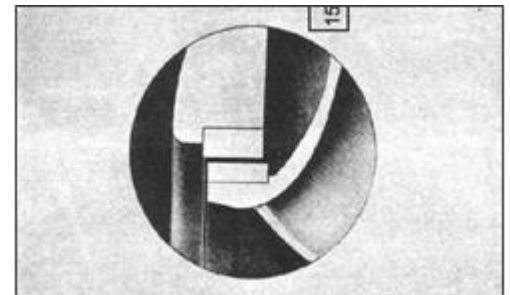
Closed impellers mean high efficiency.

Highly efficient closed impellers mean energy savings for you. All closed impellers are hydraulically balanced to further reduce bearing loads. Experience and research have shown that closed impellers also offer inherently greater axial hydraulic balance minimising thrust loads resulting in longer bearing life



Wear ring designed for easy replacement.

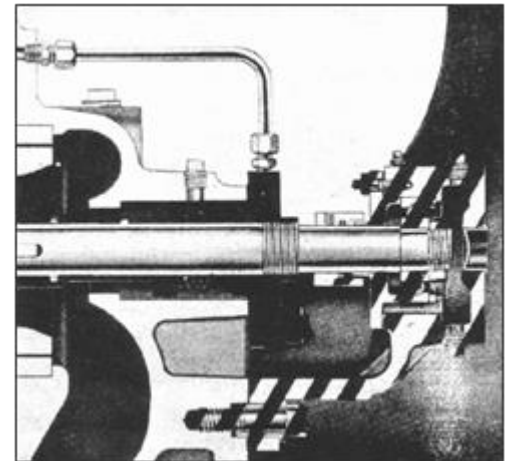
LR case wearing rings protect the pump casing from needless wear. They are renewable and held in place and protected against rotation by SS pins. Once again, easy replacement to reduce maintenance downtime and costs. The wear rings are less complex than other designs and embody a simply, heavy-cross section rectangular design for positive fit. Competitive designs use wear ring step bushings that are pin type, that is L-shaped or a “tongue-in-groove” design. Both are more difficult to replace.



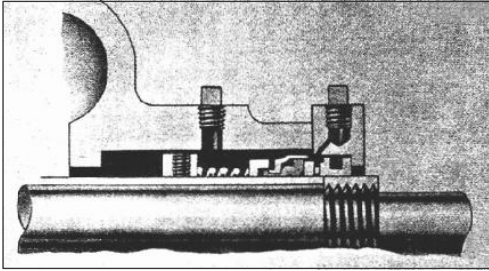
Ease of access for easy maintenance.

Merely remove the bearing brackets (crosshatched area at right) to inspect and maintain key components such as bearings, seals, packing and shaft sleeves. There’s absolutely no need to remove the upper pump casing for access to these components – which reduced maintenance time and effort appreciably.

This removable-bracket design also achieves a shorter distance between bearings which provides a more rigid shaft – resulting in less shaft deflection.



Typical LR Design and Features

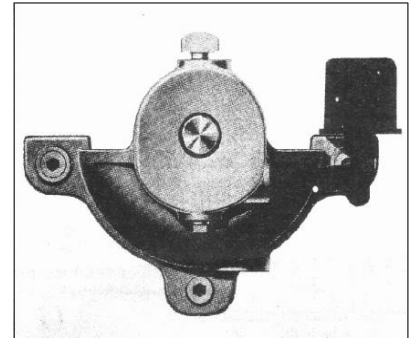


Stuffing box designed for long packing/seal life.

Because the seals or packing in the LR are adjacent to the suction side of the impeller they are sealing against the lowest pressure available WPIL employs a conventional type stuffing box – that is, easily convertible for use with packing or mechanical seal.

Oil and grease lubricated bearings.

Compatibility with your application is assured because you can choose either oil or grease lubricated bearings. And you can easily change from one the other using the same bearing housing to meet different plant specifications. The LR has fittings for grease lubrication, and a constant-level oiler for oil lubrication. Some designs require different shaft assemblies for alternate lubrication.



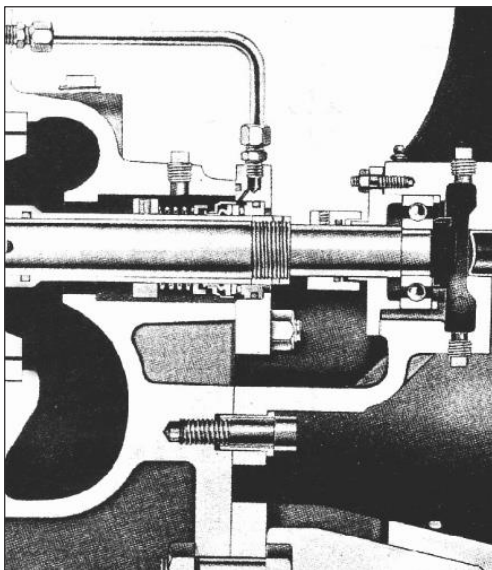
Bearing securely attached to shaft.

The thrust bearing is attached to the shaft by a locknut and washer – a method that assures a more positive fit, and is more reliable than snap rings which can bend and pop out.

More ease of maintenance features.

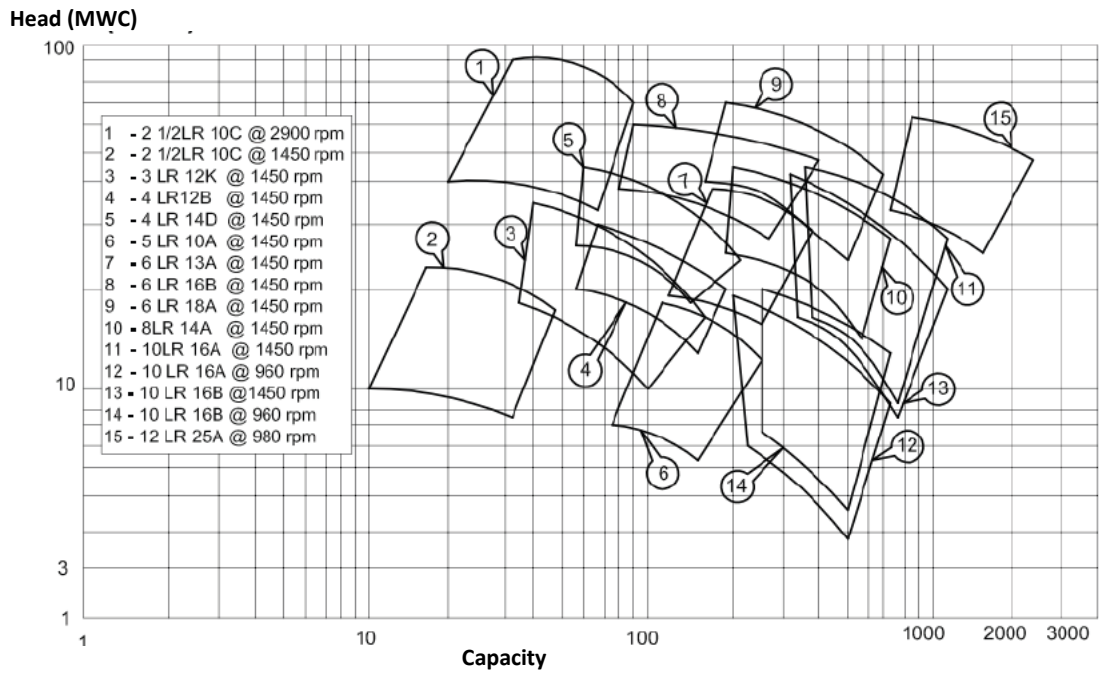
Maintenance time costs money in labour, parts and reduced production. Check these additional features designed to reduce periodic and unscheduled downtime.

- Removable, replaceable stuffing box bushing to ensure proper packing position.
- Wide range of construction materials to meet conditions of service and thus contribute to lower operating and maintenance costs.
- Shaft-sleeve nuts set-screwed to shaft prevent nuts from loosening. Also, location of exterior to stuffing box allows visibility to assure maintenance of impeller positioning.
- Impeller supported between bearings, rather than overhung like an end-suction centrifugal, reduces bearing load and increases life

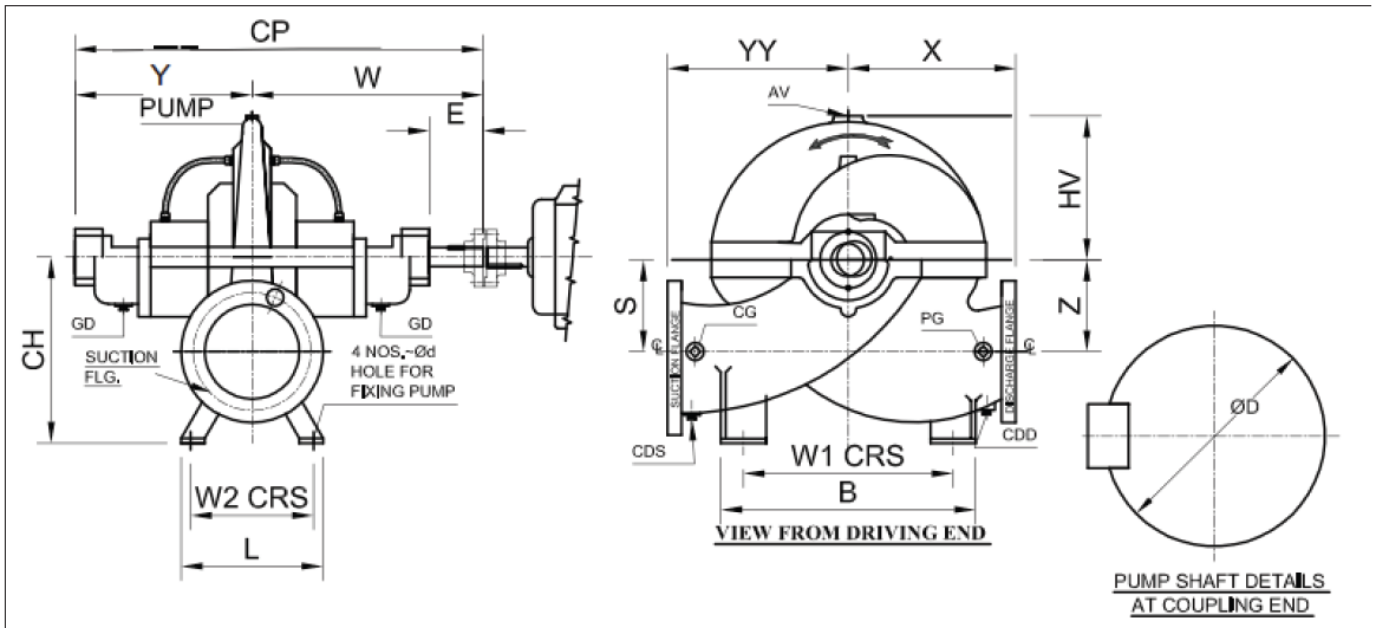


Range Chart of LR Series Pumps

Horizontal Split Case Pump LR Series Coverage Chart



Dimensions of LR Pumps



Pump Model	Suct. Size	Disch. Size	X	YY	Y	W	CP	HV	CH	S	Z	B	W1	L	W2	d	Ø SD	E	Weight in kg
2½ LR 10	80	65	203	222	221	362	583	181	267	127	165	254	178	254	184	16	25	90	130
3 LR 12	125	80	213	267	308	371	679	210	292	146	184	254	178	254	184	16	25	63	180
4 LR 12	150	100	229	279	311	375	686	222	330	162	197	254	178	254	184	16	25	64	200
4 LR 14	150	100	318	305	330	432	762	248	330	162	194	356	267	330	264	20	28.6	102	230
5 LR 10	150	125	241	330	311	375	686	-	-	165	178	-	-	-	-	20	24.97	64	170
6 LR 13	200	150	279	356	375	489	864	-	-	190.5	229	-	-	-	-	20	38.1	114	280
6 LR 16	200	150	356	381	375	489	864	292	394	194	216	356	267	330	264	20	38.1	114	350
6 LR 18	250	150	318	432	438	553	991	330	457	229	267	457	343	406	343	22	54	115	500
8 LR 14	250	200	292	432	375	489	864	273	457	225	254	356	267	330	264	20	38.1	114	375
10 LR 16	300	250	356	457	438	553	991	318	533	267	267	457	343	406	343	22	54	115	625
12 LR 25	450	300	533	629	593	775	1368	480	737	368	457	711	584	610	533	24	82.5	182	1340

Due to continuous improvement, contact Sterling Pumps for confirmation of measurements

Materials of Construction

Fittings	Standard Fitted	All Iron Fitted	All Bronze Fitted	S Steel Fitted
Casing	Cast Iron	Cast Iron	Bronze	S Steel
Impeller	Cast Iron	Cast Iron	Bronze	S Steel
Casing Rings	Cast Iron	Cast Iron	Bronze	S Steel
Gland	Cast Iron	Cast Iron	Bronze	S Steel
Shaft	Steel	Steel	S Steel	S Steel
Shaft Sleeve	S Steel	Steel	S Steel	S Steel
Shaft Nuts	S Steel	Steel	S Steel	S Steel
Bearing Housing	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Bearings	SKF or Equal Anti – Friction Type			
Packing	Graphite Impregnated Asbestos			
Base Plate	Fabricated Steel			
Coupling	Pin Bush			

Optional pumps in higher alloys like duplex steel etc. can be supplied

Flange Data	ANSI B 16.5 CLS. 150											
Nozzle Size (inch)	2	2.5	3	4	5	6	8	10	12	14	16	18
O.D Flange (mm)	152	178	191	229	254	279	343	406	483	535	595	635
Flange Thickness (mm)	19.5	22.5	24	24	24	25.5	29	30.5	32	35	37	40
No. of Bolt Holes	4	4	4	8	8	8	8	12	12	12	16	16
Size of Bolt Holes (mm)	20	20	20	20	23	23	23	26	26	29	29	32
Bolt Circle Diameter (mm)	120.5	139.7	152.4	190.5	215.9	241.3	298.4	361.9	431.8	476.2	539.7	577.8

Engineering Data

Pump Size & Type		Suction Size	Discharge Size	Maximum RPM (1)	Construction (6)	Shaft Diameter		Shaft Sleeve Diameter at Packing	Stuffing Box Data			
Horizontal	Vertical					At Impeller	At coupling		Bore	Depth of Box	Size of Packing	No Rings per Box
2½ LR 10	-	80	65	3600	SV	31.75	24.97	28.575 (3)	44.45	53.98	7.938	5
3 LR 12	3 LR 12	125	80	1800	SV	31.75	24.97	38.1	57.15	74.61	9.5252	5
4 LR 12	4 LR 12	150	100	1800	SV	34.925	24.97	38.1	57.15	74.61	9.5252	5
4 LR 14	4 LR 14	150	100	1800	SV	34.925	28.575	41.275	61.91	76.2	9.5252	5
5 LR 10	5 LR 10	150	125	1800	SV	34.925	24.97	38.1	57.15	74.61	9.5252	5
6 LR 13	6 LR 13	200	150	1800	SV	44.45	38.1	50.50.88	71.44	79.38	9.5252	5
6 LR 16	6 LR 16	200	150	1800	SV	44.45	38.1	76.2	71.44	79.38	9.5252	5
6 LR 18	6 LR 18	250	150	2000(2)	DV	63.5	53.975	50.8	101.6	95.25	12.7	5
8 LR 14	8 LR 14	250	200	1800	SV	44.45	38.1	76.2	71.44	79.38	9.525	5
10 LR 16	10 LR 16	300	250	1800	DV	63.5	53.975	107.95	101.6	95.25	12.7	5
12 LR 25	-	450	300	1200	DV	95.25	82.55		139.7	127	15.88	5

Pump Size & Type		Shaft Span Between Bearing	Casing Thickness (5)	Maximum Pressure Ratings (kg/cm ²)		SKF Ball Bearing No.		GD2 of Rotor (Wet) kg. m ²	Bare Pump Weight (kg)
Horizontal	Vertical			Cast Iron – 125 lb Std. Flat Face Flanges Maximum Suction	Cast Iron – 125 lb Standard Flat Face Flanges	Outboard	Inboard		
2½ LR 10	-	407.988	12.7	-	-	5305	6305	0.1651	130
3 LR 12	3 LR 12	536.575	9.652	10.5	18.0	6305	6305	0.633	180
4 LR 12	4 LR 12	542.925	9.652	10.5	18.0	6305	6305	0.5503	200
4 LR 14	4 LR 14	579.438	12.7	10.5	18.0	5306	6306	1.1006	230
5 LR 10	5 LR 10	542.925	9.652	10.5	18.0	6305	6305	1.300	170
6 LR 13	6 LR 13	652.463	14.224	10.5	18.0	6406	6308	1.400	280
6 LR 16	6 LR 16	652.463	15.748	10.5	18.0	6406	6406	1.5408	350
6 LR 18	6 LR 18	750.888	15.748	10.5	18.0	6309	6211	2.7515	500
8 LR 14	8 LR 14	652.463	15.748	10.5	18.0	6406	6308	3.0266	375
10 LR 16	10 LR 16	750.888	15.478	10.5	18.0	6309	6211	2.0636	625
12 LR 25	-	1038.86	19.05	10.5	18.0	6217	6217	13.479	1340

For Performance Curves, Visit www.sterlingpumps.com.au



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