

### MAGNETS (MAG-DRIVE COUPLINGS) SIZING

Three mag-coupling sizes cover the entire range of Group I operation to the run-out at max impeller diameter and are sized conservatively to the specific gravity of SG=2. Group II is covered by two sizes. Neodymium Iron Boron (NdFeB) drives are used as the standard, and Samarium Cobalt (SmCo) is used for high temperature. Mag couplings are rated by their torque transmission capability. At different speeds, these torque capabilities translate at different horsepower ratings, in accordance with the formula:

$$\text{BHP} = \text{Torque (ft-lbs)} \times \text{RPM} / 5252$$

#### NdFeB magnets, METAL shell (at ambient temperature):

*Rated Horsepower at RPM:*

SIZE	Torque (ft-lbs)	1450 rpm	1750 rpm	2880 rpm	3550 rpm
<b>Group I</b>					
1"	38	10	12	20	25
1.5"	63	17	21	34	42
2"	88	24	29	48	59
<b>Group II</b>					
2"	173	47	57	94	116
3"	276	76	91	151	186

#### NdFeB magnets, NON-METALLIC TTZ shell (at ambient temperature):

*Rated Horsepower at RPM:*

SIZE	Torque (ft-lbs)	1450 rpm	1750 rpm	2880 rpm	3550 rpm
<b>Group I</b>					
1.5"	38	10	12	20	25
2"	50	13	16	27	33
<b>Group II</b>					
2"	63	17	21	34	42
3"	104	28	34	57	70

#### NdFeB magnets, Metal Shell Eddy Current Losses:

*BHP Losses at RPM:*

SIZE	316 SS		Alloy-C	
	1750 rpm	3500 rpm	1750 rpm	3500 rpm
<b>Group I</b>				
1"	0.5	1.8	0.4	1.7
1.5"	0.7	2.6	0.6	2.4
2"	0.9	3.4	0.8	3.1
<b>Group II</b>				
2"	2.3	8.4	1.9	7.8
3"	2.7	10.0	2.3	9.2

Notes:

- 1) Coupling horsepower capabilities shown above must be greater than the required BHP at run-out obtained from individual performance curves. The required BHP is a summation of the hydraulic power required to pump the liquid plus the eddy current losses in the shell. Refer to individual curves.
- 2) Above values are for NdFeB magnets and eddy current losses. To obtain torque capability of SmCo magnets at ambient temperature, multiply the above values by 0.9.
- 3) NdFeB magnets can be used to 250 °F. Above this temperature, SmCo magnets should be used, up to 600 °F. Torque capability of NdFeB must be derated by 1% for each 15 °F. SmCo must be derated by 1% for each 50 °F.

Magnets are attached to the carrier via high temperature epoxy and additionally retained by individual slots. Inner magnets are hermetically sealed in a material consistent with the metallurgy of the pump. Couplings are 100% tested for the seam integrity and are two-plane balanced.

*Protection from de-coupling:* During normal operation, the outer (drive) magnet and the inner (driven) magnet rotate synchronously, with no slip between the two, i.e. the pump shaft speed equals the motor shaft speed. During the start-up, however, the high inertia of the motor rotor may cause the drive magnet to exceed the inner magnet's ability to stay synchronized – thus “de-coupling” may take place. Decoupling should not be allowed to continue for long periods of time. The motor must be shut down - otherwise, prolonged decoupled operation will quickly generate heat, demagnetize the coupling, and possibly cause additional problems to the pump. The remedies to decoupling are:

- a) Increase the time needed for the motor to come up to full speed, i.e. a slow start
- b) Use a larger magnetic coupling
- c) Make sure fluid viscosity is not significantly higher than expected
- d) Make sure a discharge valve is not wide open, causing high power demand
- e) Use a motor power sensor to stop the motor in the event of decoupling