

EFFECT OF VOLTAGE VARIATION ON INDUCTION MOTOR CHARACTERISTICS

TYPICAL EFFECTS OF VOLTAGE CHANGE

Operating characteristic	Effect of voltage change		
	90% voltage	110% voltage	120% voltage
Starting and max. running torque	-19%	+21%	+44%
Synchronous speed	No change	No change	No change
Percent slip	+23%	-17%	-30%
Full load speed	-1.5%	+1.5%	+1.5%
Efficiency			
Full load, high eff. T frame	-1 to -2 pts	+5 to 1 pts	Small increase
.75 load, high eff. T frame	+5 to 1 pts	-1 to -4 pts	-7 to -10 pts
.5 load, high eff. T frame	Pract. no change	Pract. no change	-.5 to -2 pts
.25 load, high eff. T frame	+1 to 2 pts	-2 to -5 pts	-9 to -12 pts
.15 load, high eff. T frame	+1 to 2 pts	-1 to -2 pts	-7 to -20 pts
.10 load, high eff. T frame	+2 to 4 pts	-4 to -7 pts	-14 to -16 pts
Power factor			
Full load, high eff. T frame	+1 pt	-3 pts	-5 to -15 pts
.75 load, high eff. T frame	+9 to 10 pts	-10 to -15 pts	-10 to -30 pts
.5 load, high eff. T frame	+2 to 3 pts	-4 pts	-10 to -30 pts
.25 load, high eff. T frame	+10 to 12 pts	-10 to -15 pts	-10 to -30 pts
.15 load, high eff. T frame	+4 to 5 pts	-5 to -6 pts	-15 to -40 pts
.10 load, high eff. T frame	+10 to 15 pts	-10 to -15 pts	-10 to -30 pts
Full load current			
High eff. T frame	+11%	-7%	-11%
T frame	+3 to 6%	+2 to 11%	+15 to 35%
Starting current	-10 to -12%	+10 to 12%	+25%
Temperature rise			
Full load, high eff. T frame	+23%	-14%	-21%
T frame	+6 to 12%	+4 to 23%	+30 to 80%
Mag. noise, any load	Slight decrease	Slight increase	Noticeable increase

Reference: P. Pillay, IEEE PCIC-95-21, Sept. 1995.

POWER SUPPLY AND MOTOR VOLTAGES

Nominal power system voltage	Motor utilization (nameplate) voltage
120 V	115 V
208V	200V
240V	230V
480V	460V
600V	575V
2400V	2300V
4160V	4000V
6900V	6600V

Reference: NEMA MG 10-2001.