RAY PUMP 8080 M

Progressive Cavity Pumps

PRINCIPLE

The main components which characterize the pump are a metallic single helical rotary part Rotor and a fixed double helical resilient polymer part Stator in which the rotor turns and thereby a complex progressive sealing line (cspl) is maintained. Whilst the rotor rotates in the stator, the cavities formed between them progresses from suction to discharge end, gently carrying the media i.e. lightweight foam

FEATURES

- Gentle pumping action minimizes shear and crush damage to the pumped product
- Self-priming pump that can operate in either direction
- Compact and rugged design for durability and reliable performance
- Simple construction for ease of maintenance
- Ability to turn suction chamber through 90° to facilitate installation
- Ideal for shear sensitive and viscous materials, solids in suspension, abrasive and gas, liquids and solids mixtures
- Pumps can be supplied to comply with ATEX Directive 94/9/EC

- **Capacity : 8.40 – 21.00 M³/Hr**
- **Pressure: 9 bars.**
- **Viscosity: 1,00,000 cST**
- **Temperature: -10º C to 100°C**

INDUSTRIES

Construction
Ceramics
Effluent & Sewage Treatment
Fertilizer
Marine
Mining
Paint & Varnish
Paper, Pulp & Cellulose
Petrochemical & Refinery

FLUIDS HANDLED

Foam Concrete
Acrylic Emulsion
Effluent & Sewage
Bentonite Slurry
Casein Slurry
Chemical Slurry
Coating Mix
Latex
Lime Slurry
Sewage Sludge
Waste Water
Effluent Sludge & many more
numerous liquids

APPLICATIONS

Transfer, Filter & Meter of fixed or variable flow rates.

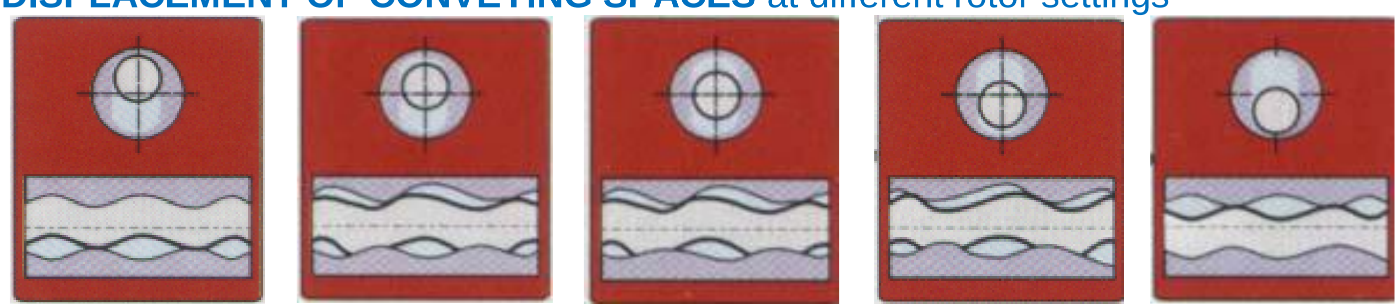
SHAFT SEALING

Single & Double Mechanical Seals.

UNIVERSAL JOINTS

Double articulated sealed, pin and bush joints ensures smooth power transmission and longer service life of critical components resistant to the lubricating media and the pumping media.
Simple to maintain and economical too.

DISPLACEMENT OF CONVEYING SPACES at different rotor settings



0º | 45º | 90º | 135º | 180º

OPTIONAL ACCESSORIES

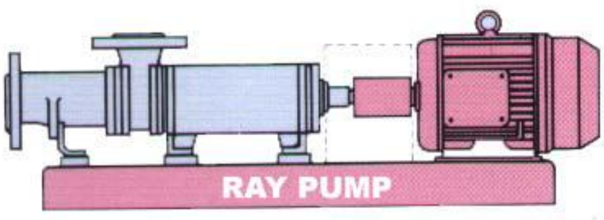
As an optional accessory the pumps should be fitted with a safety relief valve to be mounted on the discharge line wherever the possibility of the pump to run against a closed valve or in-line blockade exists. Dry running protection devices such as snorer by pass, level switch can be used for process requirements too.

TYPE OF DRIVE

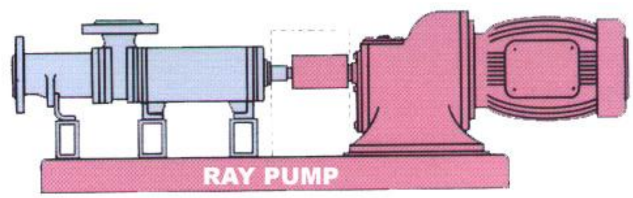
A variety of drive options such as, pump directly coupled to motor, pump directly coupled to geared motor, pump directly coupled to gear-box and gear-box directly coupled to motor, over-head or L-type base plate with V-belts & pulleys arrangement. For variable flows, pump directly coupled to current speed variac or pump directly coupled to a mechanical speed variac which is either directly coupled or V-Belt driven by a motor or prime mover connected to a Variable AC frequency drive to very accurate variable flow rates and process control requirements. Pumps can also be driven by petrol, diesel engines or hydraulic drives.

A number of standard baseplate and drive variations are indicated here, to show some of the possible configurations of the Ray Pump, to suit your plant and needs.

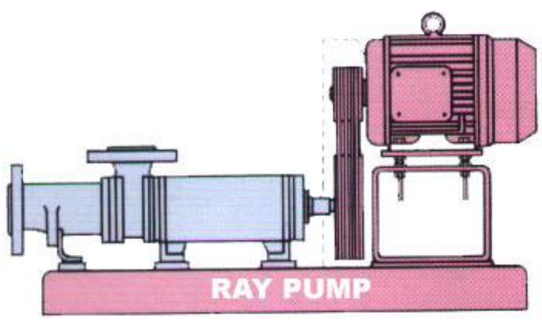
Direct Coupled To Synchronous Motor



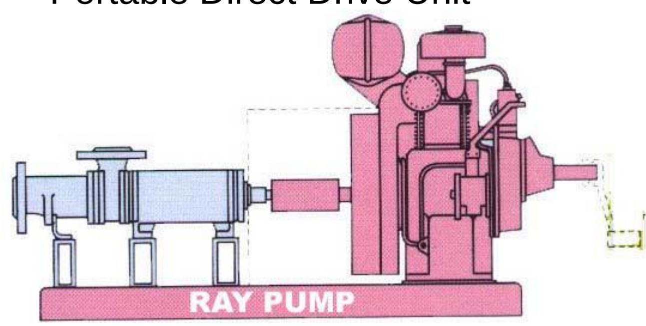
Reduction Gear in Line Drive



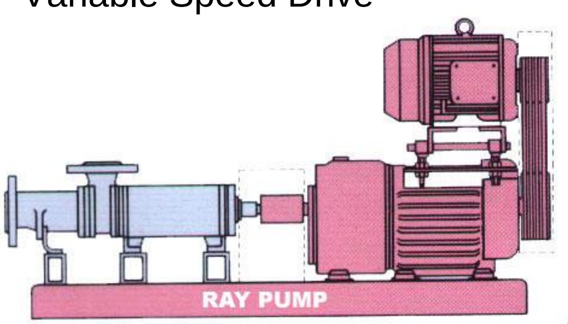
Overhead Vee Belt Drive



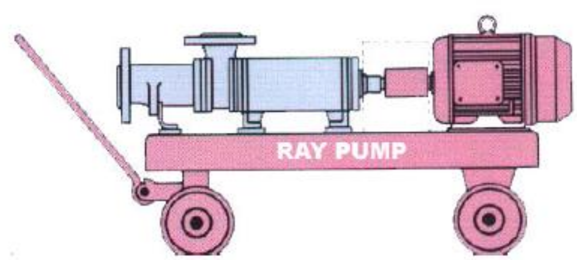
Portable Direct Drive Unit



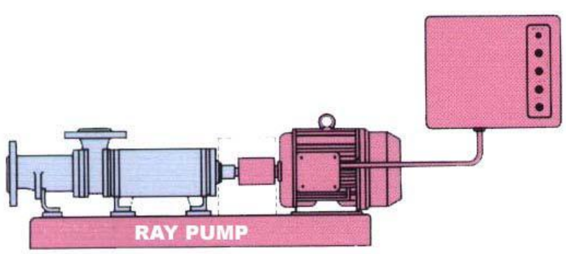
Variable Speed Drive



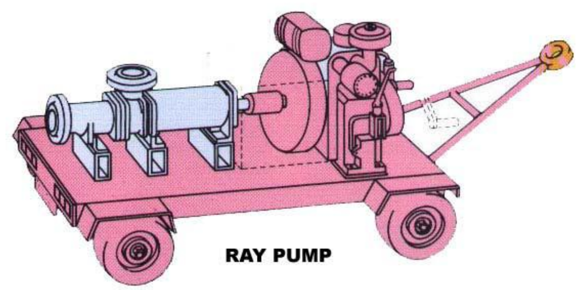
Petrol/Diesel Driven Unit



Inverter Variable Speed Drive

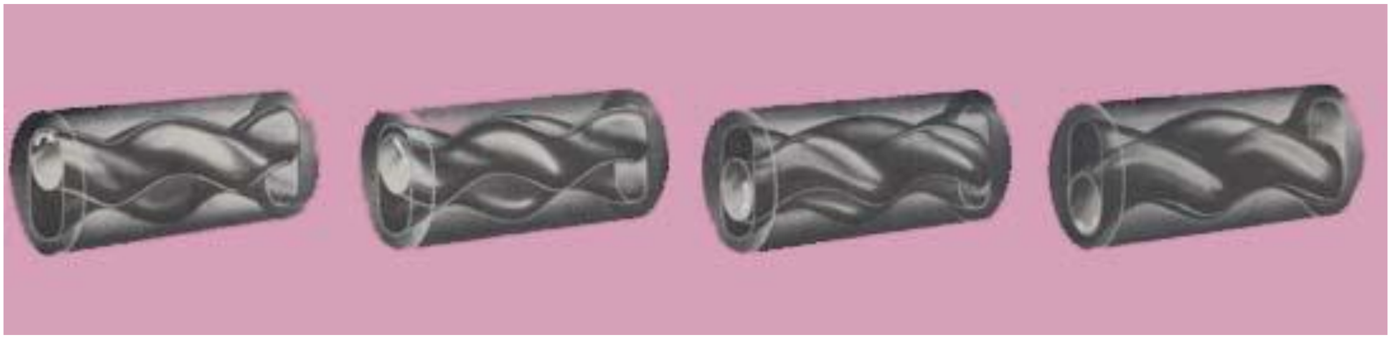


Portable Petrol/Diesel Driven Unit



PUMPING PRINCIPLES

The main pumping elements consist essentially of a resilient stator (usually rubber) in the form of a double internal helix, and a single helical rotor which rotates within the stator with a slightly eccentric motion. The rotor is of constant circular cross section, the centers of the sections forming a helix which is eccentric to the rotor axis. The pitch of the stator is twice that of the rotor and the two engage in such fashion that the rotor section traverses the stator aperture. The rotor maintains a positive seal along the length of the stator, and this seal progresses continuously through the pump, giving uniform positive displacement. The illustration shows four consecutive positions of the rotor as it makes one half turn in the stator. The progressive passages formed by the engagement of the rotor and stator helices, and the combined axial and rotational thrust of the rotor scroll through the stator will be seen.



ROTOR & STATOR PRINCIPLE

The metal rotor is machined in the unique form of a single start helix with a constant circular cross-section at right angles to its axis at any point along the length. The centre of each successive circular section lies along a helix, axis of which constitutes the axis of the rotor. The radius of this helix, i.e. the distance by which the centre of the rotor section is off-set from the axis of the rotor, is known as the eccentricity (e) Fig.1

The stator, normally a resilient elastomer, is molded in the form of a stationary sleeve incorporating a double internal helix with a constant cross-section throughout its length. This cross-section is a figure bounded by two semi-circles of the same diameter as the rotor, Fig.2, joined by two common tangents. The length of the tangents or sides of the section, i.e. distance between the semi-circle centers is equal to (4e) Fig.2
When the rotor is turned, its circular cross-section at every point in the length traverses in a straight line across the stator section from the position shown in Fig.2 to the opposite end and back in one revolution.

This remarkable motion evolves from a geometrical curiosity which shows that a curve traced by a point on the circumference of a circle rolling inside another circle which is twice the diameter, is always a straight line, and therefore a hypocycloid.

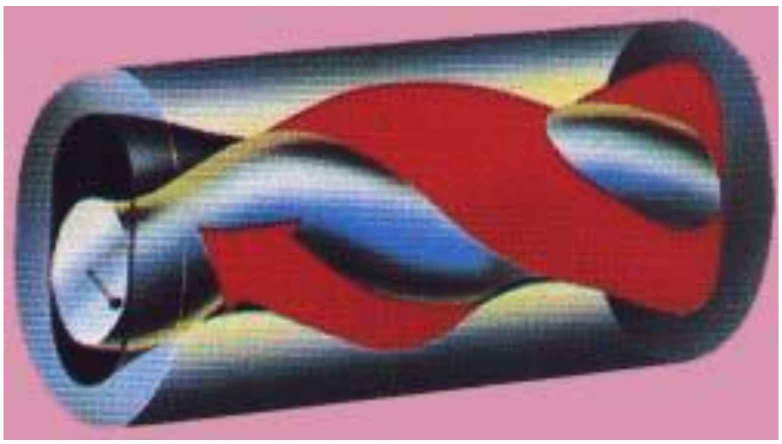
Theoretically the stator is a helical internal gear with two teeth, and the rotor a helical pinion with one tooth. Fig. 3 illustrates the imaginary fixed circle A which when regarded as a gear, is the pitch circle of the stator with a diameter equal to the distance between the centers of the semi-circles, i.e. (4e). The rolling circle is the pitch circle of the pinion, i.e. its diameter is the diameter of the rotor helix, (2e). As the rolling circle rotates, Fig.3, its centre describes a circle G also of diameter (2e) but concentric with the fixed circle, A. The point on the rolling circle, i.e. the centre of the rotor sections, reciprocates along the hypocycloid, BC.

Whilst the same motion occurs at every section along the stator length, Fig.4, the position of the rotor section varies due to the helical configuration through which continuous volumetric displacement from one end of the stator to the other is achieved.

Whilst stator length can be varied in manufacture to suit specific requirements, the minimum length for securing a complete seal between the rotor and stator is that which can accommodate an internal twist slightly in excess of 360 degrees.

A slight interference fit on the line of contact between the rotor and resilient stator forms a complete seal in the axial direction between the inlet and outlet. During normal operation the line of contact which re-creates itself every revolution, moves continuously at uniform velocity towards the outlet side. The length between two sections of the rotor occupying the same position in the stator at the same instant is known as the pitch (p) of the stator. The displacement of the pump in one revolution equals the superficial displacement on each cross-section multiplied by the stator pitch (p) Fig.5.

Area of the cross-section traversed by the rotor is equal to 4ed and theoretical displacement per revolution therefore equals 4epd.

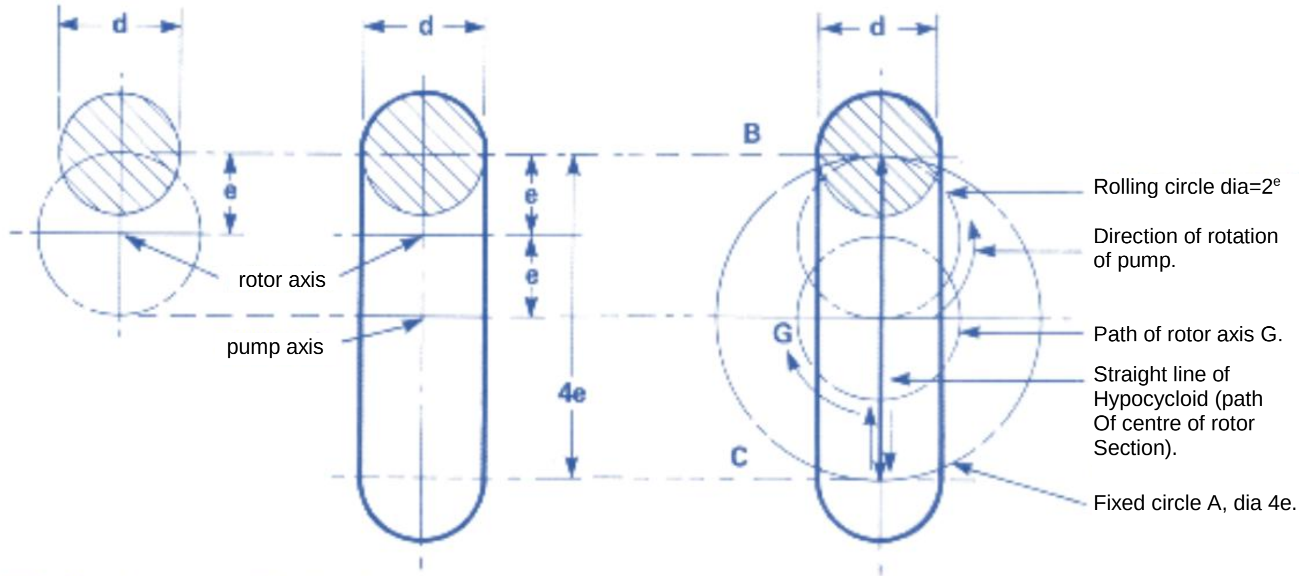


STARTING

NEVER RUN THE PUMP IN A DRY CONDITION EVEN FOR A FEW REVOLUTIONS OR THE STATOR WILL IMMEDIATELY BE DAMAGED

Pumps must be filled with liquid before starting, filling plugs are provided for this purpose. The initial filling is not for priming purposes but to provide the necessary lubrication of the Stator until the pump primes itself. When the pump is stopped, sufficient liquid will normally be trapped in the Rotor/Stator assembly to provide lubrication upon re-starting. If however, the pump has been left standing for an appreciable time, moved to a location, or has been dismantled and re-assembled, it must be re-filled with liquid and given a few turns by hand before starting. The pump is normally somewhat stiff to turn by hand owing to the close Rotor/Stator fit. However, this stiffness disappears when the pump is running normally against pressure.

Fig 1 Fig 2 Fig 3



N.B. For the purpose of clarity, the eccentricity is exaggerated in relation to the diameter (d) of the rotor (Fig.1) In practice the axis of the rotor lies within the circular cross-section.

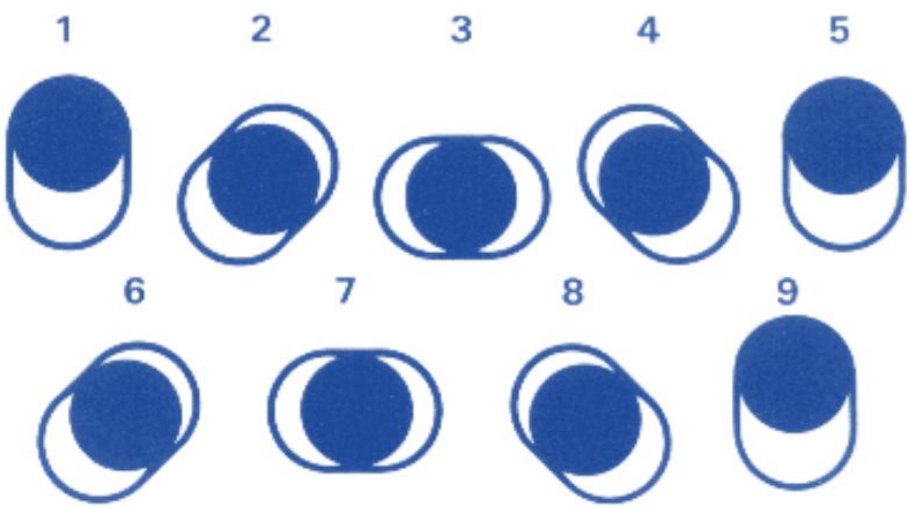


Fig 4

N.B. The numbered stationary positions of the rotor cross-section relative to the stator cross-section illustrated by Fig. 4 correspond with the numbers shown in Fig. 5

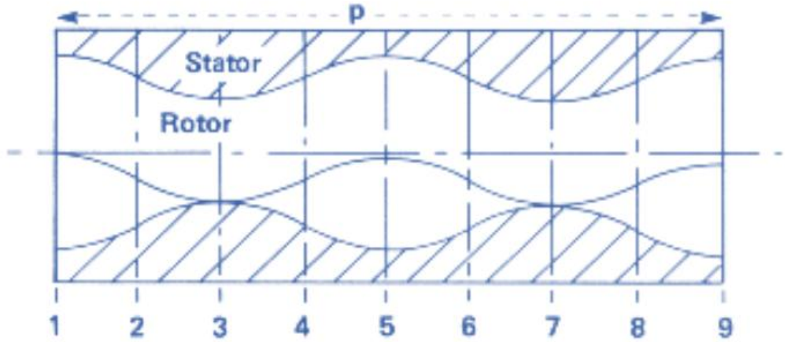


Fig 5

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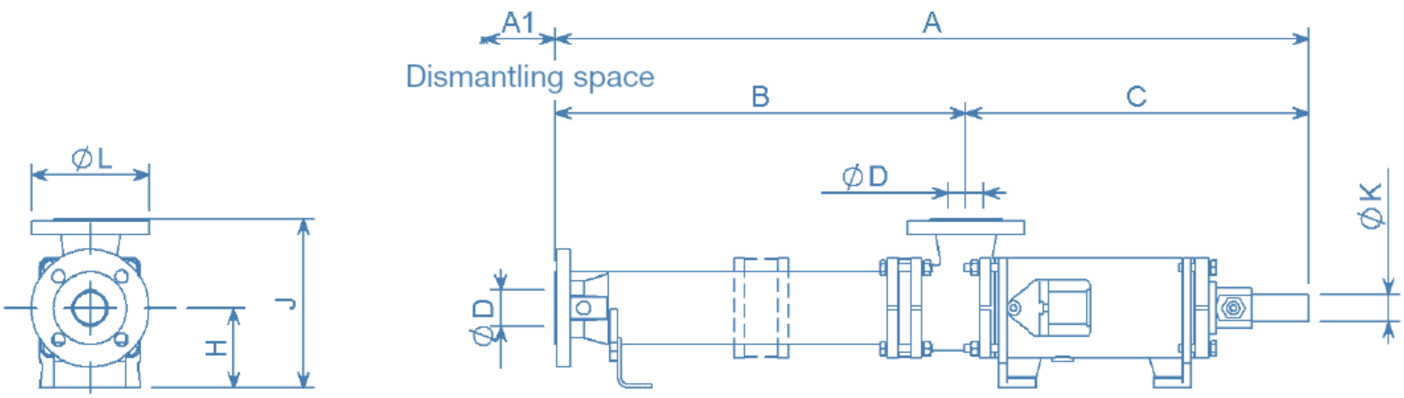
BARESHAFT PUMP DIMENSIONS



A	A1	B	C	D	E	E1	F	F1	F2	G	G1	H	J	K	L	Wt.Kg
1327	490	734	593	80	16	12	232	245	693	140	110	132	282	38	200	117

NOTES:

1. All dimensions are in millimetres unless otherwise stated and are for guidance only.
2. Cast iron flanges are to BS EN 1092 25/11
3. Shaft diameters are to BS 4506: 1970 and keyways to BS 4234 Part No. 1/ISO R773.
4. SOG refers to pump suction at the gland or drive end of the pump. DOG refers to pump delivery at the gland or drive end of the pump.
5. E & E1 refer to hold down bolt sizes.

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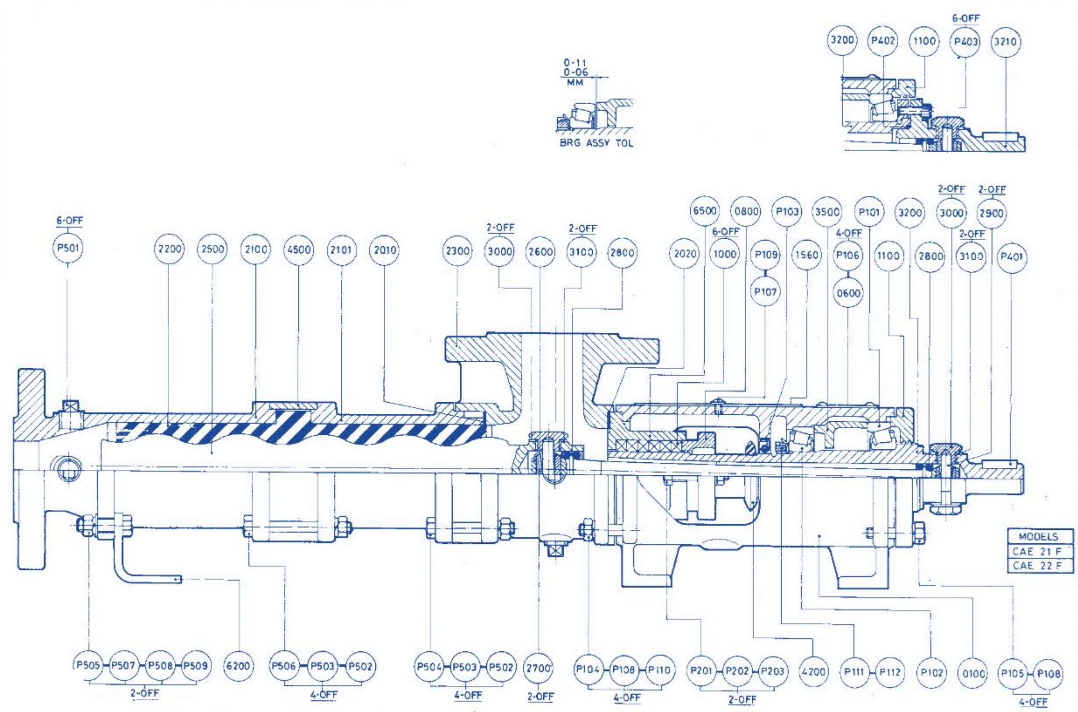
CROSS SECTIONAL ARRANGEMENT



Part No.	Description	Part No.	Description
0100	Body	P101	Bearing
0600	Nameplate	P102	Bearing
0800	Gland	P103	Rotary Shaft Lip Seal
1000	Packing	P104	Stud
1100	Bearing Cover	P105	Hex HD Bolt
1560	Thrower Guard	P106	RD HD Drive Screw
2010	Barrel Gasket	P107	Pan HD THD Cutting Screw
2020	Gland Gasket	P108	Spring Washer
2100	Combined Barrel & End Cover	P109	Bright Plain Washer
2101	Barrel	P110	Hex Nut
2200	Stator	P111	Locknut
2300	Suction Chamber	P112	Lockwasher
2500	Rotor	P201	Hex HD Bolt
2600	Coupling Rod	P202	Hex Nut
2700	Coupling Rod Bush	P203	Bright Plain Washer
2800	Coupling Rod Saling	P401	Rect or SQ Parallel Key
2900	Coupling Rod Pin	P402	Tordidal Seal Ring
3000	Pin Cap	P404	Hex Socket Cap Screw
3100	Pin Cap Washer	P501	Solid Taper Plug
3200	Shaft	P502	Spring Washer
3210	Stub Shaft	P503	Hex Nut
3500	Bearing Spacer	P504	Hex HD Bolt
4200	Thrower	P505	Hex HD Bolt
4500	Distance Piece	P506	Hex HD Bolt
6200	Support Feet	P507	Spring Washer
6500	Gland Section	P508	Hex Nut
		P509	Bright Plain Washer

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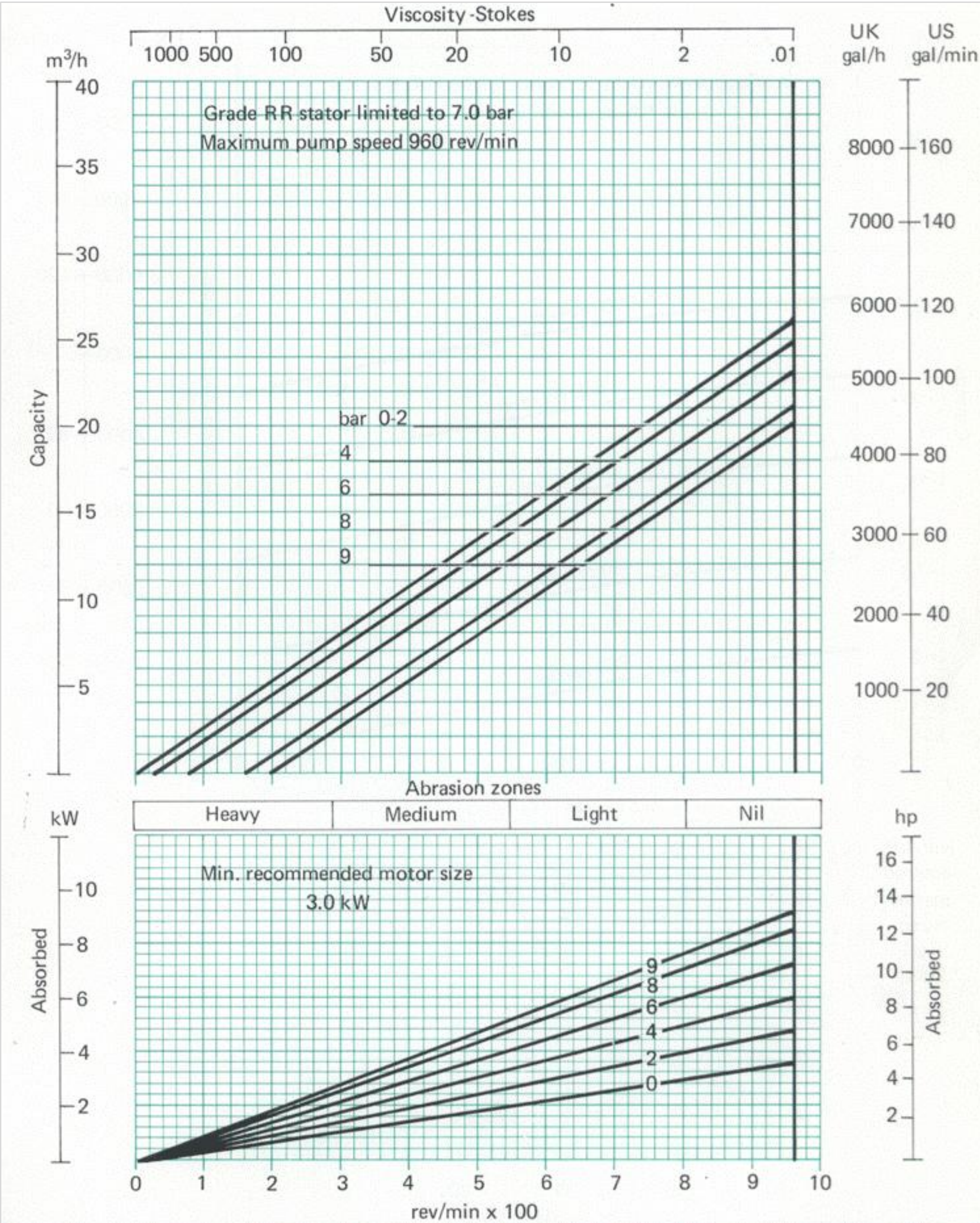
Tested on water at 20º C Without Snorer by pass	Starting torque 100 lb.ft. 135.0 Nm	SOLIDS HANDLING CAPABILITY Soft and compressible – Up to 40mm random solids Hard angular – up to 10 mm random solids



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NOTES:

1. This data relates to pumps without circulating bypass handling water or liquids of similar viscosity at 20 degree Celsius and 760 m. Hg barometric pressure.

2. The electric motor recommendations are based on standard motor ratings of reputed manufacturers and assume operation on 380/440 V, 3 Phases, 50 Hz supply with Direct-on-line starting.

3. For hydraulic/air motor drives the minimum starting torque requirements should be increased by 25%.

4. Capacity is approximately proportional to the speed of the pumps.

5. Reduced speeds should be selected for viscous or abrasive fluids.

6. This data relates to Stator of 70 shore hardness.

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