



B-Range Industrial Progressing Cavity Pumps

Installation and Operating Instructions



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1. SAFETY

Before installing and using the PC pump, carefully read the instructions provided below. This manual contains fundamental instructions that must be followed during installation, operation and maintenance. This manual must be consulted by all qualified personnel who will follow the pumps operation and installation. In addition, this manual must always be available at the location where the pump is used.

Failure to respect the safety rules may cause physical and material damage, failure of the installation or the pump's principal functions; compromised maintenance operations; mechanical or electrical damage; injury to people as well as environmental pollution. Failure to observe safety rules can void the warranty.



This is the safety alert symbol, take special note of literature in this manual highlighted with this symbol. This symbol warns about hazards that may cause serious personal injury, death or property damage if ignored.

2. GENERAL INFORMATION

This manual covers operation and important recommendations for the correct operation of the pump. It is necessary to respect these recommendations in order to maximize the pumps reliability, longevity, as well as to avoid the risk of accident resulting from improper use. The pump must never be used outside the limitations described in the technical specifications. It is necessary to respect the instructions regarding product nature; density; viscosity; temperature; flow rate; pressure; speed; direction of rotation; power of motor as well as all other instructions contained in this manual or in the documentation attached to the contract.

The manufacturer declines all responsibility in the case of accident or damage caused by negligence, Improper use of the pump or the failure to observe the instructions provided in this manual or use under conditions other than those stated in the name plate data.

3. INSTALLATION RECOMMENDATIONS

At the pumping system design stage, consideration must be given for the provision of dedicated gauges, filling or flushing connections, non-return, isolating or pressure relief valves. Due to the nature of a positive displacement pump, it is recommended a pressure relief valve is installed on the outlet side of the pump to prevent any danger and or damage in the event the flow out of the pump becomes blocked.

3.1 IMPORTANT

- For ease of maintenance, the correct dismantling space must be provided (refer to the pump dimension sheet).
- All bolts and nuts securing flanges and base mounting fixtures must be checked for tightness before operation.
- All pipework should be independently supported.
- To eliminate vibration, the pump must be correctly aligned with the drive unit, all guards must be securely fixed in position, and mounted on a suitable baseplate.
- When commissioning the plant, all joints in the system must be thoroughly checked for leaks.
- Suction pipework must be clean to prevent trap material from damaging the pump. As an added precaution a temporary strainer may be fitted.

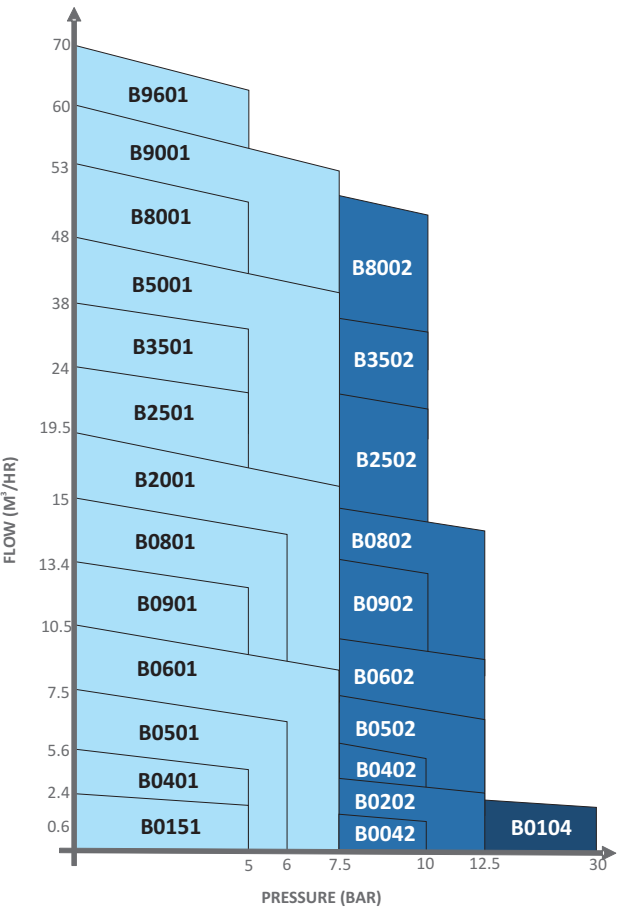


NEVER RUN THE PUMP WITH A CLOSED INLET OR OUTLET VALVE.

4. DUTY CONDITIONS

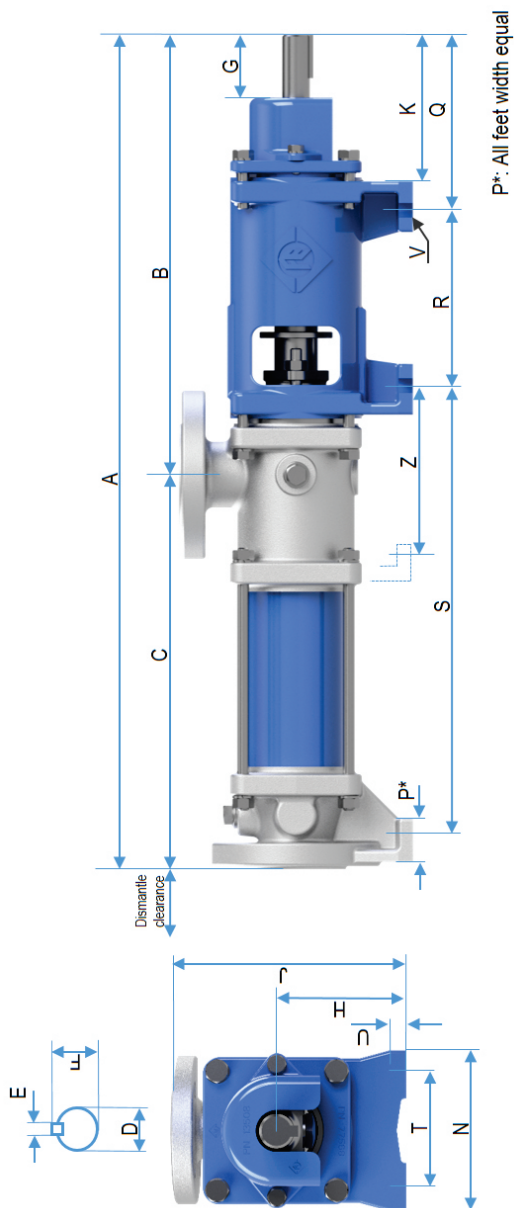
Pumps should be installed only in applications for which they were approved by Franklin Electric, having taken into account material compatibility, flow rates, temperature; solids handling; pressure; rotational speed and the environment. The performance capabilities of the Orbit industrial pump range is shown on the chart below (based on water at 20°C).

Typical Performance Guide



Should any changes in the duty conditions be envisaged following pump selection / installation, Franklin Electric's recommendations should be sought in the interest of efficiency, safety and suitability.

5. PUMP DIMENSIONS



Pump Model	A	Dismantle Clearance	B	C	D	E	F	G	H	J	K
B0042	571	315	301	270	19	6	21,5	40	80	160	100
B0104	766	282	377	389	28	8	31	50	90	200	120
B0151	531	275	301	230	19	6	21,5	40	80	160	100
B0202	822	282	377	445	28	8	31	50	90	200	120
B0401	627	300	377	250	28	8	31	50	90	200	120
B0402	757	300	377	380	28	8	31	50	90	200	120
B0501	672	282	377	295	28	8	31	50	90	200	120
B0502	847	282	377	470	28	8	31	50	90	200	120
B0601	798	430	455	343	38	10	41	60	110	230	135
B0602	958	430	455	503	38	10	41	60	110	230	135
B0901	825	430	455	370	38	10	41	60	110	230	135
B0902	1040	430	664	585	38	10	41	60	110	230	135
B0801	717	282	377	340	28	8	31	50	90	200	120
B0802	1090	385	455	635	38	10	41	60	110	230	135
B2001	870	450	455	415	38	10	41	60	110	230	135
B2501	1041	510	604	437	48	14	51,5	80	160	320	175
B2502	1321	510	603	718	48	14	51,5	80	160	320	175
B3501	1041	510	604	437	48	14	51,5	80	160	320	175
B3502	1536	700	644	892	48	14	51,5	80	160	320	215
B5001	1338	700	644	694	48	14	51,5	80	160	320	215
B8001	1416	700	644	772	48	14	51,5	80	160	320	215
B8002	1866	1600	644	1222	48	14	51,5	80	160	320	215
B9001	1481	800	644	837	48	14	51,5	80	160	320	215
B9601	1416	690	644	772	48	14	51,5	80	160	320	215

Pump Model	N	P	Q	R	S	T	U	V	FLANGE	Z	MASS (kg)
B0042	100	35	121	120	305	70	10	10	BS4504	N/A	20
B0104	125	45	145	165	426	90	10	12	BS4504	N/A	38
B0151	100	35	121	120	305	70	10	10	BS4504	N/A	18
B0202	125	45	145	165	482	90	10	12	BS4504	N/A	40
B0401	125	45	145	165	287	90	10	12	BS4504	N/A	34
B0402	125	45	145	165	417	90	10	12	BS4504	N/A	40
B0501	125	45	145	165	332	90	10	12	BS4504	N/A	36
B0502	125	45	145	165	507	90	10	12	BS4504	N/A	44
B0601	140	50	169	200	389	105	13	14	BS4504	N/A	53
B0602	140	50	169	200	549	105	13	14	BS4504	N/A	58
B0901	140	50	169	200	416	105	13	14	BS4504	N/A	58
B0902	140	50	169	200	631	105	13	14	BS4504	N/A	71
B0801	125	45	145	200	377	90	10	12	BS4504	N/A	38
B0802	140	50	169	200	681	105	13	14	BS4504	N/A	74
B2001	140	50	169	200	461	105	13	14	BS4504	N/A	57
B2501	200	70	221	210	560	150	20	16	BS4504	N/A	113
B2502	200	70	220	210	841	150	20	16	BS4504	N/A	141
B3501	200	70	221	210	560	150	20	16	BS4504	N/A	112
B3502	200	70	261	210	1015	150	20	16	BS4504	378	191
B5001	200	70	261	210	817	150	20	16	BS4504	378	169
B8001	200	70	261	210	895	150	20	16	BS4504	378	173
B8002	200	70	261	210	1345	150	20	16	BS4504	465	231
B9001	200	70	261	210	960	150	20	16	BS4504	465	176
B9601	200	70	261	210	895	150	20	16	BS4504	378	192



6. PUMPS SUPPLIED FOR FOOD APPLICATIONS

For pumps intended for food/hygienic applications, it is imperative that the correct material selection is applied. It is important that a clean in place treatment is executed on the pump at the following times (in addition to the standard CIP plan during normal pump operation):

1. When the pump is first commissioned for use.
2. When any spare components are fitted/replaced.



Hypalon stators should not be used in applications where product is destined for human consumption. Hygienic applications do require stainless steel pump components. Contact Franklin Electric for more information regarding use of food grade grease for specialized applications.

7. MOTOR WIRING ARRANGEMENT

This PD pump requires a high starting torque to overcome the rotor stator friction fit. To achieve this the motor must be started direct on line (DOL) to realize maximum starting torque. Star-delta starting is not recommended. Higher power motors, requiring starting currents in excess of supply capability need to be powered using variable frequency drives (VFD).



Star-Delta and reduced voltage (soft starters) are not recommended for PD pumps.

Consideration must be given to applications using electronic variable frequency drives, these systems:

1. Must make use of VFDs with full torque rating at start-up (as opposed to a square law drive) or
2. Use a larger motor than required according to selection (to offer greater starting torque at standstill) when operating direct online.

For applications where the motor will not be operating at full frequency, derating the motor must be accounted for to cope with torque demands within the required RPM range.

Test the motor rotation direction to ensure it is correct as required for pump operation.

Failure to follow this guidance may result in the pump not starting, not being capable of producing the required duties or lead to motor failure.

8. STARTING

Pumps must be filled with liquid / product before startup. This initial filling is not for priming purposes but to provide the necessary lubrication for the stator until the pump primes itself.

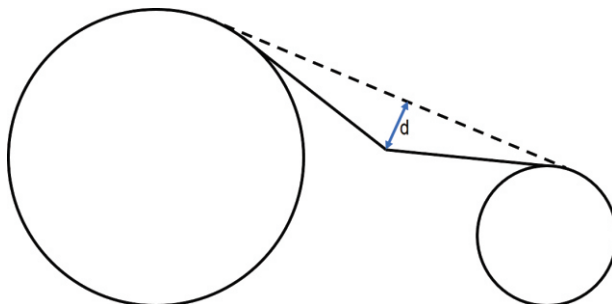
When the pump is stopped, sufficient liquid is normally trapped within rotor stator set to provide lubrication on following startup. If the pump has been standing for a long period of time, or has just been moved to a new location, or has been dismantled for examination it must be filled with liquid and be given a few turns by hand before starting. The pump is normally somewhat stiff (dependant on the model) to turn by hand on account of the close fit between the rotor and the rubber stator. If on start up, the pump does not operate correctly, the plant must be shut down immediately and the cause of the malfunction established before operations are recommenced.



Never run the pump in a dry condition, even for a few revolutions or the stator will be damaged.

Startup check list:

1. With the motor isolated from the pump, ensure that its rotation is the correct direction.
2. Are there any obstructions in the pipework or pump?
3. Are the pump connections and pipework points tight and leak free?
4. Have the inlet and outlet protective plugs been removed?
5. Is there lubrication in the drive unit / gearbox?
6. Does the product seal require a flushing arrangement?
7. Is the gland follower loose (If packed gland version)?
8. Is motor voltage correct?
9. For V-belt arrangement, is belt tension correct? Rule of thumb is 16mm deflection ("d") per 1m belt length.



10. For coupling arrangement, are shafts aligned?
11. Are the pipework valves open?
12. Are all safety guards in place?
13. Is the pump filled with 'product' to provide lubrication between the rotor and stator on start up?
14. Start then stop the pump; is the pump rotating in the correct direction?



The pump speed / pressure settings must remain below the pumps maximum limitations. Consult Franklin Electric if you are unsure.

If the pump has never been run, it may be necessary to crank the pump through one revolution manually (with water/product present in the gland). This can be achieved by using an adjustable wrench fitted at the drive shaft.

9. GUARDS



In accordance with the Health & Safety Act, all guards must be secured after installation, maintenance or any adjustments have been made to the pump.

10. ROTATION

The B-Range of Industrial pumps is suitable for rotation in either direction, i.e. flow direction out either of the pump flanges. The bearing housing direction plate indicates the resultant flow path dependent on mainshaft rotation direction. Pump flow curves also indicate flow direction.

NOTE: It is recommended product flow is directed out the “end cover” (opposite drive end) side of the pump in applications where:

- Pressure above 10 bar is required (dependant on pump capabilities)
- No suction lift is required. For Suction lift applications, delivery must be on gland.

11. DRAWING REFERENCE NUMBERS

ITEM NO.	DESCRIPTION	QTY PER PUMP
1	End cover	1
2	Plug	2
4	Rotor	1
5	Moulded Stator	1
6	Extension Piece	1
8	Gland section / Porting Chamber	1
9	Packing ring	1 set
10	Gland follower	1
11	Thrower / Flinger	1
12	Bearing housing	1
13	Bearing locknut	1
14	Bearing lock washer	1
16	Bearing distance piece	1
17	Bearing taper roller	2
18	Shaft bearing collar	1
19	Bearing cover	1
20	Pin cap guard	1
21	Main shaft	1
22	Key	1
23	Washer pin cap	4
24	Pin cap	4
25	Pin coupling rod	2
26	Coupling rod bush	2
27	Seal ring coupling rod	2
28	Coupling rod	1
34	Lip seal	1
34A	Lip seal - Drive end	1
35	Gland stud	2
37	Seal housing / Loose gland	1
39	Tie rod	4
44	Sealing Boot	1
46	Pin cap guard Bolt	2
50	Hex nut gland stud	2
51	Spring washer	16
54	Hex bolt bearing cover	4
55	Hex bolt gland section	4
85	Subassembly (Bearing housing incl internal comp.)	1
88	Gasket - Loose gland	1
88A	Gasket (Extension piece)	1

12. EXPLODED VIEW

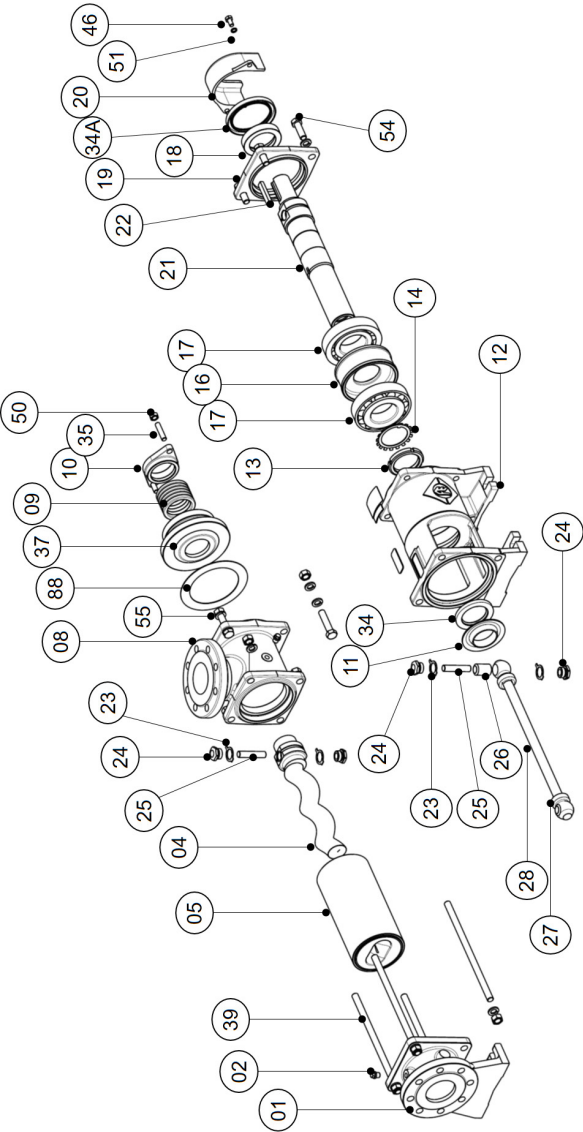


Figure 1 - Exploded view



13. DISMANTLING



Before any maintenance work is carried out on the pump, ensure that the pump is isolated from the electrical supply and that the pump's main isolating valves on the inlet and outlet are closed. Ensure that the system is de-pressurised.



Where hazardous fluids are pumped, the pump must be flushed and drained before the dismantling. Personnel dismantling the pump must wear protective clothing throughout the dismantling procedure.

If the pump has been out of operation for more than one hour, it will assist dismantling if the rotor is given a slight turn, thereby breaking the rotor/stator seal. Where a pump has been out of operation for a longer period of time, dismantling can be facilitated by lubricating the rotor/stator assembly with water through the filling plug holes, and rotating the rotor.

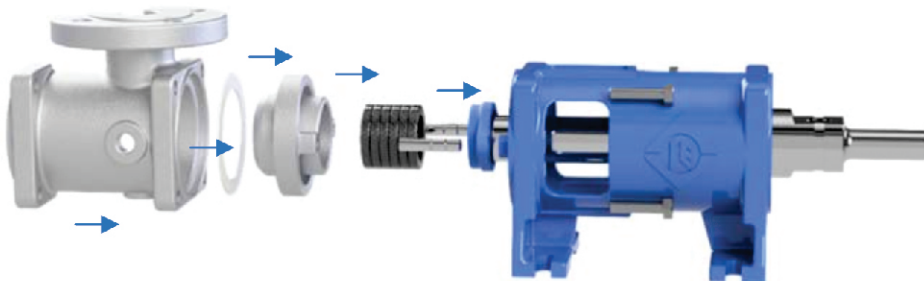
To dismantle the pump, follow the below sequence (reference to Figure 1 : Exploded view):

1. Remove bolts holding end cover (01) to baseplate/foundation.
2. Loosen tie rod nuts and tie rods (39)
3. Remove end cover (01).
4. Remove stator (05). It may be necessary to rotate mainshaft (21) with suitable spanner while gripping stator (05) to assist with this operation.
5. Remove pin cap guard (20) at drive shaft end.
6. Remove drive end pin cap (24) and lock washer (23) and withdraw coupling pin (25) with pliers.
7. The rotor (04) with attached coupling rod (28) can now be removed by pulling away from the mainshaft (21).
8. Loosen 4 hex bolts (55) holding porting chamber (08) to bearing housing (12). Loosen gland hex nuts (50).
9. Porting chamber (08) and loose gland (37) can now be removed.
10. Loosen hex bolts (54) and remove bearing cover (19) at drive end.
11. Withdraw the mainshaft (21). Bearings (17) and lipseal (34) will pull-out with mainshaft (21).
12. Strip bearing lock nut (13) and bearing lockwasher (14) to remove bearings.

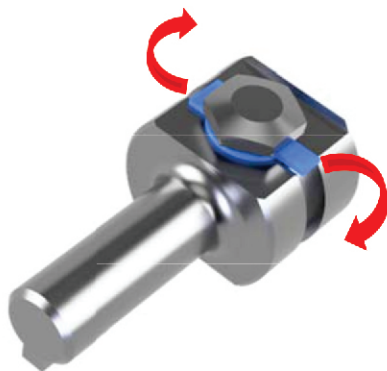
14. RE-ASSEMBLY OF PUMP

Refer to Figure 1 : Exploded view :

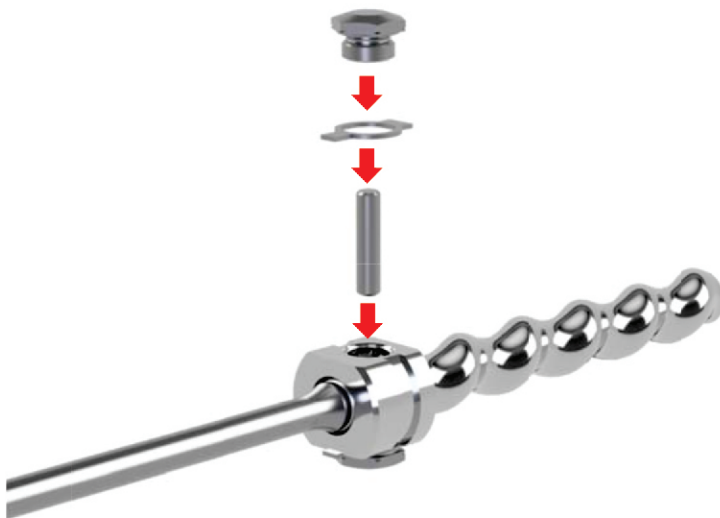
1. Assemble bearings (17) on mainshaft (21) with bearing spacer (16) in between, and bearing lock washer (14) on open end.
2. Fasten bearings (17) on mainshaft (21) with bearing lock nut (13). See 15.3 BEARINGS for bearing settings. Ensure bearings (17) are greased liberally.
3. Insert the mainshaft assembly (21) in bearing housing (12).
4. Bolt bearing cover (19) to bearing housing (12) with hex bolts (54).
5. Install lip seal (34) and drive end lip seal (34A). Lip seal opening must face inwards.
6. Install thrower / flinger (11) on mainshaft.
7. Place gland follower (10), and then loose gland (37) onto mainshaft (21) from gland end.



8. Place gasket (88) in gland section (08) recess, and bolt gland section to bearing housing (12). Flange can be positioned in any orientation.
9. Install gland packing (09) into loose gland section (37). Packing must be inserted with each consecutive packing rotated 180°. Gland follower (10) can be tightened in place loosely. Gland follower (10) must be tightened once pump is running, it must be tightened such that the gland continues to drip (a drip a second). See 15.1 GLAND PACKING.
10. Fit seal rings (27) onto coupling rod (28) by greasing rod joint ends and pulling them over at each end by hand.
11. Fit one pin cap (24) in rotor (04) end with lock washer (23). Lock lockwasher (23) by folding wide tab up against pin cap (24) and folding the narrow tab into rotor head groove - see illustration below. Always replace a damaged or missing lock washer (23) and or seal ring (27), this will prevent grease leakage from the joint and increase pump service intervals.

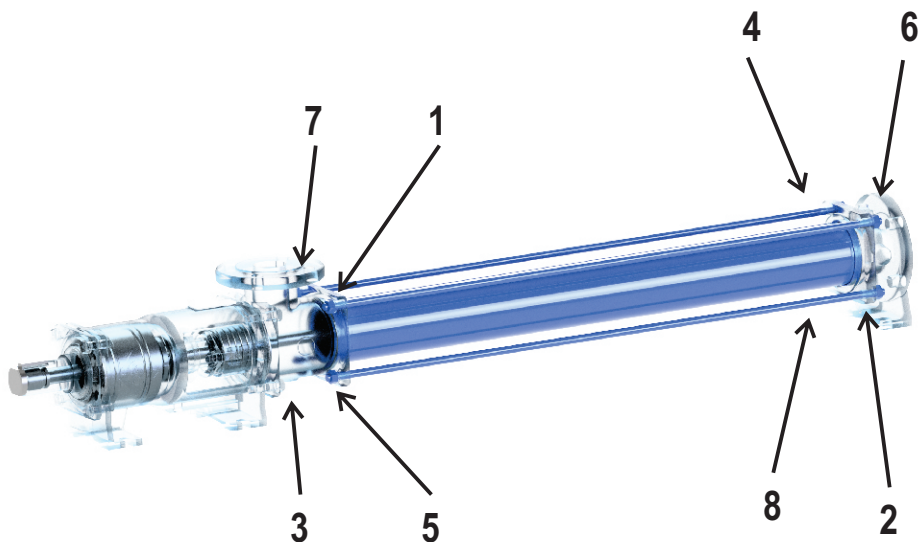


12. Fill rotor joint cavity with grease, insert coupling rod (28) head into rotor (04) cavity.
13. Insert coupling rod pin (25) and fit second lock washer (23) and pin cap (24). Repeat locking of lock washer (23).



14. Fit one pin cap (24) and lock washer (23) to mainshaft (21) joint interface.
15. Pack grease into the joint interface on the mainshaft (21). Smear the open end of the coupling rod liberally with grease and insert into the hollow mainshaft (21). Fit pin (25), remaining lock washer (23) and pin cap (24).

16. Bend locking tabs on the pin cap lock washers as per step 9.
17. Fit stator (05) ensuring it seals up against porting chamber (08). Rotate stator (05) while rotor (04) is held stationary to assist with fitment. One can use water, silicone grease or a rubber compatible liquid as a lubricant on rotor to assist with fitment of stator.
18. Refit end cover (01) and tie rods (39). Tie rods must be tightened sequentially to ensure an even clamp between the stator and adjacent castings. Tighten rods according to sequence below repeating the cycle 3 times until the correct torque rating is achieved. See torque chart below.



MODEL	TIE ROD TORQUE (NM)
B0042	12
B0104	12
B0151	12
B0202	12
B0401	12
B0402	12
B0501	12
B0502	12
B0601	12
B0602	12
B0901	12
B0902	12
B0801	12
B0802	12
B2001	12
B2501	18
B2502	18
B3501	25
B3502	25
B5001	40
B8001	40
B8002	40
B9001	65
B9601	65

15. ROUTINE MAINTENANCE

To ensure optimum pump life the following components should be routinely checked:

1. **Gland Packing** (refer to 15.1 GLAND PACKING).
2. **Universal Joints** - Joints should be greased every 500 - 1,000 running hours but this period could be more or less depending on duty conditions. Castrol Spheerol LMM or equivalent grease to be used for this purpose.
3. **Pins** - Pin wear can be detected by rocking the pump driving pulley or coupling to determine the amount of free play. If the angular deflection is excessive (greater than 5°) the universal joints should be replaced (refer to 13. DISMANTLING).
4. **Bearings** - Bearings should be cleaned and regreased every 5,000 hours.

15.1 GLAND PACKING

The gland packing supplied as a standard in these pumps is manufactured from a non-asbestos material (PTFE or cotton graphite). The gland will require adjustment during the initial running-in period. Under normal working conditions a slight drip from the gland is essential and assists in lubricating the packing.

It is usual to replace gland packing when re-assembling a pump. Clean the box and shaft thoroughly and examine mainshaft (21) for wear and scoring. Replace shaft if its wear is excessive. Install one ring at a time. Make sure it is clean, and has not picked up any dirt in handling. Joins of successive rings should be staggered and kept at least 90 degrees apart.

After the last ring is installed, take up bolts finger tight. Do not jam the packing into place by excessive gland loading. Start pump, allow packing to leak freely. Excessive leakage during the first hour of operation will result in a better packing operation over a longer period of time. Take up gradually on the gland as the packing seats, until leakage is reduced to a tolerable level, preferably 8-10 drops per minute per inch of shaft diameter. Stopping leakage entirely at this point will cause the packing to burn up. A gland which is too tight can be detected by insufficient leakage and excessive heat in gland area and should be slackened off.

15.2 COUPLING RODS AND UNIVERSAL JOINTS

The universal joints of the coupling rod are designed such that any wear occurring at these points bears on small, inexpensive and easily replaceable bushes.

The universal joints are protected by rubber seal rings to retain the grease inside the joint.

The following models utilize bushes: 61M, 62M, 61MB, 62MB, 61MCR, 71M, 72M, 81M, 82M, 81MCR, 91M, 92M, 101M, 111M. The renewable bushes (26) in the coupling rod can be pressed out and replacements inserted. When replacing the bushes it is imperative they are aligned such that the hole elongation lies directed along the length of the coupling rod as per image below. Failure to do this will result in component damage.



15.3 BEARINGS

Bearings are removed from the shaft by following steps in 13. DISMANTLING.

RECOMMENDED PROCEDURE FOR SETTING THE CORRECT RUNNING CLEARANCES IN THE BEARINGS.

1. After assembling the bearings (17) and bearing spacer (16) onto the shaft, place the assembly in a vertical position and align the bearing cups and spacer to run concentric with the shaft axis (using straight edge or steel ruler).
2. Rotate the bearing cups and spacer by hand and tighten the locknut until resistance is felt in the bearing assembly. At this point all free running clearance is eliminated. (This operation should be carried out with bearings 'dry', i.e. no grease, only a protective coating).
3. The locknut should now be loosened to give correct running clearance (see table below).
4. The tab of the lock washer should now be bent into a corresponding slot on the locknut.
5. Bearing Lubrication - The taper roller bearings should be packed with Castrol Spheroil EP2 grease or equivalent and the housing 1/3 filled.

Bearings should be cleaned and re-packed with grease every 5,000 hours.

Model	Bearing	Required Axial Clearance	Anti clockwise clearance locknut rotation for correct clearance
B0042	31307	0.05mm-0.07mm	15°
B0104	31307	0.05mm-0.07mm	15°
B0151	31307	0.05mm-0.07mm	15°
B0202	31307	0.05mm-0.07mm	15°
B0401	31308	0.05mm-0.07mm	15°
B0402	31308	0.05mm-0.07mm	15°
B0501	31308	0.05mm-0.07mm	15°
B0502	31308	0.05mm-0.07mm	15°
B0601	31308	0.05mm-0.07mm	15°
B0602	31308	0.05mm-0.07mm	15°
B0901	31310	0.06mm-0.08mm	15°
B0902	31310	0.06mm-0.08mm	15°
B0801	31310	0.06mm-0.08mm	15°
B0802	31310	0.06mm-0.08mm	15°
B2001	31310	0.06mm-0.08mm	15°
B2501	30314	0.1mm-0.12mm	20°
B2502	30314	0.1mm-0.12mm	20°
B3501	30314	0.1mm-0.12mm	20°
B3502	32217	0.2mm-0.25mm	40°
B5001	32217	0.2mm-0.25mm	40°
B8001	32217	0.2mm-0.25mm	40°
B8002	32217	0.2mm-0.25mm	40°
B9001	32217	0.2mm-0.25mm	40°
B9601	32217	0.2mm-0.25mm	40°

16. MECHANICAL SEALS

Mechanical seals are used in applications where zero leakage from the pump gland section is required. Mechanical seals can be ordered with a new pump assembly or alternatively be fitted at a later stage replacing the existing gland packing. Franklin Electric should be contacted to assist with the selection of a suitable mechanical seal. Part numbers of standard options are listed below.

Model	Mechanical seal size	Component Mechanical seal - Silicon Carbide/Silicon Carbide/Viton Max-12 Bar	Cartridge Mechanical seal - Silicon Carbide/Silicon Carbide/Viton Max-12 Bar	Cartridge Mechanical seal - Silicon Carbide/Silicon Carbide/Viton Max-20 Bar	Cartridge Mechanical seal - Tungsten Carbide/Tungsten Carbide/Viton Max-20 Bar
B0042, B0151	30mm	830009174	830009181	830011196	830011203
B0104, B0401, B0402, B0501, B0502, B0801	35mm	830009175	830009182	830011197	830011204
B0901, B0902, B0802, B0601, B0602, B2001, D0504, D1301, D1302	45mm	830009176	830009183	830011198	830011205
B2501, B2502, B3501, D0507, D0514, D1304, D1306, D2401, D2402, D2404, D4001, D4002, D4004, D5401, D5402, D9601, D9602, D15001	65mm	830009177	830009184	830011199	830011206
B3502, B8001, B8002, B5002, B9001, B9601	80mm	830009179	830009186	830011201	830011208



Franklin Electric must be consulted for mechanical seal selection assistance in instances where the seal will be exposed to hazardous products / liquids.

17. PARTS VIEW: B0042, B0104, B0151, B0202

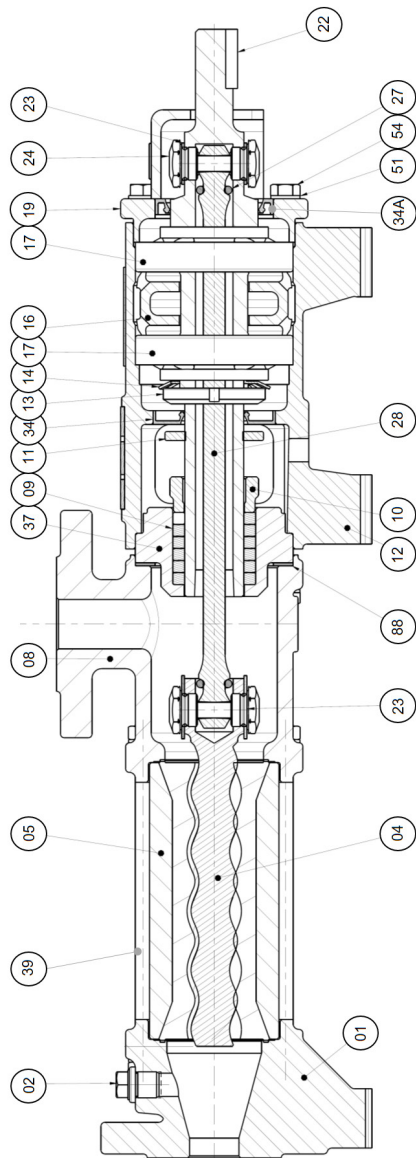


Figure 1

18. PARTS VIEW: B0401, B0402, B0501, B0502, B0601, B0602

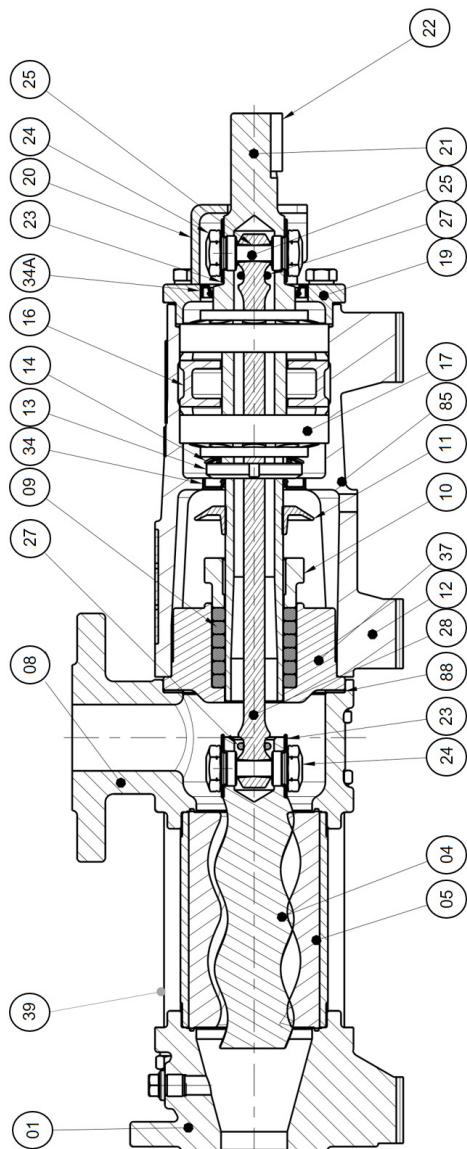


Figure 2

19. PARTS VIEW: B0901, B0902, B0801, B0802, B2001

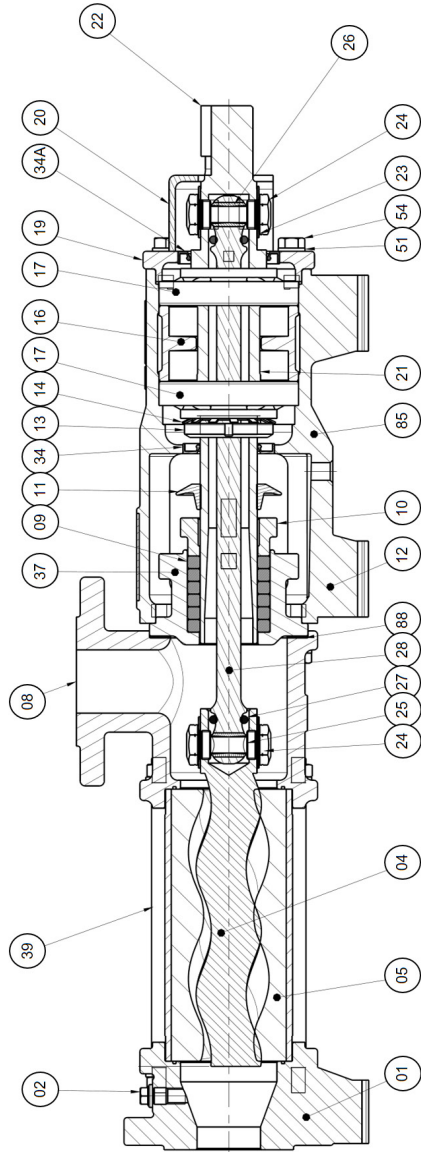


Figure 3

20. PARTS VIEW: B2501, B2502, B3501, B3502, B5001, B8001

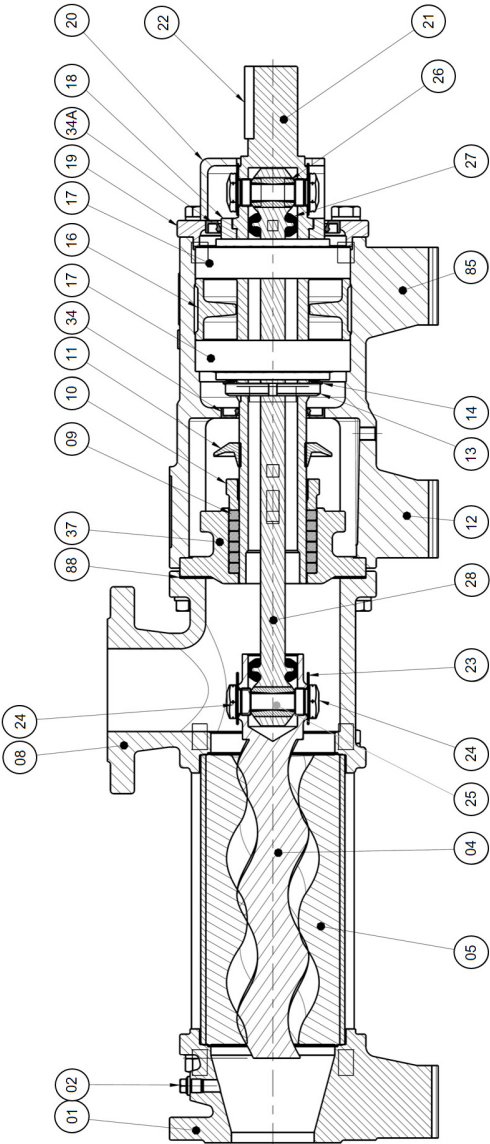


Figure 4

21. PARTS VIEW: B8002, B9001, B9601

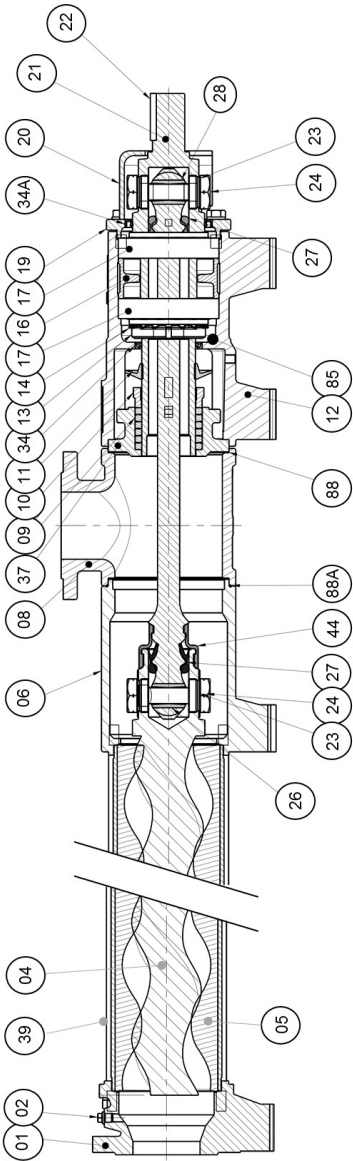


Figure 5

22. INSTALLATION DATA

Complete the installation data documentation for warranty purposes and for future referencing.

PUMP INSTALLATION DATA SHEET
Customer :
Date of installation
Pump size
Product pumped
Temperature. °C
Pump speed. rpm
Driver speed. rpm
Pumped capacity. m ³ /hr
Pressure at pump. kPa
Drive. motor/engine/tractor
Drive power rating
Relieve valve fitted. Yes/no
Method of starting. DOL/Star Delta
Altitude. m
Suction conditions
pH
Viscosity (cP)
Solids content. %
Solids detail
Specific Gravity
Materials of construction
Mech. seal or packed gland
Pump serial no
Stator serial no
Length and dia of suct. line. m / mm
Length and dia of del. line. m / mm
Suction or delivery on gland

23. TROUBLESHOOTING

Problem/Cause	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
No discharge	1	2	3			6		8												20					25				29
Under capacity				3	4	5	6	7	8		10	11			14	16				19	20	21						27	
Irregular discharge				3	4	5	6	7	8							16	18			20									
Prime lost after starting				3	4	5	6	7	8	9						16	18												
Pump stalls when starting									9			12		14			18												29
Pump overheats									9		11			14	15							22		24					
Motor overheats									9			12		14	15		18					22		24					29
Excessive power absorbed									9			12		14	15		18					22		24					29
Noise & vibration				3	4	5	6	7	8	9		11		13	14	16	18					22	23	24					
Pump element wear												11		13	14									24					
Excessive gland seal wear														13	15	17										26		28	
Product loss through gland														13		16	17												
Seizure												11		13	14	15									24				
No. Cause	Remedy																												
1	Incorrect direction of rotation																												
2	Reverse the motor																												
3	Expel gas from supply line and pumping chamber and introduce fluid.																												
4	Insufficient NPSH available																												
	Increase supply line diameter. Increase suction head. Simplify supply line configuration. Reduce speed. Decrease product temperature - check effect on viscosity and power input.																												
4	Product vapourising in supply line																												
5	As 3 above.																												
5	Air entering supply line																												
6	Remake pipe joints. Adjust or repack gland.																												
6	Gas in supply line																												
7	Expel gas from supply line and pumping chamber and introduce fluid.																												
7	Insufficient head above supply vessel outlet																												
8	Raise product level. Lower outlet position. Increase submergence of supply line.																												
8	Foot valve strainer is obstructed or blocked																												
9	Service fittings.																												
9	Product viscosity above rated figure																												
10	Decrease pump speed. Increase product temperature.																												
10	Product viscosity below rated figure																												
11	increase pump speed. Decrease product temperature.																												
11	Product temperature above rated figure																												
12	Cool the product pumping chamber.																												
12	Product temperature below rated figure																												
13	Heat the product pumping chamber - check with Franklin Electric.																												
13	Unexpected solids in product																												
14	Clean the system. Fit a strainer in the system.																												
14	Delivery pressure above rated figure																												
15	Check for obstructions. Service system and revise to prevent problem recurring. Simplify delivery line.																												
15	Gland over tightened																												
16	Slacken and re-adjust gland.																												
16	Gland under tightened																												
17	Adjust gland.																												
17	Gland flushing inadequate																												
18	Check that fluid flows freely into the gland. Increase flow rate.																												
18	Pump speed above rated figure																												
19	Decrease pump speed.																												
19	Pump speed below rated figure																												
20	Increase pump speed.																												
20	Stator turning																												
21	Replace worn parts. Tighten stator bolts.																												
21	Flexible coupling misaligned																												
22	Check flange alignment and adjust mountings accordingly.																												
22	Belt drive slipping																												
23	Re-tension to manufacturer's recommendations.																												
23	Insecure pump driver mountings																												
24	Fit lock washers to slack fasteners and retighten.																												
24	Shaft bearings worn/failed																												
25	Refer to Franklin Electric for advice and replacement parts.																												
25	Discharge blocked or valve closed																												
26	Relieve the pressure and clear the blockage.																												
26	Product entering packing area																												
27	Check packings condition and type																												
27	Worn pumping element																												
28	Fit new parts.																												
28	Shaft wearing the seals																												
29	Check for worn shaft and replace.																												
29	Frozen fluid in pump																												
30	Allow for pump to thaw slowly. Ensure pump is drained in future. Replace damaged parts.																												

24. WARRANTY

This document contains Franklin Electric Co., Inc. and all of its subsidiaries (collectively, "Franklin Electric") standard limited warranty, general sales policies and controlling terms and conditions for Submersible Pump (the "Goods"). This document shall not be altered or amended except as provided by Franklin Electric.

Limited Warranty

Franklin Electric warrants that for a period of one (1) year from the date of delivery, the goods purchased will:

- (a) Be free from defects in workmanship and material at the time of shipment;
- (b) Perform consistently with samples previously supplied; and
- (c) Conform to the specifications published or agreed to in writing between the customer and Franklin Electric.

This limited warranty is in lieu of all other warranties, written or oral, statutory, express, or implied, including any warranty of merchantability or fitness for a particular purpose. Customer's sole and exclusive remedy for Franklin Electric's breach of its obligations hereunder, including breach of any express or implied warranty or in a written instrument made of this limited warranty, shall be for the purchase price paid to Franklin Electric for the non-conforming or defective product or for the repair or replacement of non-conforming or defective product, at Franklin Electric's election.

Any Franklin Electric product which Franklin Electric determines to be defective within the warranty period shall be, at Franklin Electric's sole option, repaired or replaced, provided that Franklin Electric's obligation to repair or replace shall be subject to the following conditions:

- (a) Any allegedly defective goods or parts shall have been returned to Franklin Electric at the customer's expense;
- (b) The customer shall establish in writing to the reasonable satisfaction of Franklin Electric that the goods have been properly used and applied for normal purposes;
- (c) No person, whether authorised by the customer or not, shall have tampered with the goods or parts or shall have attempted to rectify the alleged defect in the goods or parts in any way before the inspection thereof by representatives of Franklin Electric; and
- (d) Notwithstanding anything to the contrary contained herein, whether or not Franklin Electric has repaired or replaced alleged defective goods, Franklin Electric shall be entitled at any time to refund the purchase price of any allegedly defective goods to the customer and such refund shall be in full and final settlement of such customer's claim in respect of the allegedly defective goods.

Without limiting the generality of the exclusions of this limited warranty, Franklin Electric does not warrant the adequacy of any specifications provided directly or indirectly by a customer or that Franklin Electric's products will perform in accordance with such specifications.

This limited warranty does not apply to:

- (a) Any goods that have been subject to misuse (including use in a manner inconsistent with the design of the product), abuse, neglect, accident or improper installation or maintenance; and
- (b) Any goods that have been altered or repaired by any person or entity other than Franklin Electric or its authorised representatives;
- (c) Any goods not manufactured by Franklin Electric unless Franklin Electric is entitled to the benefit of the same or similar undertaking, mutatis mutandis from the supplier or manufacturer thereof. In such case, Franklin Electric's liability to the customer for such goods shall be limited to Franklin Electric's benefit from the supplier or manufacturer thereof.

Stated performance figures are based on Franklin Electric's testing experience. Franklin Electric shall not be liable for any loss or damaged incurred or sustained by the customer as a result of the customer's reliance on such figures unless Franklin Electric shall in writing, have:

- (a) Guaranteed such performance figures within specified tolerances; and
- (b) Agreed to pay a penalty or liquidated damages in the event of such performance figures not being achieved, in which event Franklin Electric's liability shall be strictly limited to the amount of such agreed upon penalty or damages.

Notwithstanding anything to the contrary, Franklin Electric shall not be liable, under any circumstances, for:

- (a) Any loss of trade or profit occurring to the customer in the event of the delivery of goods being frustrated or delayed by acts of God or force majeure such as, but not limited to, strikes, riots, lockouts, trade disputes, fire, war, mobilisation, military conscription, confiscation, uprising, trade embargoes, shortage of raw materials, or by any other cause beyond Franklin Electric's control, and
- (b) Loss of profit or any special, incidental or consequential damages whatsoever whether arising from breach of contract, delict, negligence, or from any other cause, even if Franklin Electric shall have been advised of the possibility of such potential loss or damage.



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