FLOWSERVE

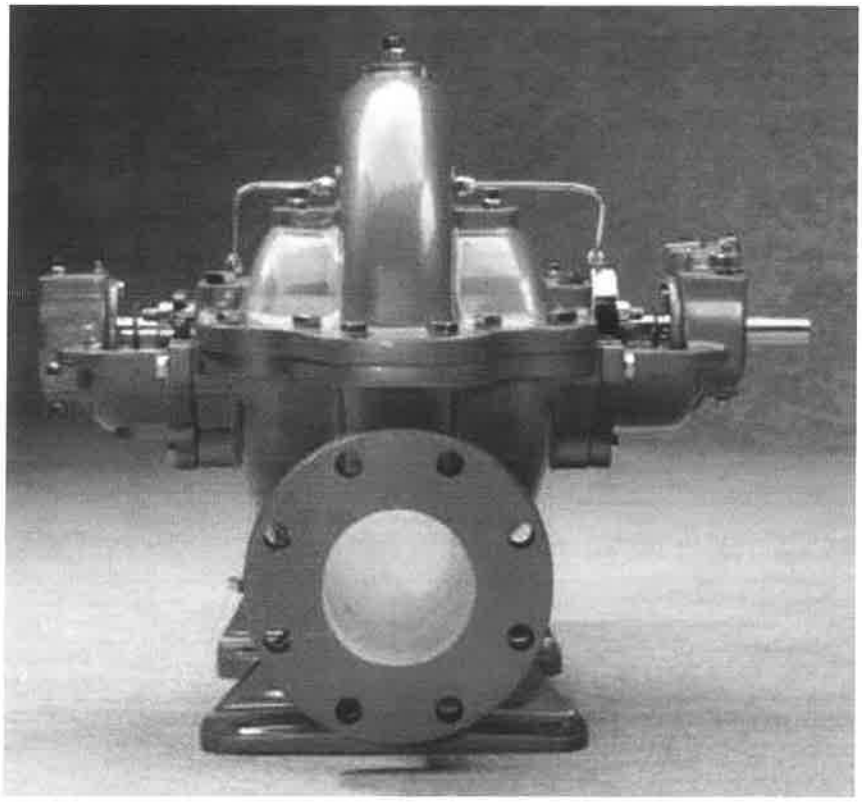
USER INSTRUCTIONS

WORTHINGTON SIMPSON® L and U

Horizontal, split case, volute type centrifugal pumps for water and general service

PCN=85392721 07-12 (Based on C953KH025)

Installation
Operation
Maintenance



⚠ ***These instructions must be read prior to installing, operating, using and maintaining this equipment.***

Experience In Motion

3.4 Performance and operating limits

This product has been selected to meet the specifications of your purchase order. See section 1.5.

The following data is included as additional information to help with your installation. It is typical, and factors such as temperature, materials, and seal type may influence this data. If required, a definitive statement for your particular application can be obtained from Flowserve.

3.4.1 Operating limits

Pumped liquid temperature limits*	- 20 to + 150 °C (- 4 to + 302 °F)
Maximum ambient temperature*	- 20 to + 40 °C (- 4 to +104 °F)
Maximum soft solids in suspension*	up to 3 % by volume (refer for size limits)
Maximum pump speed	refer to the nameplate

*Subject to written agreement from Flowserve.

3.4.2 Pump and impeller data

Pump size	Impeller minimum passage size mm (in)	Nominal wear ring diameter mm (in)	Mean radial wear ring clearance mm (in)
3L2	15 (0.59)	112.88 (4.44)	0.09 (0.003)
3L13	19 (0.75)	112.34 (4.42)	0.22 (0.009)
4L13	28.5 (1.13)	152.00 (5.98)	0.22 (0.009)
6L3	20 (0.78)	157.00 (6.18)	0.22 (0.009)
6L11	33 (1.31)	161.52 (6.36)	0.22 (0.009)
6L13	33 (1.31)	177.39 (6.98)	0.22 (0.009)
2U13	14 (0.55)	110 .00 (4.33)	0.16 (0.006)
3U15	14 (0.55)	152.00 (5.98)	0.23 (0.009)
4U13	16 (0.63)	190.00 (7.48)	0.20 (0.008)
4U18	20 (0.79)	190.00 (7.48)	0.20 (0.008)
6U18H	41 (1.61)	248.00 (9.76)	0.28 (0.011)

* May be up to 0.13 mm (0.005 in.) larger if casing ring and impeller have a tendency to gall.

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

4 INSTALLATION

Ex Equipment operated in hazardous locations must comply with the relevant explosion protection regulations. See section 1.6.4, Products used in potentially explosive atmospheres.

4.1 Location

The pump should be located to allow room for access, ventilation, maintenance and inspection with ample headroom for lifting and should be as close as practicable to the supply of liquid to be pumped.

Refer to the general arrangement drawing for the pump set.

4.2 Part assemblies

Motors may be supplied loose on vertically mounted pumps, typically on motor frame sizes 315 and above. It is the responsibility of the installer to ensure that the motor is assembled to the pump and lined up as detailed in section 4.5.2, *Alignment methods*.

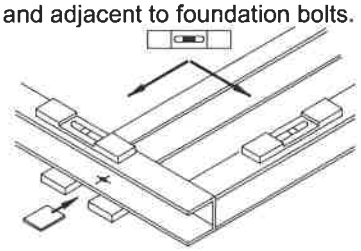
4.3 Foundation

⚠ CAUTION There are many methods of installing pump units to their foundations. The correct method depends on the size of the pump unit, its location and noise vibration limitations. Non-compliance with the provision of correct foundation and installation may lead to failure of the pump and, as such, would be outside the terms of the warranty.

Ensure the following are met:

a) The baseplate should be mounted onto a firm foundation, either an appropriate thickness of quality concrete or sturdy steel framework. (It should NOT be distorted or pulled down onto the surface of the foundation, but should be supported to maintain the original alignment.)

b) Install the baseplate onto packing pieces evenly spaced and adjacent to foundation bolts.



c) Level with shims between baseplate and packing pieces.

d) The pump and driver have been aligned before dispatch however the alignment of pump and motor half coupling must be checked. If this is incorrect, it indicates that the baseplate has become twisted and should be corrected by re-shimming.

e) Vertical pumps should be mounted following the practices outlined for baseplate mounted pumps. (Larger sizes may need the motor fitting after installing the pump - refer to section 4.5.2.)

f) If the pump is driven via a universal joint drive shaft there may be a requirement to offset the pump shaft with respect to the driver to optimize the universal joint drive shaft bearing life. This offset will typically be in the range 0 to 4 degrees depending on shaft design. Please consult the separate User Instructions before installation.

g) Any support for the universal joint drive shaft plummer blocks must not exhibit resonant frequencies in the range 0.8 to 1.2 N where N = pump running speed.

Type and size	Maximum forces (F) in N (lbf) and maximum moments (M) in Nm (lbf•ft)											
	Suction						Discharge					
	Fx	Fy	Fz	Mx	My	Mz	Fx	Fy	Fz	Mx	My	Mz
3L2	3680 (826)	2880 (648)	2100 (472)	2120 (1563)	1120 (826)	1500 (1106)	1540 (346)	1760 (396)	1280 (288)	880 (649)	480 (354)	640 (472)
3L13	2940 (661)	2310 (519)	1680 (378)	1700 (1254)	900 (664)	120 (885)	1540 (346)	1760 (396)	1280 (288)	880 (649)	480 (354)	640 (472)
4L13	4410 (991)	3470 (779)	2520 (566)	2550 (1880)	1350 (996)	1800 (1327)	1920 (432)	2200 (495)	160 (360)	1100 (811)	600 (442)	800 (590)
6L3	5880 (1322)	4620 (1039)	3.36 (755)	3400 (2507)	1800 (1327)	2400 (1770)	2880 (648)	3300 (742)	2400 (540)	1650 (1217)	900 (664)	1200 (885)
6L11	5880 (1322)	4620 (1039)	3.36 (755)	3400 (2507)	1800 (1327)	2400 (1770)	2880 (648)	3300 (742)	2400 (540)	1650 (1217)	900 (664)	1200 (885)
6L13	5880 (1322)	4620 (1039)	3.36 (755)	3400 (2507)	1800 (1327)	2400 (1770)	2880 (648)	3300 (742)	2400 (540)	1650 (1217)	900 (664)	1200 (885)
2U13	2350 (529)	1850 (415)	1340 (302)	1360 (1003)	720 (531)	960 (708)	1030 (230)	1170 (263)	850 (192)	590 (431)	320 (235)	430 (314)
3U15	3680 (826)	2880 (648)	2100 (472)	2120 (1563)	1120 (826)	1500 (1106)	1540 (346)	1760 (396)	1280 (288)	880 (649)	480 (354)	640 (472)
4U13	4410 (991)	3470 (779)	2520 (566)	2550 (1880)	1350 (996)	1800 (1327)	1920 (432)	2200 (495)	160 (360)	1100 (811)	600 (442)	800 (590)
4U18	4410 (991)	3470 (779)	2520 (566)	2550 (1880)	1350 (996)	1800 (1327)	1920 (432)	2200 (495)	160 (360)	1100 (811)	600 (442)	800 (590)
6U18H	5880 (1322)	4620 (1039)	3.36 (755)	3400 (2507)	1800 (1327)	2400 (1770)	2880 (648)	3300 (742)	2400 (540)	1650 (1217)	900 (664)	1200 (885)

Notes:

1. F= External force, tensile or compression
   M=External moment, cw or ccw
2. Forces and Moments may be applied simultaneously in any direction.
3. Values apply to all materials.
4. Higher loads may be acceptable, if direction and magnitude of individual loads are known, but these need written approval from Flowserve.
5. Pumps must be on rigid foundations and baseplates fully grouted.
6. .Pump/baseplate should not be used as pipe anchor. Suction and discharge piping should be anchored as close as possible to the pump flanges to reduce vibration and prevent strain on the pump casing. Expansion joints are recommended. They must be properly tied and located on the side of the pipe anchor away from the pump.
7. The pump mounting bolt torques specified must be used to prevent relative movement between the pump casing and baseplate. (See section 6.6 *Fastener Torques.*) The bolt material must have a minimum yield strength of 600 N/mm² (87 000 lb/in²).

4.6.3 Suction piping

a) The inlet pipe should be one or two sizes larger than the pump inlet bore and pipe bends should be as large a radius as possible.

b) Pipework reducers should be conical and have a maximum total angle of divergence of 15 degrees.

c) On suction lift the piping should be inclined up towards the pump inlet with eccentric reducers incorporated to prevent air locks.

d) On positive suction, the inlet piping must have a constant fall towards the pump.

e) Flow should enter the pump suction with uniform flow, to minimize noise and wear. This is particularly important on large or high-speed pumps which should have a minimum of five diameters of straight pipe on the pump suction between the elbow and inlet flange. See section 10.3, *Reference 1,* for more detail.

f) Inlet strainers, when used, should have a net `free area' of at least three times the inlet pipe area.

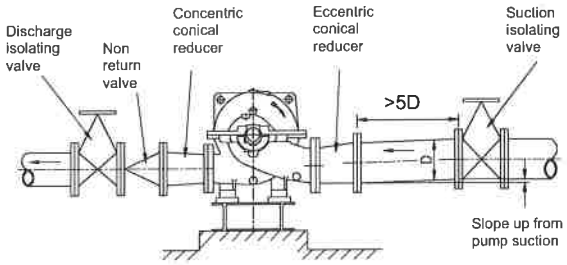
g) Do not install elbows at an angle other than perpendicular to the shaft axis. Elbows parallel to the shaft axis will cause uneven flow.

h) Except in unusual circumstances strainers are not recommended in inlet piping. If considerable foreign matter is expected a screen installed at the entrance to the wet well is preferable.

i) Fitting an isolation valve will allow easier maintenance.

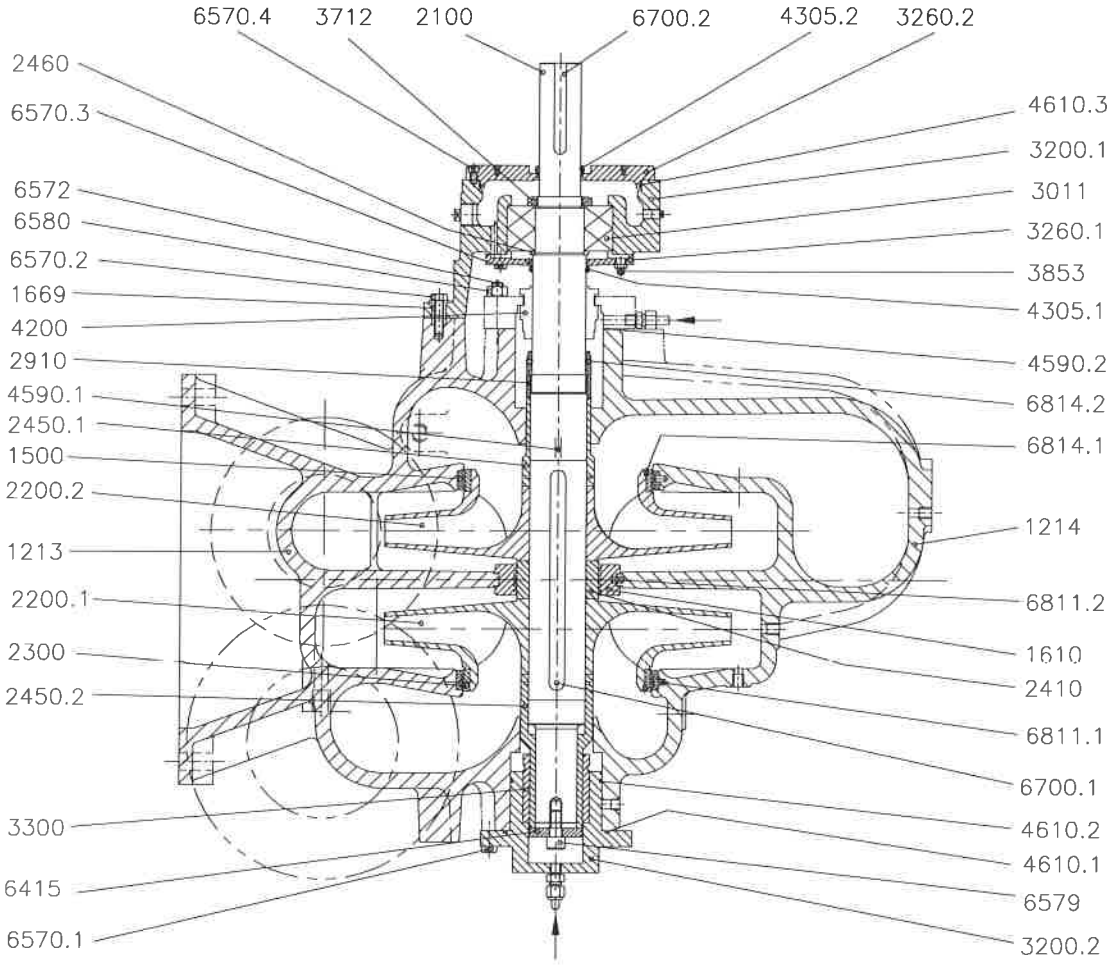
j) Never throttle pump on suction side and never place a valve directly on the pump inlet nozzle.

Typical design – flooded suction



Note:
Ideally reducers should be limited to one pipe diameter change, i.e. 150 mm (6 in.) to 200 mm (8 in.). Must have a maximum total angle of divergence of 15 degrees.

8.3 Sectional drawing – U Pump vertival, grease lubricated, cartridge seal



Drawing taken from 601060-003-2501

8.3.1 Parts list – 2-stage impeller Vertical

Item	Description
1213	Casing half - lower
1214	Casing half - upper
1500	Casing wear ring
1610	Inter stage bush
1669	Dowel Bush*
2100	Shaft
2200.1	Impeller (first stage)
2200.2	Impeller (second stage)
2300	Impeller wear ring
2410	Inter stage sleeve
2450.1	Shaft sleeve (upper)**
2450.2	Shaft sleeve (lower)
2460	Bearing spacer
2910	Shaft nut
3011	Ball bearing
3200.1	Bearing housing (upper)
3200.2	Bearing housing (lower)
3260.1	Bearing cover
3260.2	Bearing cover
3300	Bearing bush
3712	Bearing nut
3853	Grease nipple
4200	Mechanical seal (Cartridge)
4305.1	Shaft seal ring
4305.2	Shaft seal ring
4420	Seal pipe
4590.1	Gasket
4590.2	Gasket
4590.3	Gasket ***
4610.1	O-ring
4610.2	O-ring
4610.3	O-ring
6415	Cap
6570.1	Screw
6570.2	Screw
6570.3	Screw
6572	Stud
6579	Socket head cap screw
6580	Nuts
6700.1	Key
6700.2	Key
6811.1	Pin
6811.2	Pin
6814.1	Grub screw
6814.2	Grub screw

* Dowel bush only on 6U18H
** Shaft sleeve not fitted on 2U13.
*** Impeller gasket not fitted on 2U13