



IMPORTANT FORMULAS

- 1 Water Horse Power (WHP) = Pump output HP = $\frac{\text{Head in (mtrs)} \times \text{discharge in lpm}}{4565}$
- 2 Shaft Horse Power (SHP) = Motor output HP = $\frac{\text{Motor input kW} \times \text{motor efficiency in \%}}{73.6}$
- 3 Pump efficiency (%) = $\frac{\text{WHP}}{\text{SHP}}$
- 4 Overall efficiency (%) = $\frac{\text{Head in (mtrs)} \times \text{Discharge in lpm}}{6120 \times \text{IPkW}} \times 100$
- 5 Overall efficiency (%) = np x nm (pump eff(%) x motor eff(%))
- 6 Power Factor (CosØ) = $P / (V \times I)$ For 1Ø
- 7 Power Factor (CosØ) = $P / (1.732 \times V \times I)$ For 3Ø

Where,

P = Power Input (W)

V = Voltage (V)

I = Current (A)

IPkW = Motor Input kW

Material Selection For Special Application :

Application	Material Selection
Clear, cold water	: Impeller in SS/CI/ poly carbonate, stage bowls in close grain CI
Marine application	: Impellers as well as stage bowls in Bronze
Chemically aggressive and abrasive water	: Impellers as well as stage bowls in Stainless Steel.

Construction of the motor is also changed as per the pumping media,

All special grades Of material are available on request as far as the material requirements Of the pump design are satisfied.

General accessories required for Submersible Pumpsets :

- 1 Suitable Cable : Ref. cable selection chart page No. 10 & 11
- 2 Control Panel : With ISI marked Starter! Contractor Relay! Single Phasing preventer Ammeter! voltmeter Water level guard.
- 3 Galvanised Cable Clip : As per length & size of delivery pipe (One/ Oft.)
- 4 Pair of supporting clamps : As per size of delivery pipe.
- 5 Borewell cap : As per size of borewell
- 6 Cable jointing kit : As per size of cable
- 7 Sluice / Gate valve : ISI marked

Conversion Table

Discharge:

1 Imp Gallon	-	4.546 ltrs.
1 US Gallon	-	3.785 ltrs.
1 Cu m.	-	1000 ltrs.

Discharge Rate:

1 m ³ /h	-	16.67 lpm
1 m ³ /h	-	0.2778 lps
1 m ³ /s	-	60.000 lpm
1 l/s	-	60 lpm
1 Cu ft/s	-	1699.2 lpm
1 Imp. GPH	-	0.0757 lpm

Head:

1 mtrs.	-	3.28 ft.
1 ft.	-	0.3048
1 kg/cm ²	-	10 mtrs.

Power:

1 HP (Si)	-	0.746 kW
	-	746 W
1 HP (Metric)	-	0.736 Kw
	-	736 W
1 kW	-	1000 W
1 HP	-	0.9325 kVA

Weight:

1 kg	-	1000 gm.
1 kg	-	2.2046 lb.
1 lb.	-	0.4536 kg.

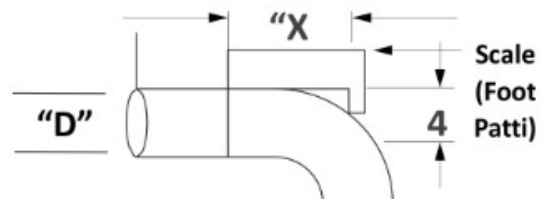
Pressure :

1 Atmosphere	-	1.033 Kg/cm ²
1 Atmosphere	-	14.7 lb/in ²
1 Atmosphere	-	10.34 mwc
1 lb/in ²	-	0.704 mwc
1 lb/in ²	-	2.31 ft wc
1 lb/in ²	-	51.6 mm of mercury.
1 cusec	-	1705 lpm
	-	1 Acre inch/hr
1 Cu mec	-	20558.3 lpm.
1 mm Hg(0°C)	-	0.0136 m

Discharge Calculation At Site

HORIZONTAL DISTANCE "X" IN INCHES	DISCHARGE RATE (L P M) NOMINAL PIPE DIAMETER "D"									
	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	
4	25.878	44.492	60.382	99.88	140.74	222.46	376.82	590.2	862.6	
5	32.234	55.388	75.364	127.12	177.06	276.94	472.16	749.1	1089.6	
6	38.59	66.738	90.8	149.82	213.38	331.42	567.5	885.3	1293.9	
7	45.4	77.634	105.328	177.06	249.7	385.9	662.84	1044.2	1520.9	
8	51.302	88.984	120.31	199.76	281.48	444.92	753.64	1180.4	1725.2	
9	58.112	99.88	135.292	227	317.8	499.4	848.98	1339.3	1952.2	
10	64.468	111.23	150.728	249.7	354.12	553.88	944.32	1475.5	2156.5	
11	70.824	118.04	165.71	276.94	390.44	608.36	1039.66	1634.4	2383.5	
12	77.18	131.66	177.06	299.64	426.76	667.38	1135	1770.6	2587.8	
13	83.99	143.01	195.22	326.88	458.54	721.86	1225.8	1929.5	2814.8	
14	90.8	154.36	211.11	349.58	494.86	776.34	1321.14	2043	3019.1	
15	96.702	164.802	225.184	376.82	531.18	830.82	1416.48	2224.6	3223.4	
16	103.058	177.06	240.62	399.52	567.5	889.84	1511.82	2360.8	3450.4	
17	109.414	188.41	255.602	426.76	603.82	944.32	1602.62	2519.7	3677.4	
18	115.77	198.398	270.584	449.46	635.6	998.8	1697.96	2678.6	3881.7	
19	122.58	209.748	285.566	476.7	671.92	1053.28	1793.3	2814.8	4108.7	
20	128.936	220.644	300.548	503.94	708.24	1107.76	1888.64	2951	4313	
21	135.292	231.54	315.53	526.64	744.56	1162.24	1983.98	3109.9	4540	
22	141.648	242.89	330.512	553.88	780.88	1221.26	2074.78	3268.8	4767	
23	148.458	253.786	345.494	576.58	812.66	1275.74	2170.12	3405	4971.3	
24	154.814	264.682	360.476	603.82	848.98	1330.22	2265.46	3541.2	5175.6	
25	161.17	275.578	375.458	626.52	885.3	1389.24	2360.8	3700.1	5402.6	
26	167.526	286.928	390.44	653.76	921.62	1443.72	2456.14	3836.3	5606.9	
27	173.882	297.824	405.422	676.46	957.94	1498.2	2546.94	3995.2	5833.9	
28	180.692	308.72	420.858	703.7	989.72	1552.68	2642.28	0	0	
29	187.048	320.07	435.84	726.4	1026.04	1607.16	2737.62	0	0	
30	193.404	330.966	450.822	753.64	1062.36	1666.18	2832.96	0	0	
31	0	0	467.62	776.34	1098.68	1720.66	0	0	0	
32	0	0	481.24	803.58	1135	1775.14	0	0	0	
33	0	0	494.86	826.28	1166.78	1829.62	0	0	0	
34	0	0	513.02	853.52	1203.1	1884.1	0	0	0	
35	0	0	526.64	880.76	1239.42	1943.12	0	0	0	

Example : Horizontal Distance X" = 20"
Nominal Pipe Diameter D" = 2"
Discharge = 504





CABLE SELECTION CHART

For Three Phase Motor Maximum Length Of Three Wire Copper Cable

HP	415v - V6 THREE PHASE																				
	LENGTH IN METERS UP TO																				
	10	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500
3.00	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	4	4	4	6	6	6
4.00	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	4	4	4	6	6	6	10	10
5.00	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	4	4	4	6	6	10	10	10	10
6.00	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	10	10	10	10	16
7.5S	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	10	10	10	16	16	16
7.5SD	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	10	10	10	10
10	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	10	10	10	10	16
12.50	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	10	10	10	16	16	16
15.00	4	4	4	4	4	4	4	4	4	4	4	6	6	6	10	10	10	16	16	16	16
17.50	6	6	6	6	6	6	6	6	6	6	6	6	6	10	10	10	16	16	16	25	25
20.00	6	6	6	6	6	6	6	6	6	6	6	10	10	10	10	16	16	16	25	25	25
25.00	6	6	6	6	6	6	6	6	6	6	6	10	10	10	16	16	16	25	25	25	35
30.00	6	6	6	6	6	6	6	6	6	6	10	10	10	10	16	16	25	25	25	35	35

For Three Phase Motor Maximum Length Of Three Wire Copper Cable

HP	415v - V6 THREE PHASE																					
	LENGTH IN METERS UP TO																					
	10	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	
10.00	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	4	4	4	6	6	10	10	10	10	16	
12.50	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	4	4	4	4	6	6	10	10	10	16	16	16	
15.00	4	4	4	4	4	4	4	4	4	4	4	6	6	6	10	10	10	16	16	16	16	
17.50	4	4	4	4	4	4	4	4	4	4	4	6	6	6	10	10	10	16	16	16	25	25
20.00	4	4	4	4	4	4	4	4	4	4	6	6	10	10	10	10	16	16	16	25	25	25
25.00	6	6	6	6	6	6	6	6	6	6	6	10	10	10	16	16	16	25	25	25	35	
30.00	6	6	6	6	6	6	6	6	6	6	6	10	10	10	16	16	25	25	25	35	35	
35.00	10	10	10	10	10	10	10	10	10	10	10	10	16	16	16	25	25	25	35	35	35	
40SD	10	10	10	10	10	10	10	10	10	10	10	16	16	16	25	25	25	35	35	50	50	
40ATS	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	25	25	35	35	50	50	
45SD	10	10	10	10	10	10	10	10	10	10	16	16	16	25	25	25	35	35	50	50	50	
45ATS	16	16	16	16	16	16	16	16	16	16	16	16	16	16	25	25	35	35	50	50	50	
50SD	16	16	16	16	16	16	16	16	16	16	16	16	16	25	25	35	35	50	50	50	70	
50ATS	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	35	35	50	50	50	70	
55/60SD	16	16	16	16	16	16	16	16	16	16	16	16	25	25	35	35	50	50	50	70	70	
55/60ATS	25	25	25	25	25	25	25	25	25	25	25	25	25	25	35	35	50	50	50	70	70	
70/75SD	16	16	16	16	16	16	16	16	16	16	16	25	35	35	50	50	50	70	70	70	70	
70/75ATS	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	50	50	70	70	95	95	

Note : * Ampere given above (for 3Ø) is as per IS specification for entire operating head range.
 Actual ampere will be less than mentioned.
 * Pumpset should NOT run, if it draw more than maximum ampere mentioned above.

Technical Details For 1 ϕ & 3 ϕ Submersible Motor (3" To 10")

Submersible Motor 3"

SR. NO.	MOTOR OUTPUT RATING IN HP	MOTOR OUTPUT RATING IN KW	METHOD OF STARTING	CABLE DETAILS 3 CORE FLAT COPPER CABLE			MAX CURRENT (Amp*) (210V)	CAPACITOR (MFD)	
				CABLE SIZE (Sq. M.M.)	CABLE LENGTH (Mtr.)	NO. OF CABLE		STARTING	RUNNING
1	0.50	0.37	DOL	1.0	3	One	4.8	100/120	25
2	0.75	0.55	DOL	1.0	3	One	5.8	100/120	36
3	1.00	0.75	DOL	1.0	3	One	7.0	100/120	36
4	1.25	0.93	DOL	1.0	3	One	8.4	100/120	45
5	1.50	1.1	DOL	1.0	3	One	9.5	100/120	60

Submersible Motor 4" (single Phase 210v)

SR. NO.	MOTOR OUTPUT RATING IN HP	MOTOR OUTPUT RATING IN KW	METHOD OF STARTING	CABLE DETAILS 3 CORE FLAT COPPER CABLE			MAX CURRENT (Amp*) (210V)	CAPACITOR (MFD)	
				CABLE SIZE (Sq. M.M.)	CABLE LENGTH (Mtr.)	NO. OF CABLE		STARTING	RUNNING
1	0.50	0.37	DOL	1.5	3	One	6.0	80/100	36
2	0.75	0.55	DOL	1.5	3	One	7.0	80/100	36
3	1.00	0.75	DOL	1.5	3	One	8.5	120/150	36
4	1.50	1.1	DOL	2.5	3	One	12.0	150/200	36+36
5	2.00	1.5	DOL	2.5	3	One	15.7	200/250	36+36
6	3.00	2.2	DOL	4.0	3	One	22.6	200/250	36+36
7	5.00	3.7	DOL	4.0	3	One	30.0	500	50+50

- Note :**
- * Ampere given above (for 1 ϕ & 3 ϕ) is as per IS specification for entire operating head range. Actual ampere will be less than mentioned.
 - * Max. current limit (Amp.) shall be in inverse proportion to rated voltage.
 - * Pumpset should NOT run, if it draw more than maximum ampere mentioned above.

Technical Details For 1 ϕ & 3 ϕ Submersible Motor (3" To 10") Submersible Motor 4" (Three Phase 415v)

SR. NO.	MOTOR OUTPUT RATING IN HP	MOTOR OUTPUT RATING IN KW	METHOD OF STARTING	CABLE DETAILS 3 CORE FLAT COPPER CABLE			MAX CURRENT (Amp*) (415V)
				CABLE SIZE (Sq. M.M.)	CABLE LENGTH (Mtr.)	NO. OF CABLE	
1	1.50	1.1	DOL	1.5	3	One	12.0
2	2.00	1.5	DOL	1.5	3	One	15.7
3	3.00	2.2	DOL	4.0	3	One	22.6
4	5.00	3.7	DOL	4.0	3	One	30.0

Submersible Motor 5" (Three Phase 415v)

SR. NO.	MOTOR OUTPUT RATING IN HP	MOTOR OUTPUT RATING IN KW	METHOD OF STARTING	CABLE DETAILS 3 CORE FLAT COPPER CABLE			MAX CURRENT (Amp*) (415V)
				CABLE SIZE (Sq. M.M.)	CABLE LENGTH (Mtr.)	NO. OF CABLE	
1	3.0	2.2	DOL	1.5	3	One	6.5
2	4.0	3.0	DOL	1.5	3	One	8.5
3	5.0	3.7	DOL	2.5	3	One	10.0
4	6.0	4.5	DOL	4.0	3	One	12.0
5	7.5	5.5	DOL	6.0	3	One	14.5
6	10.0	7.5	S/D	4.0	3	Two	19.5

Submersible Motor 6" (Single Phase 230v)

SR. NO.	MOTOR OUTPUT RATING IN HP	MOTOR OUTPUT RATING IN KW	METHOD OF STARTING	CABLE DETAILS 3 CORE FLAT COPPER CABLE			MAX CURRENT (Amp*) (230V)	CAPACITOR (MFD)	
				CABLE SIZE (Sq. M.M.)	CABLE LENGTH (Mtr.)	NO. OF CABLE		STARTING	RUNNING
1	3.0	2.2	DOL	4.0	3	One	20.6	250/300	50+50
2	5.0	3.7	DOL	6.0	3	One	30.0	400/500	72+72
3	7.5	5.5	DOL	6.0	3	One	45.0	400/500	72+72+72
4	10.0	7.5	DOL	10.0	3	One	60.0	400/500	100+100 +40+40

Head Loss Due to Friction in mtr. in GI & MS Delivery Pipes Per 100 mtrs. Length

DISCHARGE IN IPM	INSIDE DIAMETER OF DELIVERY PIPE IN MM								
	25	40	50	65	80	100	125	150	200
40	1.25	--	--	--	--	--	--	--	--
80	4.69	0.57	--	--	--	--	--	--	--
100	7.00	0.08	0.662	--	--	--	--	--	--
150	--	1.85	1.099	0.540	--	--	--	--	--
200	--	3.13	1.670	0.78	0.54	--	--	--	--
250	--	4.75	2.260	1.31	0.837	0.292	--	--	--
300	--	6.80	3.980	2.00	1.163	0.476	--	--	--
400	--	--	5.970	2.84	1.983	0.721	--	--	--
500	--	--	--	5.00	3.017	1.393	--	--	--
600	--	--	--	--	--	2.206	0.463	--	--
800	--	--	--	--	--	2.677	0.740	--	--
1000	--	--	--	--	--	--	0.887	0.182	--
1400	--	--	--	--	--	--	1.250	0.305	--
1800	--	--	--	--	--	--	--	0.363	--
2000	--	--	--	--	--	--	--	0.517	--
2400	--	--	--	--	--	--	--	--	0.138

Frictional Losses in Mtr. in Non Return Valve

SIZE OF NRV IN INCH	DISCHARGE IN LPM														
	100	200	300	400	500	600	700	800	900	1000	1500	2000	2300	3000	3500
2"	0.02	0.18	0.35	--	--	--	0.43	--	--	--	--	--	--	--	--
3"	--	0.02	0.08	0.15	0.22	0.30	0.14	--	0.22	--	--	--	--	--	--
4"	--	--	--	0.4	0.08	0.11	0.02	--	0.08	0.28	0.62	--	--	--	--
5"	--	--	--	--	--	--	--	--	--	0.12	0.25	0.45	0.60	--	--
6"	--	--	--	--	--	--	--	--	--	0.02	0.21	0.21	0.27	0.48	0.60



CABLE SELECTION CHART

For Single Phase Motor Maximum Length Of Three Wire Copper Cable

HP	230v - V4 SINGLE PHASE																					
	LENGTH IN METERS UP TO																					
	10	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500	
0.50	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	4	4	4	6	6	6	10	10	
0.75	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	4	4	4	6	6	6	10	10
1.00	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	4	4	4	6	6	6	10	10	10	16	16	
1.50	2.5	2.5	2.5	2.5	2.5	2.5	4	4	4	6	6	10	10	10	10	16	16	16	25	25	25	
2.00	2.5	2.5	2.5	2.5	4	4	4	6	6	6	10	10	10	16	16	16	25	25	25	35	35	
3.00	4	4	4	4	4	4	6	6	6	10	10	10	16	16	16	25	25	25	35	35		
4.00	4	4	4	4	4	6	6	10	10	10	10	16	16	16	25	25	25	35	35	35		
5.00	4	4	4	4	4	6	10	10	10	10	16	16	16	25	25	25	35	35	50	50	50	

For Three Phase Motor Maximum Length Of Three Wire Copper Cable

HP	350v - V4 THREE PHASE																				
	LENGTH IN METERS UP TO																				
	10	20	30	40	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400	450	500
1.50	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.5	1.5	2.5	2.5	2.5	4	4
2.00	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	4	4	4	4
3.00	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	6	6
4.00	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	6	10	10
5.00	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	10	10	10	10

For Other Voltages the cable size is to be selected as follow:

Calculated Length= (Rated volt ÷ Actual Volt) x actual Length

Conversion Table :

1 m = 3.28 ft.

1 ft = 0.305 m

Example : For 3 HP, 3Ø, 415 actual volts motor and 100 meters actual cable length
 calculated length (350/415) x 100 = 84m. The size of the 84m from the chart is 16mm².

These are maximum length of cable in METERS FROM POWER SOURCE TO MOTOR. Exceeding these lengths will void guarantee.

Technical Details For 1 ϕ & 3 ϕ Submersible Motor (3" To 10") Submersible Motor 6" (three Phase 415v)

SR. NO.	MOTOR OUTPUT RATING IN HP	MOTOR OUTPUT RATING IN KW	METHOD OF STARTING	CABLE DETAILS 3 CORE FLAT COPPER CABLE			MAX CURRENT (Amp*) (415V)
				CABLE SIZE (Sq. M.M.)	CABLE LENGTH (Mtr.)	NO. OF CABLE	
1	3.00	2.2	DOL	1.5	3	One	6.5
2	4.00	3.0	DOL	1.5	3	One	8.5
3	5.00	3.7	DOL	2.5	3	One	10.0
4	6.00	4.5	DOL	4.0	3	One	12.0
5	7.50	5.5	ATS	6.0	3	One	14.5
6	7.50	5.5	S/D	4.0	3	Two	14.5
7	10.00	7.5	S/D	4.0	3	Two	19.5
8	12.50	9.3	S/D	4.0	3	Two	25.0
9	15.00	11.0	S/D	4.0	3	Two	29.0
10	17.50	13.0	S/D	6.0	3	Two	34.0
11	20.00	15.0	S/D	6.0	3	Two	39.0
12	25.00	18.5	S/D	6.0	3	Two	48.0
13	30.00	22.0	S/D	6.0	3	Two	57.0

Submersible Motor 8" to 10" (Three phase 415v)

SR. NO.	MOTOR OUTPUT RATING IN HP	MOTOR OUTPUT RATING IN KW	CABLE DETAILS 3 CORE FLAT COPPER CABLE						MAX CURRENT (Amp*) (415V)
			FOR S/D STARTING			FOR ATS STARTING			
			CABLE SIZE (Sq. M.M.)	CABLE LENGTH (Mtr.)	NO. OF CABLE	CABLE SIZE (Sq. M.M.)	CABLE LENGTH (Mtr.)	NO. OF CABLE	
1	10.0	7.5	2.5	3	Two	-	-	-	19.5
2	12.5	9.3	2.5	3	Two	-	-	-	25.0
3	15.0	11.0	4.0	3	Two	-	-	-	29.0
4	20.0	15.0	4.0	3	Two	-	-	-	39.0
5	25.0	18.5	6.0	3	Two	-	-	-	48.0
6	30.0	22.0	6.0	3	Two	-	-	-	57.0
7	35.0	26.0	10.0	3	Two	16.0	3	One	66.0
8	40.0	30.0	10.0	3	Two	16.0	3	One	76.0
9	45.0	33.6	10.0	3	Two	16.0	3	One	80.0
10	50.0	37.0	16.0	3	Two	25.0	3	One	85.0
11	55.0	41.0	16.0	4	Two	25.0	4	One	93.0
12	60.0	45.0	16.0	4	Two	25.0	4	One	100.0
13	65.0	48.5	16.0	4	Two	35.0	4	One	108.0
14	75.0	55.0	16.0	4	Two	35.0	4	One	120.0