



# All Motors

## APPLICATION

### Transformer Capacity - Single-Phase or Three-Phase

Distribution transformers must be adequately sized to satisfy the KVA requirements of the submersible motor. When transformers are too small to supply the load, there is a reduction in voltage to the motor.

Table 4 references the motor horsepower rating, single-phase and three-phase, total effective KVA required,

and the smallest transformer required for open or closed three-phase systems. Open systems require larger transformers since only two transformers are used.

Other loads would add directly to the KVA sizing requirements of the transformer bank.

**TABLE 4 Transformer Capacity**

Motor Rating		Total Effective KVA Required	Smallest KVA Rating-Each Transformer	
HP	KW		Open WYE or DELTA 2-Transformers	Closed WYE or DELTA 3-Transformers
1.5	1.1	3	2	1
2	1.5	4	2	1.5
3	2.2	5	3	2
5	3.7	7.5	5	3
7.5	5.5	10	7.5	5
10	7.5	15	10	5
15	11	20	15	7.5
20	15	25	15	10
25	18.5	30	20	10
30	22	40	25	15
40	30	50	30	20
50	37	60	35	20
60	45	75	40	25
75	55	90	50	30
100	75	120	65	40
125	90	150	85	50
150	110	175	100	60
175	130	200	115	70
200	150	230	130	75

**NOTE:** Standard KVA ratings are shown. If power company experience and practice allows transformer loading higher than standard, higher loading values may be used for transformer(s) to meet total effective KVA required provided correct voltage and balance is maintained.

### Effects of Torque

During starting of a submersible pump, the torque developed by the motor must be supported through the pump, delivery pipe or other supports. Most pumps rotate in the direction which causes unscrewing torque on right-handed threaded pipe or pump stages. All threaded joints, pumps and other parts of the pump support system must be capable of withstanding the maximum torque repeatedly without loosening or breaking. Unscrewing joints will break electrical cable and may cause loss of the pump-motor unit.

To safely withstand maximum unscrewing torques with a minimum safety factor of 1.5, tightening all threaded joints to at least 13.57 N-m per motor horsepower is recommended (Table 4A). It may be necessary to tack or strap weld pipe joints on high horsepower pumps, especially at shallower settings.

**TABLE 4A Torque Required (Examples)**

Motor Rating		HP x 13.57 N-m	Minimum Safe Torque-Load
HP	KW		
1 HP & Less	.75 KW & Less	1 X 13.57	13.57 N-m
20 HP	15 KW	20 X 13.57	271.4 N-m
75 HP	55 KW	75 x 13.57	1017.8 N-m
200 HP	150 KW	200 x 13.57	2714 N-m