

APPENDICES



APPENDIX 1

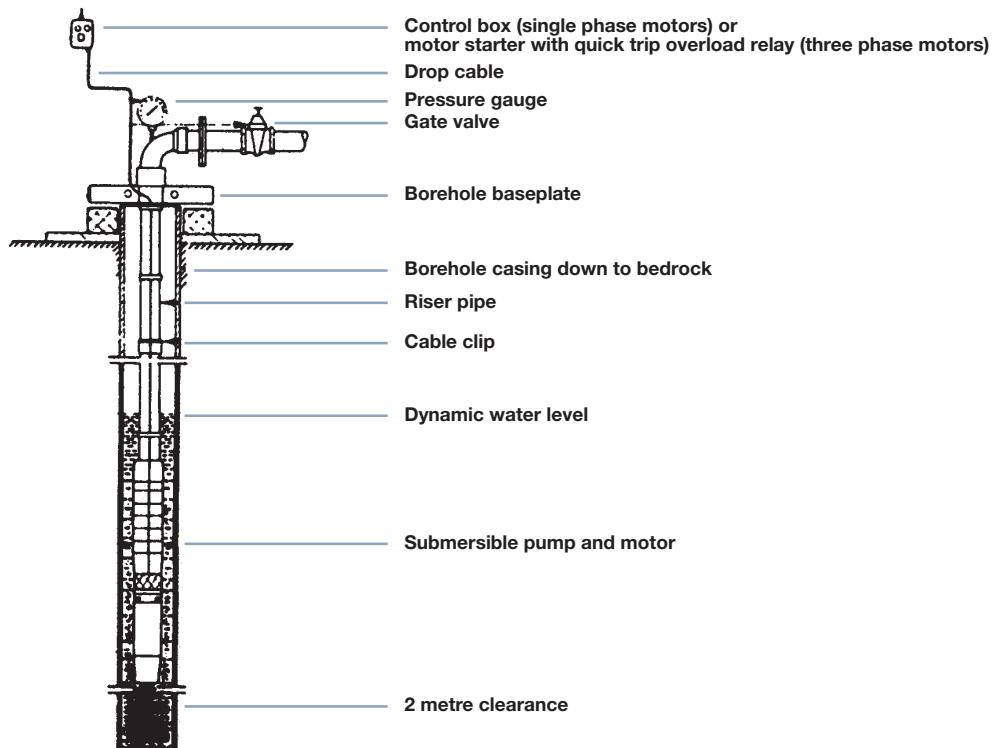
CABLE SELECTION GUIDE FOR AQUAVERN SUBMERSIBLE PUMP CABLE

Motor Rating		Metric Cable Size										Maximum Length in metres
	H.P.	kW	1.5mm ²	2.5mm ²	4mm ²	6mm ²	10mm ²	16mm ²	25mm ²	35mm ²		
220 Volts 50 Hz	0.33	0.25	170	280	450	670	1130	1750	2640	3590		
	0.50	0.37	120	200	320	480	810	1260	1900	2590		
	0.75	0.55	80	130	220	320	550	850	1290	1760		
	1.00	0.75	60	100	170	250	430	670	1010	1380		
	1.50	1.1	40	70	120	180	300	470	710	980		
	2.00	1.5	30	60	90	130	230	360	550	760		
	3.00	2.2	20	40	60	90	150	230	350	490		

Motor Rating		Metric Cable Size										Maximum Length in metres
	H.P.	kW	1.5mm ²	2.5mm ²	4mm ²	6mm ²	10mm ²	16mm ²	25mm ²	35mm ²	50mm ²	
380 Volts 50 Hz	0.50	0.37	810	1350	2160	3240	5500	8530	-	-	-	
	0.75	0.55	550	920	1480	2230	3780	5860	8890	-	-	
	1.00	0.75	410	680	1090	1640	2780	4330	6570	9010	-	
	1.50	1.1	300	500	810	1210	2060	3200	4850	6640	9220	
	2.00	1.5	220	370	590	880	1500	2340	3560	4890	6830	
	3.00	2.2	150	250	400	600	1030	1600	2440	3350	4680	
	5.00	3.7	90	150	240	370	630	980	1490	2050	2870	
	7.50	5.5	60	110	170	260	440	690	1060	1450	2030	
	10.0	7.5	50	80	130	200	340	530	810	1110	1560	
	15.0	11.0	-	50	90	130	230	360	550	750	1060	
	20.0	15.0	-	-	70	100	170	270	410	570	800	
	25.0	18.5	-	-	-	80	140	210	330	450	630	
	30.0	22.0	-	-	-	70	120	180	280	380	540	
	40.0	30.0	-	-	-	-	90	130	210	280	400	
	50.0	37.0	-	-	-	-	-	110	170	230	320	

The above tables indicate the maximum length of cable that can be utilised from the power source to the electrical motor. Exceeding these lengths will void warranty.

A Typical Submersible Pump Installation



APPENDIX 2

CURRENT RATINGS FOR WELDING CABLES

Current ratings for PEROPOWER and FLEX-O-POWER welding cables are for welding purposes only with a maximum conductor temperature of 70°C.

Ratings generally assigned to different types of welding machines

Automatic	Up to 100%
Semi Automatic	30 to 85%
Manual Welding	30 to 60%
Intermittent or occasional	Up to 30%

Size mm ²	100% (5 min)	85% (4.25 min)	75% (3.75 min)	60% (3 min)	30% (1.5 min)	20% (1 min)
16	120	130	140	155	220	270
25	160	175	185	205	295	360
35	200	220	230	260	365	450
50	255	280	295	330	465	570
70	315	340	365	410	575	705
95	380	415	440	480	695	850
120	440	480	510	570	805	985
150	510	555	590	660	930	1140
185	580	630	670	750	1060	1300

A duty cycle is the percentage welding time of any 5 minutes.

Technical Data

Note: If surrounding temperature is higher than 25°C multiply the above ratings by the following factors:

30°C	35°C	40°C	45°C
0.96	0.91	0.87	0.82

Calculation to find current rating for a duty cycle not in the table:

$$\text{Current rating of duty cycle required} = \text{Current rating for 100\% duty cycle} \times \sqrt{\frac{100}{\% \text{ duty cycle required}}}$$

Example: 50mm² cable has a rating of 255 amps for 100% duty cycle
What is the current rating if only operated on a 40% duty cycle?

$$255 \times \sqrt{\frac{100}{40}} = 403.19 \text{ amps}$$

APPENDIX 3

PVC WIRING CABLES 300/500 V, 450/750 V AND 600/1000 V

Current ratings and volt drop for single and multicore cables to SABS 10142 2008.

Conductor	Single core in/on a wall or Multicore in a wall			
	Single Phase a.c.		3-Phase a.c.	
	Size mm ²	Rating (A)	Volt Drop per A/m (mV)	Rating (A)
1.0	12.5	44	10.5	38
1.5	16	29	13.5	25
2.5	22	18	18.5	15
4	30	11	25	9.5
6	38	7.3	32	6.4
10	53	4.4	45	3.8
16	71	2.8	61	2.4
25	94	1.8	80	1.55
35	117	1.3	100	1.10
50	141	1.0	120	0.85
70	180	0.72	154	0.61
95	218	0.56	186	0.48
120	252	0.47	215	0.41
150	282	0.41	236	0.36
185	320	0.37	267	0.32

Conductor	Multicore in trunking or conduit surface mounted on a wall or floor			
	Single Phase a.c.		3-Phase a.c.	
	Size mm ²	Rating (A)	Volt Drop per A/m (mV)	Rating (A)
1.0	12	44	10	38
1.5	14.5	29	12.5	25
2.5	19	18	17	15
4	26	11	23	9.5
6	31	7.3	29	6.4
10	47	4.4	41	3.8
16	63	2.8	55	2.4
25	84	1.8	69	1.55
35	103	1.3	85	1.10
50	125	1.0	106	0.85
70	157	0.72	134	0.61
95	188	0.56	161	0.48
120	218	0.47	185	0.41
150	242	0.41	203	0.36
185	276	0.37	230	0.32

Conductor	Single and multicore on a wall, floor unperforated tray, under plaster			
	Single Phase a.c.		3-Phase a.c.	
	Size mm ²	Rating (A)	Volt Drop per A/m (mV)	Rating (A)
1.0	14	44	12	38
1.5	18	29	15.5	25
2.5	24	18	21	15
4	32	11	28	9.5
6	43	7.3	37	6.4
10	59	4.4	51	3.8
16	79	2.8	68	2.4
25	105	1.75	86	1.55
35	129	1.25	107	1.10
50	157	0.95	129	0.82
70	200	0.66	166	0.57
95	242	0.50	201	0.43
120	281	0.41	233	0.36
150	323	0.34	265	0.30
185	368	0.25	307	0.25

Conductor	Single and multicore in free air or on perforated racks and ladders			
	Single Phase a.c.		3-Phase a.c.	
	Size mm ²	Rating (A)	Volt Drop per A/m (mV)	Rating (A)
1.0	15.5	NA	13	NA
1.5	20.5	NA	16.5	NA
2.5	28	NA	22	NA
4	37	NA	30	NA
6	47	NA	38	NA
10	65	NA	54	NA
16	88	NA	72	NA
25	111	1.75	91	1.55
35	139	1.25	113	1.10
50	170	0.95	138	0.82
70	218	0.66	176	0.57
95	265	0.50	214	0.43
120	308	0.47	249	0.36
150	356	0.34	287	0.30
185	407	0.29	328	0.26

This information is given in good faith and we accept no responsibility for any errors.

FORMULAE SHEET

To Find	Single Phase	Three Phase
Amperes when Horsepower is known	$I = \frac{HP \times 746}{E \times \text{Eff} \times \text{pf}}$	$I = \frac{HP \times 746}{1.73 \times E \times \text{Eff} \times \text{pf}}$
Amperes when Kilowatts are known	$I = \frac{Kw \times 1000}{E \times \text{pf}}$	$I = \frac{Kw \times 1000}{1.73 \times E \times \text{pf}}$
Amperes when Kva are known	$I = \frac{Kva \times 1000}{E}$	$I = \frac{Kva \times 1000}{1.73 \times E}$
Kilowatts	$Kw = \frac{I \times E \times \text{pf}}{1000}$	$Kw = \frac{1.73 \times I \times E \times \text{pf}}{1000}$
Kva	$Kva = \frac{I \times E}{1000}$	$Kva = \frac{1.73 \times I \times E}{1000}$
Horsepower = (Output)	$Hp = \frac{I \times E \times \text{Eff} \times \text{pf}}{746}$	$Hp = \frac{1.73 \times I \times \text{Eff} \times \text{pf}}{746}$

To Find	
Volt Drop	$V_{\text{drop}} = \frac{\text{mVolts} \times L \times m}{1000}$
Short Circuit Rating	$I_s = \frac{115 \times A}{\sqrt{t}}$
Square Area of Cable	$\frac{\text{Strand Diameter} \times \text{Strand Diameter} \times \text{Pi} (3.14) \times \text{No. of Strands}}{4}$
Diameter of Cable	$\sqrt{(4 \times (\text{The Area} / \text{Pi} (3.142)))}$

BARE COPPER

Size	Weight	Meters
1.5 mm ²	5 kg	353.71 m
2.5 mm ²	5 kg	217.18 m
4.0 mm ²	5 kg	131.81 m
6.0 mm ²	5 kg	86.77 m
10.0 mm ²	25 kg	259.71 m
16.0 mm ²	25 kg	164.77 m

THE AMERICAN WIRE GAUGE (AWG)

FOR SOLID WIRES

AWG # Size	Inch Dia	MM Dia	Area mm ²
4/0	0.4600	11.684	107.219
3/0	0.4096	10.404	85.014
2/0	0.3648	9.266	67.433
1/0	0.3249	8.251	53.469
1	0.2893	7.348	42.406
2	0.2576	6.554	33.736
3	0.2294	5.827	26.667
4	0.2043	5.189	21.147
5	0.1819	4.621	16.771
6	0.1620	4.115	13.299
7	0.1443	3.665	10.550
8	0.1285	3.264	8.367
9	0.1144	2.906	6.633
10	0.1019	2.588	5.260
11	0.0907	2.305	4.173
12	0.0808	2.053	3.310
13	0.0720	1.828	2.624
14	0.0641	1.628	2.082
15	0.0571	1.450	1.651
16	0.0508	1.291	1.309
17	0.04526	1.150	1.039
18	0.04030	1.024	0.8235
19	0.03589	0.9116	0.6527
20	0.03196	0.8118	0.5176
21	0.02846	0.7229	0.4104
22	0.02535	0.6438	0.3255
23	0.02257	0.5733	0.2581
24	0.02010	0.5106	0.2047
25	0.01790	0.4547	0.1624
26	0.01594	0.4049	0.1287
27	0.01420	0.3606	0.1021
28	0.01264	0.3211	0.0810
29	0.01126	0.2859	0.0642
30	0.01003	0.2546	0.0509
31	0.00893	0.2258	0.0400
32	0.00795	0.2019	0.0320
33	0.00708	0.1800	0.0254
34	0.00630	0.1601	0.0201
35	0.00561	0.1426	0.0160
36	0.00500	0.1270	0.0127
37	0.00445	0.1131	0.0100
38	0.00396	0.1007	0.0080
39	0.00353	0.0897	0.0063
40	0.00315	0.0799	0.0050

DRUM DIMENSIONS

Size	Weight	Height	Length	Width
Code 1	12 kg	60 cm	60 cm	40 cm
Code 2	16 kg	67 cm	67 cm	40 cm
Code 3	18 kg	67 cm	67 cm	55 cm
Code 4	31 kg	75 cm	75 cm	55 cm
Code 5	37 kg	80 cm	80 cm	65 cm
Code 6	44 kg	90 cm	90 cm	65 cm
Code 7	49 kg	100 cm	100 cm	65 cm
Code 8	61 kg	1 m 10 cm	1 m 10 cm	75 cm
Code 9	75 kg	1 m 20 cm	1 m 20 cm	75 cm
Code 10	83 kg	1 m 30 cm	1 m 30 cm	75 cm
Pallet	15 kg	1 m	1 m 20 cm	1 m 20 cm