English

MONO™ Agricultural Products

BOREHOLE - Product Manual

Section 4

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Published information other than that marked CERTIFIED is to be used as a guide only.

DESCRIPTION:

The Mono Borehole pump is the essence of simplicity in design. The simple positive displacement, Mono designed rotor and stator are immersed below draw-down level in the bore or well. The motor and drive head are located at ground level for easy inspection, maintenance and installation.

APPLICATION:

Mono is not just one pump, but a complete and versatile range designed to cover all deep-well borehole and "down the bank" installations.

Mono borehole pumps will operate against total heads of 15-360 metres (50 to 1180 feet). The pumps are suitable for all types of underground waters - whether sand or silt laden, brackish or corrosive. Stainless steel shafting and column is available for brackish applications. Special purpose corrosive water pumps are available for special applications, contact NOV for details.

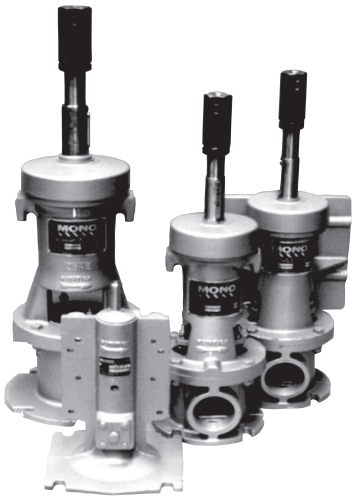
Capacities range from 10 to 840 lpm (100 to 11,000 gph) to suit bores from as small as 76 to 203mm (3" to 8" ID), in fact, all bores and wells.

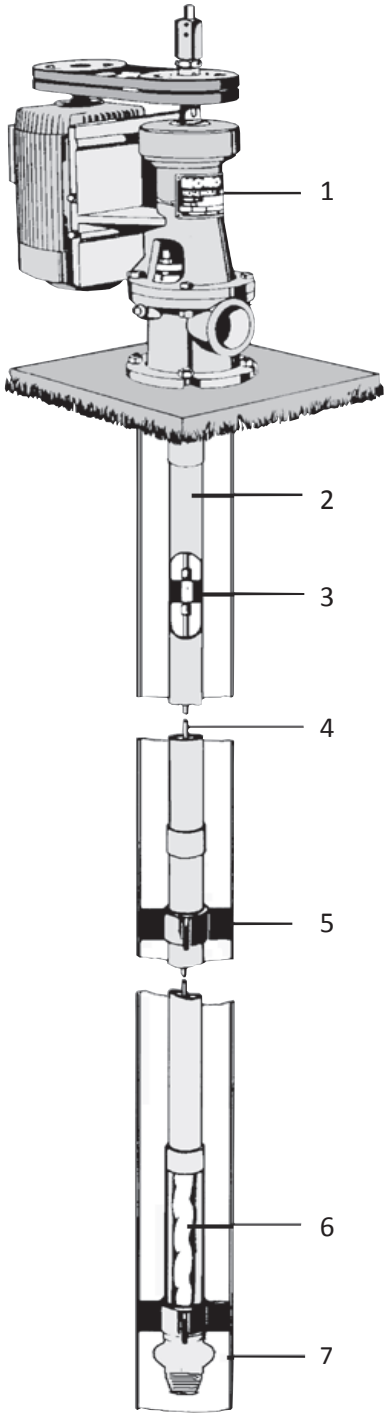
Pump capacity can be matched to the yield of your bore to maximise the output simply by varying the speed of the pump.

BENEFITS:

- Simple, innovative design.
- Outstanding versatility - suits wide range of bore sizes and applications.
- Superior performance - can pump high heads over long distances making optimum use of available bores with good water.
- Longer life - due to high abrasives handling capability and low speed which helps minimise abrasion.
- Stainless steel elements and shaft with stainless steel column - ideal for corrosive waters.
- Little or no maintenance.
- Drives available: petrol, diesel, electric, PTO, solar

Borehole Heads





MONO BOREHOLE PUMP COMPRISES SEVEN BASIC ASSEMBLIES:

1 Combined discharge and drivehead with radial and thrust bearings.
Discharge heads are compact, robust and weatherproof. All feature grease lubricated prepacked or sealed bearings. Two designs are available. Vertical shaft models for electric or quarter twist diesel drive and right angle for PTO or compact side mount diesel.

2 Column.
Columns are available in 3 and 6 metre lengths manufactured from heavy duty galvanised pipe. Connection is by Mono's exclusive precision parallel threads producing a strong watertight joint.

3 Patented bobbin or spider bearings. Simple, efficient and above all, long-wearing, even under abrasive conditions. Short bobbin bearing shafts made of stainless steel run in bobbins to totally eliminate wear on the main drive shaft.

4 Drivehshaft.
Driveshaft is supplied in equivalent lengths with rolled threads for maximum torque transmission. You have the option of carbon steel or stainless steel shafting depending on the quality of the water.

5 Column stabilizers.
A unique Mono development. Supplied to support the discharge column in relation to the bore casing, thus eliminating vibration and ensuring the discharge column is always accurately centred.

6 Mono's rotor/stator pumping element. Perfected after many years of NOV world-wide development and research.

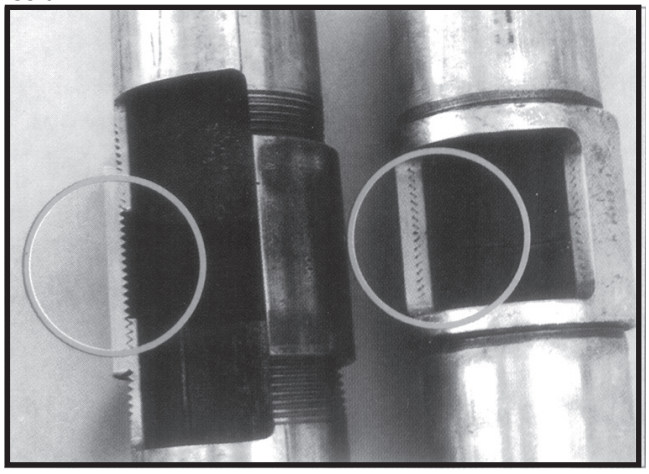
7 Strainer with foot valve.
Designed specifically to ensure efficient lubrication of the column to prevent leakage and loss of pipeline water with minimum restriction to the pump inlet.

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COMPARE!

Ordinary Column

Exclusive Mono® Heavy Duty Column



Ordinary Column
in medium weight pipe requires taper threads. These may seal well when new but vibration can cause water and corrosion to enter. If these few turns of thread give way, what happens to your pump?



MEDIUM WALL

Mono Heavy Duty column
is thick enough for parallel threads. We carefully machine the ends for a face to face connection. When you screw these faces together, you keep water out and many more threads are working for you.



MONO HEAVY DUTY WALL

FACTORS TO REMEMBER DURING THE SELECTION PROCESS:

Whilst the information in this publication will allow you to select the correct size and type of pump element, column and shafting and drive head, you are advised to remember the following important points:

1. When placing your order, confirm your requirement and full conditions of service with your NOV representative.

   This will ensure your calculations are correct, and the ancillary equipment you have selected, the pump and the pump speed, horsepower, etc., are matched to suit your actual conditions of service.

   This is particularly the case where you have unusual operating conditions, such as borewater containing high sand or silt concentrations, using internal combustion engines or when discharging through long lengths of piping and reticulation services.

2. When operating the pump with a diesel or petrol engine, it is necessary to use a clutch between engine and pump. This serves two purposes, the first allowing the engine to obtain operating speed and sufficient torque to overcome the inertia of the pump unit in starting, and if the clutch is hand operated, allows you to service and test-run the engine without necessarily driving the pump at the same time.

   Ample derating allowances should be made on the rated horsepower of the engine to suit ambient temperature conditions, height above sea level, and continuous operation. These deratings can exceed 25 percent in some circumstances, so that it is important to consult your NOV office, or the engine manufacturer, to ensure the engine is adequate for the pump operation.

3. Equally the electric motor operation, it is essential that the starting equipment on 3 phase motors provide adequate starting torque requirements, and if your supply authority requests Star Delta, or other reduced current starting, please advise your NOV Office for their recommendations, to ensure you have no trouble with your Mono installation.

4. The Mono pump will handle silt laden and corrosive borewaters, but where the water is abrasive, you should contact your NOV Office, who will give you advice on this aspect of bore pumping.

5. The pump should always be installed in a vertical, straight bore, but of course there are many bores in Australia where alignment is not known, particularly below surface water level and where corkscrew or bending is common.

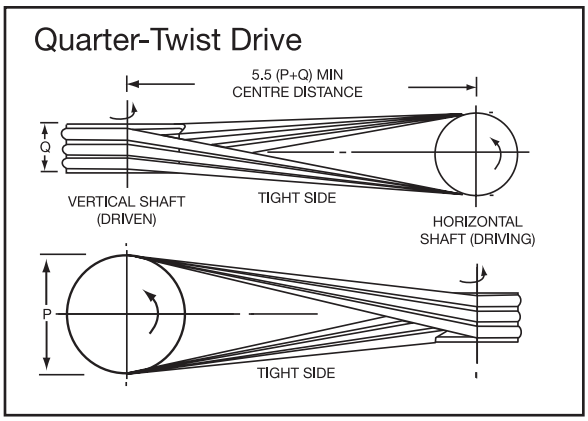
   Generally speaking, the Mono borehole pump can be installed in vertical holes with approximately half the diameter of the hole misalignment, per 100 feet in depth. They can also be installed on inclined river bank installations providing proper column support is assured.

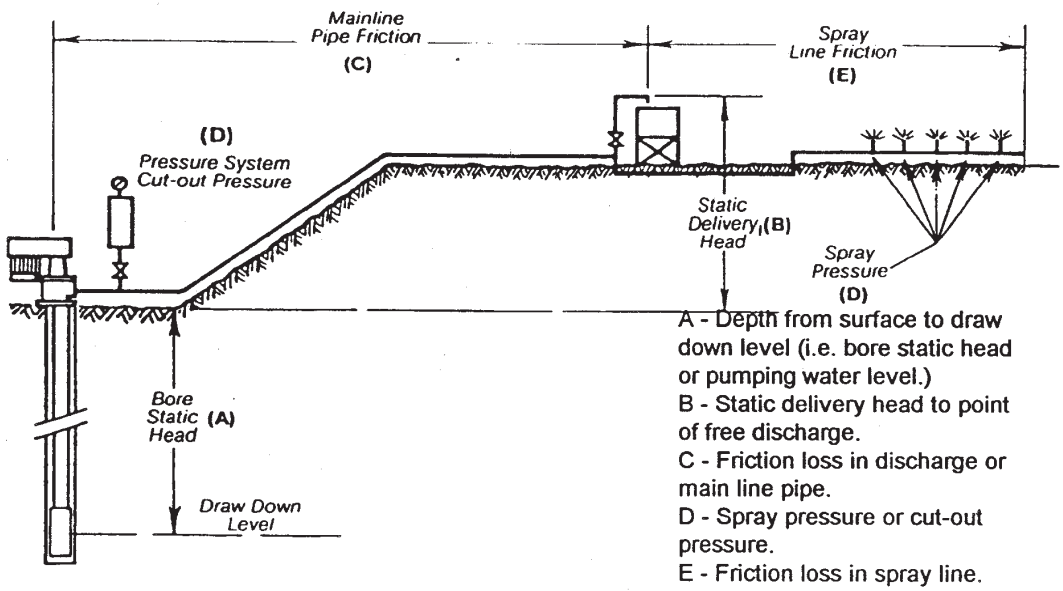
   But wherever these circumstances prevail, your NOV representative again should be consulted for our recommendation.

6. NOV agricultural products are assembled in Australia and sold and serviced by the company's offices and authorised agents in every state of the Commonwealth, the company's offices in Southeast Asia, and its agents in Africa, Asia and the Pacific.

When using a quarter-twist drive please observe the following principles:

1. Suitable guarding must be installed to protect the operator from the belts and pulleys.
2. Drive ratio should not exceed 2.5:1.
3. The centre distance between pulleys should not be less than 5.5 times a distance equalling the diameter of the larger pulley plus the width of the pulley 5.5 (P + Q).
4. Drive side must always be on the bottom.





Use the diagram above and formula below to calculate the systems basic head before proceeding to pages 12 - 29 for pump model selection.

Example 1:
To calculate Basic Head for free discharge applications (eg tank or dam filling, flood irrigation): Formula: A plus B plus C.

Example 2:
For irrigation to sprays.
Formula: A plus B plus C (as above).
plus D plus E.
Note: Remember to convert spray pressure in psi or kPa to feet or metres head.
ie psi x 2.311 = feet head
psi x 0.700 = metres head
psi x 0.102 = metres head

Example 3:
For Automatic Water pressure system.
Formula: A plus Pressure system cutout pressure in feet or metres head.

Typical Calculation:

Consider a 152mm (6in) ID bore of 3.5 l/s (2700 gph) tested capacity to a draw down level of 35m (115 ft).

Water required for spray irrigation through 300m (1000 ft) of 3in. PVA class C main line plus 100m (330 ft) of 2 in. PVC spray line.

Maximum static delivery head 10m (33 ft) spray pressure required (manufacturer's recommendations) at nozzle, 30 psi or 21m.

A -	Draw down	=	35m
B -	Static delivery head	=	10m
C -	Friction loss in main line 3 in. PVC at 3.5 l/s	=	2m
D -	Spray pressure (30 psi)	=	21m
E -	Friction loss in spray line 2 in. PVC at 3.5 l/s	=	3m
	System basic head	=	71m

NOTE: This is not the total head on the pump.

Before beginning pump selection the following basic information must be known:

(a) Capacity required from bore (maximum generally 80-85% of bore yield).

(b) Static head, discharge pipe friction, spray or automatic water system pressure.

(c) Borehole internal diameter.

(d) Pump setting - generally 2m below pumping water level.

1. Plot capacity required and basic delivery head on the pre selection curve.

2. At intersection point note pump model. Turn to the selected model page and select column and shafting size.

3. To establish that system TOTAL head does not exceed the selected pumps maximum rated head. Check the percentage friction loss on page 31 related to capacity required and selected column X shaft size.

4. Multiply this figure as a percentage (eg 18% - multiply by 0.18) by the pump setting.

5. Add this value to BASIC delivery head to obtain system TOTAL head. Recheck with this head on selection chart that pump model selection is still correct and that its rated head has not been exceeded. Also check that pump model is suitable for your particular bore size.

6. Refer to performance tables for pump model selected.

7. Once again plot capacity required against calculated TOTAL head and note rpm required. If duty falls between two curves choose the closest speed.

8. For this rpm (and same TOTAL head) note kW absorbed figure from curves immediately below capacity curves.

9. Refer to Shafting Power Loss Curves and note kW loss per 100m figure at rpm selected for particular column shaft size. Multiply this figure by pump setting divided by 100.

10. Select type and size of Mono Drive Head best suited for your needs as referred to under pump model.

11. Refer to Drivehead Power Loss Curve and note kW loss for this head at rpm selected.

12. Finally, add together kW values obtained in steps 8, 9 and 11. Divide this figure by 0.96 to allow for vee-belt loss for all heads.

This represents the required power in kW for your particular pump installation. It is this power value that must be multiplied by multiplier relative to selected drive.

The size of electric motor or engine selected must have an output equal to or greater than the kW figure calculated above. In the case of an engine its output power must be calculated using manufacturers recommendations for deration due to altitude, temperature, duty conditions, etc. Further check that motor or engine selected can deliver or develop the starting torque at the head input shaft (allowing for pulley ratio) quoted under pump model.

13. Having selected pump model, column x shaft size and drive head, refer to table under particular pump model section for selection of adaptor kit necessary to connect pump, column assembly and head together.

EXAMPLE ON PUMP SELECTION

Data: (a) Capacity required 4 L/s.
(b) Basic delivery head - 80m.
(c) Borehole ID - 6 inch.
(d) Pump setting - 37m.

STEP

1 AND 2.
Pump selection from pre selection chart - 620 borehole pump. The power absorbed at this duty is 4 kw so select the 50x16 column and shafting (less than 5.5 kW.

3, 4 AND 5.
From Friction Curve percentage friction loss at 4 l/s = 25%. Draw down = 35m. Pump setting = 37m. Therefore Column friction loss = 37 x 0.25 = 9.3m. Therefore TOTAL HEAD on pump element = 80 + 9.3 = 89.3m. Therefore the 620 pump is still suitable for duty.

6, 7 AND 8.
From the performance curve the closest pump speed is 1450 rpm for 4 l/s at 89.3m head and kW absorbed figure is 4 kW.

9.
From Shafting Power Loss Curve loss at 1450 rpm for 16 dia = 0.63 kW/100m. Actual loss = 0.35 x 0.63 = 0.22 kW.

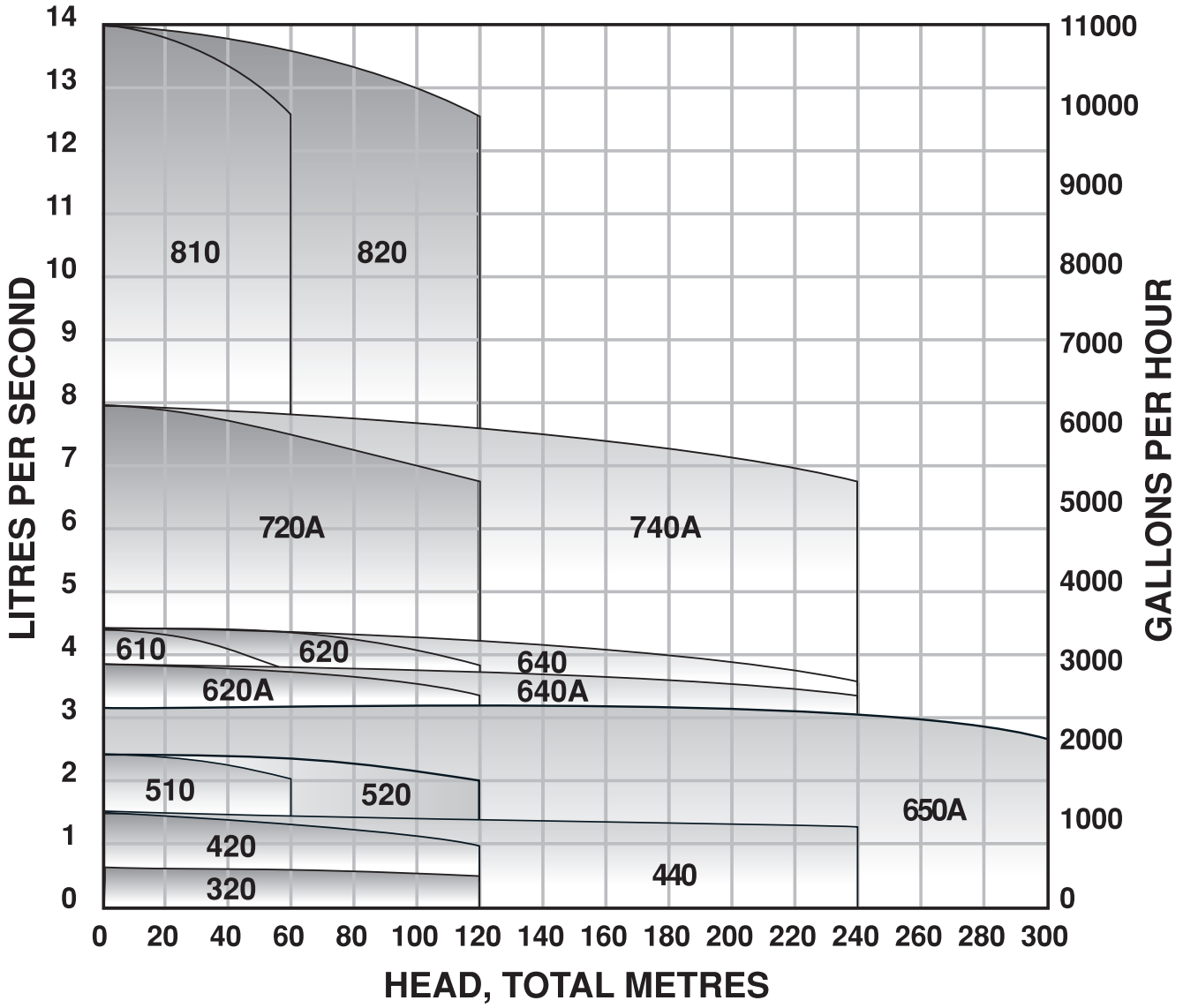
10 AND 11.
Suitable drive head say B Mk 11 pad mount for electric drive via V-belts. Head Power Loss from page 30 = 0.28 kW.

12.
Total minimum power required at pump head = 5 + 0.22 + 0.28 = 4.5 ÷ .96 for vee drive = 4.9 kW.

Minimum power output required at motor shaft equals 4.9 x 1.25 multiplier = 6.13 kW.

The next available motor size is 7.5 kW.

BOREHOLE



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MONO™ Agricultural Products	Selection 310	Title: Borehole Section: 4 Page: 11 Date: April 2014

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

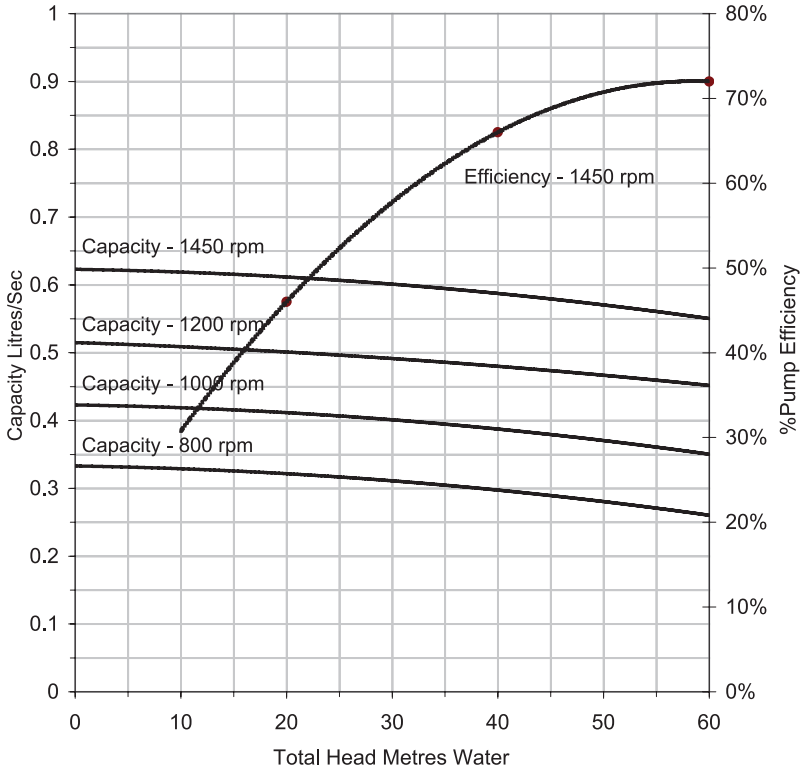
- Suitable for 76mm (3") internal diameter bore
- Total head of 60m (197 feet)
- Maximum yield of 2230 litres (490 gallons) per hour.

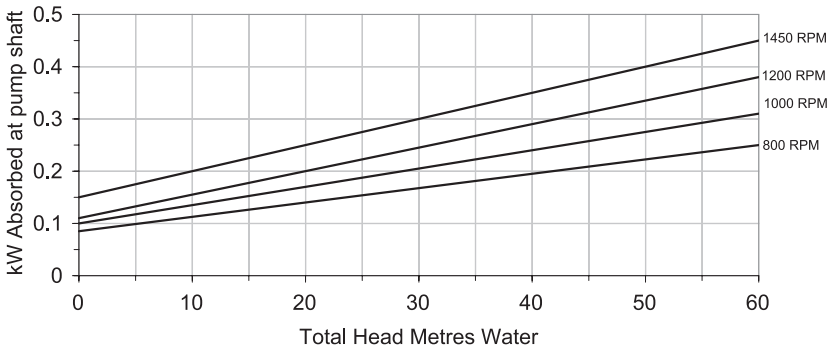
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

Common Conversions	
1 l/sec	= 792 gal/hr
1000 gal/hr	= 1.26 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	61	1 1/2 x 1/2 40 x 13	82	A
3	61	1 1/2 x 1/2 40 x 13	83	B
3	61	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	0.65 514 0.20	0.65 514 0.28	0.65 514 0.36	0.64 506 0.43	0.63 499 0.51	0.62 491 0.59
1200	Litres/Sec Gph kW abs	0.54 427 0.16	0.53 419 0.23	0.53 419 0.29	0.53 419 0.36	0.52 412 0.42	0.51 404 0.49
1000	Litres/Sec Gph kW abs	0.45 356 0.14	0.45 356 0.19	0.45 356 0.24	0.44 348 0.30	0.43 340 0.35	0.43 340 0.4
960	Litres/Sec Gph kW abs	0.43 342 0.13	0.43 342 0.18	0.43 342 0.23	0.42 334 0.28	0.41 327 0.33	0.41 327 0.38
800	Litres/Sec Gph kW abs	0.37 293 0.11	0.37 293 0.15	0.36 285 0.19	0.35 277 0.23	0.34 269 0.27	0.33 261 0.31

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

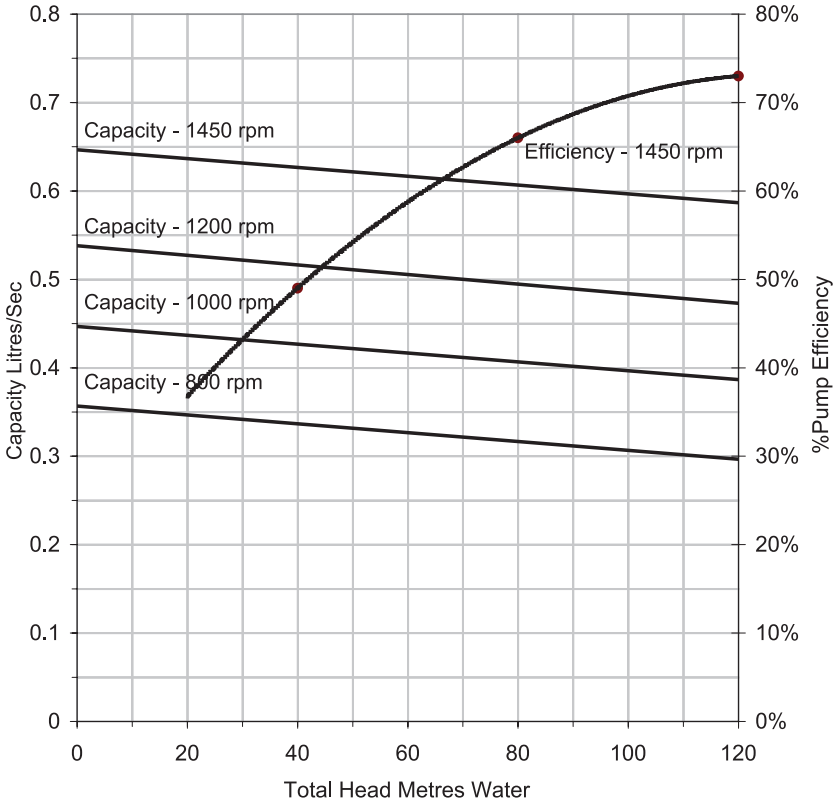
- Suitable for 76mm (3") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 2230 litres (490 gallons) per hour.

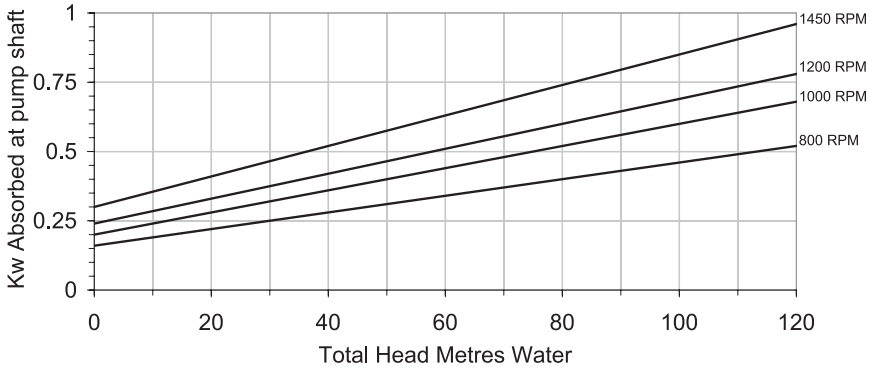
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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
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

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

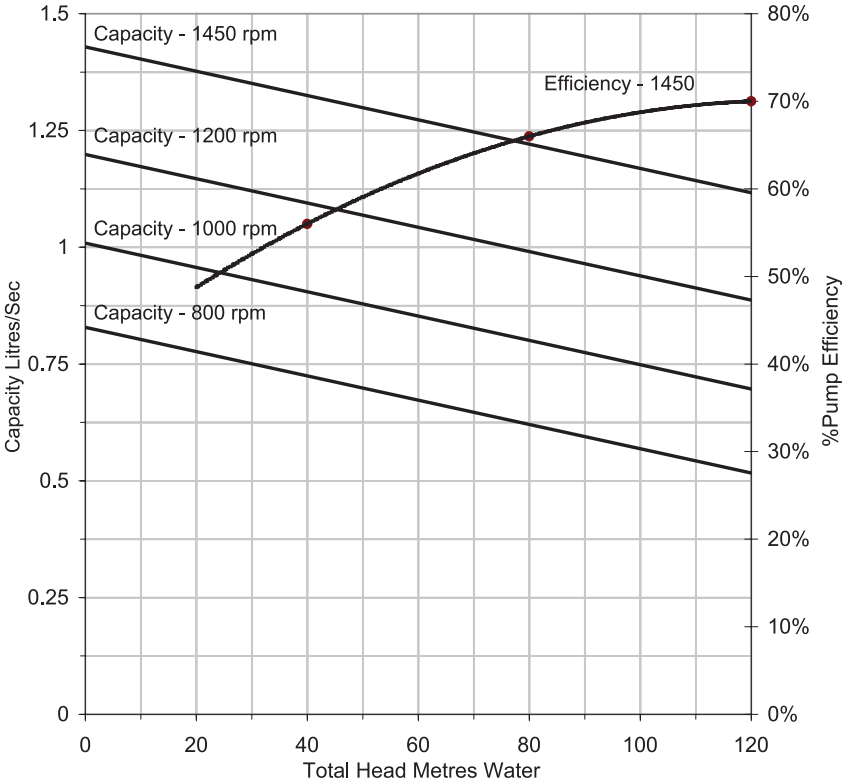
- Suitable for 76mm (4") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 5000 litres (1100 gallons) per hour.

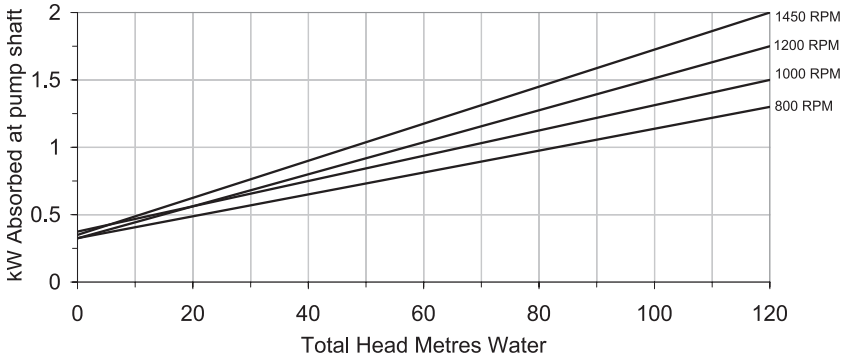
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1 l/sec	= 792 gal/hr
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10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

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.

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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	2 x 5/8 50 x 16	85	B
3	63	2 x 5/8 50 x 16	85	DR21 MKII

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

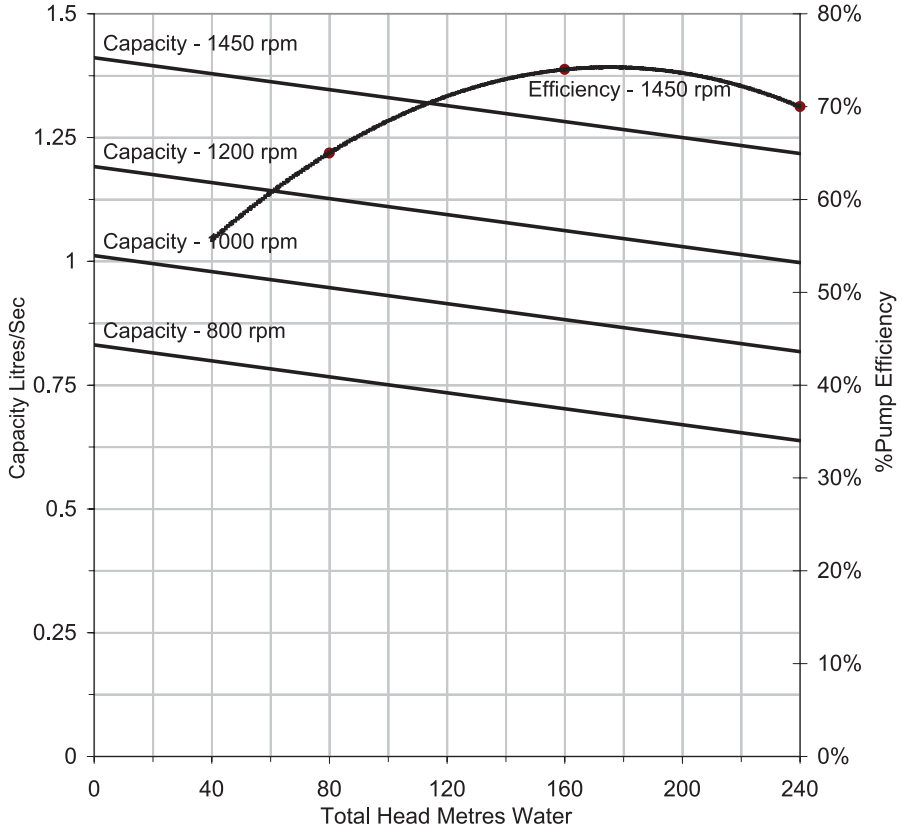
- Suitable for 100mm (4") internal diameter bore
- Total head of 240m (786 feet)
- Maximum yield of 4900 litres (1080 gallons) per hour.

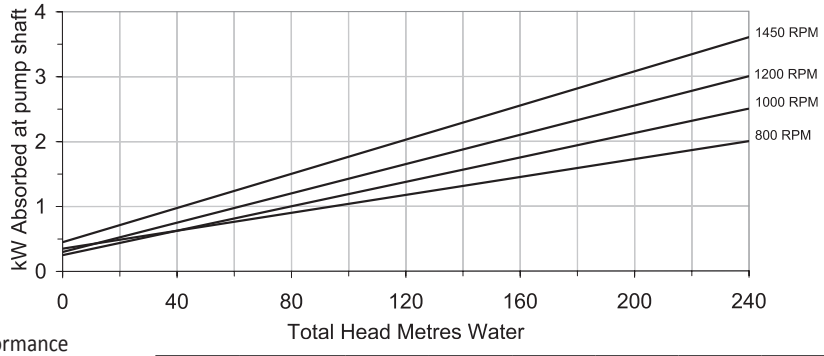
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10 m	= 34 ft = 14.2 psi = 98 kpa
100 ft	= 30.5 m = 43.3 psi = 298 kpa
1 hp	= 0.75kw
1 kW	= 1.34 hp

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)					
		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

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

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

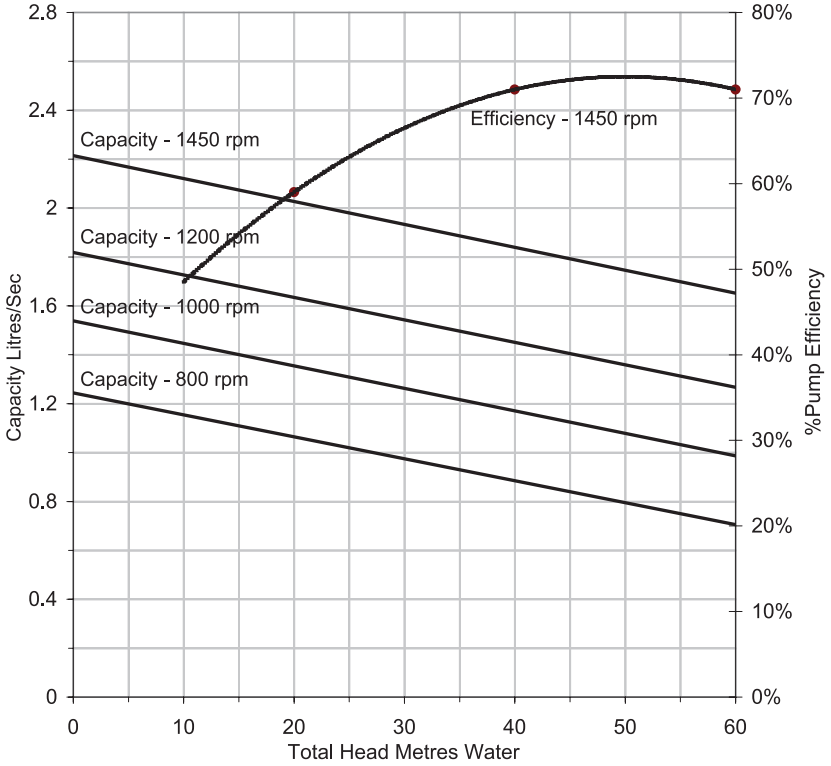
- Suitable for 100mm (4") internal diameter bore
- Total head of 60m (197 feet)
- Maximum yield of 7740 litres (1700 gallons) per hour.

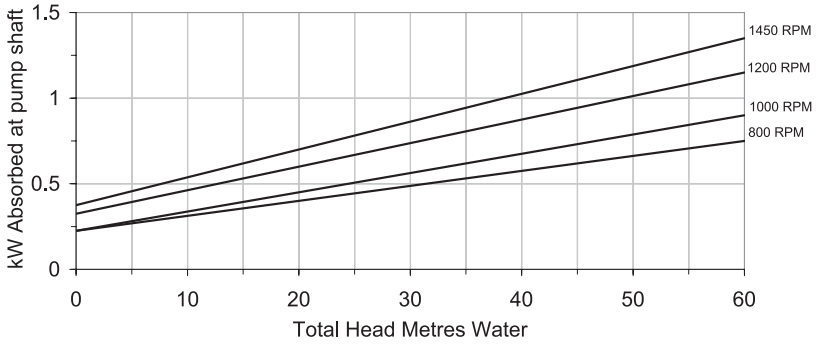
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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.

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

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
5.5	63	1 1/2 x 1/2 40 x 13	83	DR21 MKII

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

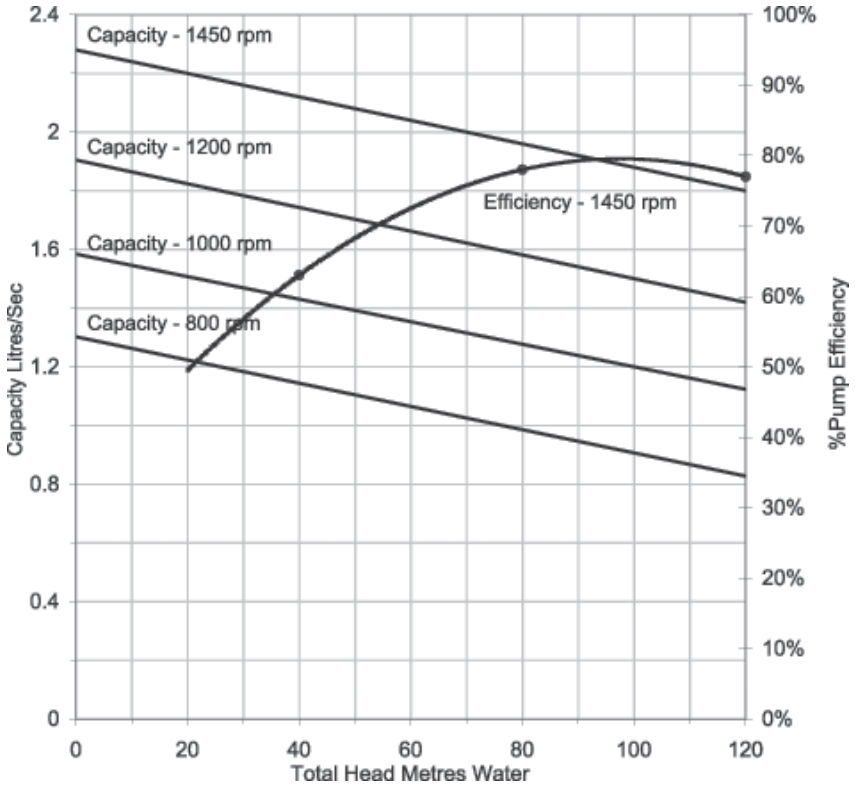
- Suitable for 100mm (4") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 7920 litres (1740 gallons) per hour.

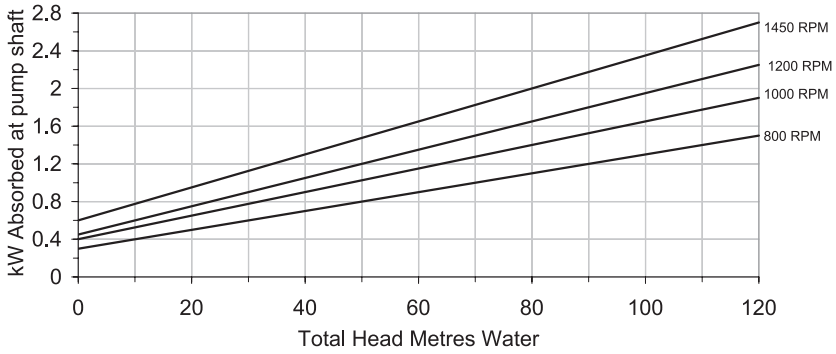
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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	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

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

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

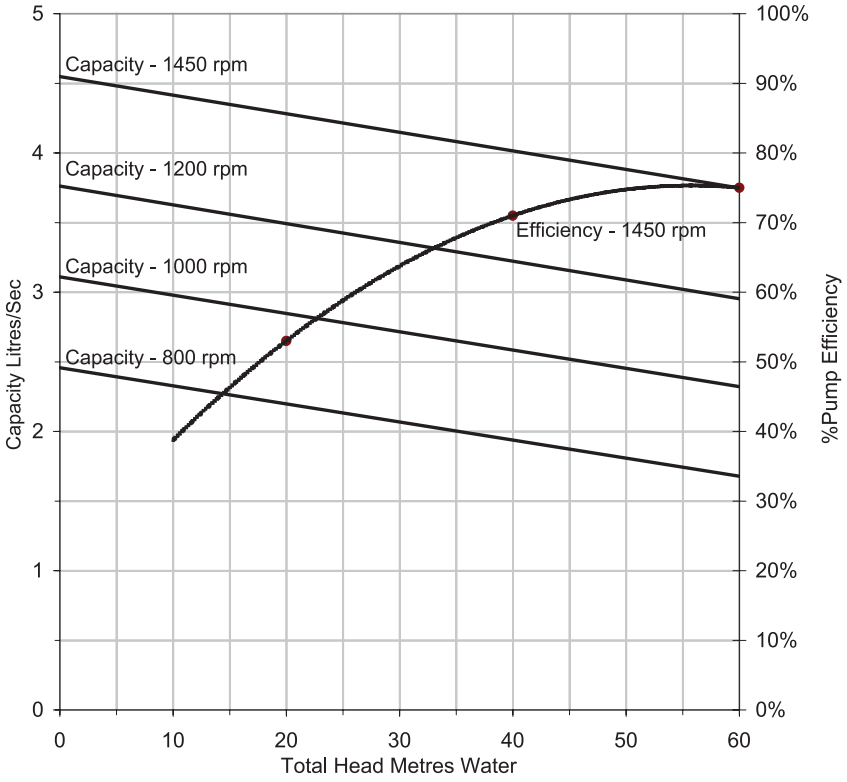
- Suitable for 115mm (4 1/2") internal diameter bore
- Total head of 60m (197 feet)
- Maximum yield of 16020 litres (3520 gallons) per hour.

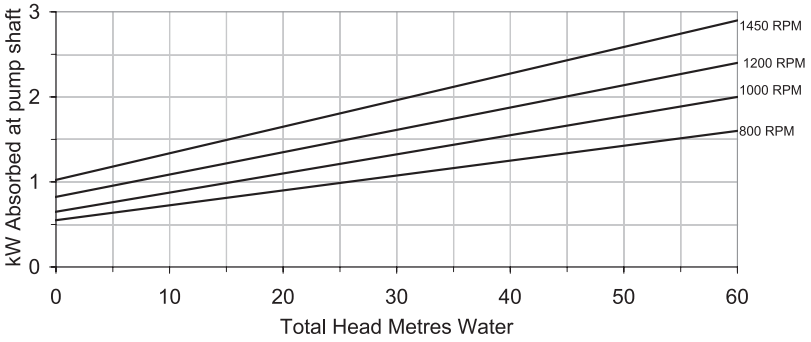
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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	74	2 x 5/8 50 x 16	85	B
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)					
		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

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

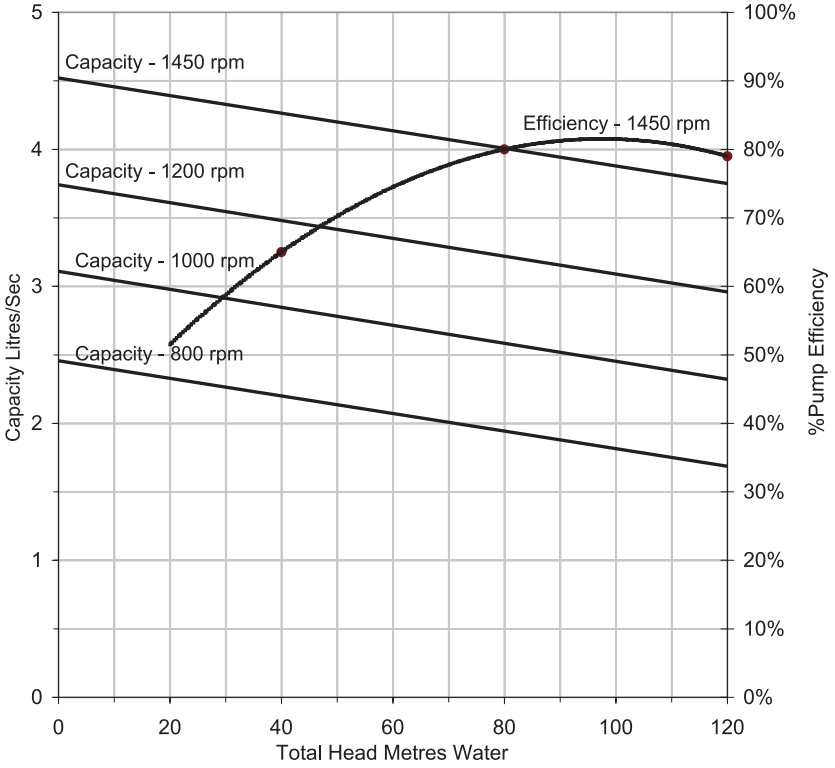
- Suitable for 115mm (4 1/2") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 16020 litres (3520 gallons) per hour.

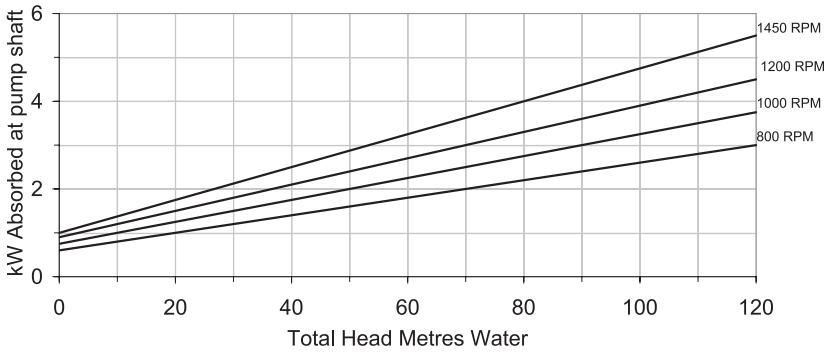
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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
15	73	2 1/2 x 3/4 65 x 19	86	B
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

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

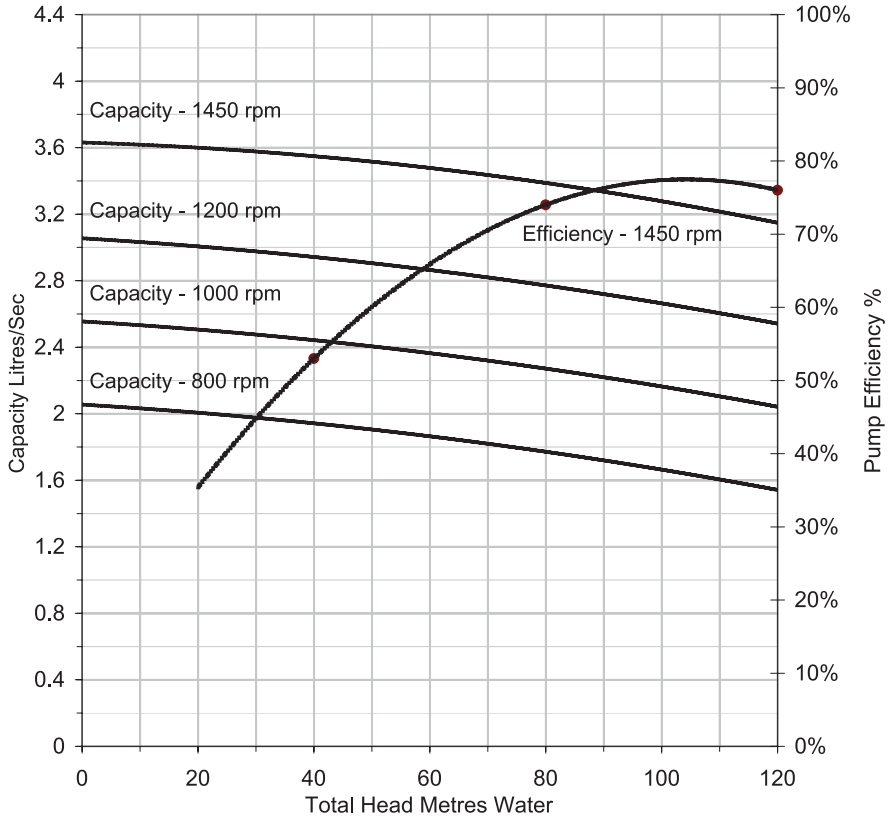
- Suitable for 100mm (4") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 12960 litres (2850 gallons) per hour.

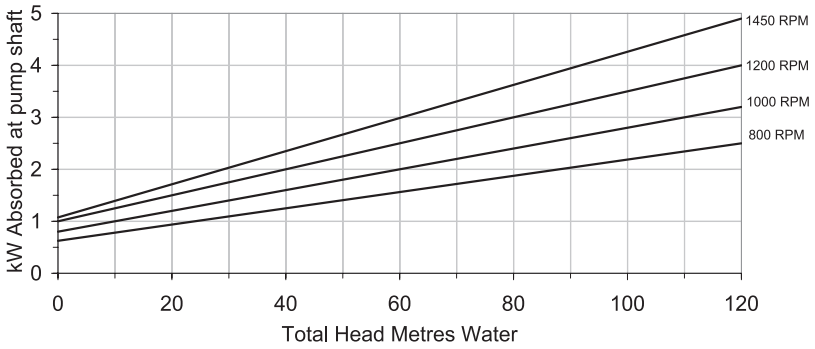
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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
5.5	66	2 x 5/8 50 x 16	83	DR21 MKII

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

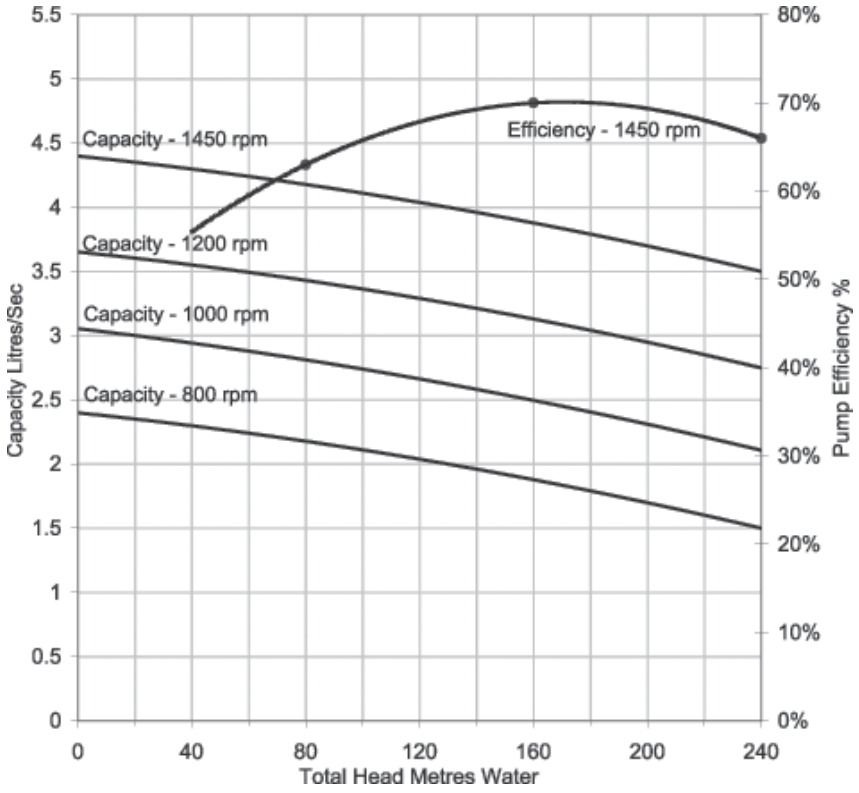
- Suitable for 115mm (4 1/2") internal diameter bore
- Total head of 240m (787 feet)
- Maximum yield of 15840 litres (3480 gallons) per hour.

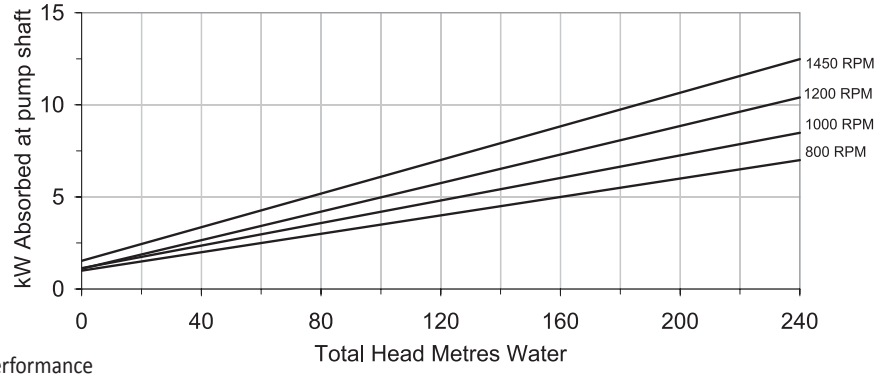
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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
9.3	67	2 1/2 x 3/4 65 x 19	86	DR21 MKII
20	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)					
		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

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Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

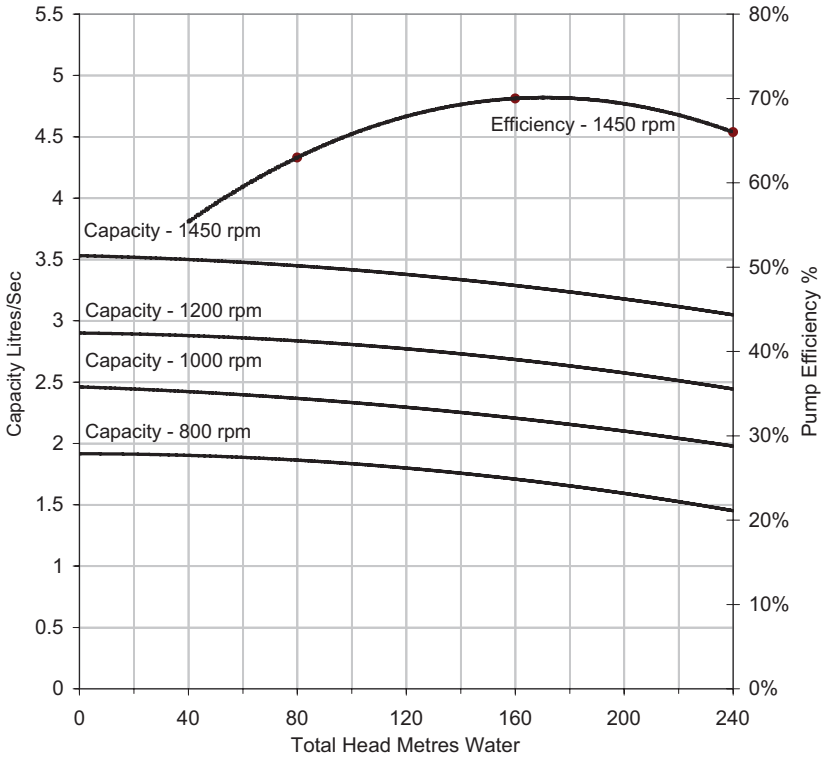
- Suitable for 100mm (4") internal diameter bore
- Total head of 240m (787 feet)
- Maximum yield of 12600 litres (2770 gallons) per hour.

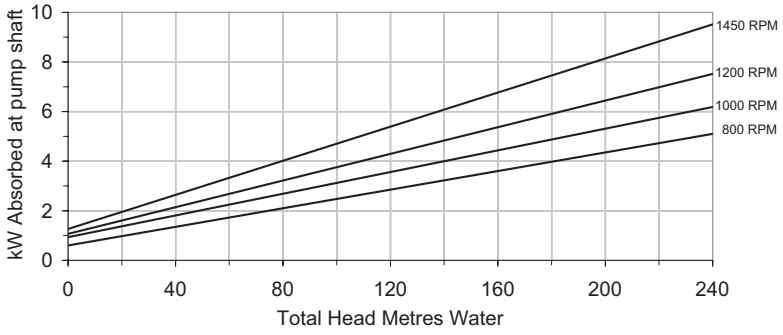
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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
9.3	67	2 1/2 x 3/4 65 x 19	86	DR21 MKII
20	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)					
		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

Published information other than that marked CERTIFIED is to be used as a guide only.

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

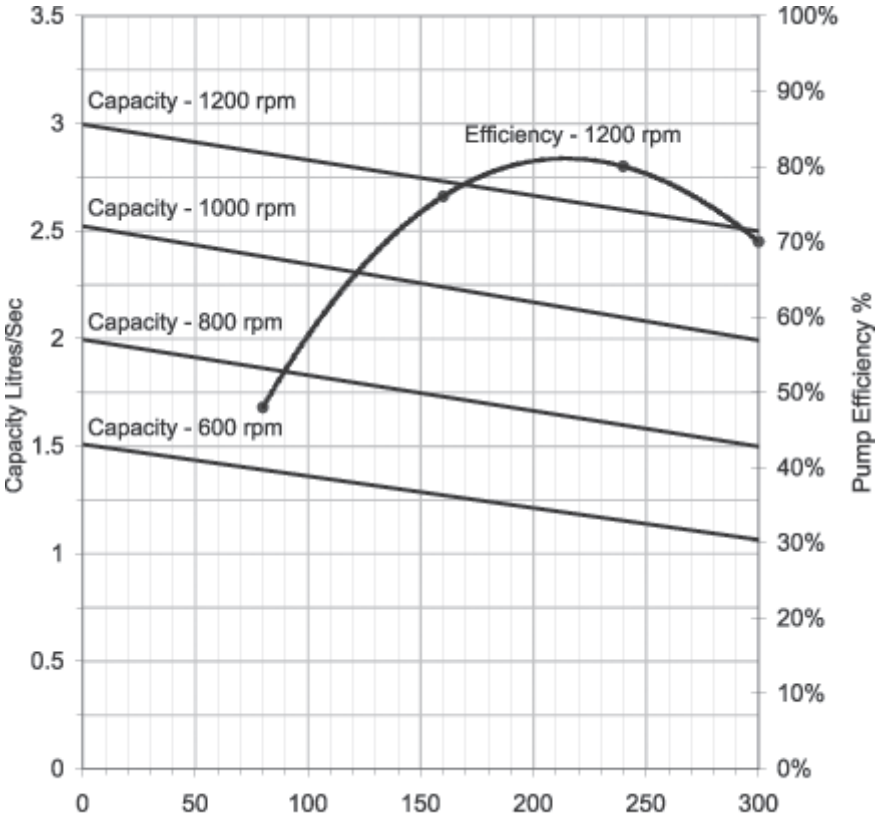
- Suitable for 100mm (4") internal diameter bore
- Total head of 300m (984 feet)
- Maximum yield of 10440 litres (2300 gallons) per hour.

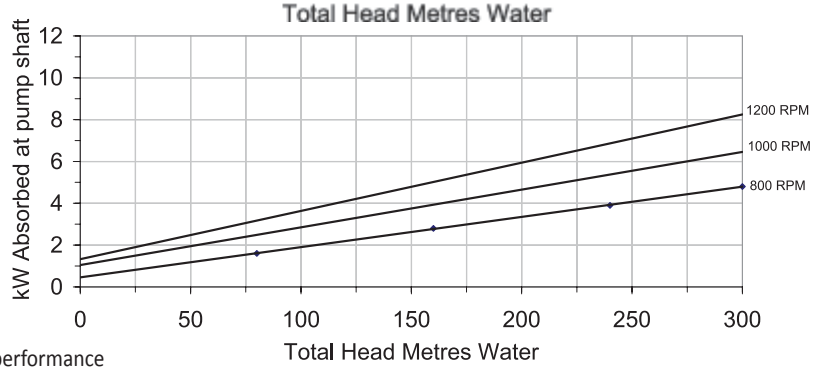
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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)			
		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

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

MONO™ Agricultural Products	Selection 720A	Title: Borehole Section: 4 Page: 23 Date: April 2014

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

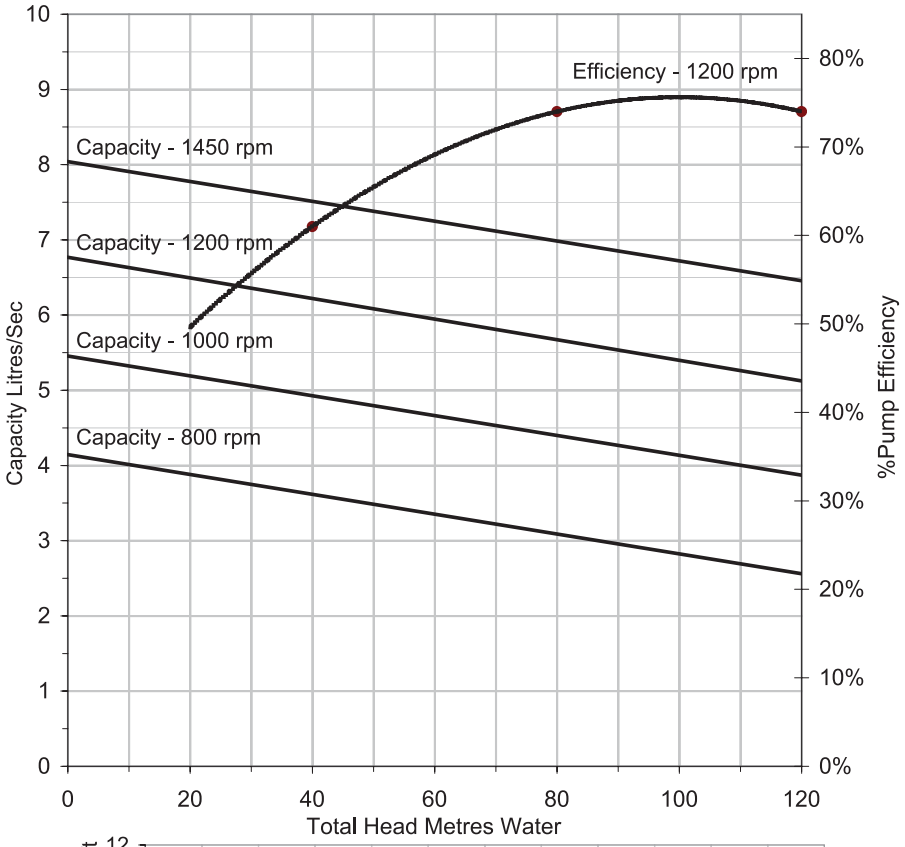
- Suitable for 127mm (5") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 28080 l/h (6180 gallons) per hour

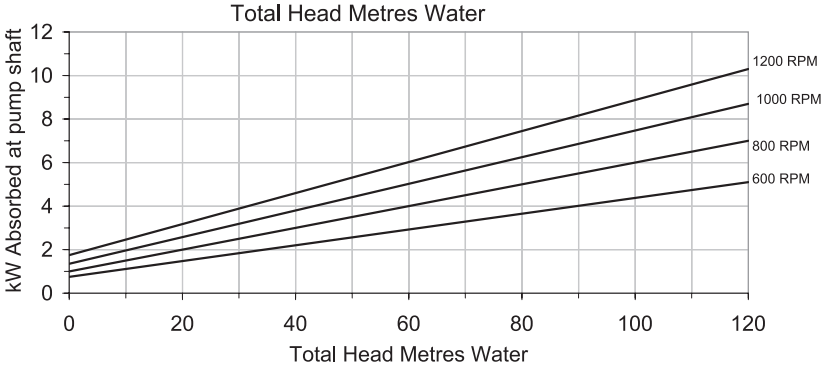
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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

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MONO™ Agricultural Products	Selection 740A	Title: Borehole Section: 4 Page: 24 Date: April 2014

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

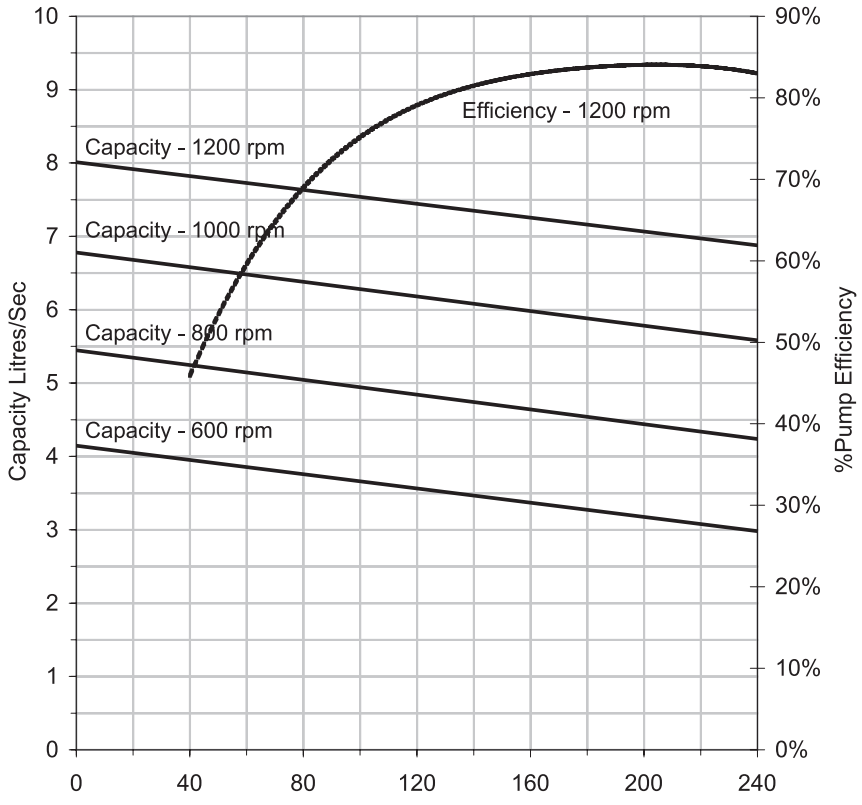
- Suitable for 127mm (5") internal diameter bore
- Total head of 240m (787 feet)
- Maximum yield of 28080 litres (6180 gallons) per hour.

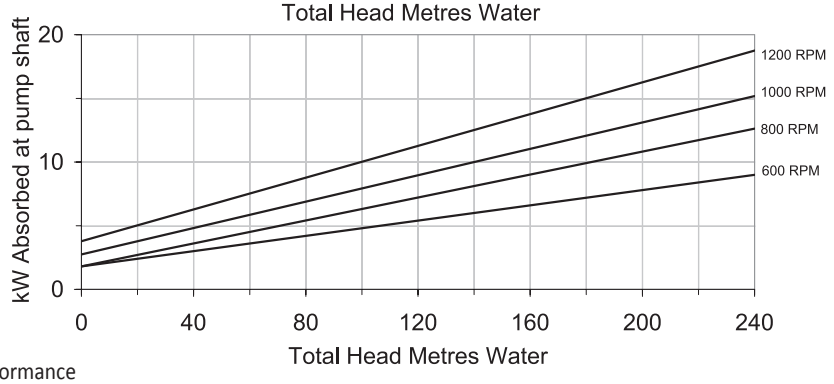
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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
25	76	3 x 7/8 80 x 22	89	C MKIII
25	76	3 x 7/8 80 x 22	89S	RD-F30A

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

Pump element performance, element efficiency and power absorbed curves:

DESCRIPTION

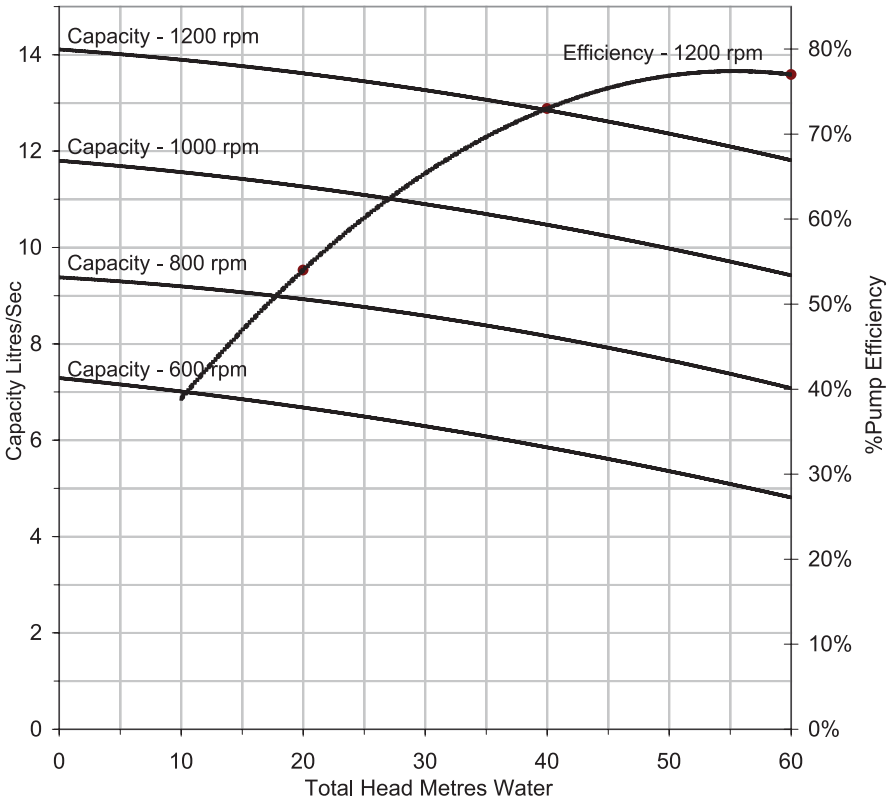
- Suitable for 145mm (5 5/8") internal diameter bore
- Total head of 60m (197 feet)
- Maximum yield of 50760 litres (11170 gallons) per hour.

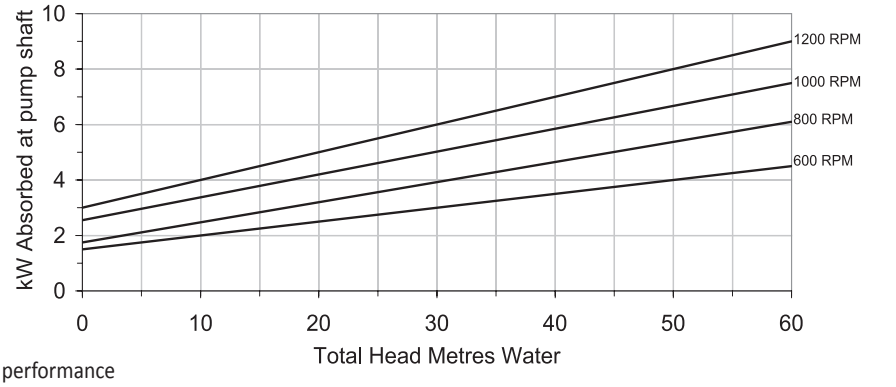
The head, column assembly and element are connected by the use of kits as per table below. For special and non standard applications other kits can be supplied.

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

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)					
		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

DESCRIPTION

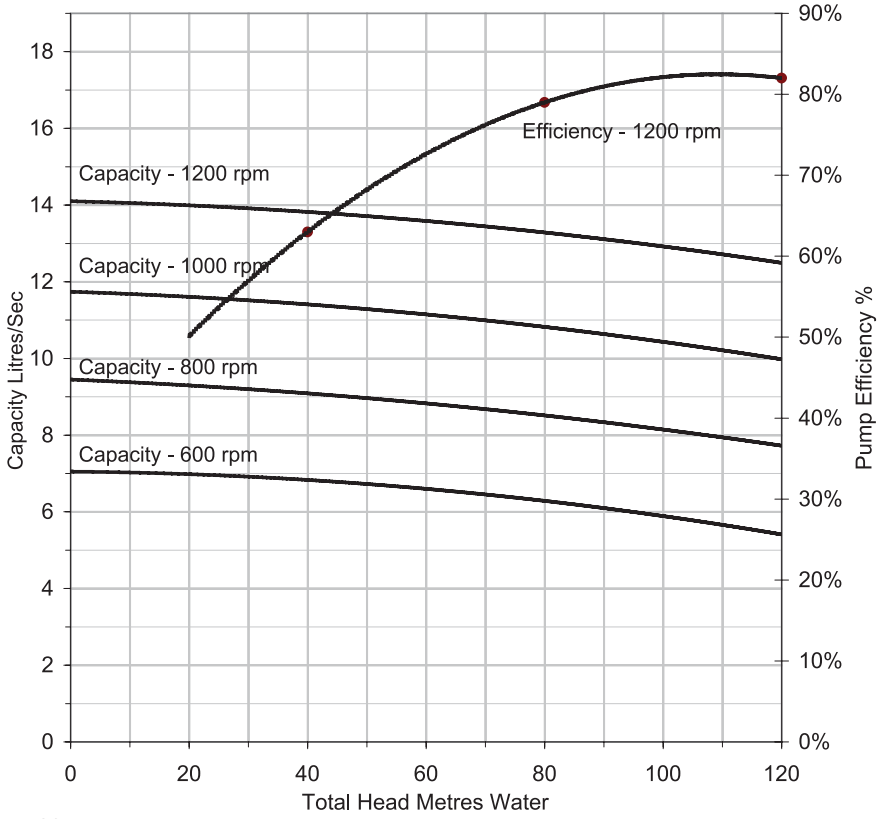
- Suitable for 145mm (5 5/8") internal diameter bore
- Total head of 120m (393 feet)
- Maximum yield of 50760 litres (11170 gallons) per hour.

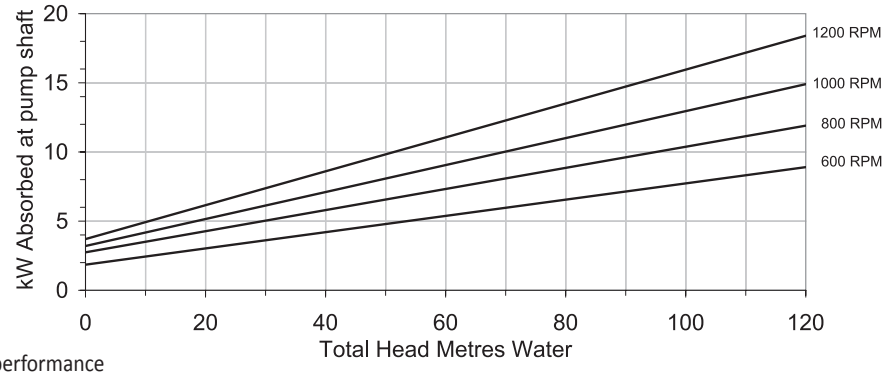
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Rotor Selection
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41° - 70°C Mark 3 Rotor
For applications outside these temperature limits, contact NOV.

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: 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



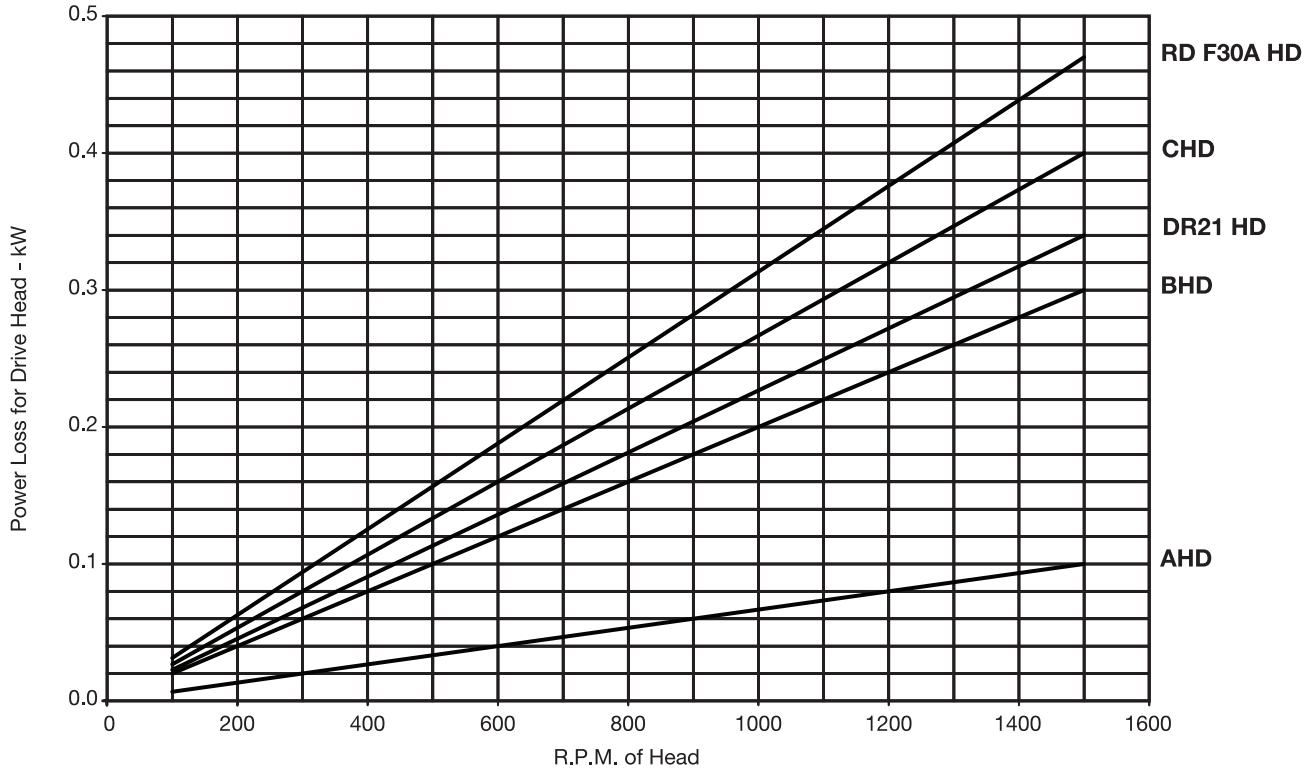


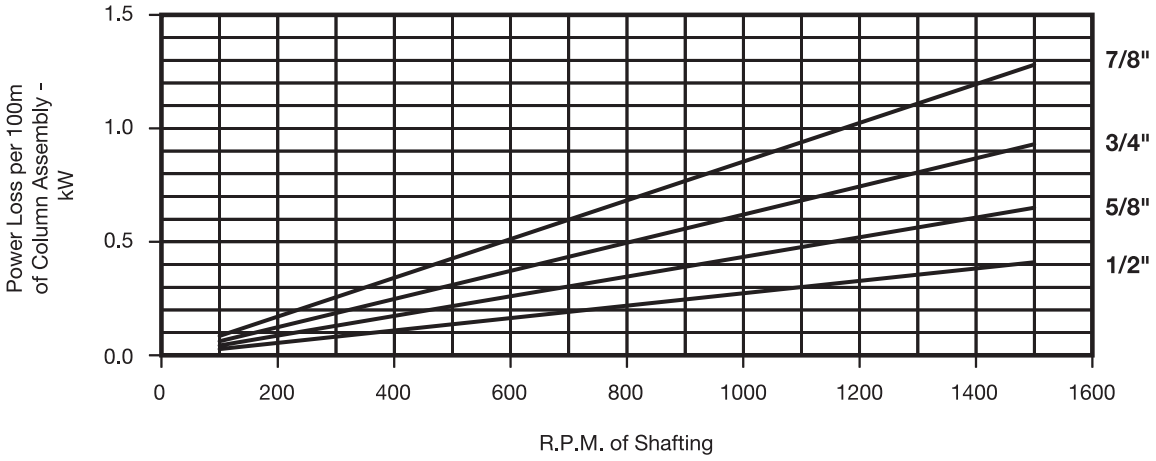
Test curve and table are typical only figures at 20°C performance may vary with temperature and field condition.

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

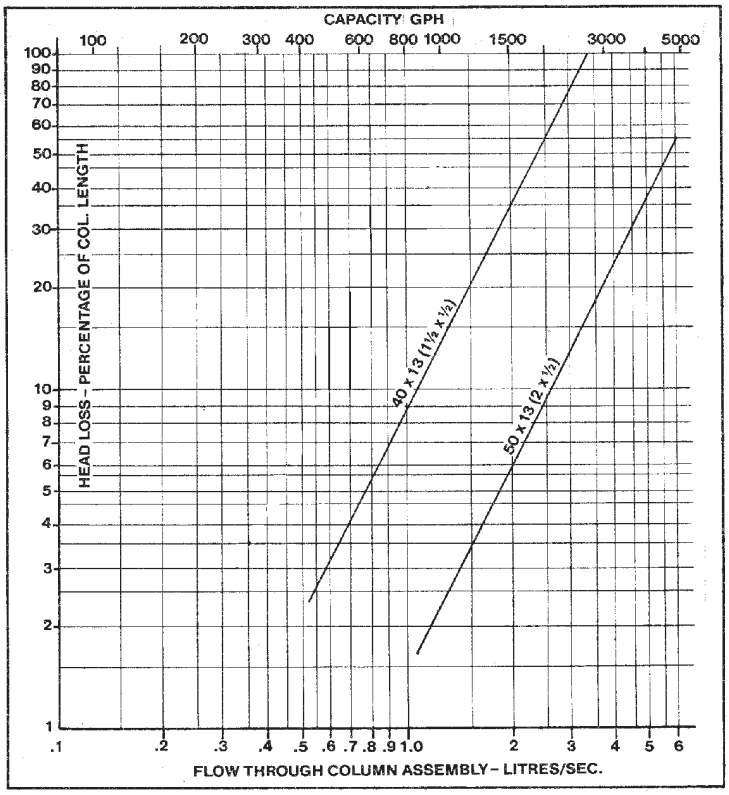
Pump Speed rpm	Capacity and Power	Total head from all causes (m)					
		20 65ft	40 130ft	60 197ft	80 262ft	100 328ft	120 393ft
1200	Litres/Sec Gph kW abs	14.00 11086 6.20	13.80 10928 8.60	13.60 10770 11.00	13.30 10532 13.50	12.90 10215 16.00	12.50 9899 18.40
1000	Litres/Sec Gph kW abs	11.60 9186 5.20	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





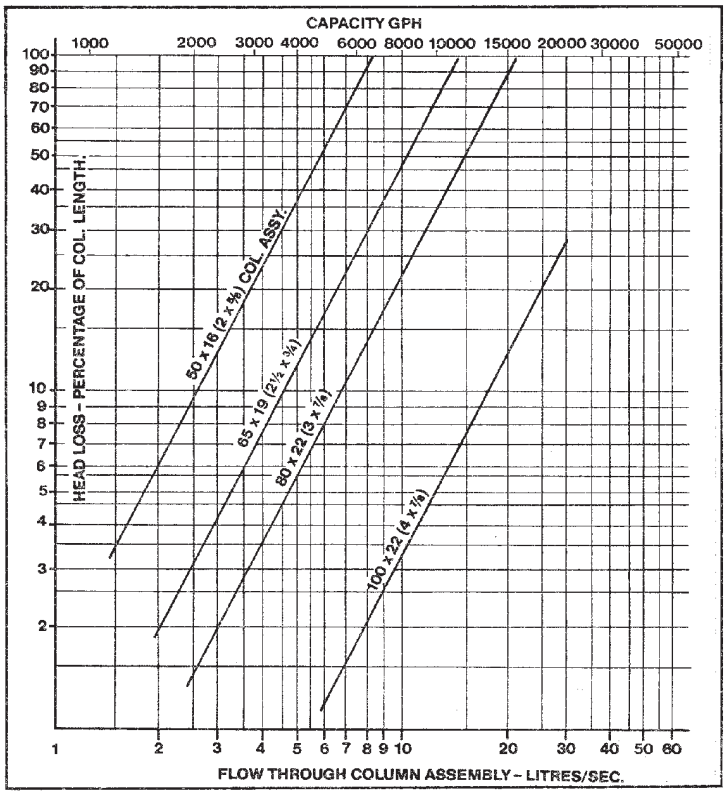
Published information other than that marked CERTIFIED is to be used as a guide only.

Friction Loss
Borehole Column Assembly
and Tangential Bobbin
Bearing



Note: 40 x 13 denotes nominal column ID of 40mm with 13mm diameter shafting. Similarly with two other assemblies.

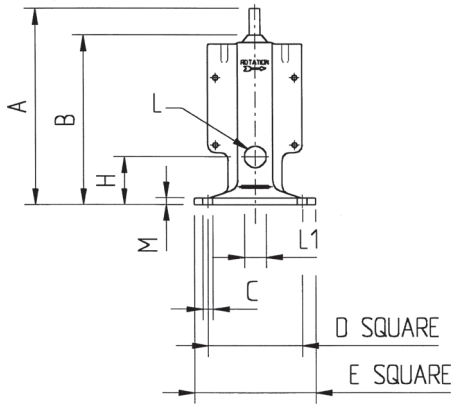
Friction Loss
Borehole Column Assembly with
Tangential Bobbin Bearing



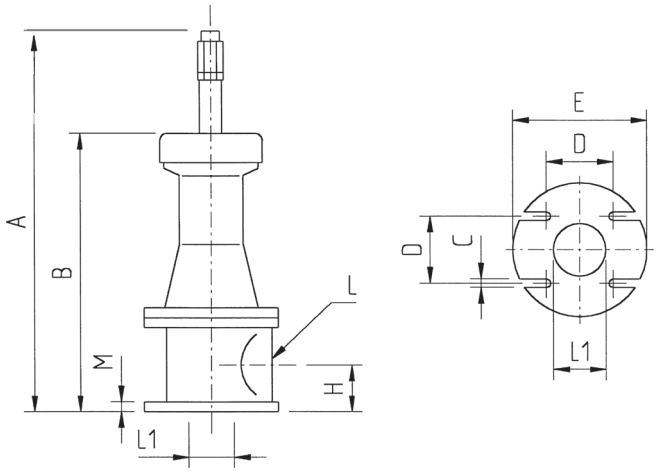
Note: 50 x 16 denotes nominal column ID of 50mm with 16mm diameter shafting. Similarly with three other assemblies.

Published information other than that marked CERTIFIED is to be used as a guide only.

Drive Head	Dimensions in Metric (mm) top Imperial Equivalent (inches) below													
	A	B	C	D	E	H	L	L_1	M	P	R	S	Shaft dia	Key size
AMK1	370	320	16	178	229	67	1 1/2"	1 1/2"	12	-	-	-	-	-
	14.6	12.6	0.6	7.0	9.0	2.6	BSP	BSP	0.5	-	-	-	0.75	None
BMK2	530	450	14	127	210	98	2 1/2"	2 1/2"	16	273	-	-	-	-
	20.9	17.7	0.6	5.0	8.3	3.9	BSP	BSP	0.6	10.7	-	-	1.375	3/8 x 1/4
BMK3	530	450	14	127	210	98	2 1/2"	2 1/2"	16	-	-	-	-	-
	20.9	17.7	0.6	5.0	8.3	3.9	BSP	BSP	0.6	-	-	-	1.375	3/8 x 1/4
CMK3	635	535	18	175	286	89	4"	4"	16	-	-	-	-	-
	25.0	21.1	0.7	6.9	11.3	3.5	BSP	BSP	0.6	-	-	-	1.875	1/2 x 5/16



AMK1



BMK3 & CMK3

Lineshaft Borehole Pump Drive Heads - General Specifications

	Vertical Shaft Drive		
	AMK1	BMk3	CMk3
Bare Head:			
		BMK2HD*	
Product Part Number	AMK1HD	BMK3HD	CMK3HD
Input Power Range kW	0.75 - 2.2	2.2 - 9.5	9.5 - 22.0
hp	1.0 - 3.0	3.0 - 12.5	12.5 - 30.0
Maximum Input Speed rpm	1450		
Gear Ratio (Spiral Bevel Gears)	Not Applic		
Gear and Bearing Lubrication	Grease		
Bearing Type - Radial	Deep Groove Ball		
Bearing Type - Thrust	Angular Contact Ball		
Rotation looking on input shaft	Anti - clockwise only		
Anti - Reverse Device	None	Drop Pin and Ratchet	
Input Shaft Diameter mm (ins)	0.75"	1.375"	1.875"
Input Shaft Key w x d mm (ins)	NONE	3/8" x 1/4"	1/2" x 5/16"
Inlet Port Size BSP female	1 1/2"	2 1/2"	4"
Discharge Port Size BSP female	1 1/2"	2 1/2"	4"
Final Drive Shaft Diameter	0.500"	0.750"	0.875"
Final Drive Shaft Thread size	1/2" UNS LH	3/4" UNS LH	7/8" UNS LH
Final Shaft Seal	Mech Seal	Gland Packing	Gland Packing
Weight - bare kg	10	42 & 31	60

Published information other than that marked CERTIFIED is to be used as a guide only.

Non-standard combinations are available on request to NOV branches and agent offices.

Element	Column and Shaft inch	Kit	Vertical Shaft Drives	
			Head	Kit
306	1 1/2 x 1/2	BH-KIT62	A	BH-KIT82
310	1 1/2 x 1/2	BH-KIT61	A	BH-KIT82
310	1 1/2 x 1/2	BH-KIT61	B	BH-KIT83
320	1 1/2 x 1/2	BH-KIT62	A	BH-KIT82
320	1 1/2 x 1/2	BH-KIT62	B	BH-KIT83
420 440	2 x 5/8	BH-KIT74	B	BH-KIT85
510	1 1/2 x 1/2	BH-KIT63	A	BH-KIT82
510	1 1/2 x 1/2	BH-KIT63	B	BH-KIT83
520	2 x 5/8	BH-KIT65	B	BH-KIT85
610	2 x 5/8	BH-KIT74	B	BH-KIT85
620	2 x 5/8	BH-KIT65	B	BH-KIT85
620	2 1/2 x 3/4	BH-KIT73	B	BH-KIT86
620A	2 x 5/8	BH-KIT66	B	BH-KIT85
640	2 1/2 x 3/4	BH-KIT67	B	BH-KIT86
640	2 1/2 x 3/4	BH-KIT67	C	BH-KIT87
640A	2 1/2 x 3/4	BH-KIT67	B	BH-KIT86
640A	2 1/2 x 3/4	BH-KIT67	C	BH-KIT87
650A	2 1/2 x 3/4	BH-KIT67	C	BH-KIT87
720	3 x 7/8	BH-KIT69	C	BH-KIT89
720A	2 1/2 x 3/4	BH-KIT75	C	BH-KIT87
720A	3 x 7/8	BH-KIT76	C	BH-KIT89
740A	3 x 7/8	BH-KIT76	C	BH-KIT89
810	3 x 7/8	BH-KIT69	C	BH-KIT89
810	4 x 7/8	BH-KIT70	C	BH-KIT90
820	3 x 7/8	BH-KIT69	C	BH-KIT89
820	4 x 7/8	BH-KIT70	C	BH-KIT90

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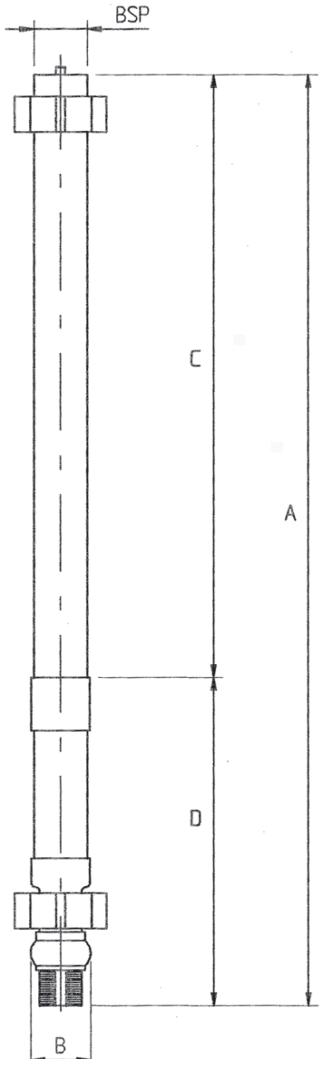
Column Size and Avaliable Material

Part Number	Length	Pipe Diameter	Material
MT COL 125X10	3080	1.25"	HD Galvanised Pipe
MT COL 150X10	3080	1.5"	HD Galvanised Pipe
MT COL 150X20	6180	1.5"	HD Galvanised Pipe
MT COL 200X10	3080	2"	HD Galvanised Pipe
MT COL 200X20	6160	2"	HD Galvanised Pipe
MT COL 250X10	3058	2.5"	HD Galvanised Pipe
MT COL 250X20	6116	2.5"	HD Galvanised Pipe
MT COL 300X10	3080	3"	HD Galvanised Pipe
MT COL 300X20	6160	3"	HD Galvanised Pipe
MT COL 400X10	3080	4"	HD Galvanised Pipe
MT COL 400X20	6160	4"	HD Galvanised Pipe

Drive Shaft Size and Avaliable Material

Part Number	Length	Pipe Diameter	Material
SF COL 200X10	3080	2"	316 Stainless Steel
SF COL 200x2980	2980	2"	316 Stainless Steel

Published information other than that marked CERTIFIED is to be used as a guide only.

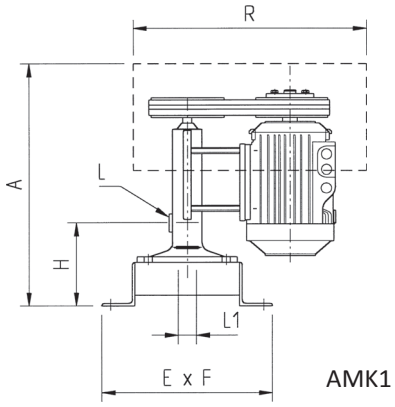


Suitable for bore Min.Dia.	310	320	420	440	510
	76mm 3"	76mm 3"	100mm 4"	100mm 4"	100mm 4"
A A	1150mm 45 3/8"	1440mm 56 3/4"	1416mm 55 3/4"	1695mm 66 3/4"	1500mm 59"
B B	73mm 2 7/8"	73mm 2 7/8"	73mm 2 7/8"	73mm 2 7/8"	79mm 3 1/8"
C C	805mm 31 5/8"	900mm 35 1/2"	900mm 35 1/2"	898mm 35 3/8"	775mm 30 1/2"
D D	350mm 13 3/4"	540mm 21 1/4"	516mm 20 3/8"	796mm 31 3/8"	725mm 28 1/2"
BSP	1 1/4"	1 1/2"	2"	2"	2"
Weight (kg)		11.3	14	17.5	

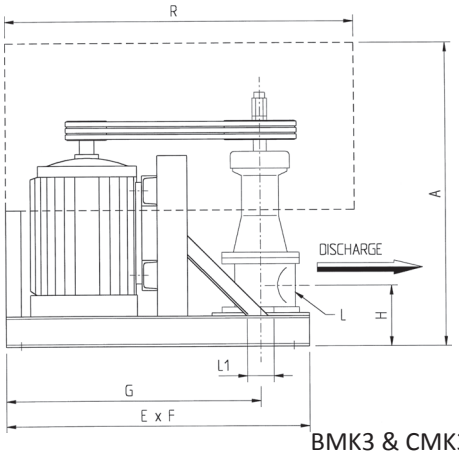
Suitable for bore Min.Dia.	520	610	620	620A	640	640A
	100mm 4"	115mm 4 1/2"	115mm 4 1/2"	100mm 4"	115mm 4 1/2"	100mm 4"
A A	1762mm 69 3/8"	1492mm 58 3/4"	1740mm 68 1/2"	1930mm 76"	2197mm 86 1/2"	2360mm 93"
B B	79mm 3 1/8"	89mm 3 1/2"	89mm 3 1/2"	79mm 3 1/8"	89mm 3 1/2"	79mm 3 1/8"
C C	920mm 36 1/4"	810mm 31 7/8"	920mm 36 1/4"	1050mm 41 3/8"	910mm 34 1/2"	1050mm 41 3/8"
D D	840mm 33 1/8"	680mm 26 7/8"	820mm 32 1/4"	880mm 34 5/8"	1321mm 52"	1310mm 51 5/8"
BSP	2"	2"	2"	2 1/2"	2 1/2"	2 1/2"
Weight (kg)	19	18.7	24	23		

Suitable for bore Min. Dia.	650A	720A	740A	810	820
	100mm 4"	127mm 5"	127mm 5"	145mm 5 5/8"	145mm 5 5/8"
A A	2870mm 113"	2664mm 104 7/8"	3102mm 122 1/8"	2180mm 85 7/8"	2970mm 117"
B B	80mm 3 1/8"	114mm 4 1/2"	114mm 4 1/2"	130mm 5 1/8"	130mm 5 1/8"
C C	1320mm 52"	1530mm 65 5/8"	1365mm 65 5/8"	1320mm 52"	1245mm 67 3/4"
D D	1550mm 61"	995mm 39 1/4"	1435mm 56 1/2"	860mm 33 7/8"	1250mm 49 1/4"
BSP	2 1/2"	3"	3"	4"	4"
Weight (kg)	42		70		

Published information other than that marked CERTIFIED is to be used as a guide only.



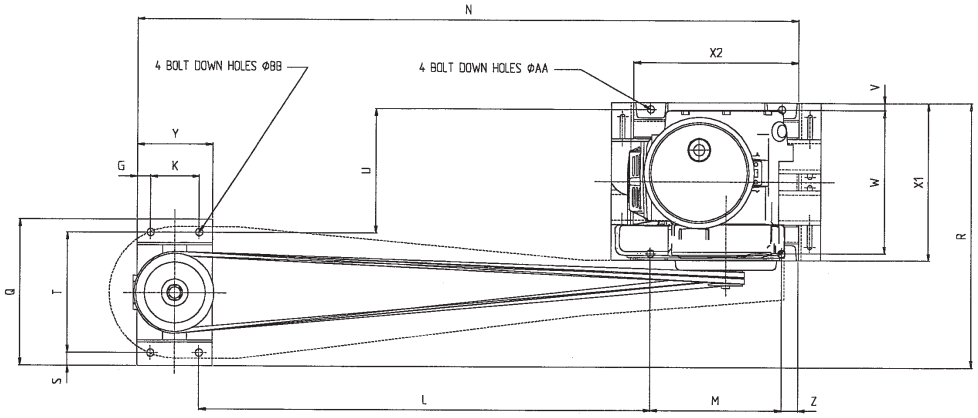
AMK1



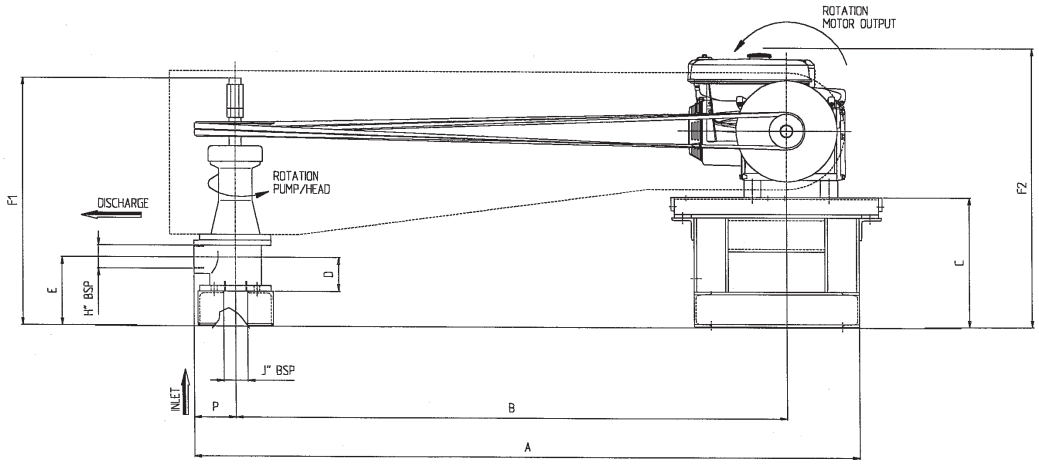
BMK3 & CMK3

Drive Head	Drive Type, Arrangement, Mounting and Base	A	E	F	G	H	L	L_1	R
AMK 1 head	AC Electric 240V & Diesel/Petrol Vee drive, pad mount on head plus head base Quarter twist vee-belt, separate engine and head base	500 19.7	400 15.7	400 15.7	- -	167 6.6	1 1/2” BSP	1 1/2” BSP	530 20.9
BMK3 head	AC Electric 7.5kW and above 415V - Diesel Vee drive, tee mount on one piece base Quarter twist vee-belt, separate engine and head base	820 32.3	1000 39.4	500 19.7	160 6.3	198 7.8	2 1/2” BSP	2 1/2” BSP	850 33.5
CMK3 head	AC Electric 5.5kW and above 415V - Diesel Vee drive, tee mount on one piece base Quarter twist vee-belt, separate engine and head base	935 36.8	1000 39.4	500 19.7	160 6.3	210 8.3	4” BSP	4” BSP	900 35.4

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QUARTER TWIST



Head Type	Centre Dist.	A	B	C	D	E	F1	F2	G	H	J	K	L	M	N
A	62"	1952	1709	380	90	340	470	840	38	1 1/2"	1 1/2"	325	1310	385	2107
B	62"	1918	1675	380	80	180	630	1047	39	2 1/2"	2 1/2"	144	1311	385	1929
C	62"	2005	1762	480	90	190	760	1147	48	4"	4"	200	1320	385	2003
A	82"	2460	2217	380	90	340	470	840	38	1 1/2"	1 1/2"	325	1818	385	2615
B	82"	2426	2183	380	80	180	630	1047	39	2 1/2"	2 1/2"	144	1819	385	2437
C	82"	2513	2270	480	90	190	760	1147	48	4"	4"	200	1828	385	2511

Head Type	Centre Dist.	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	X1
A	62"	45	200	722	38	325	375	20	420	485	200	50	22	18	460
B	62"	100	429	774	38	353	370	20	420	485	222	50	22	22	460
C	62"	150	475	797	33	358	345	20	420	485	296	50	22	22	460
A	82"	45	200	722	38	325	375	20	420	485	200	50	22	18	460
B	82"	100	429	774	38	353	370	20	420	485	222	50	22	22	460
C	82"	150	475	797	33	358	345	20	420	485	296	50	22	22	460

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