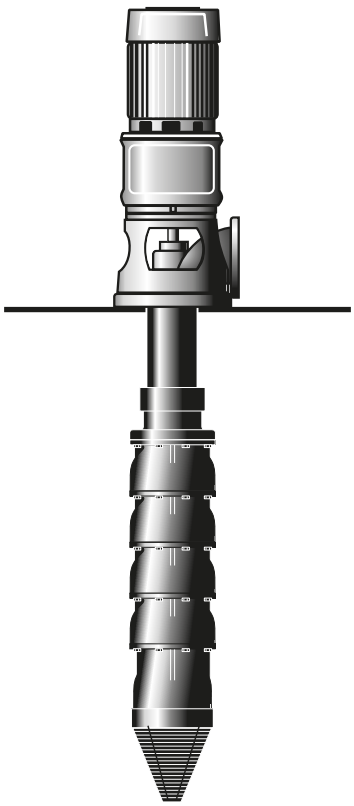
PENTAIR

INSTALLATION AND OPERATING INSTRUCTIONS

VERTICAL TURBINE PUMPS



Southern Cross

Everflow Pumps

IMPORTANT

This instruction book should be used as a guide only as pump installation should only be carried out by qualified and experienced personnel using certified lifting and handling equipment.

PRELIMINARY PRECAUTIONS

RISK OF DAMAGE TO THRUST BEARING ASSEMBLY

WARNING: Do not restrict or shut off the discharge of the pump. The pumping characteristics of a turbine pump are such that the load on the thrust bearing assembly increases significantly as the discharge is throttled down from its operating duty point.

OVERPUMPING OF BORES

The warranty covers the failure of parts due to faulty materials or workmanship only and does not cover failure or excessive wearing of pump components or shafting due to overpumping of bores. Everflow Pumps will not accept any responsibility or liability for bores or pumps ruined as a result of overpumping.

Where possible pumps should be installed in properly screened and developed bores. When installed in uncased or slotted cased bores, care should be taken to ensure that the bore is not being overpumped (solids being discharged with the water), causing damage to both the pump and bore.

Frequent or continuous pumping of sand indicates that erosion is occurring in the bore, forming a cavity in the water bearing strata, which will ultimately result in the bore collapsing, causing loss of water supply and possible loss of pump and piping etc.

In properly screened and developed bores, damage to the bore by over pumping is less rapid, but damage to pump bearings and shafting will result from intermittent supply of water to the pump inlet imposing varying tension on the line shaft causing it to whip in the column pipe. This damage can also result from overpumping in uncased and slotted cased bores.

To guard against overpumping…

…do not use the pump to clean out or test bores. This should be done before installation by the well borer using the correct type of pump and measuring equipment.

…accurately determine the capacity of the bore, and pumping levels before installation so that the pump can be set at the correct pumping level.

…the amount of water discharged should not exceed 80% of the rate at which the bore will deliver absolutely clear water.

CHECKING THE BORE OR WELL

The Bore or Well should be checked for…

…straightness of hole. A misaligned bore can bend the column pipe and cause excessive vibration and rapid wear on the shaft and bearings.

…diameter of casing. Must be of sufficient diameter to allow the pump to easily installed and retrieved.

…depth. The bore depth must be checked before pump installation. The pump strainer must have a minimum of 1.5 metres clearance from the bottom of the bore.

AIR OR GAS IN BORE

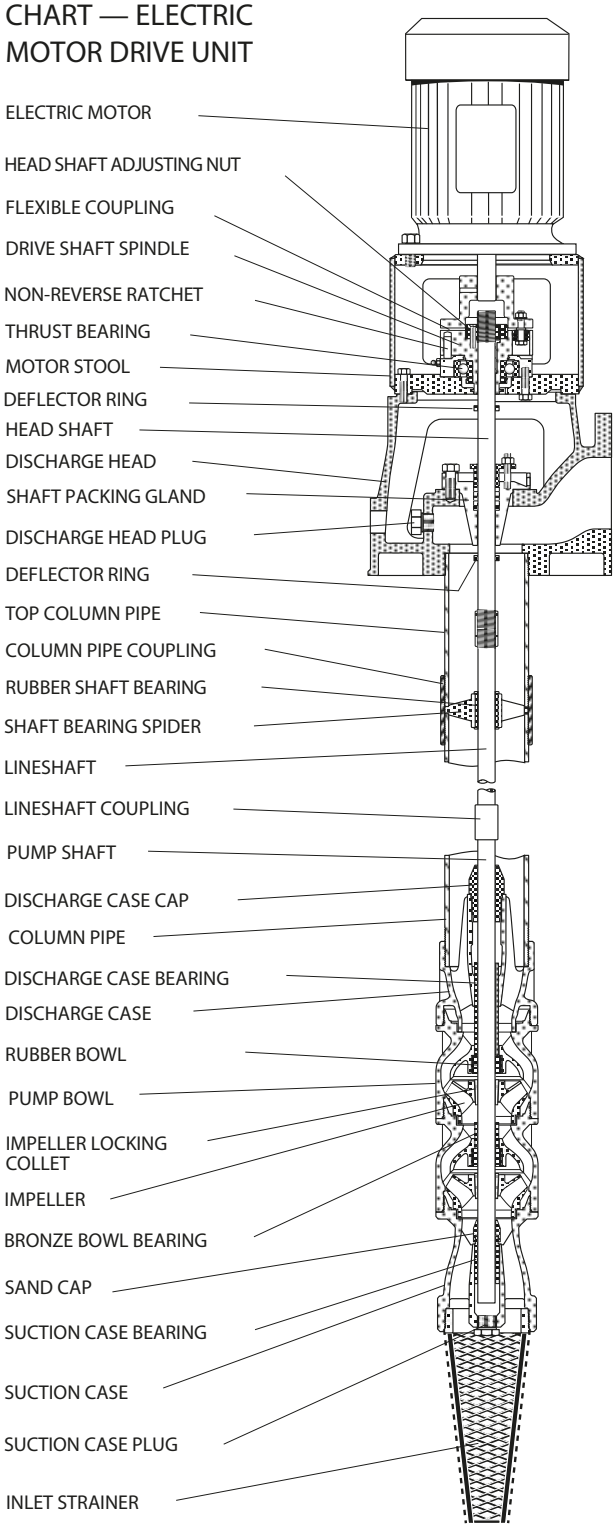
Air or gas can be the cause of poor pump performance, vibration and damage, or even prevent the pump from delivering any water at all.

HANDLING OF PARTS

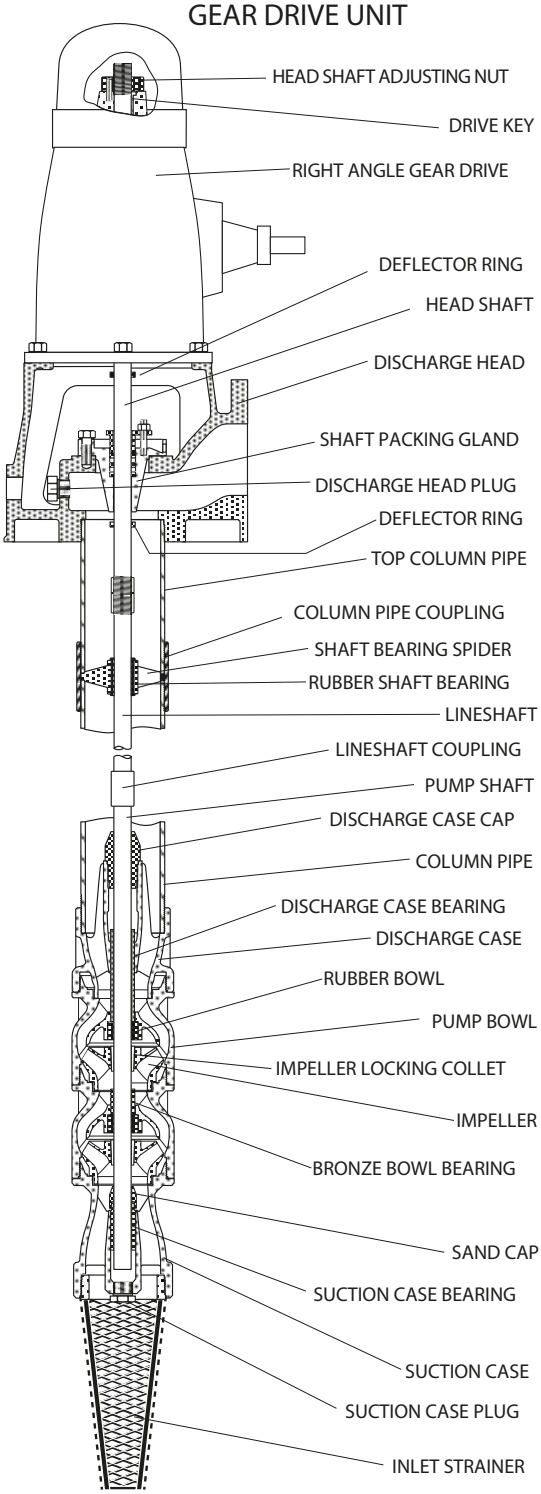
All parts should be handled with care to prevent damage. Particular care must be taken with column and shafting to avoid misalignment resulting in poor performance and eventual failure.

Check all parts for transport and handling damage before installation.

PARTS IDENTIFICATION CHART — ELECTRIC MOTOR DRIVE UNIT



PARTS IDENTIFICATION CHART — RIGHT ANGLE GEAR DRIVE UNIT



INSTALLATION

PUMP FOUNDATION

The foundation is usually constructed as a reinforced, cast, concrete block approximately 150mm wider than the base of the discharge head around all sides. Size of the foundation is dependent on allowable soil loadings and must be capable of carrying the combined weight of the pump, column pipe, shafting, drive head, discharge head and column full of water. Vital pump and shaft adjustments and alignments will be disturbed if the foundation subsides.

For installations incorporating direct coupling to right angle gear drive head, the foundation for the pump and driver should be integral.

Use of a wooden template will ensure accurate location of discharge head foundations bolts in the concrete foundation and will also ensure that the column pipe and pump will be centrally located in the bore casing.

HOISTING

Lifting equipment must be of sufficient capacity to safely lift and hold the entire pump unit, and must reach a height of 5 metres above the foundation. Column pipes and shafting require special attention, as these parts are manufactured to accurate alignment, and if dropped or sprung in any way, should not be installed.

INSTALLING THE PUMP

The pump should be handled carefully to prevent damage. Secure a pump lifting tool and raise the pump assembly into a vertical position taking care not to damage the strainer. Lower pump assembly into well and support on pipe clamps fitted to the bowl assembly just below the pump outlet and remove the lifting tool. Note: Wrap sacking or similar material around pump to avoid damage.

COLUMN PIPE AND SHAFTING

Note… Drive shafts and drive shaft couplings are screwed left-hand thread.
Column pipes and column pipe sockets are screwed right-hand thread.

Assemble 3 metre lengths of column and shafting incorporating two 1.5 metre lengths of column pipe (as supplied with socket and bearing fitted) and one 3 metre length of shaft. Clean all faces and threads and inspect for damage or burrs etc. Pipe threads must be thoroughly cleaned and lubricated. Carefully fit shaft through bearings and screw the two lengths together and tighten with chain wrenches. Carefully raise the assembly using column pipe lowering tool fitted at the socket end of the 3 metre length, firmly supporting the lower end of the shaft to prevent it from slipping through the bearings and damaging the threads. Lift the assembly over the pump and connect shaft to pump shaft coupling using anti-seize compound on the threads. Shaft faces must butt solidly with an equal amount of shaft thread showing at each side of the coupling. Lock shafts using two stilsons.

Clean and lubricate the column pipe and pump discharge case threads and screw the column fully into the pump outlet and tighten using chain wrenches. Column pipe threads are right-hand and care should be taken to start the threads squarely by hand to avoid cross threading.

Take the weight of the pump and length of column pipe on the lifting equipment and remove the pipe clamp from the pump. Lower the assembly into the well and support on the foundation with pipe clamps. Coat the threads of the drive shaft with anti-seize compound and fit a drive shaft coupling.

Measure the length of shaft protruding from the column pipe and ensure this remains constant on all sections added. Any variation will indicate incorrect butting of parts which must be corrected.

Repeat this procedure for the remaining 3 metre lengths of column and shaft .

INSTALLATION (CONT'D)

DISCHARGE HEAD

When all of the 3 metre sections of column pipe have been installed in the bore the discharge head can be fitted. Screw the head shaft into the drive shaft coupling of the assembled column pipe and shafting so that the long threaded end with the keyway is to thetop. Tighten the shaft coupling securely . Remove packing gland from discharge head and screw top column pipe (short length of column without socket) into base of discharge head and tighten. Lift discharge head with top column pipe fitted and lower into position over the head shaft and column pipe in bore. Screw into socket on top of column pipe and tighten securely.

Take the weight of the discharge head assembly and column pipe and remove the pipe clamps. Lower the complete assembly, guiding the discharge head over the foundation bolts, onto the foundation. Check that the head shaft is centralised in the packing box. If not accurately aligned the discharge head base will have to be shimmed at the corners to centre the shaft. To confirm accurate alignment temporally fit the motor stool with thrust bearing and check shaft alignmentt through the drive shaft spindle. When alignment is finally adjusted remove the motor stool assembly and grout under the discharge head leaving the shims in place. Allow 48 hours before tightening down the foundation bolt nuts.

When the discharge pipe is fitted to the discharge head it must be supported so that no load is transmitted to the discharge head to disturb the alignment.

PACKING GLAND

Slide the stainless steel deflector ring onto the head shaft into position just below the packing gland. Fit the packing gland assembly over the shaft and bolt into the discharge head. If packing has been removed reinstall in the order in which they were originally fitted, making sure that the joints in the packing rings are staggered. Do not tighten gland onto packing at this stage. (see adjusting packing gland).

MOTOR STOOL WITH THRUST ASSEMBLY

Remove motor shaft half of flexible coupling and fit motor stool and thrust assembly over head shaft and bolt to discharge head. Rotate shaft spindle to align keyways and fit key. Screw head shaft adjusting nut onto shaft (right-hand thread). Thrust bearings are pre-greased during factory assembly and no further grease should be added during installation, as excessive greasing could cause overheating. A small amount of grease should be added every 1,000 hours of running.

ADJUSTING IMPELLER SETTINGS

Slowly raise the impellers by screwing adjusting nut on head shaft until impellers break free from the bowls allowing free rotation of pump and no binding of impellers in bowls. Final adjustment is now made by raising impellers to measurements calculated using the following formula and multiple 'X' for different pump models as per following table.

To calculate impeller lift — multiply 'X' by pump setting and total discharge head (T.D.H.) of the particular pump.

Example: 200F Pump with 1" Shaft
Pump Setting = 45m
T.D.H. = 70m
Impeller Lift = .00115 x 45 x 70 = 3.6mm

Secure adjusting nut with the locking screw. This setting is extremely important to the performance and life of the pump and should be rechecked after a running-in period.

INSTALLATION (CONT'D)

IMPELLER SETTING TABLE

PUMP MODEL	COLUMN SHAFT DIAM.	'X' MULTIPLIER
150R	25.4 (1″)	.00045
180R	25.4 (1″) 31.75 (1-1/4″)	.00076 .0005
200F	25.4 (1″) 31.75 (1-1/4″)	.00115 .00075
250R	25.4 (1″) 31.75 (1-1/4″) 38.1 (1-1/2″)	.00120 .00078 .00054
250F	25.4 (1″) 31.75 (1-1/4″) 38.1 (1-1/2″)	.002 .0013 .0009
300F	31.75 (1-1/4″) 38.1 (1-1/2″) 44.4 1-3/4″)	.0015 .00106 .00077

FITTING ELECTRIC MOTOR

Fit motor shaft key and motor shaft coupling to electric motor, lock with setscrew and temporally fit motor to motor stool before fitting drive pins and bushes to coupling to check motor for correct direction of rotation. It must run ANTI-CLOCKWISE when viewed from the top. Fit drive pins and bushes and adjust clearance between coupling halves to a maximum of 1.5mm and tighten locking screws securely onto the coupling driving half key. To maintain alignment of the flexible coupling the drive pin nuts must be tightened evenly and progressively.

ADJUSTING PACKING GLAND

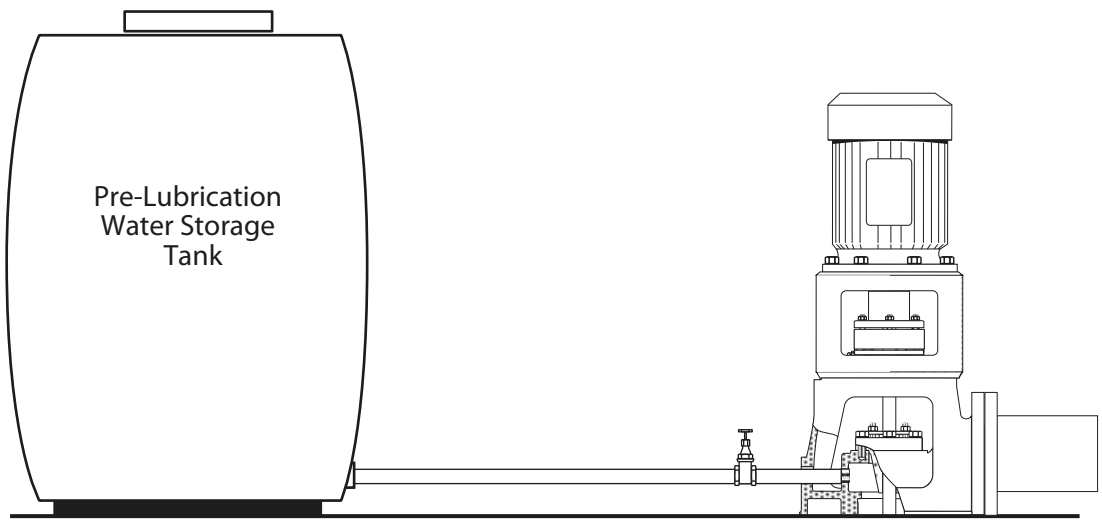
Adjust the shaft packing gland with the pump operating by slowly tightening the gland nuts until it leaks slightly. Do not tighten until no water flows as the packing will not be lubricated and will wear quickly.

PRE-LUBRICATION

Each time the pump is started the rubber lineshaft bearings may have to be pre-lubricated with water. Pre-lubrication varies with pump size and setting. Where a supply of water for pre-lubrication is not available a tank must be installed to gravity feed into the tapping in the discharge head located on the opposite side to the discharge. Connecting pipe should be of equal size to the tapping in the discharge head, and include an automatic or manual gate valve. For the initial start-up the tank will need to be filled from an external source but is refilled by the pump for future starts. Allow 75% of the water to drain into the column before starting pump. The gatevalve on the pre-lubrication line is left open on start-up and closed when the tank is filled by the pumped water ready for the next start. Pre-lubrication is required on all installations where the distance from the static water level to the discharge head exceeds 15 metres. . Where pre-lubrication is fitted, never start the pump without lubrication of the bearings irrespective of the interval between start up, as the bearings may burnt out.

The recommended pre-lubrication tank capacity for various column sizes and settings is as follows…

Column Size (mm)	Pump Setting (m)		
75 100	60 45	105 90	
130 150	35 30	75 60	150 120
200 250 300		45 35 35	120 105 60
TANK SIZE LITRES	100	200	400



INSTALLATION AND OPERATION OF AIR LINE GAUGE

If accurate "Standing" or "Static" water level readings or "Pumping Level" and "Drawdown" readings are required, an air line gauge is installed.

"Standing" or "Static" water level readings should be taken when the pump has been stopped for a suf ficient period to allow the water level to return to normal.

"Pumping Level' and "Drawdown" readings are taken after the pump has been operating against normal head for a sufficient period of time for the water level to remain stationary.

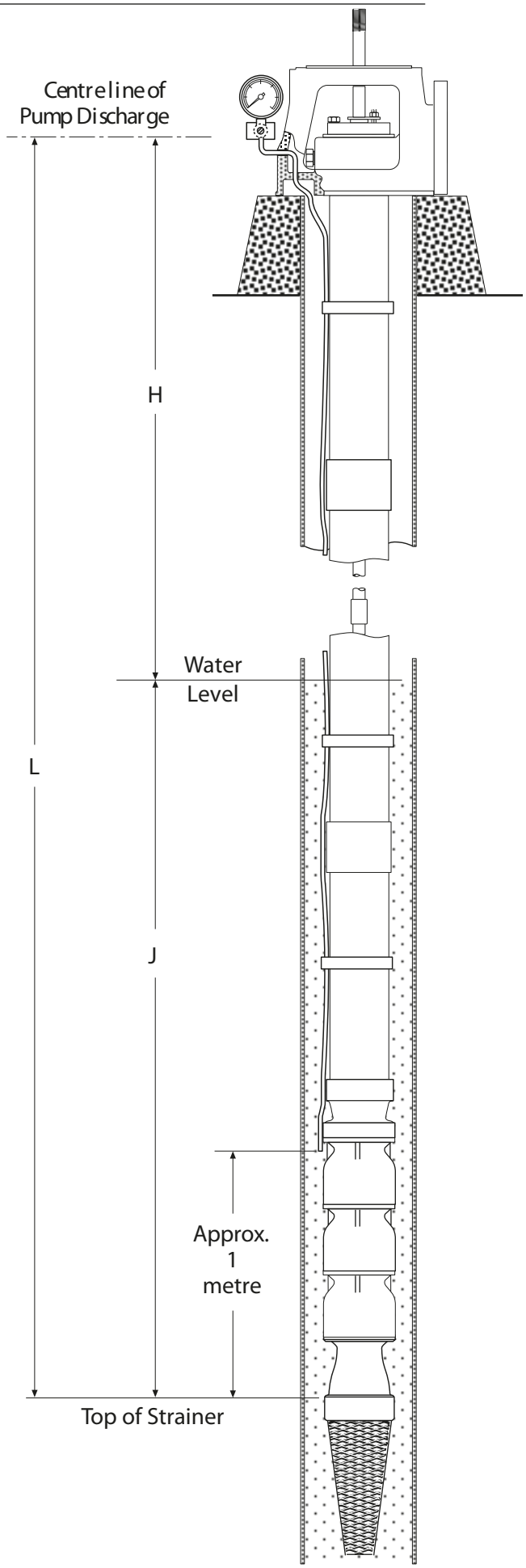
The air line may be copper, plastic or galvanised steel pipe and should be securely fastened to the column pipe at regular intervals to prevent slipping during installation of the column.

To use an airline, it is necessary to know the exact length of the line.

During pump assembly the lower end of the air line should be attached to the pump approximately 1 metre above the pump suction strainer, as illustrated, and the overall length to the centre of the discharge flange calculated. Air line is fitted through discharge head using fittings supplied and attached to gauge and air line charging valve mounted to discharge head. All joints must be completely air tight and should be sealed with pipe jointing compound.

To operate the air line gauge pump air into the system until the maximum reading is reached. The gauge will return to and hold a pressure reading (kPa) from where the water level can be calculated using the following formula.

Depth H metres = L — 0.102 P — 1
Depth of Water J = 0.102 P + 1
(P = Pressure Gauge Reading in kPa)



NON-REVERSE RATCHET

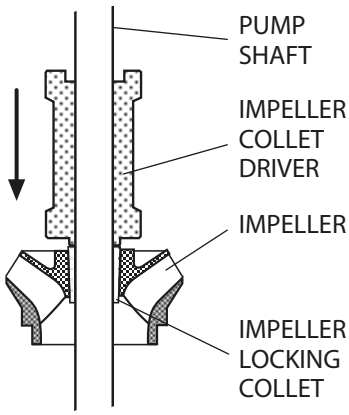
Everflow turbine pump drive heads are fitted as standard with non-reverse ratchets to prevent the receding column of water in the column pipe from driving the pump in the reverse direction when the pump unit is stopped. At deep settings high reverse pump speeds can be attained, which can cause serious damage to the equipment through column pipe or shaft couplings unscrewing or bearings burning out.

Non-reverse ratchet should be used on all electric motor installations as the motor is free to run in the reverse direction once it is switched off.

For right angle gear drive heads the non-reverse ratchet is required when engine driven via a clutch. When engine drive has no clutch the ratchet pins should be removed from the drive head as some engines kick back when stopped.

PUMP ASSEMBLY PROCEDURE

To assemble the pump locate the first impeller onto the pump shaft to the dimension in the table(page 9). Slip the collet with smaller diameter down, over the shaft and into the impeller hub opening. Use a screwdriver blade or wedge tool in collet slot to allow sliding on shaft, and drive collet into place with several sharp blows using the collet driver. On new components the collet will project above impeller hub from 0 to 3 mm. On previously assembled units the collet may drive further into the impeller hub.



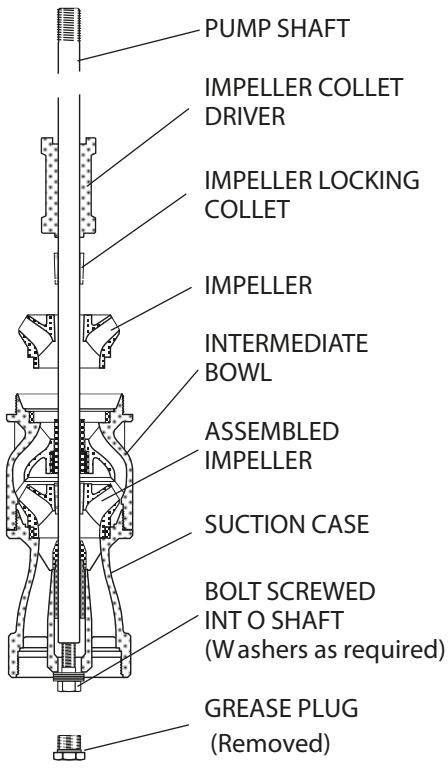
Slide bottom bearing sand cap onto shaft from bottom, small end up. Do not Lock setscrews. Slide suction case onto shaft from bottom until impeller is firmly seated in case. Pull bearing sand cap over inlet case bushing projection, slide inlet case off shaft and lock sand cap in position with locking screws. Refit inlet case, insert bolt through suction case grease hole and screw into tapping in bottom of shaft. Tighten securely using washers so that impeller is firmly seated against the base of the sealing diameter.

Slide intermediate bowl onto shaft from top and bolt or screw into section case. Slip next impeller over shaft and seat firmly against bowl wear ring and drive collet into place as before.

Loosen tie down bolt in bottom of shaft after each impeller is set to check that shaft and impellers rotate freely. Also check lateral movement by sliding shaft with impellers all the way in and out to be sure of adequate end play (refer to Shaft and Impeller Running Clearances Table).

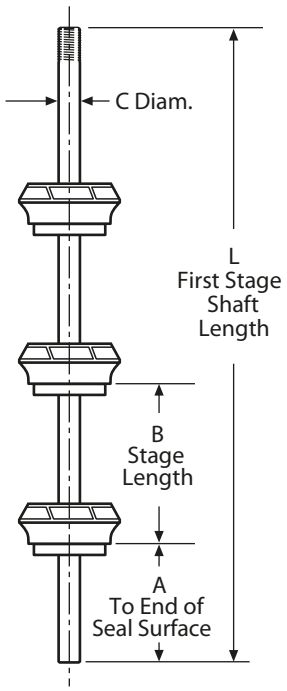
Continue assembly until last bowl is fitted. Top bowl has no bushing to allow discharge case bushing projection to fit into bowl when assembled to top of pump. Fit discharge case cap onto shaft and screw into position in discharge case. Fit pump shaft coupling so that end of shaft is in middle of coupling. Check again for free shaft rotation and adequate end movement. Remove grease plug from suction case and fill with a good quality waterproof grease and refit plug.

The pump is now ready for installation.



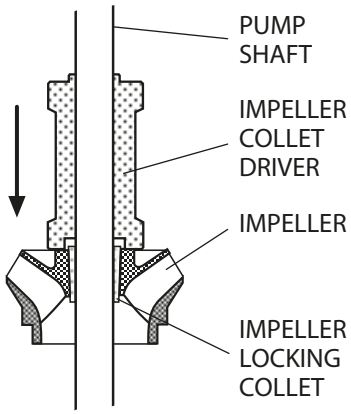
IMPELLER LOCATION TABLE

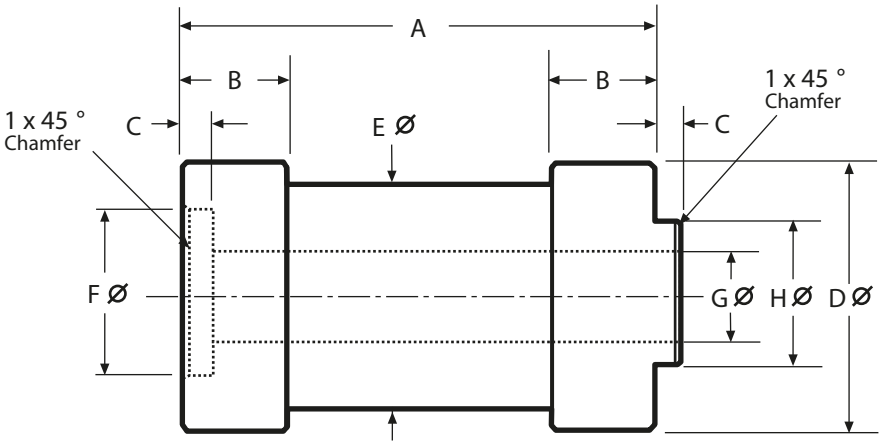
Pump	A	B	C	L
150R	130	130	25.4	590
180R	130	150	31.75	725
200F	160	180	31.75	810
250R	175	212	38.1	930
250F	230	222	44.4	990
300F	203	280	50.8	1040



PUMP DISASSEMBLY PROCEDURE

Remove shaft coupling and unscrew discharge case cap from discharge case. Discharge case and top bowl need not be separated for pump disassembly but can be treated as one part. Remove top bowl. Slip collet driver onto shaft from top, pull shaft out as far as possible so that impellers are well off seats, and knock impeller off collet (see illustration). Use screw driver to spread collet and side off shaft. Continue dismantling procedure down to suction case using reversal of assembly procedure.





IMPELLER
COLLET
DRIVER
DIMENSIONS

Pump Shaft Diam.	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm
25.4 mm (1″)	130	25	8	58	48	35	25.80	32.30
31.75mm (1-1/4″)	150	30	10	65	55	42	32.15	39.60
38.1mm (1-1/2″)	180	35	10	75	68	53	38.60	49.20
44.4 mm (1-3/4″)	180	35	10	82	70	59	45.00	55.80
50.8 mm (2″)	200	40	12	90	80	64	51.40	60.80

SHAFT AND IMPELLER RUNNING CLEARANCES
(mm)

Pump	Impeller Skirt O/D		Bowl Bore I/D		Diam. Clearance		Lateral Movement	Impeller 'K' Factor	Shaft & Bearing Clearance	
	Min.	Max.	Min.	Max.	Min.	Max.			Min.	Max.
150R	79.05	79.07	79.38	79.43	0.31	0.38	8	4.67	0.10	0.15
180R	107.57	107.62	107.95	108.00	0.33	0.43	16	7.90	0.15	0.25
200F	126.62	126.67	127.00	127.05	0.33	0.43	17	11.8	0.15	0.25
250R	132.94	133.00	133.35	133.40	0.35	0.46	10	12.4	0.15	0.25
250F	167.87	167.92	168.27	168.33	0.35	0.46	10	20.7	0.18	0.28
300F	183.72	183.77	184.15	184.20	0.38	0.48	11	24.5	0.18	0.28

Problem	Cause	Action
Pump Shaft Hard to Turn	Head nut Impeller or intake blocked Rubber Bearings Dry Misalignment in Pump	Check nut adjustment Unblock as necessary Lubricate bearings Check dimensions
Pump will not start	Motor wired in reverse Blown fuses Supply fault Starter fault	Check motor direction Replace fuses Check supply Check starter
No Flow	Pump Running in Reverse Shaft coupling disconnected Shaft broken Speed too low Total lift too high Water Level Too low	Check motor direction Connect coupling Replace shaft Increase speed Check water level Raise water level to min
Low Flow	Insufficient flow to intake Total lift too high Speed too low Inlet Blocked Leaks in column or pipe Valve partially closed	Increase flow Check total lift Increase speed Unblock inlet Check for leaks Open valve
Power excessive	Impeller rubbing Motor fault Lift too high	Check setting Check motor Check water level
Pump vibration	Worn bearings Motor out of balance Drive coupling misaligned Pump sucking air Speed incorrect	Replace bearings Overhaul motor Check coupling Check pipe connections Operate at correct speed
Excessive wear	Solids or abrasives in pumped fluid Bent shafting Fluid is corrosive Misalignment in Pump Incorrect lubrication	Check screening Replace shaft Revise materials Check alignment Check lubrication
Excessive Noise	Faulty bearings in motor or thrust assembly Misalignment in Pump Incorrect lubrication	Replace bearings Check alignment Check lubrication

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