English

Installation, Operation and Maintenance Instructions

Borehole Pump

MPA554/12

Contents

Contents	Page
Warranty	3
Introduction	4
Safety Notices	4
Borehole Systems	5
Overview	6
Equipment	7
Pre-installment Checks	9
Motorised Units	10
Per-selection	11
Selection	27
Pre-assembly	33
Installation	36
Installation Instructions for A HeadOnly	40
Installation Instructions for B and C Heads Only	43
Operating Instructions	45
Maintenance	46
APPENDIX 1	47

Warranty

Warranty

1. Pumps manufactured by NOV are covered by warranty for a period not exceeding twenty four (24) months from installation.

2. NOV will make good by repair, or at their option, the replacement of faulty parts under warranty, providing always that:

   (a) The equipment was correctly installed and properly used in accordance with NOV Installation and Operation Instruction and accepted coeds of good engineering practice.

   (b) The claim for goods under warranty arises solely from faulty design, material or workmanship.

   (c) The repair is carried out in the NOV factory or by an authorised dealer or distributor appointed by NOV. Authorised agents must obtain written approval from NOV before completing any repairs under warranty.

   (d) All freight costs to and from the factory or repair agent are to be paid by the purchaser.

3. In the case of equipment or components which are not of NOV manufacture, but supplied by them, the warranty is limited to that extended by the suppliers or manufacturers of such equipment.

4. NOV warranty does not cover any of the following:

   (a) Claims for third party liability of damage caused by failure of any of the company's products.

   (b) Damage caused by abnormal operating conditions, war, violence, storm cataclysm or any other force.

   (c) Damage caused by the equipment being used for an application for which it is not recommended.

   (d) Damage caused by sand or abrasive materials, corrosion due to acid waters, electrolytic action, liquid temperature beyond the recommended range, cavitation, improper supply voltage, use of non-approved control gear, inadequate cooling, or insufficient liquid to enable the pump to perform to specification.

5. The decision of NOV in relation to any claims or disputes over warranty is final.

6. The warranty is in lieu of all other warranties and conditions expressed or implied, written or oral, statutory or otherwise, which are hereby negated and excluded.

7. This express warranty does not exclude any conditions or warranty implied by the Trade Practices Act 1974 or separate State laws and in addition to any other right, that the original purchasers or any subsequent purchaser may have at law.

In case of claim please contact your Authorised NOV Dealer or contact NOV Australia Pty Ltd direct with details as completed in Delivery Record.

Introduction

The Mono Water Pumping System you have purchased represents a significant capital expenditure of quality, efficient equipment. Once the system is properly installed, and with minimal maintenance, you can expect a long and efficient trouble free service life.

EQUIPMENT DELIVERED

Your system will consist of one or more of the following items:

1. Drive and discharge head.
2. Pump Element.
3. Column and shafting.
4. Column to head kit.
5. Column to element kit.
6. Stabilizers.

ANCILLARY EQUIPMENT

1. Engine/Electric motor.
2. Vee drive assembly.
3. Vee drive guard.
4. Base plate assembly.

Damage during delivery to any components should be reported promptly to an authorised NOV dealer or to the NOV office in your capital city.

SAFETY NOTES:



Guard or Belts and rotating components between drive head and motor. All guard must be in accordance with local regulations. The equipment must not be run without guarding in place.



Any electrical connections must be carried out by a qualified electricain in accordance with the local regulatory requirements



Fully isolate equipment prior to any maintenance.



All pumps must be bolted down to prevent them moving and causing injury or damage



All powered bareshft units must be mounted on suitable bases and guarded to prevent injury or damage.



Hot Surfaces - During operation drive head may become hot.



Heavy Item - Always use suitabily rated liftng equipment for installation and maintenance of the system.

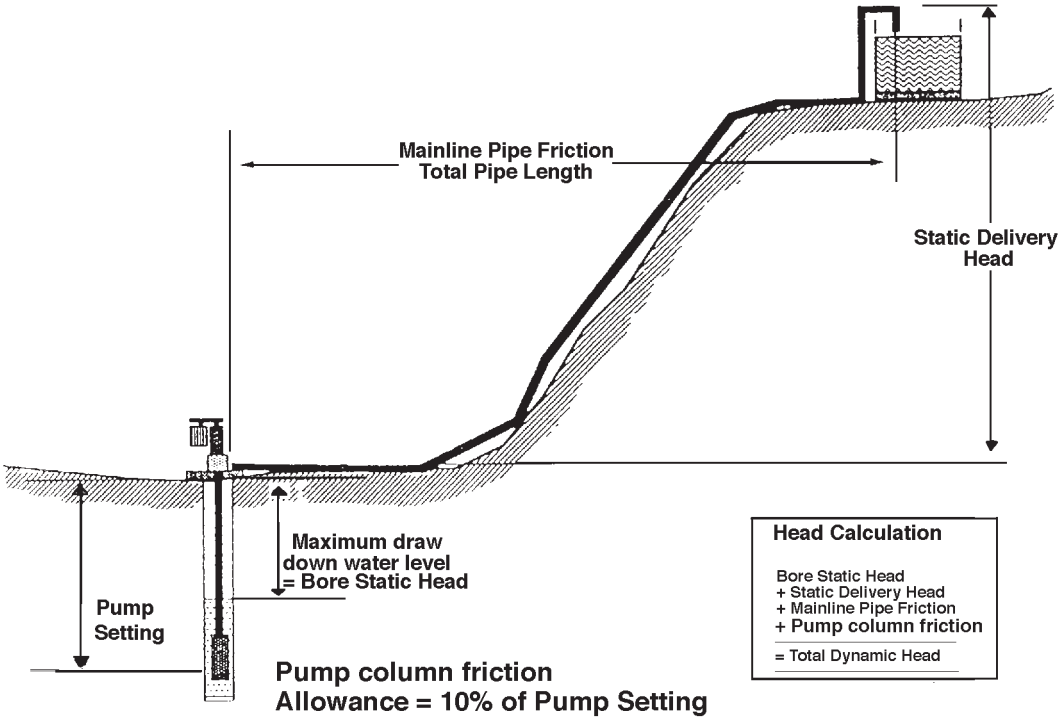


It is recommended that a pressure relief valve be fitted to the discharge of the pump to prevent over-pressurisation of the system. The relief valve should be set at the minimum pressure rating of any component in the system.



Be careful to avoid any contamination of the bore with diesel fuel or other petroleum based products as damage may occur to the natural rubber based stator.

Borehole Systems



TOOLS REQUIRED

The Mono Borehole Water Pumping System is designed for easy installation with few specialised tools required, as follows:

- firm standing tripod of suitable load capacity which gives at least 4 1/2 metres clear lift
- a safety winch or block and tackle. An adequate length of wire rope of sufficient load rating to take the weight of column and shafting with swivelling safety hook, sling or lifting cables
- two pairs of pipe wrenches - (914mm/36")
- two pairs of vice grips
- one hacksaw
- one set of imperial and metric Allen keys
- lifting tool & column clamp
- wire brush and file
- thread sealant for column - stag
- thread lubricant for shafting - molybdenum grease Kopre Kote or Nickel Antisieze.
- basic set of ring and open spanners
- bucket and stop watch to measure flow
- pressure gauge to measure head.

SAFE WORKING LOADS MATRIX

Weights of Columns and Shafting (Kg. per metre)

NB		DRY	INCLUDING WATER
1 1/4"	(32mm)	4.5	6.5
1 1/2"	(40 mm)	5.5	7
2"	(50mm)	8	10
2 1/2"	(65 mm)	10	14
3"	(80 mm)	13	18
4"	(100 mm)	18	26

Overview

Average safe working loads for wire rope in reasonable condition would be:

6mm (1/4") dia.	600 kg per rope
10mm (3/8") dia.	1500 kg per rope
12mm (1/2") dia.	2500 kg per rope

NOTE: The maximum load a block and tackle may lift safely is the above figure x number of ropes attached to or going through the bottom sheaf.

OVERVIEW

Installing a borehole pump is not difficult provided you are well organised and that you have read these instructions before commencing the work. The following summary gives an overview of the installation procedure. Note that the preparatory work and pre-assembly steps are most important to achieve a smooth running job.
Summary of events:

- Checks prior to delivery of the system -
- Preparation of the work site -
- Check alignment of bore -
- Pre-assembly of all the drive shaft lengths -
- Pre-assembly of all the column and shafting -
- Installing the base plate -
- Lowering the pump element into the bore -
- Lowering the column and shafting into the bore-
- Finishing column and shafting installation -
- Installing the pump head and driver -
- Final actions -

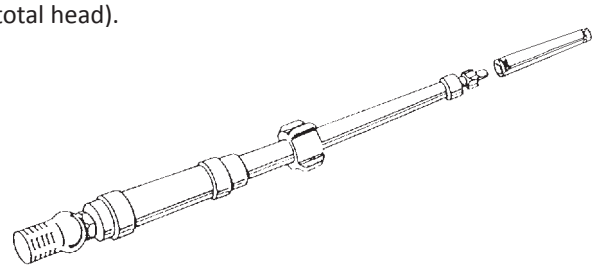
Each of the above steps will now be discussed in detail.

EQUIPMENT ITEMS

What you should receive:

1. A PUMP ELEMENT

Depending on the system duty (i.e. required flow and total head).



2. DRIVE AND DISCHARGE HEAD

Depending on the application Drive and Discharge Head assembly is supplied bareshaft or fitted with electric motor or engine drive, 1/4 twist belt drive assemblies are also an option.

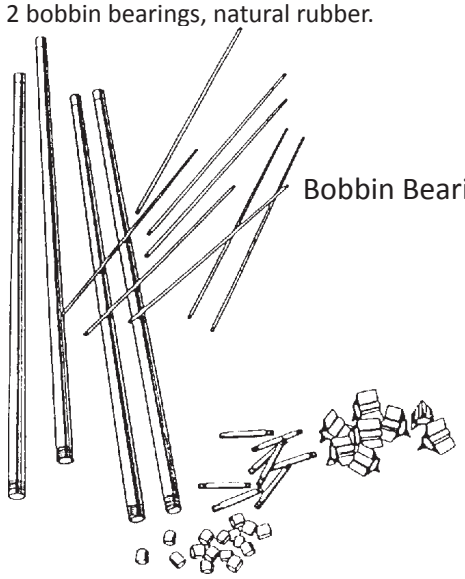
3. COLUMN AND SHAFTING

There should be sufficient lengths of column and shafting to reach the level of pump setting in the bore. The Rising Main (column assembly) comprises:
For each length of column (3m/10ft) there are two lengths of drive shaft (1.5m/5ft) and two bobbin bearing shaft assemblies.

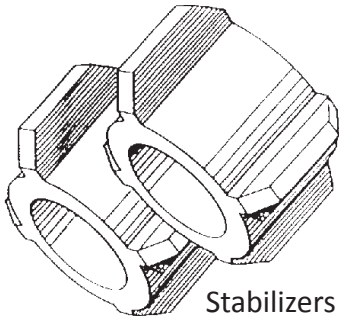
Equipment

The column is made of heavy duty galvanised pipe, with parallel thread. Each pipe length is supplied with a pipe socket fitted on one end. The drive shaft is made from high tensile steel as standard (stainless steel optional).
The Bobbin Assembly comprises:

- 2 bobbin bearing shafts of high tensile steel (stainless steel optional)
- 4 coupling nuts of high tensile steel (stainless steel optional)
- 2 bobbin bearings, natural rubber.



Bobbin Bearings

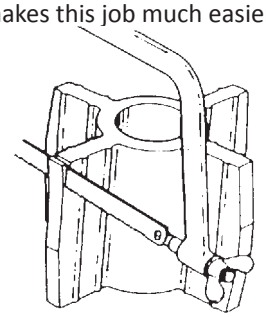


Stabilizers

4. STABILISERS

Natural rubber stabilisers are used in cased bores, one every third length of column.
In un-cased bores at least one stabiliser should be used per each length of column.

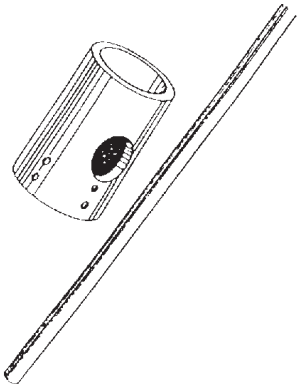
(a) Trimming and fitting column stabilisers. Mostly these should fit without the need for trimming. However if needed, use a hacksaw or sharp knife to trim them so they fit snugly and centrally in the bore casing. A chamfer top and bottom on parallel types will help installation (see sketch). Wetting the saw or knife with water makes this job much easier.



(b) 2 stabilisers are fitted to the pump element. They may also need trimming.

5. FINAL CONNECTING SHAFT AND JACK COUPLING

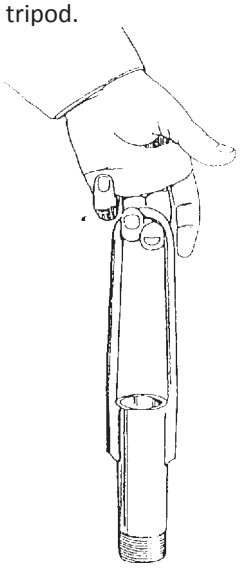
(a) A Mk 1 Vertical Drive Head.
The final connecting shaft is 279mm/11" long x 1/2" diameter and is stainless steel.
The jack coupling comes with internal thread to accept the drive head main shaft with 4 grub screws on the end. There is a horizontal hole in the centre to allow adjustment and tightening using a bar placed through the hole.



(b) B Mk2, B MK3 and C MK3 Vertical Drive Heads.
The B MK2 and 3 heads use a 3/4" x 2' shaft. The C MK3 heads use a 7/8" x 3' shaft.
(c) DR21 and RD F30A Right Angle Drive Heads.
The DR21 head uses a 20mm x 600m shaft with a 3/4" thread at one end. The RD F30A head uses a standard 7/8" x 3' shaft, with a 7/8" thread at one end.

6. LIFTING AND LOWERING TOOL

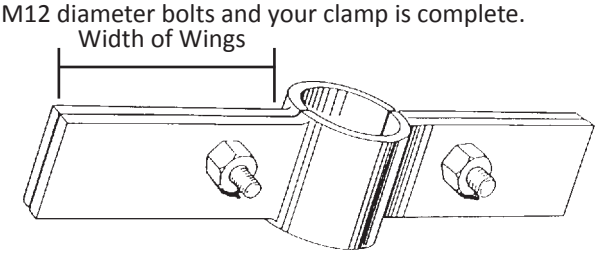
This tool screws into the column socket enabling the column to be safely lowered into the bore. The eye of the lifting tool is provided for the hook from the block and tackle on the tripod.



7. COLUMN CLAMP

This tool must be used whenever lowering or raising any equipment into the bore. It holds the column in position and must always be fitted below the column socket as a safety precaution.

For most efficient installation, you are advised to use a Morissey, or similar, Pipe Column Clamp but if this is not available an effective substitute can be improvised by sawing vertically through a Column Socket, and welding to each half, two 80 x 10 mm mild steel side "wings", as illustrated. The width across the wings should be 1 1/2 time the diameter of your bore casing, (e.g., if your bore casing is 200 mm diameter, the width across the wings should be 300 mm). Drill holes as illustrated to take M12 diameter bolts and your clamp is complete.



8. BASE PLATE

The drive and discharge head is fitted to a base plate. Rag bolts, nuts and washers are supplied, for bolting the base plate to the concrete plinth.
The base plate is bolted onto a concrete plinth which is usually prepared in advance to allow the concrete time to cure. Refer to the drawings supplied with this manual and next section on preparing the plinth.

Pre-Installment Checks

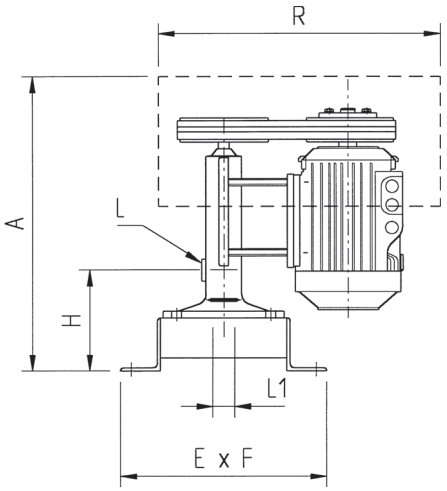
CHECKS PRIOR TO DELIVERY OF THE SYSTEM

(1) Check to see if the bore is cased.
If it is not cased, more stabilisers on the column will need to be used. These will have to be ordered with the equipment.
(2) Measure the diameter of the bore casing.
The stabilisers normally are trimmed to fit the bore casing size. If the casing is larger than normal or the pump is to be installed in a well, Mono will need to be consulted to allow for the special requirements of this situation.
(3) Check the depth of the bore.
Method: Place a weighted object on end of a rope and lower into bore. When the rope goes slack the bottom of the bore has been reached. Measure the length of rope used to the point where the rope went slack.
(4) Check the water level.
Method: Use the weighted object on the end of a rope as before. Either listen for the splash or locate the wet mark on the rope after the weighted object reaches the bottom of the bore.
(5) Check the alignment of the bore.
Normally this should not be necessary to check since most bores if drilled properly will be straight. However if the bore is suspect, use the following method to determine if the bore is suitable for installing the pump. Lower **3 column lengths,** joined together (with a socket at the bottom end to avoid thread damage) but without stabilizers down the bore to the pump setting. You will need the bore depth of cable or rope to do this. If the column lengths reach the desired setting without any resistance then the pump can be installed. If the column lengths meet resistance or jam then the pump should not be installed. Consult your NOV dealer for advice. Failure to observe this recommendation may result in premature wear and possible damage of the pump and lineshaft components.

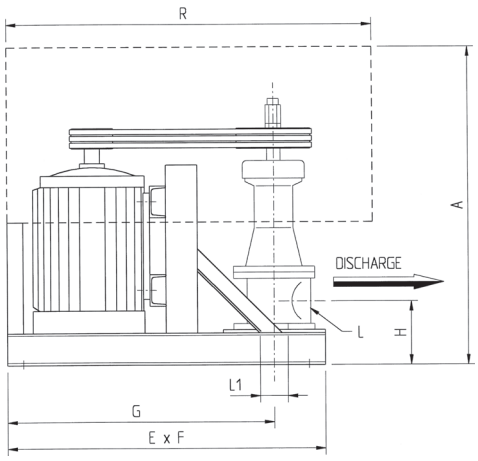
(6) Determine the pump setting.
Normally the pump is positioned about 3m/10ft above the bottom of the bore or just above the screen. The pump setting depends on the normal draw down of the water level which is expected from a heavy pumping duty. The pump should be positioned to avoid dry running even under the worst possible conditions.
The draw down level of the bore is usually written on the driller's certificate.
If there is some doubt about the test results or the condition of the bore is uncertain, it is recommended that the bore be tested prior to determining the pump setting. This is achieved by bringing an engine or electric driven pump to the bore and pumping at a higher than required rate for at least 24 hours. The level of the water in the bore is then re-measured and the pump setting decided.
Example - The standing water level may be 6m/20ft from the surface. When the bore is pumped for 24 hours at required flow rate, the draw down water level may hold at 12m/40ft. Therefore it would be safe to install the pump at below 12m/40 ft, say 14m/45 ft.
(7) Prepare the Plinth
Drawings of the plinth size and construction for both electric and diesel drive bore hole pump types are shown on the following pages.
There are two ways of attaching the base plate of the pump to the concrete plinth.
(a) Place rag bolts into wet concrete immediately after pouring as per the drawing dimensions.
(b) After the concrete plinth has cured, holes may be drilled into the concrete and Loxins used to hold down the baseplate onto the plinth.

A,B & C Heads
Motorised Units

Dimensions in Metric (mm) top. Imperial equivalent (inches) below.								
Drive Head	A	E	F	G	H	L	L_1	R
AMK1 Pad Mount	500	400	400	-	167	1 1/2”	1 1/2”	530
Motor on Base	19.7	15.7	15.7	-	6.6	BSP	BSP	20.9
BMK3 on Tee Base	820	1000	500	160	198	2 1/2”	2 1/2”	850
	32.3	39.4	19.7	6.3	7.8	BSP	BSP	33.5
CMK3 on Tee Base	935	1000	500	160	210	4”	4”	900
	36.8	39.4	19.7	6.3	8.3	BSP	BSP	35.4



AMK1



BMK3 & CMK3

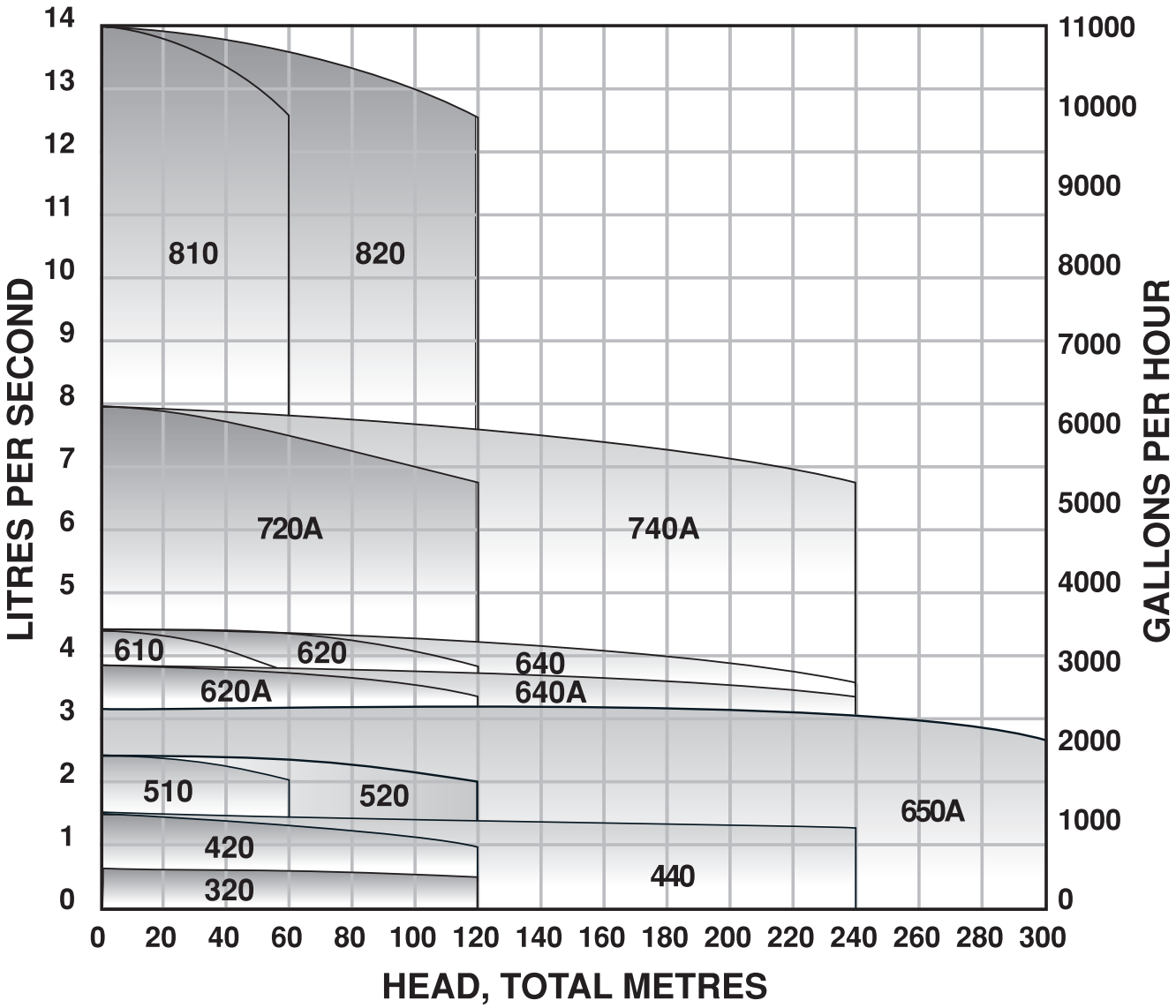
NOTES:

1 - Concrete mounting plinth for normal soil conditions should be poured using 4:2:1 mix (screenings:sand:cement) and left to cure for at least 48 hours before fixing baseplate.

2 - Length and width of the plinth to be equal to the baseplate plan dimensions + 100mm minimum, all round. Depth to be minimum 200mm below ground level. The finished top surface must be square with the bore.

3 - It is important for correct operation of the pump that the vertical centreline of the drive head is in line with the bore centreline.

Pre-Selection



320

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

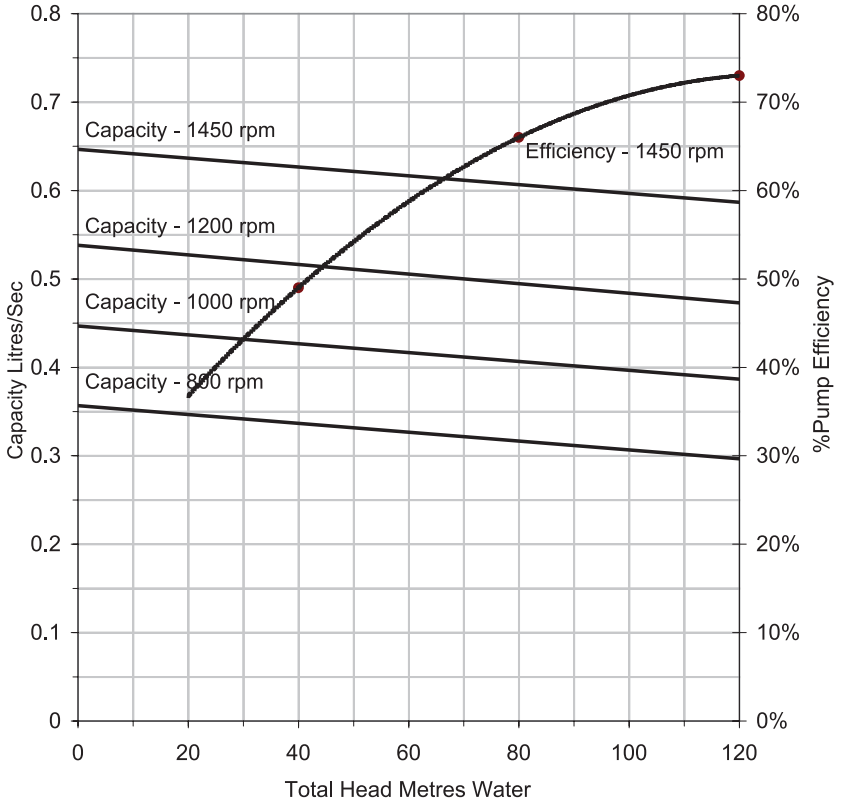
- Suitable for 76mm (3") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 2230 litres (490 gallons) per hour.

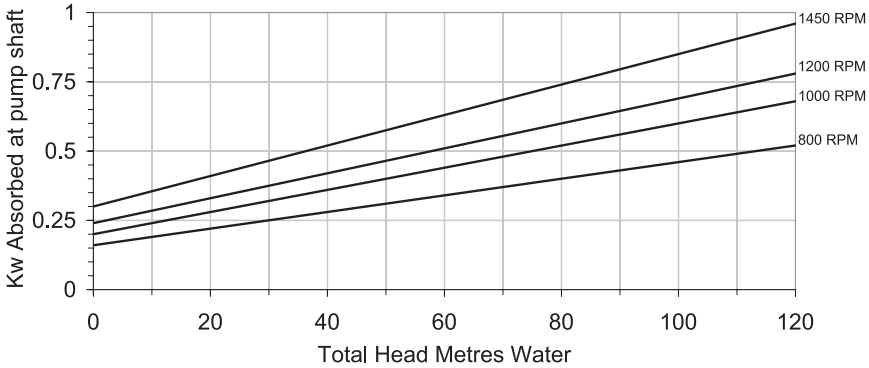
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 0.75kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/ motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
2.2	62	1 1/2 x 1/2 40 x 13	82	A
3	62	1 1/2 x 1/2 40 x 13	83	B MKIII
3	62	1 1/2 x 1/2 40 x 13	83	DR21 MKII

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		20 65ft	40 130ft	60 197ft	80 262ft	100 328ft	120 393ft
1450	Litres/Sec Gph kW abs	0.66 522 0.47	0.66 522 0.62	0.65 514 0.78	0.65 514 0.93	0.64 506 1.09	0.63 499 1.24
1200	Litres/Sec Gph kW abs	0.55 435 0.38	0.55 435 0.50	0.55 435 0.62	0.54 427 0.74	0.54 427 0.86	0.52 412 0.98
1000	Litres/Sec Gph kW abs	0.46 364 0.30	0.46 364 0.39	0.46 364 0.49	0.45 356 0.58	0.45 356 0.68	0.44 348 0.77
800	Litres/Sec Gph kW abs	0.37 293 0.22	0.37 293 0.28	0.37 293 0.34	0.36 285 0.40	0.35 277 0.46	0.34 269 0.52

420

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

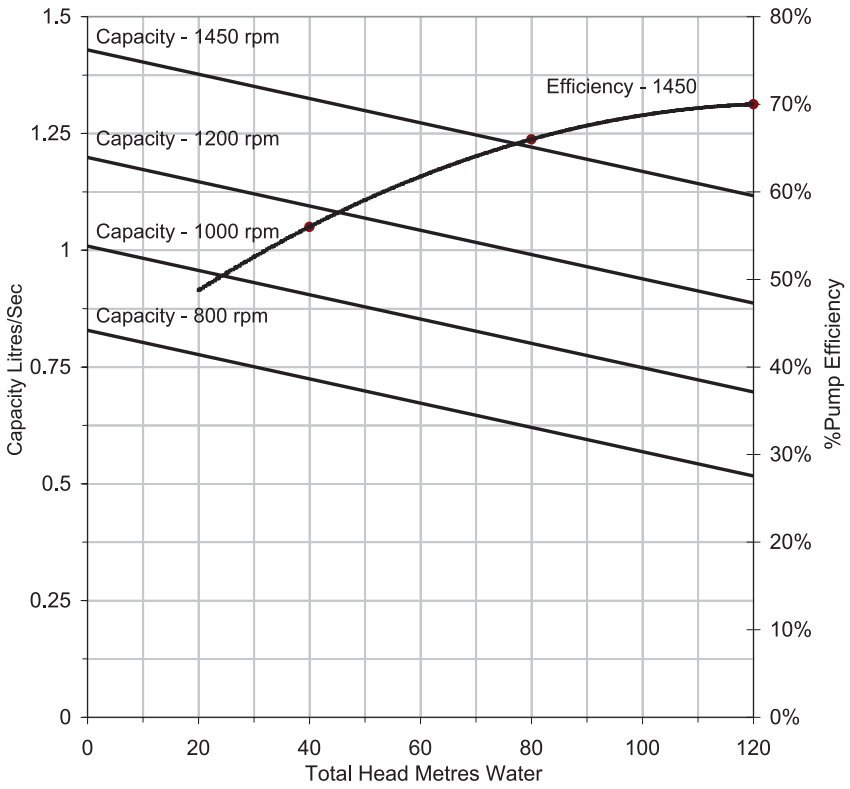
- Suitable for 76mm (4") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 5000 litres (1100 gallons) per hour.

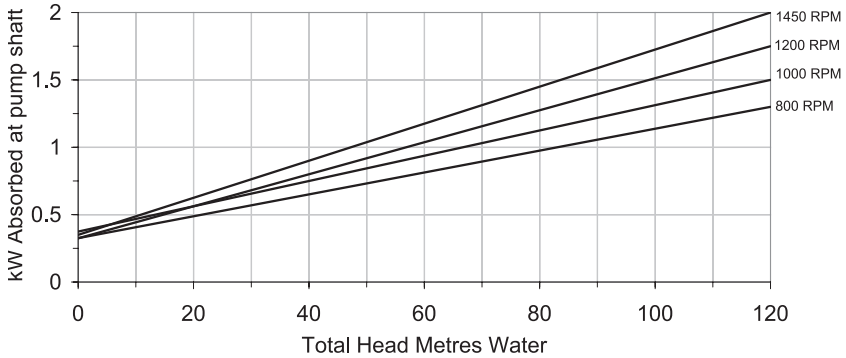
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
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10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 1.1kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/ motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		20 65ft	40 130ft	60 197ft	80 262ft	100 328ft	120 393ft
1450	Litres/Sec Gph kW abs	1.43 1132 0.46	1.4 1108 0.74	1.36 1076 1.06	1.32 1045 1.37	1.27 1005 1.67	1.21 958 1.97
1200	Litres/Sec Gph kW abs	1.18 934 0.36	1.15 910 0.6	1.11 878 0.87	1.07 847 1.12	1.02 807 1.37	0.95 752 1.62
1000	Litres/Sec Gph kW abs	0.98 776 0.28	0.95 752 0.49	0.91 720 0.7	0.87 689 0.91	0.81 641 1.12	0.75 594 1.34
800	Litres/Sec Gph kW abs	0.77 609 0.22	0.74 586 0.38	0.70 554 0.55	0.66 522 0.71	0.60 475 0.89	0.535 423 1.06

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
3	63	1 1/2 x 1/2 40 x 13	85	B MkIII
3	63	1 1/2 x 1/2 40 x 13	85	DR21 MKII

440

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

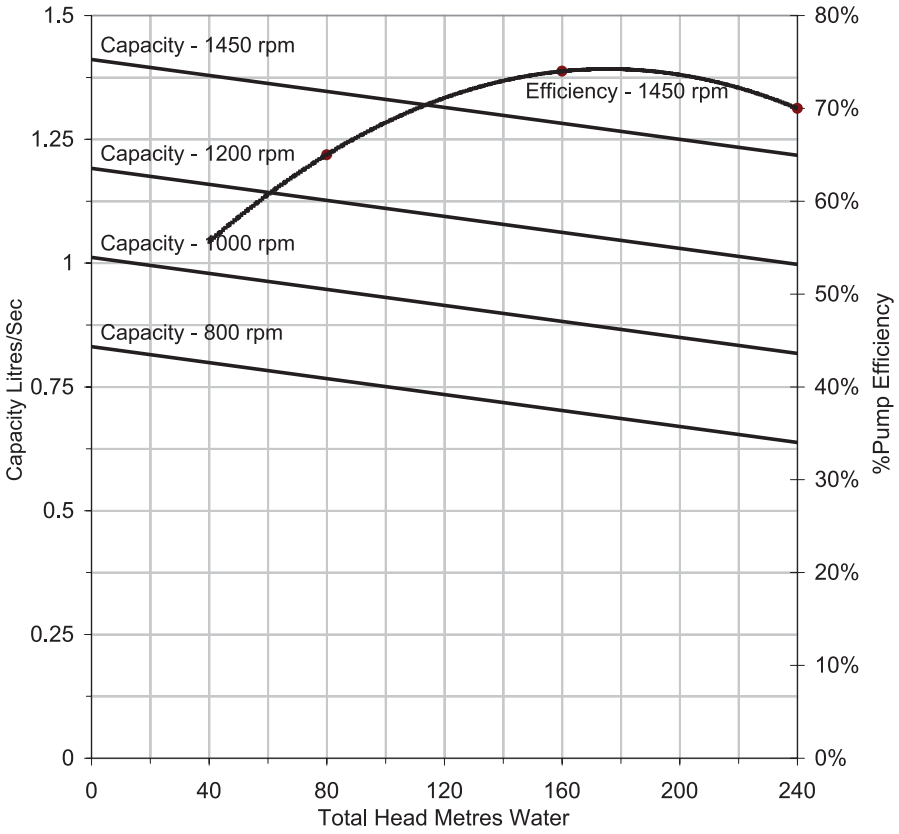
- Suitable for 100mm (4") internal diameter bore
- Total head of 240m (786 feet)
- Maximum yield of 4900 litres (1080 gallons) per hour.

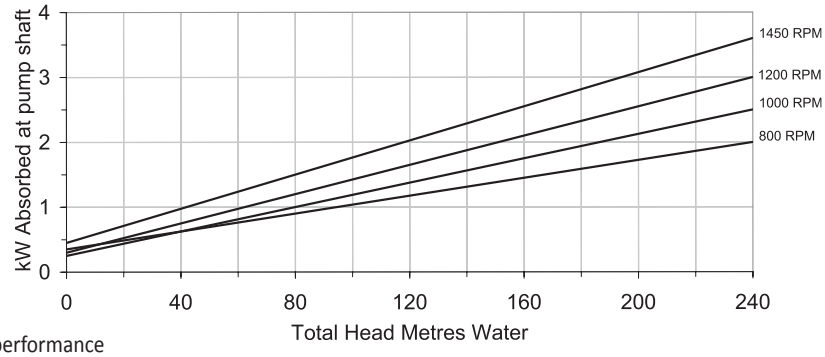
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Minimum Motor Size: 1.5kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
5.5	74	2 x 5/8 50 x 16	85	B MkIII
5.5	74	2 x 5/8 50 x 16	85	DR21 MKII

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		40 130ft	80 262ft	120 393ft	160 528ft	200 660ft	240 792ft
1450	Litres/Sec Gph kW abs	1.46 1155 0.88	1.45 1148 1.47	1.43 1132 2.05	1.38 1092 2.60	1.30 1029 3.24	1.23 973 3.83
1200	Litres/Sec Gph kW abs	1.21 958 0.73	1.19 942 1.20	1.17 926 1.70	1.12 886 2.17	1.05 831 2.68	0.95 752 3.19
1000	Litres/Sec Gph kW abs	1.00 791 0.59	0.99 783 1.01	0.97 768 1.40	0.91 720 1.80	0.82 649 2.21	0.73 578 2.65
800	Litres/Sec Gph kW abs	0.80 633 0.47	0.79 625 0.80	0.75 594 1.10	0.69 546 1.44	0.60 475 1.78	0.50 396 2.11

510

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

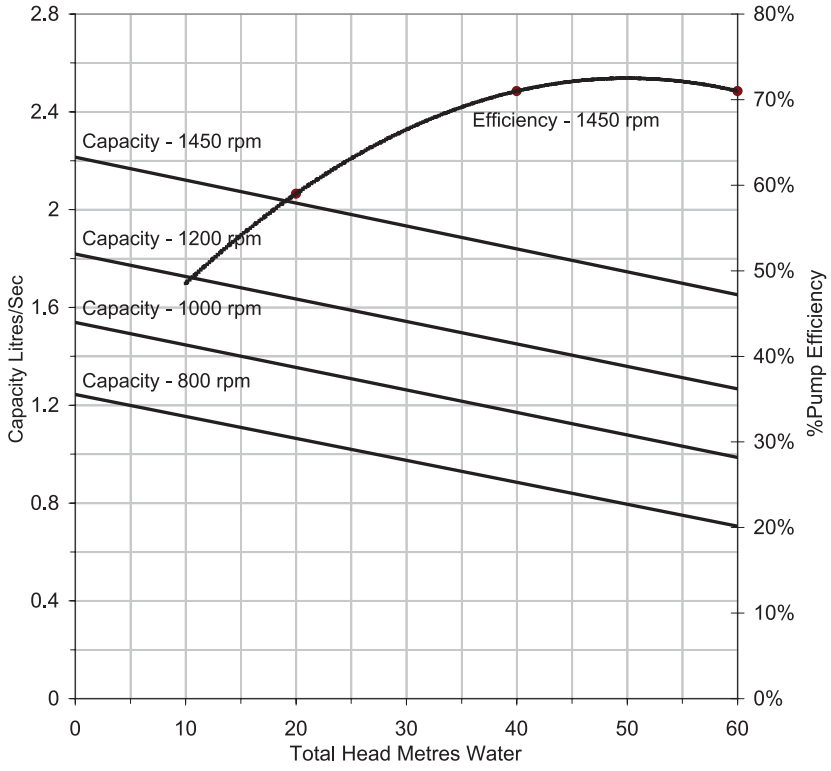
- Suitable for 100mm (4") internal diameter bore
- Total head of 60m (197 feet)
- Maximum yield of 7740 litres (1700 gallons) per hour.

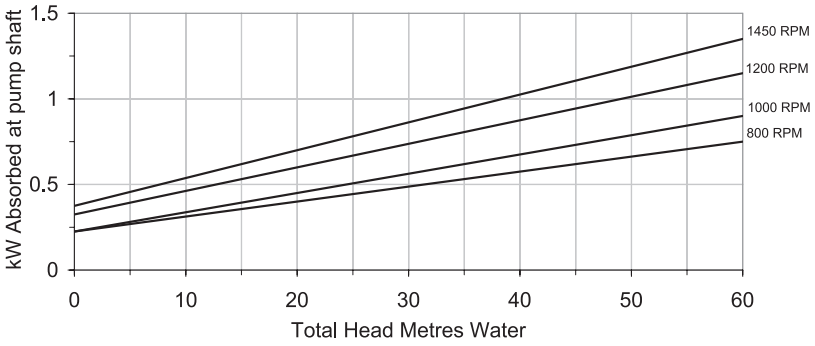
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 1.1kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
2.2	63	1 1/2 x 1/2 40 x 13	82	A
5.5	63	1 1/2 x 1/2 40 x 13	83	B MkIII
5.5	63	1 1/2 x 1/2 40 x 13	83	DR21 MKII

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		10 33ft	20 65ft	30 98ft	40 130ft	50 164ft	60 197ft
1450	Litres/Sec Gph kW abs	2.15 1702 0.43	2.14 1694 0.65	2.10 1662 0.87	2.00 1583 1.08	1.93 1527 1.30	1.84 1456 1.52
1200	Litres/Sec Gph kW abs	1.78 1409 0.34	1.76 1393 0.52	1.68 1330 0.70	1.63 1290 0.88	1.50 1187 1.06	1.39 1100 1.24
1000	Litres/Sec Gph kW abs	1.48 1171 0.27	1.44 1140 0.42	1.37 1084 0.57	1.30 1029 0.73	1.15 910 0.88	1.06 839 1.03
800	Litres/Sec Gph kW abs	1.17 926 0.20	1.14 902 0.32	1.00 791 0.44	0.96 760 0.56	0.80 633 0.68	0.70 554 0.80

520

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

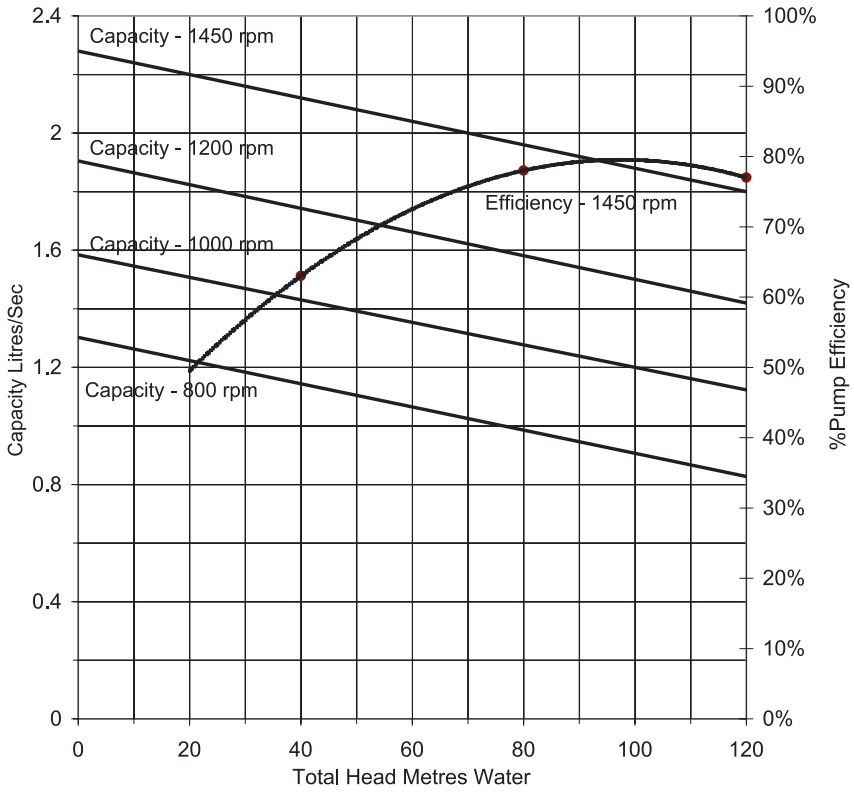
- Suitable for 100mm (4") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 7920 litres (1740 gallons) per hour.

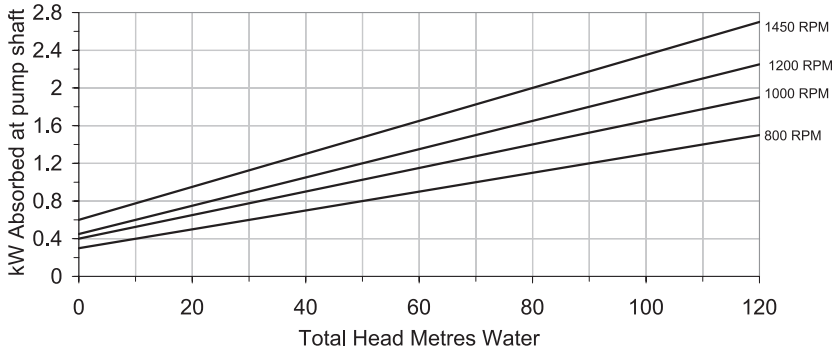
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 1.5kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
5.5	65	2 x 5/8 50 x 16	85	B MkIII
5.5	65	2 x 5/8 50 x 16	85	DR21 MKII

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		20 65ft	40 130ft	60 197ft	80 262ft	100 328ft	120 393ft
1450	Litres/Sec Gph kW abs	2.14 1694 0.77	2.12 1678 1.23	2.09 1654 1.70	2.04 1614 2.15	1.98 1567 2.60	1.89 1496 3.07
1200	Litres/Sec Gph kW abs	1.79 1417 0.62	1.75 1385 1.01	1.72 1361 1.37	1.68 1330 1.76	1.61 1274 2.13	1.51 1195 2.50
1000	Litres/Sec Gph kW abs	1.49 1179 0.49	1.47 1163 0.80	1.43 1132 1.11	1.38 1092 1.40	1.30 1029 1.73	1.20 950 2.04
800	Litres/Sec Gph kW abs	1.19 942 0.39	1.16 918 0.63	1.13 894 0.87	1.06 839 1.10	0.98 776 1.36	0.87 689 1.63

610

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

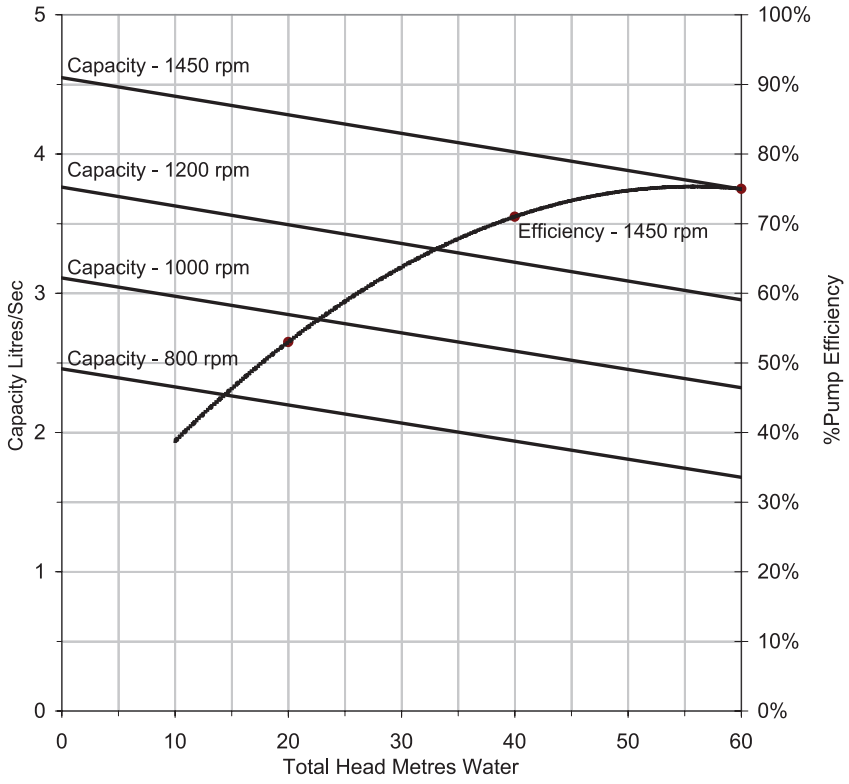
- Suitable for 115mm (4 1/2") internal diameter bore
- Total head of 60m (197 feet)
- Maximum yield of 16020 litres (3520 gallons) per hour.

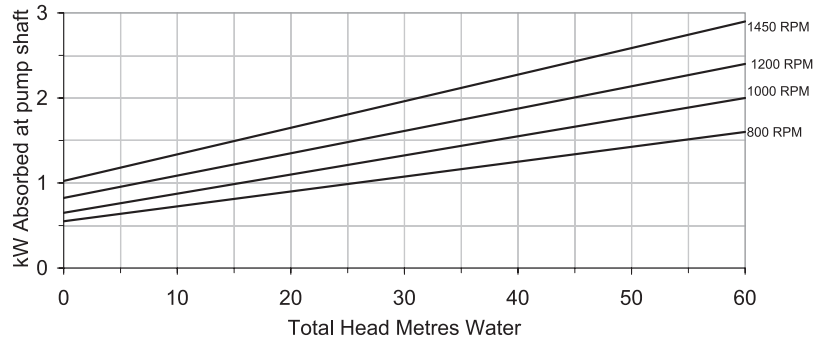
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 1.5kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		10 33ft	20 65ft	30 98ft	40 130ft	50 164ft	60 197ft
1450	Litres/Sec Gph kW abs	4.30 3403 0.99	4.21 3332 1.41	4.14 3276 1.83	4.01 3174 2.24	3.90 3086 2.66	3.74 2960 3.08
1200	Litres/Sec Gph kW abs	3.60 2849 0.73	3.47 2746 1.09	3.37 2667 1.45	3.29 2604 1.80	3.10 2453 2.16	2.95 2335 2.52
1000	Litres/Sec Gph kW abs	3.00 2374 0.57	2.89 2287 0.87	2.75 2176 1.17	2.66 2105 1.46	2.45 1939 1.76	2.29 1812 2.06
800	Litres/Sec Gph kW abs	2.43 1923 0.42	2.28 1804 0.66	2.12 1678 0.89	2.06 1630 1.13	1.82 1440 1.36	1.64 1298 1.60

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
5.5	74	2 x 5/8 50 x 16	85	B MKIII
5.5	74	2 x 5/8 50 x 16	85	DR21 MKII

620

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

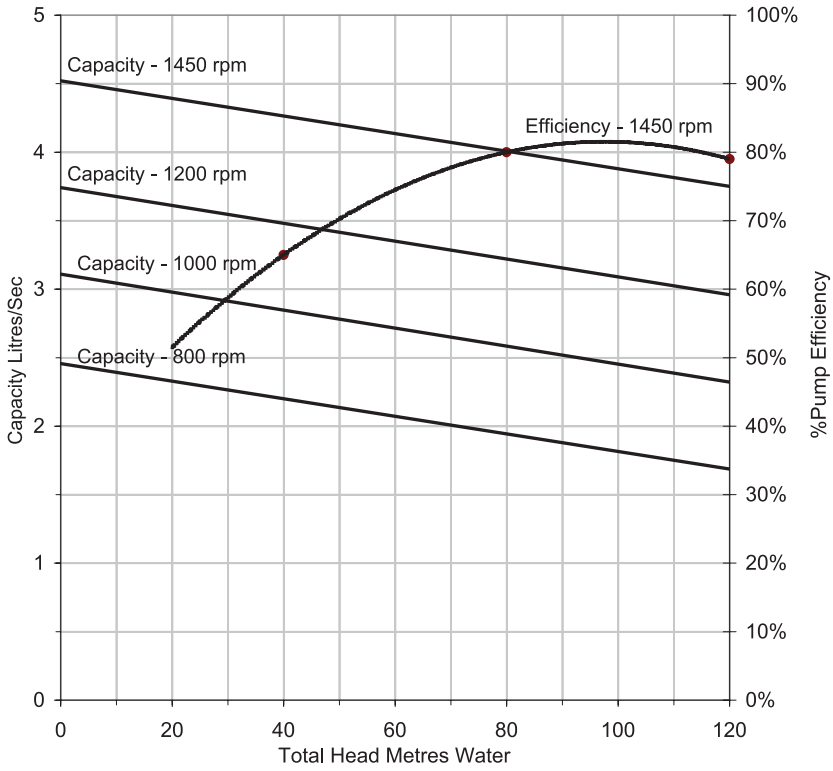
- Suitable for 115mm (4 1/2") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 16020 litres (3520 gallons) per hour.

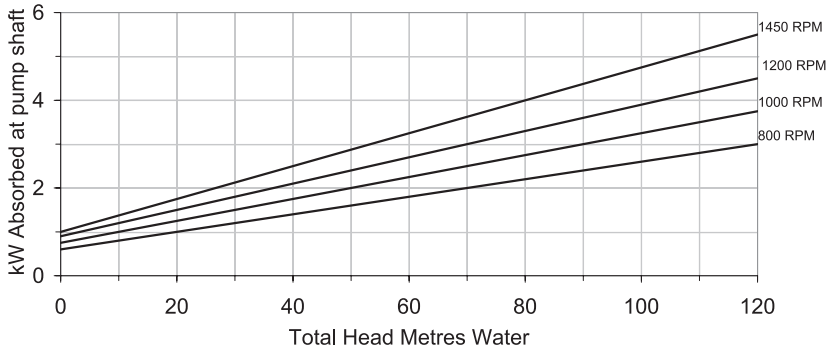
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 1.5kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
5.5	65	2 x 5/8 50 x 16	85	B MkIII
9.5	73	2 1/2 x 3/4 65 x 19	86	B MkIII
5.5	65	2 x 5/8 50 x 16	85	DR21 MKII
9.3	73	2 1/2 x 3/4 65 x 19	86	DR21 MKII

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		20 65ft	40 130ft	60 197ft	80 262ft	100 328ft	120 393ft
1450	Litres/Sec Gph kW abs	4.35 3443 1.80	4.28 3387 2.50	4.15 3284 3.25	4.05 3205 4.00	3.90 3086 4.70	3.70 2928 5.50
1200	Litres/Sec Gph kW abs	3.57 2825 1.50	3.50 2770 2.10	3.37 2667 2.70	3.25 2572 3.30	3.10 2453 3.90	2.92 2311 4.50
1000	Litres/Sec Gph kW abs	2.95 2335 1.25	2.85 2255 1.75	2.75 2176 2.25	2.60 2058 2.75	2.45 1939 3.25	2.30 1820 3.75
800	Litres/Sec Gph kW abs	2.30 1820 1.00	2.20 1741 1.40	2.10 1662 1.80	1.97 1559 2.20	1.83 1448 2.60	1.65 1306 3.00

620A

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

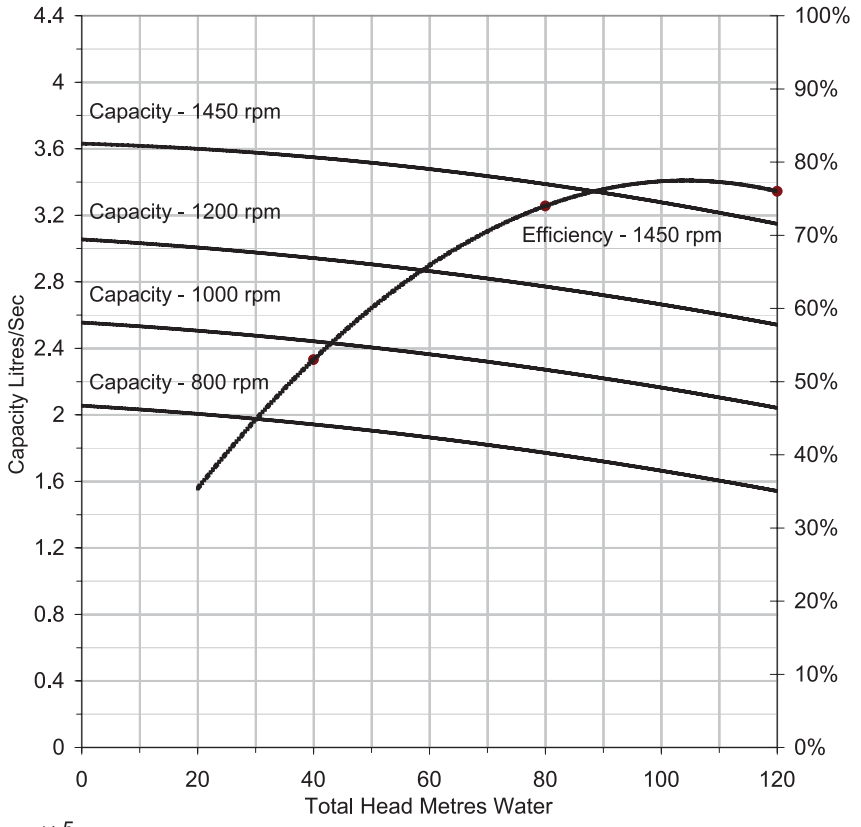
- Suitable for 100mm (4") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 12960 litres (2850 gallons) per hour.

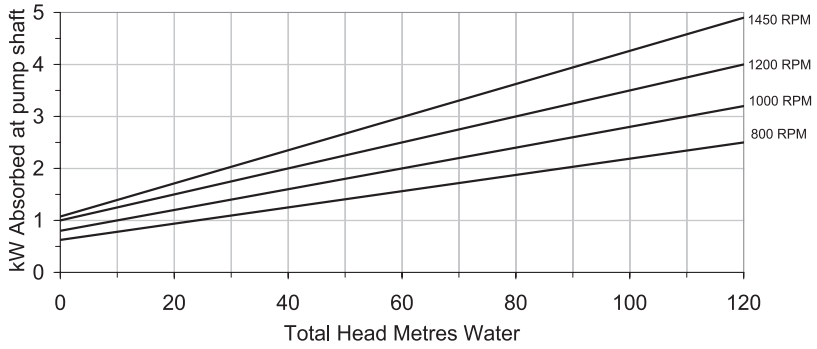
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 1.5kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		20 65ft	40 130ft	60 197ft	80 262ft	100 328ft	120 393ft
1450	Litres/Sec Gph kW abs	3.60 2851 1.70	3.55 2811 2.35	3.47 2748 3.00	3.40 2692 3.60	3.27 2589 4.25	3.15 2494 4.90
1200	Litres/Sec Gph kW abs	3.00 2376 1.50	2.95 2336 2.00	2.87 2273 2.50	2.77 2194 3.00	2.65 2099 3.50	2.55 2019 4.00
1000	Litres/Sec Gph kW abs	2.50 1980 1.20	2.45 1940 1.60	2.37 1877 2.00	2.27 1798 2.40	2.15 1703 2.80	2.05 1623 3.20
800	Litres/Sec Gph kW abs	2.00 1584 0.95	1.95 1544 1.25	1.87 1481 1.60	1.77 1402 1.90	1.65 1307 2.20	1.55 1227 2.50

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
5.5	66	2 x 5/8 50 x 16	85	B MkIII
5.5	66	2 x 5/8 50 x 16	85	DR21 MKII

640

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

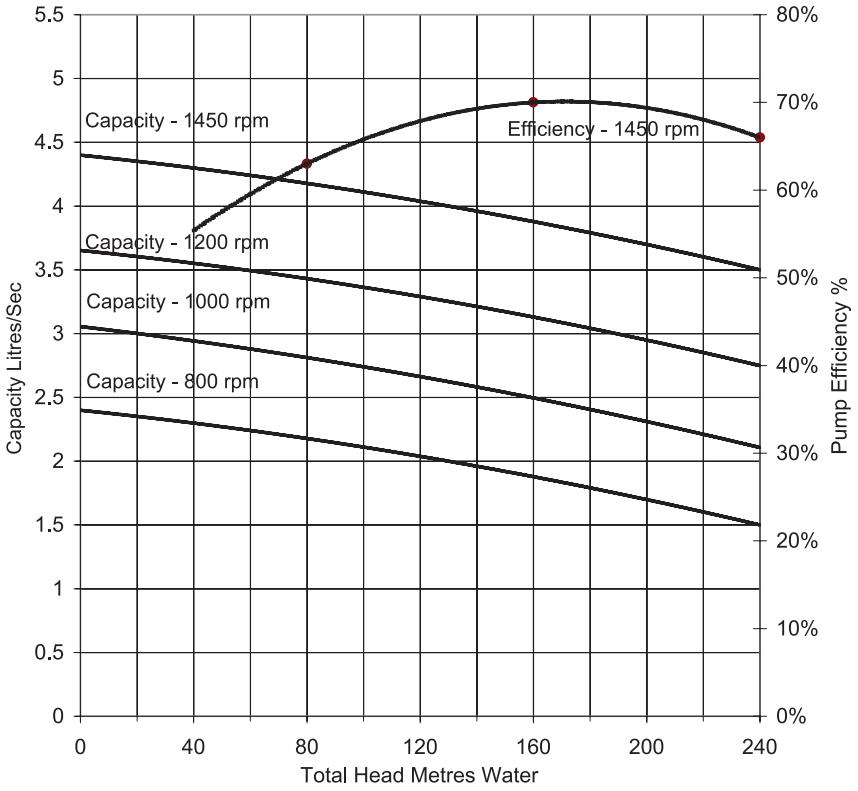
- Suitable for 115mm (4 1/2") internal diameter bore
- Total head of 240m (787 feet)
- Maximum yield of 15840 litres (3480 gallons) per hour.

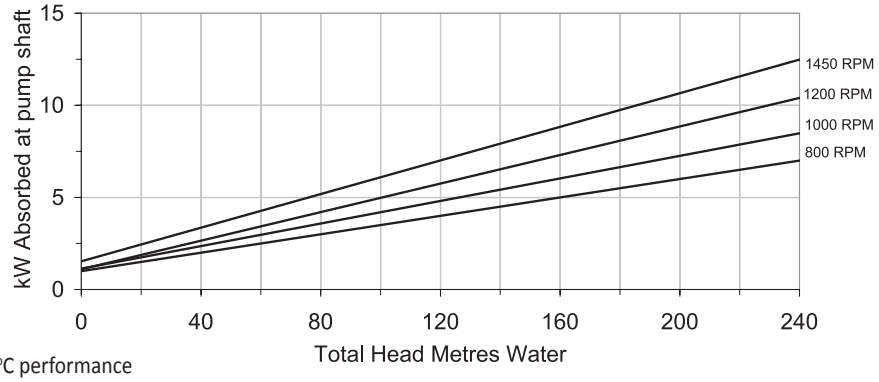
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 2.2kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
15	67	2 1/2 x 3/4 65 x 19	86	B MKIII
20	67	2 1/2 x 3/4 65 x 19	87	C MKIII
20	67	2 1/2 x 3/4 65 x 19	87S	RD-F30A
9.3	67	2 1/2 x 3/4 65 x 19	86	DR21 MKII

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		40 130ft	80 262ft	120 393ft	160 528ft	200 660ft	240 792ft
1450	Litres/Sec Gph kW abs	4.30 3405 3.30	4.17 3302 5.20	4.05 3207 7.00	3.87 3065 8.80	3.70 2930 10.60	3.50 2772 12.50
1200	Litres/Sec Gph kW abs	3.55 2811 2.70	3.43 2716 4.20	3.30 2613 5.80	3.12 2471 7.30	2.95 2336 8.80	2.75 2178 10.40
1000	Litres/Sec Gph kW abs	2.95 2336 2.30	2.80 2217 3.60	2.66 2106 4.80	2.50 1980 6.00	2.32 1837 7.20	2.10 1663 8.50
800	Litres/Sec Gph kW abs	2.30 1821 2.00	2.17 1718 3.00	2.05 1623 4.00	1.87 1481 5.00	1.70 1346 6.00	1.50 1188 7.00

640A

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

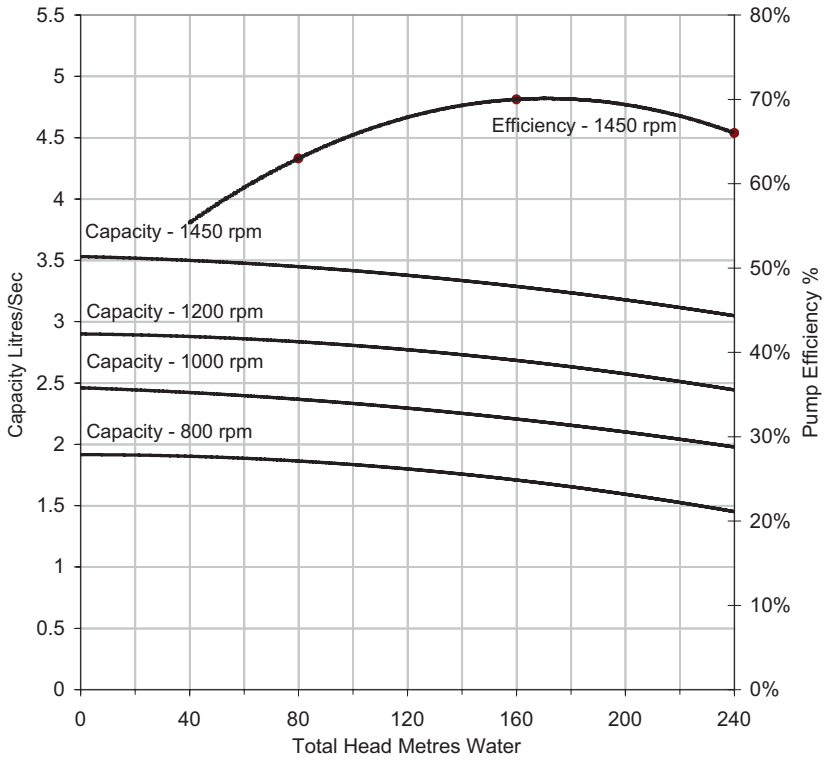
- Suitable for 100mm (4") internal diameter bore
- Total head of 240m (787 feet)
- Maximum yield of 12600 litres (2770 gallons) per hour.

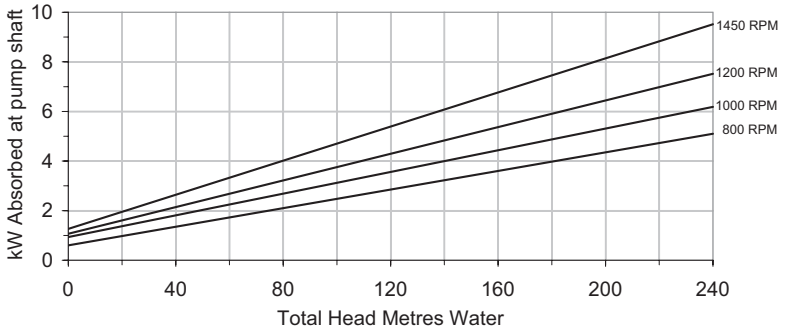
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 2.2kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		40 130ft	80 262ft	120 393ft	160 528ft	200 660ft	240 792ft
1450	Litres/Sec Gph kW abs	3.50 2772 2.60	3.45 2732 4.00	3.37 2669 5.40	3.30 2613 6.80	3.17 2510 8.20	3.05 2415 9.50
1200	Litres/Sec Gph kW abs	2.87 2273 2.20	2.85 2257 3.20	2.78 2201 4.30	2.67 2114 5.40	2.57 2035 6.40	2.45 1940 7.50
1000	Litres/Sec Gph kW abs	2.42 1916 1.80	2.37 1877 2.70	2.30 1821 3.60	2.20 1742 4.40	2.10 1663 5.30	1.98 1568 6.20
800	Litres/Sec Gph kW abs	1.90 1505 1.30	1.87 1481 2.10	1.80 1425 2.80	1.70 1346 3.60	1.60 1267 4.40	1.45 1148 5.10

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
9.5	67	2 1/2 x 3/4 65 x 19	86	B MKIII
20	67	2 1/2 x 3/4 65 x 19	87	C MKIII
20	67	2 1/2 x 3/4 65 x 19	87S	RD-F30A
9.3	67	2 1/2 x 3/4 65 x 19	86	DR21 MKII

650A

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

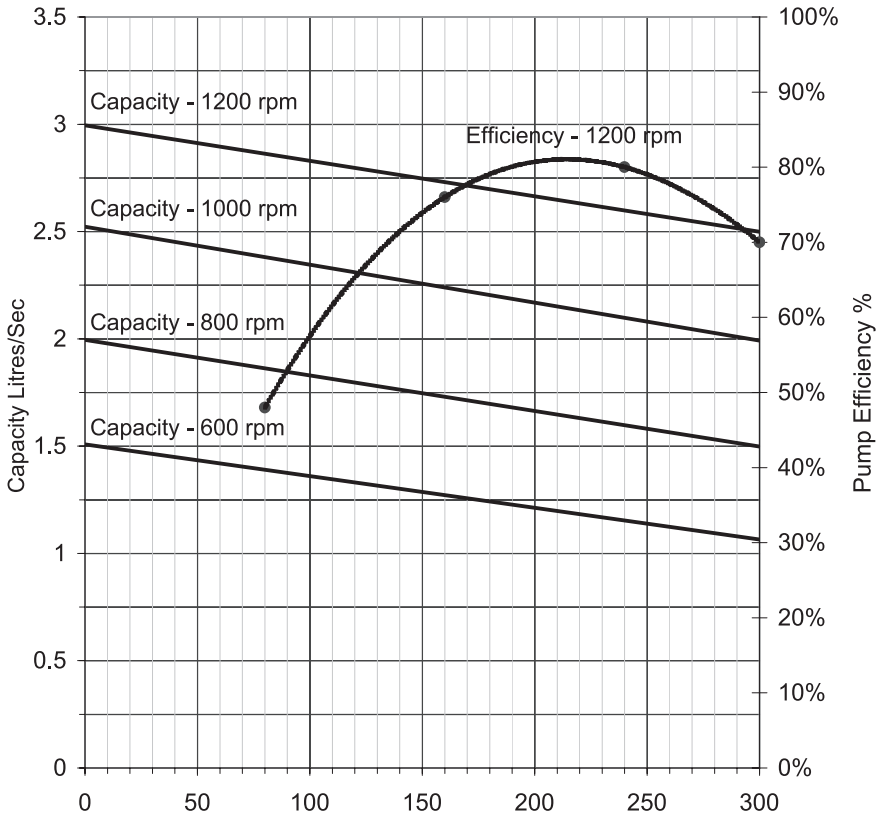
- Suitable for 100mm (4") internal diameter bore
- Total head of 300m (984 feet)
- Maximum yield of 10440 litres (2300 gallons) per hour.

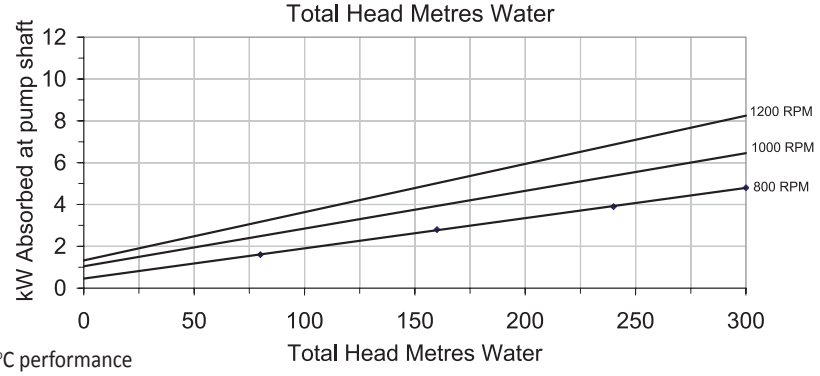
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 4.0kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
20	67	2 1/2 x 3/4	87	C MKIII
11	67	2 1/2 x 3/4 65 x 19	87S	RD-F30A

Pump Speed rpm	Capacity and Power	Total head from all causes (m)			
		80 262ft	160 525ft	240 787ft	300 984ft
1200	Litres/sec Gph kW abs	2.85 2257 3.60	2.75 2178 5.90	2.60 2059 8.00	2.49 1972 9.60
1000	Litres/sec Gph kW abs	2.38 1885 3.20	2.24 1774 5.00	2.10 1663 6.80	1.99 1576 8.30
800	Litres/sec Gph kW abs	1.85 1465 2.50	1.75 1386 3.90	1.60 1267 5.40	1.49 1180 6.45
600	Litres/sec Gph kW abs	1.38 1093 1.60	1.28 1014 2.80	1.17 927 3.90	1.05 832 4.80

720A

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

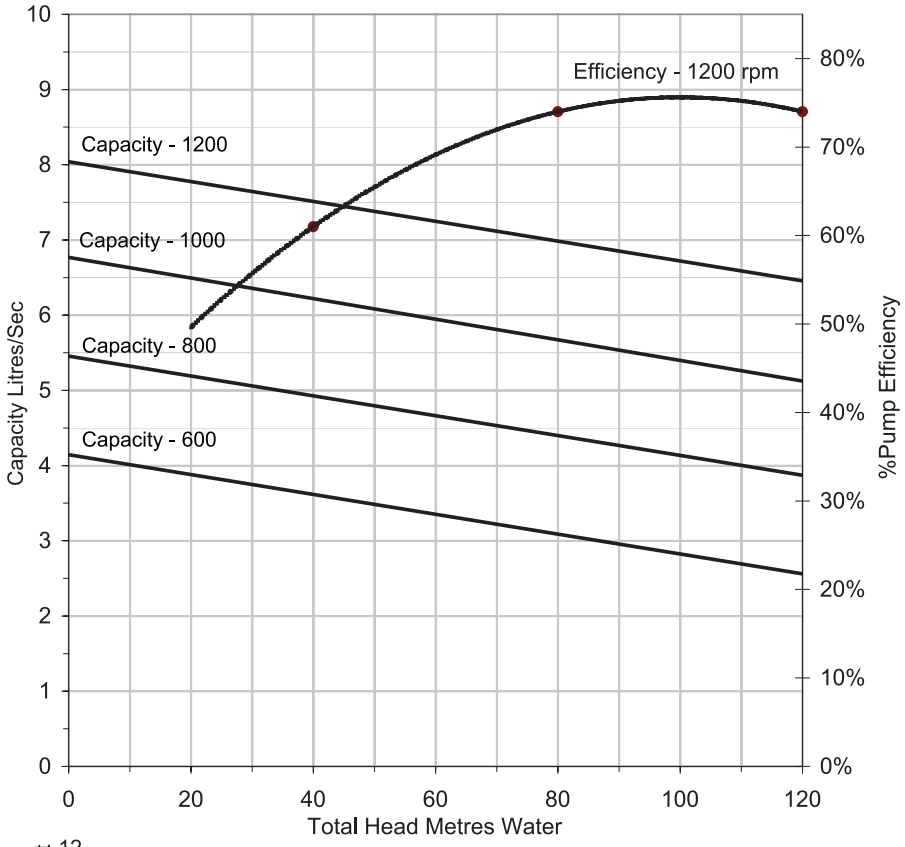
- Suitable for 127mm (5") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 28080 l/h (6180 gallons) per hour

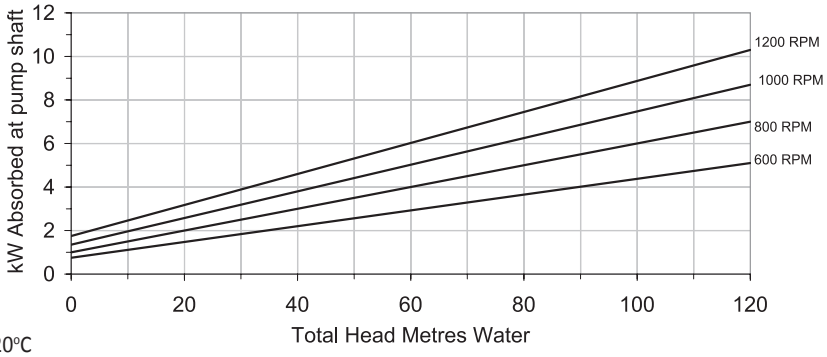
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 2.5kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
15	75	2 1/2 x 3/4 65 x 19	87	C MKIII
25	76	3 x 7/8 80 x 22	89	C MKIII
15	75	2 1/2 x 3/4 65 x 19	87S	RD-F30A
11	76	3 x 7/8 80 x 22	89S	RD-F30A

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		20 65ft	40 130ft	60 197ft	80 262ft	100 328ft	120 393ft
1200	Litres/Sec Gph kW abs	7.70 6098 3.20	7.55 5979 4.60	7.30 5781 6.00	7.02 5559 7.50	6.73 5329 9.00	6.40 5068 10.30
1000	Litres/Sec Gph kW abs	6.40 5068 2.50	6.25 4949 3.80	6.00 4751 5.00	5.75 4553 6.20	5.42 4292 7.50	5.03 3983 8.70
800	Litres/Sec Gph kW abs	5.10 4039 2.00	4.97 3936 3.00	4.72 3738 4.00	4.45 3524 5.00	4.15 3286 6.00	3.80 3009 7.00
600	Litres/Sec Gph kW abs	3.80 3009 1.50	3.65 2890 2.20	3.40 2692 3.00	3.15 2494 3.70	2.82 2233 4.40	2.50 1980 5.10

740A

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

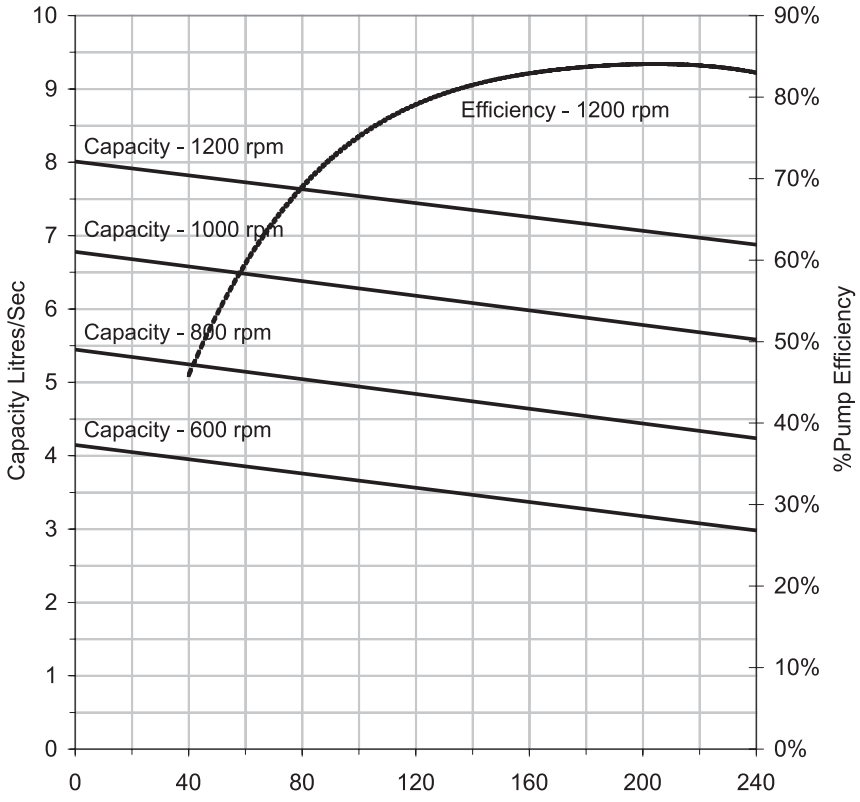
- Suitable for 127mm (5") internal diameter bore
- Total head of 240m (787 feet)
- Maximum yield of 28080 litres (6180 gallons) per hour.

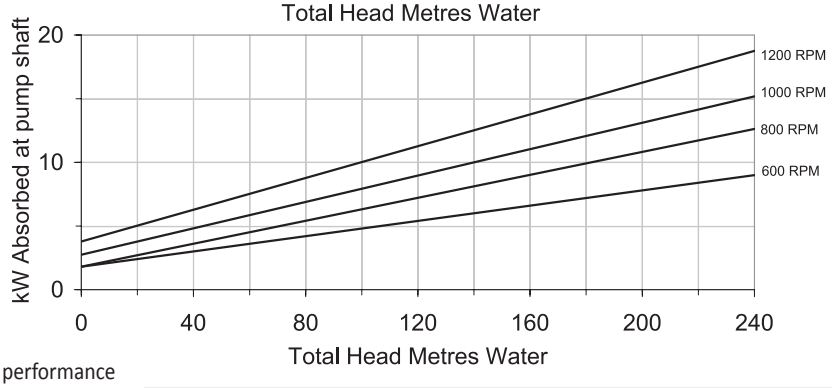
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 4.0kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		40 130ft	80 262ft	120 393ft	160 528ft	200 660ft	240 792ft
1200	Litres/Sec Gph kW abs	7.75 6137 6.30	7.65 6058 8.80	7.50 5939 11.20	7.30 5781 13.80	7.10 5622 16.20	6.80 5385 18.80
1000	Litres/Sec Gph kW abs	6.50 5147 4.80	6.40 5068 6.90	6.23 4933 9.00	6.05 4791 11.00	5.80 4593 13.10	5.50 4355 15.20
800	Litres/Sec Gph kW abs	5.15 4078 4.00	5.10 4039 4.70	4.90 3880 7.40	4.70 3722 9.20	4.40 3484 10.80	4.20 3326 12.60
600	Litres/Sec Gph kW abs	3.85 3049 3.00	3.80 3009 4.20	3.65 2890 5.40	3.40 2692 6.60	3.20 2534 7.80	2.90 2296 9.00

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
25	76	3 x 7/8 80 x 22	89	C MKIII
25	76	3 x 7/8 80 x 22	89S	RD-F30A

810

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

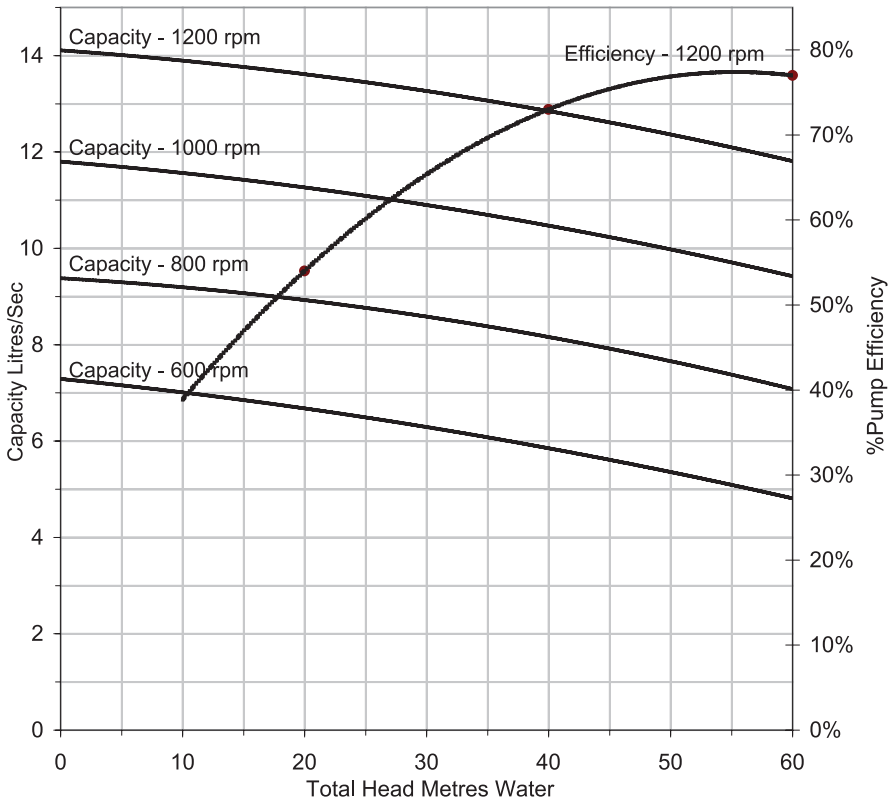
- Suitable for 145mm (5 5/8") internal diameter bore
- Total head of 60m (197 feet)
- Maximum yield of 50760 litres (11170 gallons) per hour.

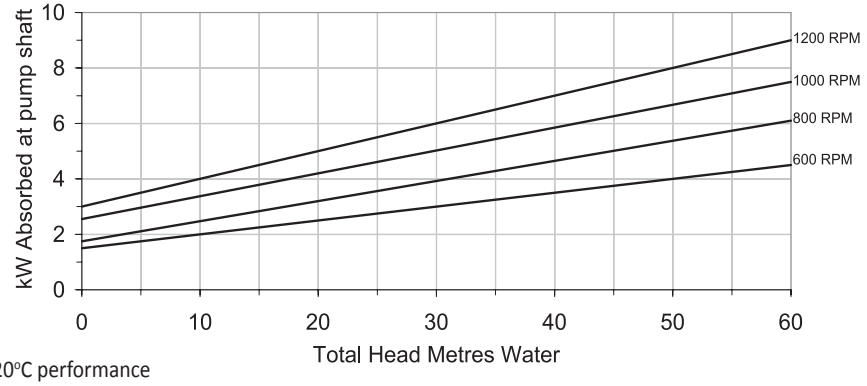
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

Rotor Selection
10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
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10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 4.0kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		10 33ft	20 65ft	30 98ft	40 130ft	50 164ft	60 197ft
1200	Litres/Sec Gph kW abs	13.90 11007 4.00	13.60 10770 5.00	13.30 10532 6.00	12.80 10136 7.00	12.40 9819 8.00	11.80 9344 9.00
1000	Litres/Sec Gph kW abs	11.60 9186 3.30	11.20 8869 4.20	10.90 8632 5.00	10.50 8315 5.80	10.00 7919 6.70	9.4 7444 7.5
800	Litres/Sec Gph kW abs	9.20 7285 2.50	8.90 7048 3.20	8.60 6710 4.00	8.20 6493 4.60	7.60 6018 5.40	7.10 5622 6.10
600	Litres/Sec Gph kW abs	7.00 5543 2.00	6.70 5306 2.50	6.30 4989 3.00	5.80 4593 3.50	5.40 4276 4.00	4.80 3801 4.50

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
25	76	3 x 7/8 80 x 22	89	C MKIII
25	76	3 x 7/8 80 x 22	89S	RD-F30A

820

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

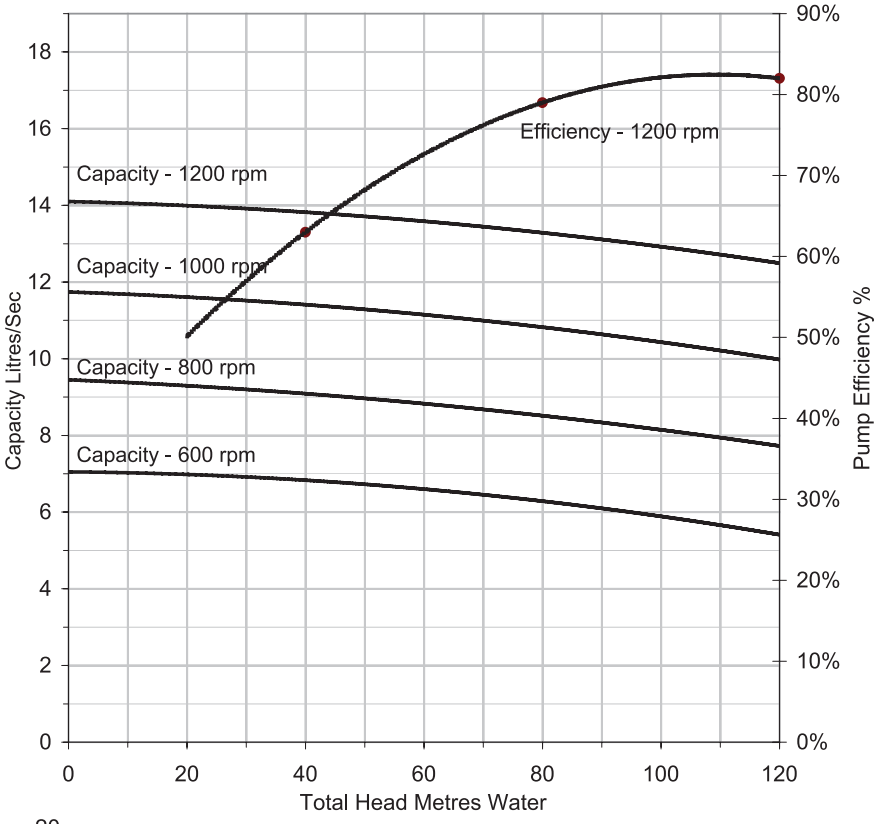
- Suitable for 145mm (5 5/8") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 50760 litres (11170 gallons) per hour.

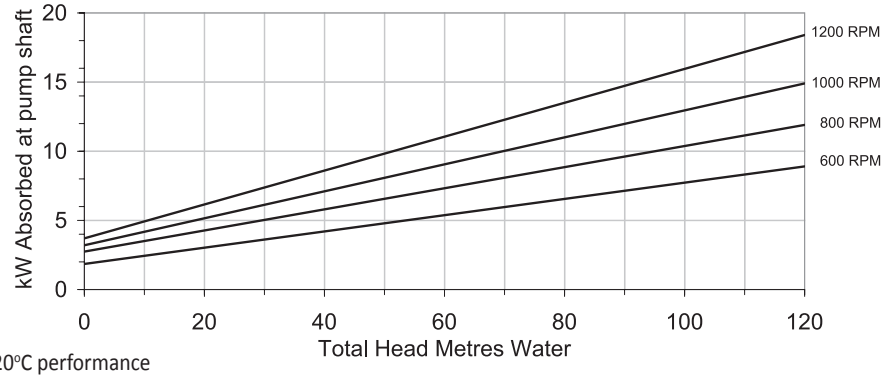
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10° - 40°C Standard Rotor
41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact Mono Pumps.

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 75.6 l/min
10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

Minimum Motor Size: 5.5kW
kW absorbed curve and figures relate to power absorbed at the pump element. Power losses through the drive head and shafting 04-28 must be added to the element absorbed power, and this total must be multiplied by the following factors to determine appropriate element/motor size.
DIESEL x 1.33 PETROL x 1.5 ELECTRIC x 1.25





Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

Note: All reference to gallons in this publication is specified in Imperial units.

Max kW	Elem Kit No.	Column & Shaft	Head Kit No.	Head Type
25	69	3 x 7/8 80 x 22	89	C MKIII
25	70	4 x 7/8 100 x 22	90	C MKIII
25	69	3 x 7/8 80 x 22	89S	RD-F30A
25	70	4 x 7/8 100 x 22	90S	RD-F30A

Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		20 65ft	40 130ft	60 197ft	80 262ft	100 328ft	120 393ft
1200	Litres/Sec Gph kW abs	14.00 11086 6.20	13.80 10928 8.60	13.60 10770 11.00	13.30 10532 13.50	12.90 10215 16.00	12.50 9899 18.40
1000	Litres/Sec Gph kW abs	11.60 9186 5.20	11.40 9028 7.10	11.20 8869 9.00	10.80 8552 11.00	10.40 8236 12.90	10.00 7919 14.90
800	Litres/Sec Gph kW abs	9.30 7365 4.20	9.10 7206 5.80	8.80 6969 7.30	8.50 6731 8.80	8.20 6493 10.40	7.70 6098 11.90
600	Litres/Sec Gph kW abs	7.00 5543 3.10	6.80 5385 4.20	6.60 5226 5.40	6.30 4989 6.60	5.90 4672 7.70	5.40 4276 8.90

Selection

HEAD AND MOTOR

A-Head		Motor Power							
Drive Type	Code	1.5kW C 800rpm	1.5kW C 1000rpm	1.5kW C 1200rpm	1.5kW C 1450rpm	2.2kW D 800rpm	2.2kW D 1000rpm	2.2kW D 1200rpm	2.2kW D 1450rpm
AC Electric - 240V - Single Phase	S	AC1S	AC2S	AC3S	AC4S	AD1S	AD2S	AD3S	AD45
AC Electric - 415V - Three Phase	T	AC1T	AC2T	AC3T	AC4T	AD1T	AD2T	AD3T	AD4T
Diesel Kubota - Manual Start	DK	AC1DK	AC2DK		AC4DK	AD1DK		AD3DK	AD4DK
Diesel Kubota - Electric Start	DKE								
Diesel Yanmar - Manual Start	DY	AC1DY	AC2DY	AC3DY	AC4DY	AD1DY	AD2DY	AD3DY	AD4DY
Diesel Yanmar - Electric Start	DYE	AC1DYE	AC2DYE	AC3DYE	AC4DYE	AD1DYE	AD2DYE	AD3DYE	AD4DYE
Honda Petrol - Manual Start	PH								AD4PH

B-Head		Motor Power							
Drive Type	Code	1.5kW C 600rpm	1.5kW C 800rpm	1.5kW C 1000rpm	1.5kW C 1000rpm	1.5kW C 1200rpm	2.2kW D 800 rpm	2.2kW D 1000 rpm	2.2kW D 1200 rpm
AC Electric - 240V - Single Phase	S			BC2S	BC3S	BC4S	BD1S	BD2S	BD3S
AC Electric - 415V - Three Phase	T	BC0T		BC2T	BC3T	BC4T	BD1T	BD2T	BD3T
Diesel Kubota - Manual Start	DK			BC2DK	BC3DK	BC4DK	BD1DK	BD2DK	BD3DK
Diesel Kubota - Electric Start	DKE								
Diesel Yanmar - Manual Start	DY		BC1DY	BC2DY	BC3DY	BC4DY	BD1DY	BD2DY	BD3DY
Diesel Yanmar - Electric Start	DYE		BC1DYE	BC2DYE	BC3DYE	BC4DYE	BD1DYE	BD2DYE	BD3DYE
Drive Type	Code	5kW G 600rpm	5kW G 800rpm	5kW G 1000rpm	5kW G 1200rpm	5kW G 1450rpm	7kW H 600rpm	7kW H 800rpm	7kW H 1000rpm
AC Electric - 240V - Single Phase	S	BG0S	BG1S	BG2S	BG3S	BG4S			
AC Electric - 415V - Three Phase	T		BG1T	BG2T	BG3T	BG4T		BH1T	BH2T
Diesel Kubota - Manual Start	DK		BG1DK	BG2DK	BG3DK	BG4DK		BH1DK	BH2DK
Diesel Kubota - Electric Start	DKE		BG1DKE	BG2DKE	BG3DKE	BG4DKE		BH1DKE	BH2DKE
Diesel Yanmar - Manual Start	DY		BG1DY	BG2DY	BG3DY	BG4DY		BH1DY	BH2DY
Diesel Yanmar - Electric Start	DYE	BG0DYE	BG1DYE	BG2DYE	BG3DYE		BH0DYE	BH1DYE	BH2DYE

Selection

HEAD AND MOTOR cont.

A-Head

Drive Type	Code	3kW E 800rpm	3kW E 1000rpm	3kW E 1200rpm	3kW E 1450rpm	4kW F 800rpm	4kW F 1000rpm	4kW F 1200rpm	4kW F 1450rpm
AC Electric - 240V - Single Phase	S								
AC Electric - 415V - Three Phase	T								
Diesel Kubota - Manual Start	DK	AE1DK	AE2DK	AE3DK	AE4DK	AF1DK	AF2DK	AF3DK	AF4DK
Diesel Kubota - Electric Start	DKE					AF1DKE	AF2DKE	AF3DKE	AF4DKE
Diesel Yanmar - Manual Start	DY	AE1DY	AE2DYE	AE3DY	AE4DY	AF1DY	AF2DY	AF3DY	A4DY
Diesel Yanmar - Electric Start	DYE	AE1DYE	AE2DYE	AE3DYE	AE4DYE	AF1DYE	AF2DYE	AF3DYE	AF4DYE
Honda Petrol - Manual Start	PH	AE1PH	AE2PH	AE3PH	AE4PH	AF1PH	AF2PH	AF3PH	AF4PH

B-Head

Drive Type	Code	2.2kW D 1450 rpm	3kW E 800rpm	3kW E 1000rpm	3kW E 1200rpm	3kW E 1450rpm	4kW F 600rpm	4kW F 800rpm	4kW F 1000rpm	4kW F 1200rpm	4kW F 1450rpm
AC Electric - 240V - Single Phase	S	BD4S	BE1S	BE2S	BE3S	BE4S		BF1S	BF2S	BF3S	BF4S
AC Electric - 415V - Three Phase	T	BD4T	BE1T	BE2T	BE3T	BE4T		BF1T	BF2T	BF3T	BF4T
Diesel Kubota - Manual Start	DK	BD4DK	BE1DK	BE2DK	BE3DK	BE4DK		BF1DK	BF2DK	BF3DK	BF4DK
Diesel Kubota - Electric Start	DKE							BF1DKE	BF2DKE	BF3DKE	BF4DKE
Diesel Yanmar - Manual Start	DY	BD4DY	BE1DY	BE2DY	BE3DY	BE4DY		BF1DY	BF2DY	BF3DY	BF4DY
Diesel Yanmar - Electric Start	DYE	BD4DYE	BE1DYE	BE2DYE	BE3DYE	BE4DYE	BF0DYE	BF1DYE	BF2DYE	BF3DYE	BF4DYE

Drive Type	Code	7kW H 1200rpm	7kW H 1450rpm	11kW I 800rpm	11kW I 1000rpm	11kW I 1200rpm	11kW I 1450rpm
AC Electric - 240V - Single Phase	S						
AC Electric - 415V - Three Phase	T	BH3T	BH4T	BI1T	BI2T	BI3T	BI4T
Diesel Kubota - Manual Start	DK	BH3DK	BH4DK				
Diesel Kubota - Electric Start	DKE	BH3DKE	BH4DKE	BI1DKE	BI2DKE	BI3DKE	BI4DKE
Diesel Yanmar - Manual Start	DY	BH3DY	BH4DY				
Diesel Yanmar - Electric Start	DYE	BH3DYE	BH4DYE	BI1DYE	BI2DYE	BI3DYE	BI4DYE

Selection

HEAD AND MOTOR cont.

C-Head — **Motor Power**

Drive Type	Code	5kW G 800rpm	5kW G 1000rpm	5kW G 1200rpm	5kW G 1450rpm	7kW H 800rpm	7kW H 1000rpm	7kW H 1200rpm	7kW H 1450rpm
AC Electric - 415V - Three Phase	T	CG1T	CG2T	CG3T	CG4T	CH1T	CH2T	CH3T	CH4T
Diesel Kubota - Manual Start	DK	CG1DK	CG2DK	CG3DK	CG4DK	CH1DK	CH2DK	CH3DK	CH4DK
Diesel Kubota - Electric Start	DKE	CG1DKE	CG2DKE	CG3DKE	CG4DKE	CH1DKE	CH2DKE	CH3DKE	CH4DKE
Diesel Yanmar - Manual Start	DY	CG1DY	CG2DY	CG3DY	CG4DY	CH1DY	CH2DY	CH3DY	CH4DY
Diesel Yanmar - Electric Start	DYE	CG1DYE	CG2DYE	CG3DYE	CG4DYE	CH1DYE	CH2DYE	CH3DYE	CH4DYE

Drive Type	Code	11kW I 800rpm	11kW I 1000rpm	11kW I 1200rpm	11kW I 1450rpm	15kW J 800rpm	15kW J 1000rpm	15kW J 1200rpm
AC Electric - 415V - Three Phase	T	CI1T	CI2T	CI3T	CI4T	CJ1T	CJ2T	CJ3T
Diesel Kubota - Manual Start	DK							
Diesel Kubota - Electric Start	DKE	CI1DKE	CI2DKE	CI3DKE	CI4DKE			
Diesel Yanmar - Manual Start	DY							
Diesel Yanmar - Electric Start	DYE	CI1DYE	CI2DYE	CI3DYE	CI4DYE			

Drive Type	Code	18.5kW K 800rpm	18.5kW K 1000rpm	18.5kW K1200rpm	18.5kW K 1450rpm	22kW L 800 rpm	22kW L 1000 rpm	22kW L 1200 rpm	22kW L 1450 rpm
AC Electric - 415V - Three Phase	T	CK1T	CK2T	CK3T	CK4T	CL1T	CL2T	CL3T	CL4T
Diesel Kubota - Manual Start	DK								
Diesel Kubota - Electric Start	DKE								
Diesel Yanmar - Manual Start	DY								
Diesel Yanmar - Electric Start	DYE								

Selection

BOREHOLE PUMP SELECTION GUIDE

SELECTION:
Select your borehole pump from pump performance chart to get the flow and head required and also to determine pump speed and kilowatt required (remember your drive multiplier).

EXAMPLE:
Duty 3.25 lps @ 85m head - you would select a 620 pump to operate at a speed of 1200rpm with 3.5kW absorbed. Remember kW power of pump, head, column and shaft must be added and then multiplied by appropriate multiplier to ensure correct engine/motor selection.

PRICING:
The following references will give you the price of:

- A - Drive head alone.
- B - Motorised drive head complete.
- C - Pump element.
- D - 10ft column and shafting per length.
- E - 20ft column and shafting per length.
- F - Adaptor kit to go from pump element to column and shaft.
- G - Adaptor kit to go from drive head to column and shaft.
- H - Stabilizers - We recommend one (1) stabilizer to be fitted to every 3rd length of 10ft colum and every length of 20ft column.
- I - Loctite 567 which we recommend using on all threaded column joints and Kopre Kote on all shafting joints
- J - Column clamp if required.

EXAMPLE:
Your customer has three phase power and requires a 620 element with a B head to pump from the bore which requires a pump setting of about 200 feet.

B.	Drive head selection is BF2T	$?,???*
C.	620 element	$?,???*
D.	20 lengths of 2” x 5/8” with HT column & shaft	$?,???*
F.	Kit-65 620 element to 2” x 5/8” column & shaft	$???*
G.	Kit-85 B drive head to 2” x 5/8” column & shaft	$???*
H.	7 x stabilizers to suit 6” I.D. bore and 2” column (RB STA 155x050) @ $70 ea.	$???*
I.	Loctite 567 ($155) and Kopre Kote ($52)	$???*

TOTAL LIST PRICE: (*Refer to Agricultural price book)

Selection

MOTORISED DRIVE HEADS - DO IT YOURSELF SELECTION

Drive Head Types	Pump Speeds	Drive Types
A - A head	0 - 600rpm (720A and above)	S - single phase
B - B head	1 - 800rpm	T - three phase
C - C head	2 - 1000rpm	DK - diesel Kubota
T - RD F30A head	3 - 1200rpm	DKE - diesel Kubota (elec. start)
R - DR 21 MKII	4 - 1450rpm	DY - diesel Yanmar
		DYE - diesel Yanmar (elec. start)
		PH - petrol Honda

1. Select correct element size to achieve required flowrate & pressure
2. Determine the speed that the element will need to operate at
3. Determine element power absorbed from power curve in product manual
4. Apply appropriate multiplier:
   - Diesel x 1.33
   - Petrol x 1.5
   - Electric x 1.25
5. Determine the type of drive head required
6. Determine the motor type (and brand for diesel units) required
7. Using the table based on the drive-head selected, select the row that applies to the motor type selected
8. Read across the row and select a motor where the maximuim power (at nominal speed) is greater than the power required (as calculated in step 4)
   The price is the list price for the complete drive package
9. The number reference at the top of the column is the drive power code
10. Determine the speed code
11. Order complete package - reffer to Product Manual for full coding details

Package includes the following:
- Drivehead
- Galvanised baseplate
- Galvanised steel guard
- Diesel, petrol or electric motor
- Clutch (diesel only)
- Belts & pulleys

Selection

EXAMPLE:

520 Element is required to deliver 1.5 litres per second at 100m discharge pressure
A B-Head drivehead is required, to be driven by an electric start, Kubota diesel engine

From the curves in this Product Manual:

Pump Speed	= 1200rpm
Max Power Absorbed	= 2kW

Applying 1.33 multiplier for a diesel motor:

Shaft Power Required	= 2 x 1.33
	= 2.66kW

Using the "B-Head" table

Read across the bottom row (Diesel Kubota - Electric Start)
Select a RK70, suitable for delivering up to 3.4kW power
Drivehead Price = $?,???
Look at the top of the comumn - Motor Power code - F

Determine Complete System Code

B - B head
F - power code (nominal 4kW drive)
3 - 1200rpm drive speed
DKE - Diesel Kubota - Electric Start

BF3DKE

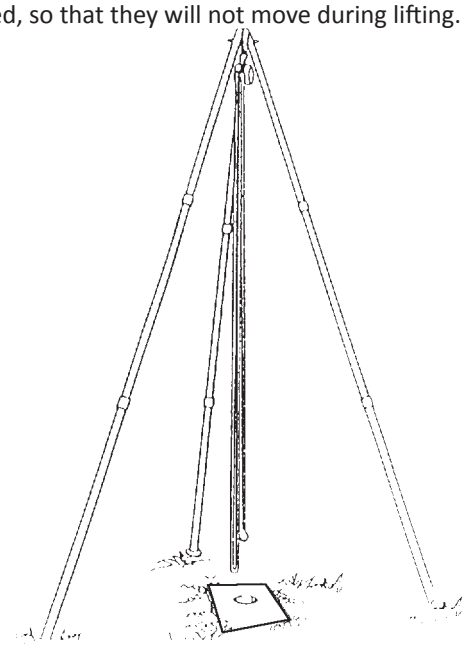
*Motor speeds have been selected to achieve peak performance from drives. The motors have not been set to run at the specified speeds and can run faster or slower depending on actual throttle settings. Mono recommends that the motor speed is measured at the time of commissioning the unit and speed limit screw set to prevent overspeed. Operating the motor at speeds faster or slower than the design speed can result in damage to either the pump or the motor. Mono Pumps can arrange motors that have the maximum speed factory set however additional charges will apply and units will not be available on standard lead-times.

Pre-assembly

Motorised Units

PREPARATION OF THE WORK SITE

Ensure the work area is clean and clear. Position the tripod with the apex centrally above the bore. Test the tripod carefully to ensure steadiness, firmness and rigidity. Ensure that the feet of the tripod are fixed or secured, so that they will not move during lifting.



PRE-ASSEMBLY OF THE DRIVE SHAFT LENGTHS

In a dirt free area, preferably on blocks of wood, assemble the drive shafting. Each assembly comprises 2 drive shafts and two bobbin bearing shafts, 4 coupling nuts and two bobbin bearings, in 3m/10ft lengths.

STEPS

(1) Take one long drive shaft and place in the working area. Do not grease inside of female threads as build up between shaft ends will cause hydraulic effect.



(2) Assemble from right to left. Lubricate male shaft threads only with small amount of Kopre kote antisieze.

(3) Screw a coupling nut onto the left hand end leaving two threads exposed.

NOTE: Threads are left hand.
Only use vice grips on long drive shaft and coupling nuts.



WARNING: Never use vice grips on the bobbin bearing shaft. The vice grips could score the bobbin shaft and as it rotates inside the captive bobbin bearing, the scoring could grab or cut the bobbin bearing.

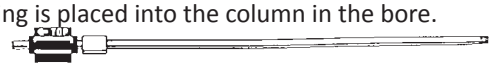


(4) Screw the bobbin bearing shaft into coupling nut, after lubricating male thread only.



(5) Place the bobbin bearing on the bobbin bearing shaft arrow pointing left.

Note: An arrow and top is marked on the bobbin bearing. The arrow must be pointing upwards when the shafting is placed into the column in the bore.



(6) Screw on another coupling nut.
(7) Place vice grips on the drive shaft and first coupling nut.
(8) Tighten this sub assembly.



Pre-assembly

Motorised Units

STEPS

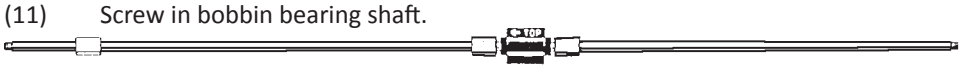
(9) Screw second long drive shaft into left hand coupling nut leaving two threads exposed.



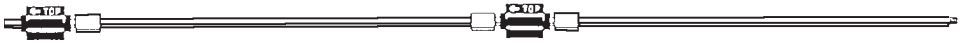
(10) Place vice grips on second coupling nut and second drive shaft. Tighten. Screw on coupling nut leaving two threads exposed.



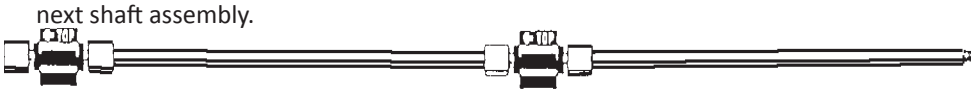
(11) Screw in bobbin bearing shaft.



(12) Place bobbin bearing on shaft.



(13) Screw the fourth coupling nut down by hand leaving two threads exposed. This will be tightened when joining next shaft assembly.



(14) Place vice grips on third coupling nut and second drive shaft. Tighten.
The assembly is complete.

NOTE: Two threads are left exposed to ensure that the shafts on either side are screwed evenly into the coupling nuts. This will also ensure that mating shafts bottom out and lock against each other, allowing free travel of shafting inside the bobbin bearing.

Continue assembling shafting until all the 3m/10 ft shafting assemblies are completed.

Pre-assembly

Motorised Units

PRE-ASSEMBLY OF ALL COLUMN AND SHAFTING

The number of 3m/10 ft shafting assemblies prepared should match the number of 3m/10 ft columns provided for the bore setting.

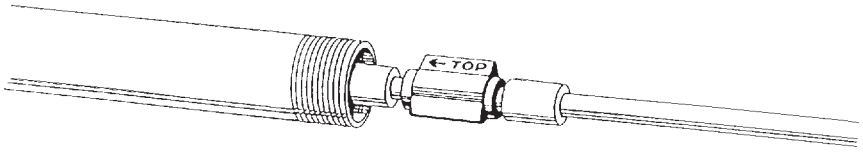
NOTE: Each length of column section comes complete with a socket screwed to one end.

STEPS

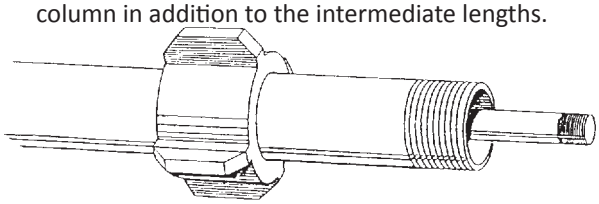
(1) Line up the columns.
(2) Pick up a shafting assembly.
(3) Fit the left hand end (end with the coupling nut on it) of the shafting into the male threaded end of the column.
(4) Push the shafting assembly into the column leaving 150mm/6 inches of drive shafting protruding from the threaded end of the column.

Note that the arrow on the bobbin bearing points towards the socket.

(5) Fit stabilisers to the column.



Stabilisers should be fitted to every third length of column. One on the first length of column and then every third length. It is recommended that a stabiliser is fitted to the first and last length of column in addition to the intermediate lengths.



(6) Stabilisers may need to be trimmed to suit the bore casing diameter.

Remember to measure accurately.
"Measure twice and cut once."
Repeat for all the lengths of column.

NOTE: Installation of the pump can be achieved with the head base in position over the bore.

INSTALLING THE BASE PLATE

Place the base plate on the concrete plinth place nuts on the rag bolts or fit the Loxins and bolt down.

BASEPLATE FRAME COMPLETE WITH DRIVE HEAD AND PRIME MOVER

In most cases the baseplate frame will be supplied complete with the drive head fixed in position and connected to the prime mover (diesel or electric motor) via belts and pulleys.
Prior to the installation of this baseplate, the drive head will need to be removed. The installation of this baseplate arrangement is as follows:

(1) Remove drive guard if fitted.
(2) Loosen the prime mover baseplate /packer hold down bolts, and slide the prime mover towards the drive head to loosen the belts.
(3) Remove the belts, and slide the prime mover as far away from the drive head as possible.
(4) Remove the drive head hold down nuts and bolts.
(5) Remove the drive head from the baseplate.
(6) Remove the drive head plate from the drive head/ prime mover baseplate frame. (DR21 and RD F30A right angle drive arrangements).

LOWERING THE PUMP ELEMENT INTO THE BORE

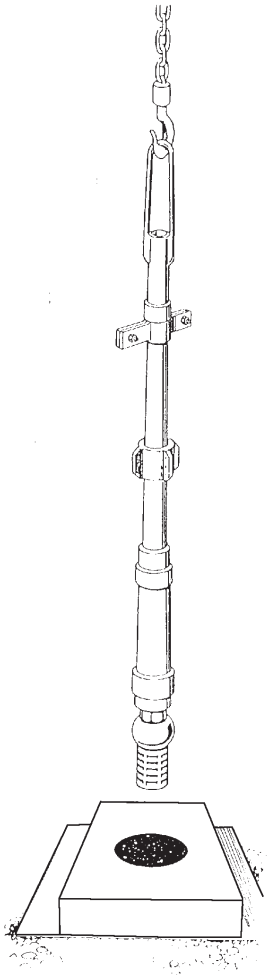
STEPS

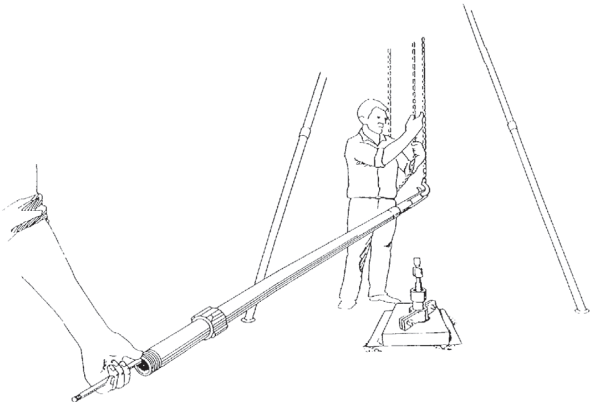
(1) Screw the lifting tool onto the socket on the end of the pump barrel.
(2) Place the column clamp on the barrel of the pump below the socket. Tighten the clamp.
(3) Bring the hook from the block and tackle to the lifting tool and lift the pump above the bore ensuring that the pump is central to the bore hole.
(4) Lower the element into the hole until the bore clamp rests on the base plate.
(5) Remove the eye hook and lifting piece.
(6) Unscrew the lifting tool from the element and screw it into the first length of column. The lifting tool will screw into the socket on the end of the next length of column. (The other end of the column is left with the thread exposed).
(7) Screw the long coupling onto the shaft protruding from the element. (The long coupling is supplied in element to column connection kit - Refer to Appendix 1 for the correct kit).

LOWERING THE COLUMN AND SHAFTING INTO THE BORE

STEPS

(1) Lift the first column assembly above the bore. It may be necessary to hold the shafting to stop it from slipping out of the column.



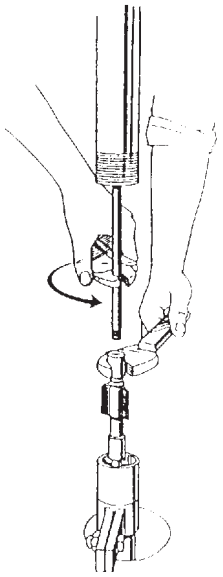


Installation

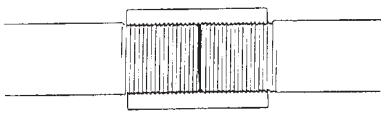
(2) Put anti-seize compound (Kopre Kote) on the drive shaft male thread. Use sparingly. If not, a cushion effect may occur preventing shafts from properly butting together.
There should be a male drive shaft protruding from the lower end of the column assembly and a long coupling female thread protruding from the pump element.

(3) Pull down the shafting, and using two pairs of vice grips, screw the shafting into the long coupling.

NOTE: The threads are left handed. Tighten, using one vice grip on the long coupling and one on the drive shaft.



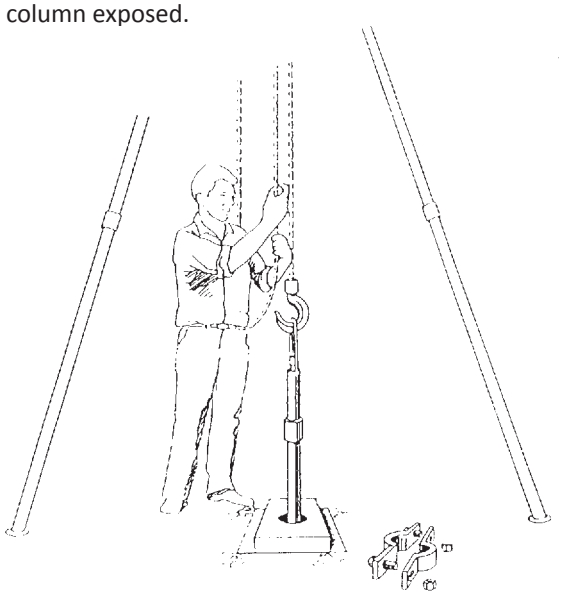
(4) Put thread sealant (Loctite 567) on the exposed threads of the column. Lower the column down to meet the socket on the end of the pump. Tighten with the pipe wench. Columns must butt together inside the socket.



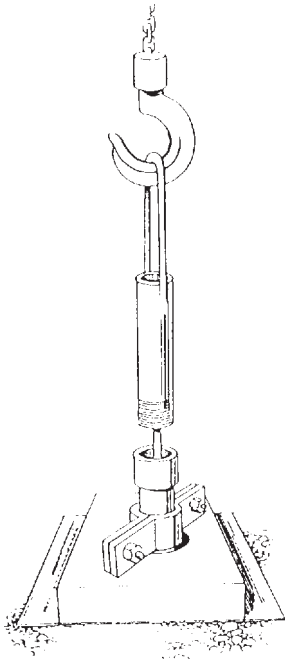
NOTE 1: To achieve maximum strength and best sealing, each male thread must be screwed equally into the socket. This may leave two threads exposed on each male column.

NOTE 2: All shaft threads must be coated with anti-seize compound (Kopre Kote) and all column threads must be coated with a pipe jointing compound (Loctite 567). Kopre Kote prevents thread seizure and corrosion. Loctite 567 is a column sealant and anti corrosion agent. In the unlikely event that the pump has to be lifted out of the bore at a later date, use of these two substances will allow easy and trouble free disassembly.

(5) Lift the whole pump and column assembly clear of the base frame, making sure that the block and tackle is taking the weight of the column, shafting and pump element. Remove the column clamp from the element and gently lower the assembly down the bore, leaving approximately 250mm (10 inches) of column exposed.



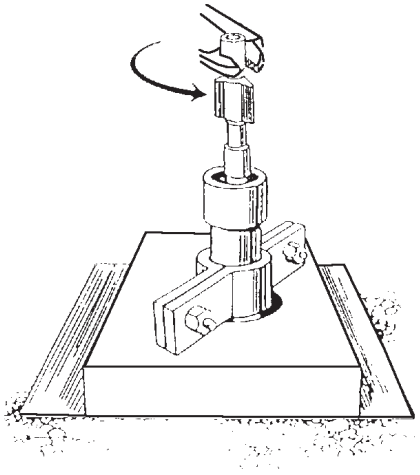
(6) Refit the column clamp below the upper most column socket and tighten the clamp to the column. Lower the pump and column until the clamp is resting on the baseplate. Release the block and tackle.



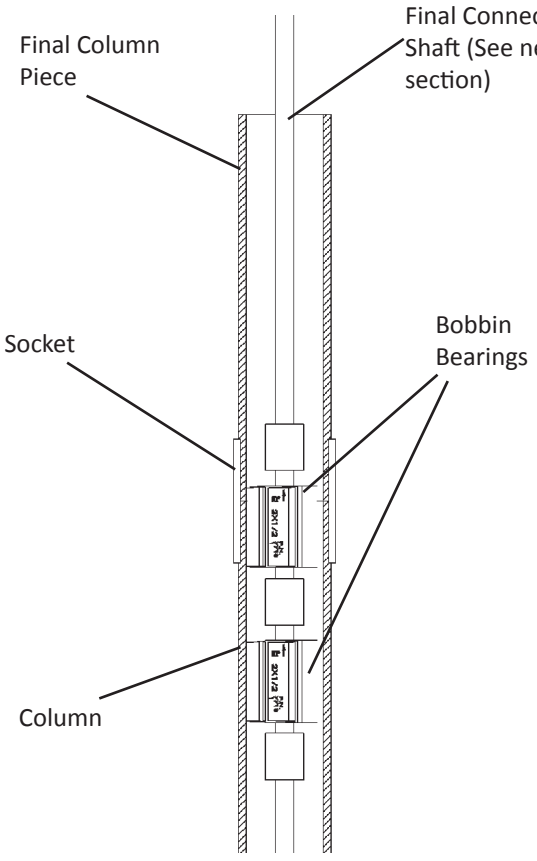
WARNING: When screwing column down in a clockwise direction (column has right hand thread), as shafting is left hand or anti clockwise, shafting may unscrew.

(7) In case the shaftings may have been loosened when the column was tightened, when the next length of column and shafting is being connected, take the vice grip and place it on the coupling nut protruding from the column and rotate it in an anti-clockwise direction. The shaftings should then be properly tightened.

Repeat the column and shafting installation procedure until all the lengths have been fitted.



The short piece of column is used last. This piece enables easier connection of the drive head due to having the end of the column closer to the ground. The final column assembly is shown below.



Installation
A Head only

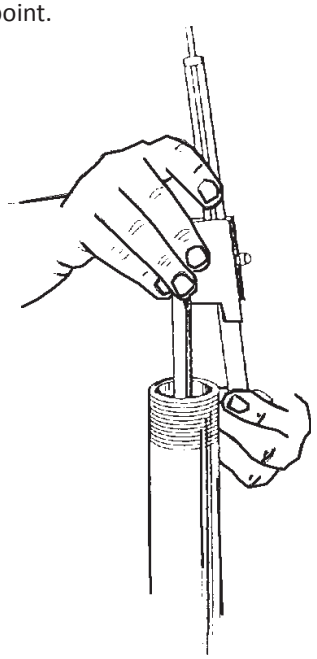
INSTALLATION 'A' HEAD ASSEMBLY

FINAL COLUMN SHAFTING INSTALLATION

STEPS

(1) After installing all the necessary column and shaft lengths, screw in the final 1/2" X 9" connecting shaft into the last coupling nut. (Refer to Appendix 1 for the correct, final connection kit).
Some shafting will be protruding. Take a block of soft wood and gently tap the top of the shafting to knock it down. This will ensure that the pump rotor has bottomed and is located on the datum bar of the pump element.

(2) Measure from the top of the male thread of the column section 55mm along the protruding shaft. Mark the point.

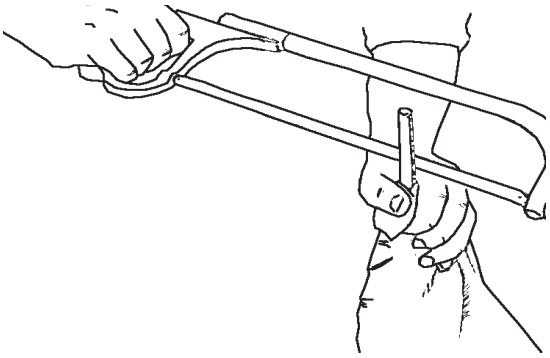


Remember to measure accurately.
"Measure twice and cut once."

(3) Place a rag around the shafting covering the opening at the end of the column.

(4) Using a hack saw cut off the final connecting shaft at the mark.

(5) Using a small fine file, dress up the end of the shaft, to remove burrs.

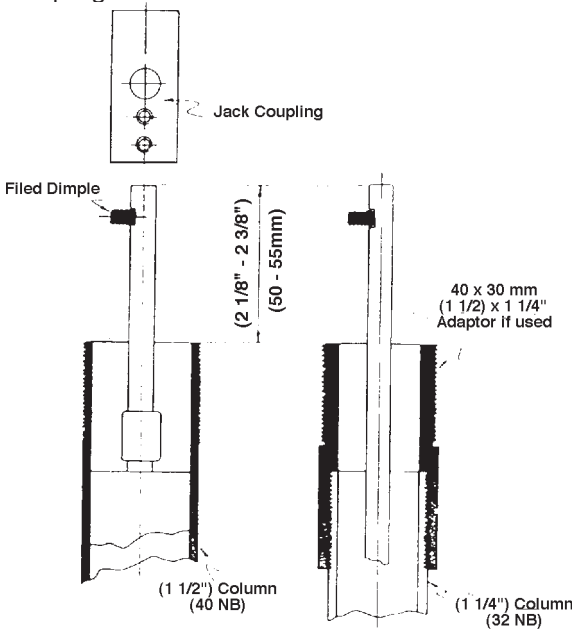


INSTALLING THE PUMP HEAD

STEPS

(1) Take the jack coupling and place the plain end on the shafting and tap it down until the end of the drive shaft just comes up to the bottom of the hole through the centre of the jack coupling.

(2) Tighten each of the socket set screws in the jack coupling onto the shaft to make a mark.



(3) Loosen and remove the jack coupling.

(4) Using the marks as a guide, file flats on the shaft to allow for the seating of the socket set screws when fitted.

(5) Re-fit the jack coupling.

(6) Line up the socket set screw holes with the flats on the shaft. Tighten the socket set screws onto the flats.

Installation
A Head only

'A' HEAD FINAL CONNECTION

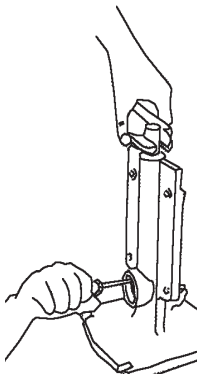
STEPS

(1) Take the drive head and remove the inspection cover.

(2) Apply thread sealant to column and screw the head down on the final column until the main shaft comes into contact with the jack coupling. This can be observed through the inspection opening.

(3) Ensure that the vee belts have been removed from the drive head pulley.

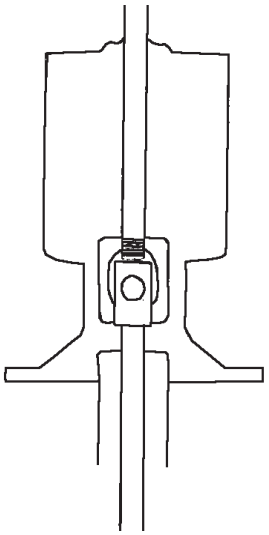
(4) Place a bar or large screw driver through the inspection cover and the hole in the jack coupling so that the jack coupling is prevented from turning. Whilst screwing down the head onto the column, turn the drive head main shaft in an anti-clockwise direction and start the main shaft screwing into the jack coupling.



(5) Turn the pulley by hand in an anti-clockwise direction whilst holding the bar through the jack coupling hole. This will now finally tighten the main shaft into the jack coupling.

NOTE: It is this final tightening of the head main shaft onto the jack coupling that effectively lifts the pump rotor off the datum plate. Provided the correct cut off and fitting procedures have been adhered to, the clearance will be 20-25mm.

(6) Replace the inspection cover, ensuring that its gasket is in place. Tighten the bolts.



(7) With the weight of the head and column and shafting taken by the block and tackle, remove the column clamp.

(8) Lower the pump head to its final working position on the base plate. Install and tighten the hold down nuts and bolts.

(9) Rotate the pump by hand by turning the pulley in an anti-clockwise direction. The pump should turn quite easily with no pronounced resistance.

Installation
A Head only

FINAL ACTIONS

(1) With the vee-belts disconnected, start and run the prime mover/driver and check that the pump rotation will be correct when the belts are reconnected.
The 'A' vertical drive head shaft rotates anti-clockwise looking on shaft end.
Note: For electric drives ensure that the motor is wired in accordance with relevant local standards.
(2) Replace vee-belts and check that the pulleys are aligned and the correct tension has been applied before finally tightening the prime mover/driver holding down bolts.
(3) Refit the all-weather/safety cover.



SPECIAL WARNING FOR DEEP BORE SETTINGS:
In deep setting bores, it may be that resistance is felt when the pump is turned by hand. This can occur, because the bobbin bearings are a snug fit into the column and are held captive in the column with the shaft rotating inside the bearing. During installation, when pulling and screwing the column down, the bobbin bearings can be forced up against the coupling nuts causing friction. This will normally not be evident in shallow pump settings.
If this is the case, the friction effect can be minimised by the following steps.

STEPS
(1) With the shafting completely attached, unscrew the discharge head assembly from the column pipe two complete turns.
(2) Screw the head down again tightly and check the resistance by turning the pulley anti-clockwise.
(3) If resistance is still felt, it may be necessary to repeat the above unscrewing the head, four turns and then maybe six turns. This should solve the problem.

NOTE: This procedure will ensure that the whole shafting assembly and the bobbin bearings are lifted and when the head is screwed back down, the bobbin bearings will be located in a central position along the bobbin bearing shaft, thus minimising the friction.

Installation
B and C Heads

INSTALLATION OF 'B' AND 'C' HEAD ONLY

NOTE: The last length of 10 foot column and shafting will only require one bobbin bearing assembly, the final connecting shaft should screw directly into a coupling nut fitted to the last 5' shaft length.
Final Column and Shafting Installation (with element, column and shaft still held by column clamp).

STEPS

(1) After installing all the necessary column and shaft lengths, tightly screw the final connecting shaft into the last coupling nut.
(2) With shafting protruding, take a block of wood and gently tap the top of the shaft to knock it down. This will ensure the pump rotor has bottomed and is located on the datum bar of the pump element.
(3) Take the "B" or "C" head and remove the jack and lock nuts from the shaft. Separate the top and bottom sections of the head by removing the four bolts and nuts.
(4) Screw on the column/head adaptor fitting to the column, then take the stuffing box section and tightly screw it onto the column head adaptor. (Refer to appendix 1 for the correct, final connection kit).
(5) At this point you can now conveniently pack the gland with the packing supplied.

NOTE:

(a) Ensure that each join of the gland packing piece is evenly offset approximately 1/2 turn from the next one.
(b) Use the gland follower to press each piece of packing into the gland.
(c) When gland packing is (4mm approx) from the top, place the gland follower plate in position and screw on nuts finger tight.
(d) The gland follower can be tightened after pump has run. The nuts should then be tightened firmly to allow for a slight weep. Excessive tightening causes shaft wear and excessive friction load on the prime mover/driver.
(e) Place the rubber thrower onto the shaft.
(6) Take the top section of the head and -
(a) Install over final connecting shaft. The final connecting shaft should now protrude at least 50-100mm above head mainshaft.
(b) Replace the four bolts and nuts, and secure top and bottom head sections together, tighten bolts and nuts securely.
(7) Attach -
(a) Cable or chain from block and tackle to lifting lugs on the head.
(b) Taking the weight of complete pump assembly on lifting gear, raise sufficiently to remove the column clamp.
(c) Lower the complete assembly into place and secure the head onto the base plate with the bolts and nuts provided.
(8) Install pulley on the main shaft and align at correct height to drive pulley.
(9) Replace the lock nut and jack nut onto main shaft, screw both down as far as possible.
(10) To ensure rotor is sitting on the datum point, again take a block of wood or soft mallet and tap the final connection shaft firmly.
(11) Proceed to -
(a) Tighten grub screws in jack nut firmly to make position marks on the final connecting shaft.
(b) Loosen off grub screws and remove jack nut.
(c) File flats on shaft where grub screws have left marks. (Alternatively drill locating dimples) large enough to allow grub screws to seat.
(d) Replace the jack nut and securely tighten grub screws into flats. Take care with alignment of all 4 screws.

Installation
B and C Heads

(12)

(a) Holding the lock nut securely with a spanner, rotate the jack nut with another spanner in an anti-clockwise direction until the gap between jack nut and lock nut matches the shaft lift required, see the table below.

Shaft lifts (mm) required for BMk2, 3 and DR Heads to give the correct operating position of the rotor within the stator.

Pump	Depth of setting only - metres			
Element	0-60	60-120	120-180	180-240
310	10-15	OBSOLETE - INFO ONLY		
320	10-15	15-20		
420	10-15	15-20		
440		15-20	20-30	30-40
510	10-15			
520	10-15	15-20		
620A	30-35	35-40		
640A		30-35	35-40	40-45
610	20-25			
620	20-25	25-35		
640		20-30	30-40	40-45
720A	30-35	(80m max. setting)		

Shaft lifts (mm) required for C Mk3 and RD F30A heads to give correct operating position of the rotor within the stator.

Pump	Depth of setting only - metres			
Element	0-60	60-120	120-180	180-240
640A		30-35	35-40	40-45
650A		30-35	35-40	40-45
640		20-30	30-40	40-45
720A	30-35	35-40		
740A		30-35	35-45	45-55
810	20-25			
820	20-25	25-35		
2521	35-40	40-50	(150m Max. setting)	
4011	35-40		(75m Max. setting)	

(b) Raising the jack nut the prescribed distance should give the correct rotor operating position, however in some cases you may need to manually rotate pulley on pump by hand to feel least restriction and adjust the jack nut height accordingly.

(c) When final lift correct position has been achieved, screw lock nut up and tighten against the jack nut. If the lock nut has grub screw location disregard screw as grub screw in lock nut can cause damage to main shaft thread.

(d) Coat the jack nut, grub screws, lock nut threads and main shaft liberally with Kopre Cote to avoid corrosion and galling of threads.



WARNING: Do not start the Mono Borehole Pump, under any circumstances, until the final drive shaft has been cut to project not more than 1/8" to 1/2" above the top jack nut, otherwise damage and personal injury could endure.

See Page 30 for Operating Instructions.

OPERATING INSTRUCTIONS

STEPS

(1) Your pump installation is now complete. Before replacing vee belts and drive guard, check that the direction of rotation from the motor or engine via the belts will be anti-clockwise when viewed from the end of the drive shaft.

NOTE: For right angle drive heads only, refit the housing cover and check to see if the final connection shaft, that is protruding, is not touching the cap, before starting the pump.

(2) If an engine driver is used either a manual or centrifugal (automatic clutch) must be used to allow the motor to build up speed before engaging.

(3) The bore must be properly developed before delivering water into a reticulation system. Usually two hours running will ensure sand and silt are removed and the water will be clear.
Do not stop the pump if the water is sandy or dirty: sand will settle and you will not be able to restart the pump.

(4) If air is pumped at any time after normal startup, the bore is being over-pumped (forked). Reduce pump speed either by slowing the engine or changing pulley sizes for a motor until air is no longer present.

(5) If you intend to pump against -

(a) high surface discharge head

(b) a pressure system
A non-return valve must be fitted to the discharge line.

(6) The Mono borehole pump is a positive displacement unit. For high heads or long lines it is suggested that either -

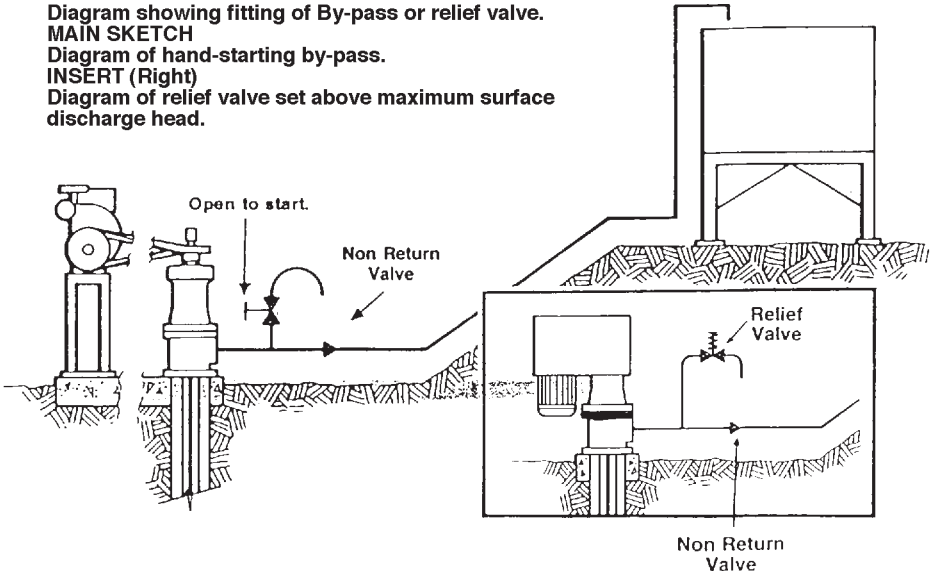
(a) hand operated by-pass valve, or

(b) relief valve set to 10% above the maximum surface discharge pressure be fitted.

WARNING: Ensure that all valves are set open and locked before starting the pump.

See sketches below.

Diagram showing fitting of By-pass or relief valve.
MAIN SKETCH
Diagram of hand-starting by-pass.
INSERT (Right)
Diagram of relief valve set above maximum surface discharge head.



Maintenance

PUMP MAINTNENANCE AND SERVICE REQUIREMENTS

Because of its simplicity of design, and the fact that rotating underground parts and bearings are water and self-lubricated, the underground section of your installation should require little attention or replacement, unless you are pumping particularly corrosive or abrasive water.

NOTE: If the water is known to be corrosive (ie, it has a low pH value, or high conductivity value) a water analysis should be obtained to ensure that correct pump materials are selected for your installation. This will ensure a longer, maintenance free life.

1. PACKED GLANDS
The gland should be inspected and adjusted regularly to provide the correct lubrication with a slight leakage. The gland packing should be replaced approximately every 5,000 hours, or sooner if the gland shows signs of excessive leakage. Grease gland bolts and nuts at each inspection.

2.BEARINGS
Bearings are rated for operation in excess of 10,000 hours. However wear will occur quickly if bearings are allowed to operate without lubrication or under dirty conditions, or if overloaded due to excessive belt tension. See Table 1.

3.OPEN CAGE BEARINGS
Check every 5,000 hours. Wash thoroughly with solvent. Repack with high speed ball bearing grease. Sealed bearings require no attention.

4. BELT TENSION
Belt tension should be checked during gland inspections. If belts need replacement, replace ALL belts with a matched set.

UNDERGROUND COMPONENTS

1. PUMP ELEMENT
As the pumping element is water-lubricated, it should not require service. However if service or replacements become necessary, the work can be carried out on the site without special tools.
Care should be taken not to damage the surface finish of the flexible drive shaft (Part No. 2600). Never use stilsons or tightening tools on the flexible shaft during service.

2. COLUMN, DRIVESHAFT, BOBBIN BEARINGS
Need for replacement of any worn or defective units will be obvious from visual inspection, but as withdrawl of column and driveshaft assemblies, and the pumping elements, requires time and effort it is wise always to replace any items which are suspect.

3. PUMP STATOR
The stator is natural rubber moulded inside a metal tube, and **should not** be lubricated with any petroleum based products (i.e., hand cleaner, grease etc.).
Stators to be fitted with suction end (marked on stator) towards the foot valve.

Appendix

Borehole Adapter Kits		
Pump Element to Column and Drive Shaft		
PART NO.	**COLUMN SIZE**	**PUMP ELEMENT**
BH-KIT61	1 1/2” x 1/2”	310
BH-KIT62	1 1/2” x 1/2”	320, 306
BH-KIT63	1 1/2” x 1/2”	420, 510
BH-KIT64	2” x 1/2”	440, 610
BH-KIT65	2” x 5/8”	520, 620
BH-KIT66	2” x 5/8”	620A, 640A
BH-KIT67	2 1/2” x 3/4”	640, 640A, 650A
BH-KIT69	3” x 7/8”	720A, 810, 820
BH-KIT70	4” x 7/8”	810, 820, 2521, 4011
BH-KIT71	2” x 1/2”	620A
BH-KIT73	2 1/2” x 3/4”	620
BH-KIT74	2” x 1/2”	520, 620
BH-KIT74	2” x 5/8”	420, 440, 510, 610
BH-KIT75	2 1/2” x 3/4”	720A, 740A
BH-KIT76	3” x 7/8”	720A, 740A

Notes:

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