

## LIST OF SYMBOLS

$m_1$	fixed magnet
$m_2$	movable magnet (magnet clamped on piston head)
mm	milli meter
kg	kilogram
$^{\circ}\text{C}$	temperature in degree centigrade
Br	remnant Flux Density
Hc	coercivity
T	Tesla
Oe	Oersted
$\mu_{\text{rec}}$	recoil permeability
Bg	air gap flux density
Hm	magnetic height
g	air gap
H	magnetizing Force
B	flux Density
S	shielding Factor
Hi	internal magnetic field
He	external magnetic field
psi	air gap shear stress
ksi	yield stress
Rr	receiver signal system
Tr	transmitter signal system
m.n	piston in row and column
Fm	magnetic force between the $m_1$ & $m_2$
Fa	attach force between the gate and $m_1$ & gate and $m_2$
Fr	frictional force
Fn	reduced magnetic strength of the magnet in due course of time and

$F_{gt}$	total force required to operate the gate
$F_{mg}$	force required to counter balance the mechanical inertia of gate
$F'$	magnetic force between $m_1$ and $m_2$ after insertion of gate
$a$	gate factor
$f$	magnetic counter force
$F_{ag}$	magnetic inertia force
$M_p$	moving mass (piston crank assembly)
$X$	position of the piston in the time frame with respect to the fixed magnet
$B_0$	magnetic flux density very close to each pole
$A$	area of magnetic pole
$L$	length of magnet
$R$	radius of magnet
$V_c$	volume of the cylinder when there is no magnet is housed inside it
$\rho_c$	density of the cylinder material
$M_{ct}$	total mass of the piston cylinder after inserting n number of magnets
$\rho_c$	density of cylinder material
$V_c$	volume of the cylinder
$n$	number of magnets housed into the cylinder
$M_m$	mass of the magnet
$M_p$	moving mass
$M_{ph}$	mass of the piston head
$M_c$	mass of the cylinder
$M_{cr}$	mass of the connecting rod
$m_s$	mass of single magnet
$b$	coefficient of blocked (retaining) magnetic field by gate
$d$	coefficient of diverted magnetic field from the gate
$p$	coefficient of passing (transmitting) of magnetic field through the gate
$P_g$	total power required to operate the gate
$P_s$	power in the stroke
$\eta$	efficiency

N	Force unit
$x_1$	distance between $m_1$ & gate
$x_2$	distance between $m_2$ & gate
$\mu$	permeability of the gate material
$t_1, t_2$	thickness of the gate
gg	geometry of the gate
v	velocity with which the gate operates
$k_1, k_2, k_3, k_4, k_5, k_6, r_1, r_2, r_3, n_1, n_2, n_3$ are constants	