SOME THOUGHTS ON ELECTRIC MOTORS

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THE ELECTRIC MOTOR IS THE MOST COMMON MACHINE IN THE WORLD.

SOME THOUGHTS ON ELECTRIC MOTORS

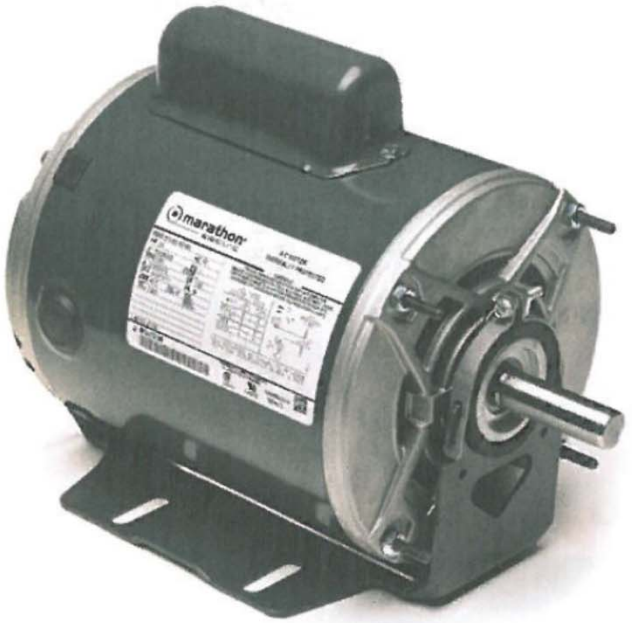
GENERAL CATAGORIES OF ELECTRIC MOTORS

- AC MOTORS
  - THREE PHASE
  - SINGLE PHASE
- DC MOTORS
  - SERIES
  - PARALLEL
  - COMPOUND
- AC/DC

SOME THOUGHTS ON ELECTRIC MOTORS

I will focus on
single phase AC motors.

SOME THOUGHTS ON ELECTRIC MOTORS



SOME THOUGHTS ON ELECTRIC MOTORS

THE INDUCTION MOTOR IS THE MOST WIDELY USED ELECTRIC MOTOR.

IT IS RUGGED, SIMPLE AND ITS OPERATING CHARACTERISRICS ARE WELL ADAPTED TO CONSTANT SPEED USE.

SOME THOUGHTS ON ELECTRIC MOTORS

THE INDUCTION MOTOR HAS MAGNETIC WINDINGS IN MULTIPLES OF TWO.

SOME THOUGHTS ON ELECTRIC MOTORS

THE SPEED OF THE MOTOR IS DETERMINED BY THE NUMBER OF POLES AND THE FREQUENCY OF THE SUPPLIED AC POWER.

SOME THOUGHTS ON ELECTRIC MOTORS

THE FORMULA FOR DETERMINING THE SYNCHRONOUS SPEED IS:

$$N = \frac{f \times 120}{P}$$

N= SPEED in RPM

f= FREQUENCY in HERTZ

P= NUMBER of POLES

SOME THOUGHTS ON ELECTRIC MOTORS

FREQUENCY= 60 HERTZ

FOR A TWO POLE MOTOR THE RESULT IS:

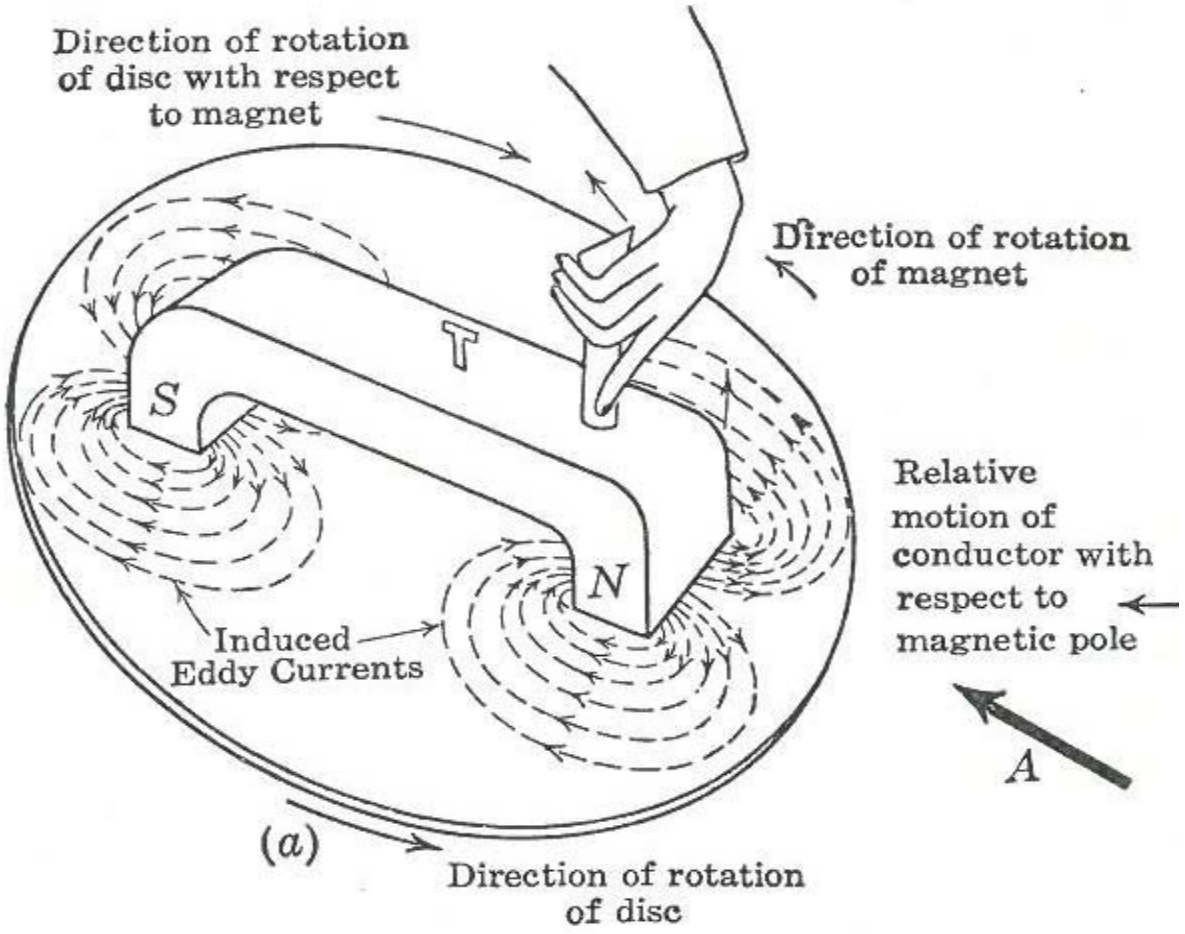
$$N = \frac{60 \times 120}{2} = 3600 \text{ RPM}$$

BUT AN INDUCTION MOTOR DOES NOT RUN AT SYNCHRONOUS SPEED. MORE ABOUT THAT LATER.

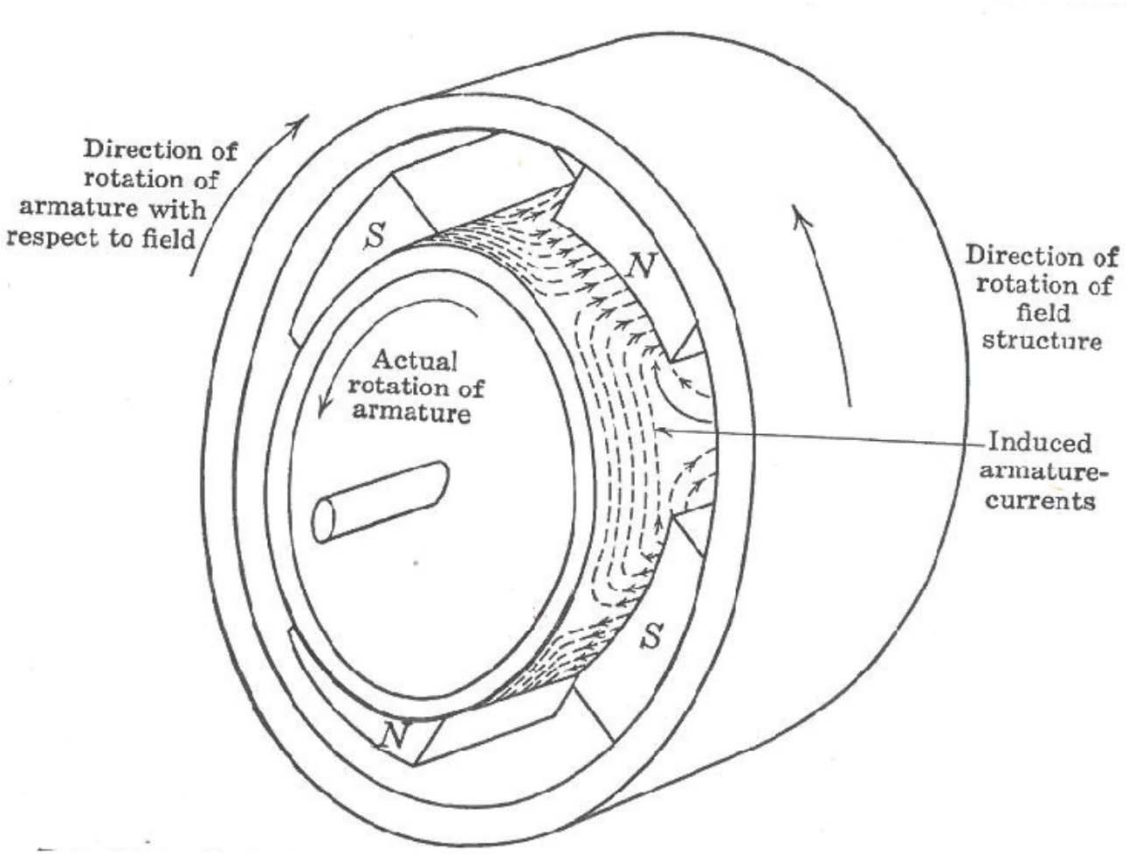
SOME THOUGHTS ON ELECTRIC MOTORS

THE INDUCTION MOTOR HAS A STATOR WINDING, A ROTOR WITH A SHAFT, BEARINGS AND A HOUSING TO HOLD IT ALL TOGETHER.

SOME THOUGHTS ON ELECTRIC MOTORS



SOME THOUGHTS ON ELECTRIC MOTORS



SOME THOUGHTS ON ELECTRIC MOTORS

THE ROTATING SPEED OF THE ROTOR IS LESS THAN THE SYNCHRONOUS SPEED BECAUSE LIKE THE DISC, THE ROTOR CAN'T KEEP UP.

THE DIFFERENCE IN SPEED IS CALLED THE ***SLIP***.

SOME THOUGHTS ON ELECTRIC MOTORS

THE FORMULA FOR CALCULATING THE SLIP IS:

$$S = \frac{N_s - N_a}{N_s}$$

S= SLIP, USUALLY EXPRESSED IN PERCENT.

N_s= SNYCHRONOUS SPEED IN RPM.

N_a= ACTUAL SPEED IN RPM

SOME THOUGHTS ON ELECTRIC MOTORS

$$S = \frac{1800 - 1745}{1800}$$

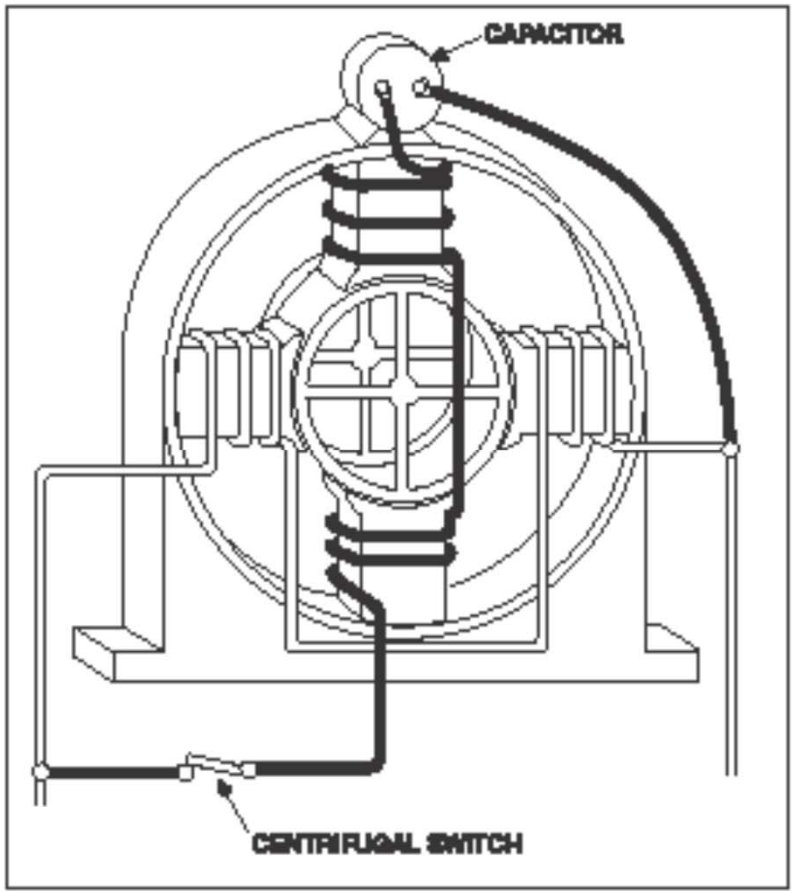
$$S = .030 \text{ or } 3\%$$

S = SLIP, USUALLY EXPRESSED IN PERCENT.

N_s= SNYCHRONOUS SPEED IN RPM.

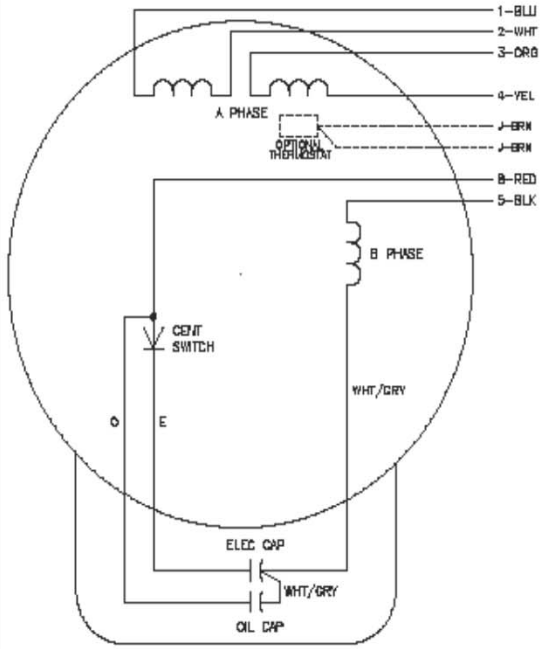
N_a= ACTUAL SPEED IN RPM

SOME THOUGHTS ON ELECTRIC MOTORS



SOME THOUGHTS ON ELECTRIC MOTORS

CD0055



	LINE A	LINE B	JOIN
HIGH STD	1	4,5	2,3,8
HIGH OPP	1	4,8	2,3,5
LOW STD	1,3,8	2,4,5	–
LOW OPP	1,3,5	2,4,8	–

NOTES:

1. STANDARD ROTATION IS CCW FACING END OPPOSITE SHAFT EXTENSION.
2. OPTIONAL THERMOSTAT IS PROVIDED WHEN SPECIFIED.
3. MULTIPLE CAPACITORS ARE CONNECTED IN PARALLEL UNLESS OTHERWISE SPECIFIED.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0055

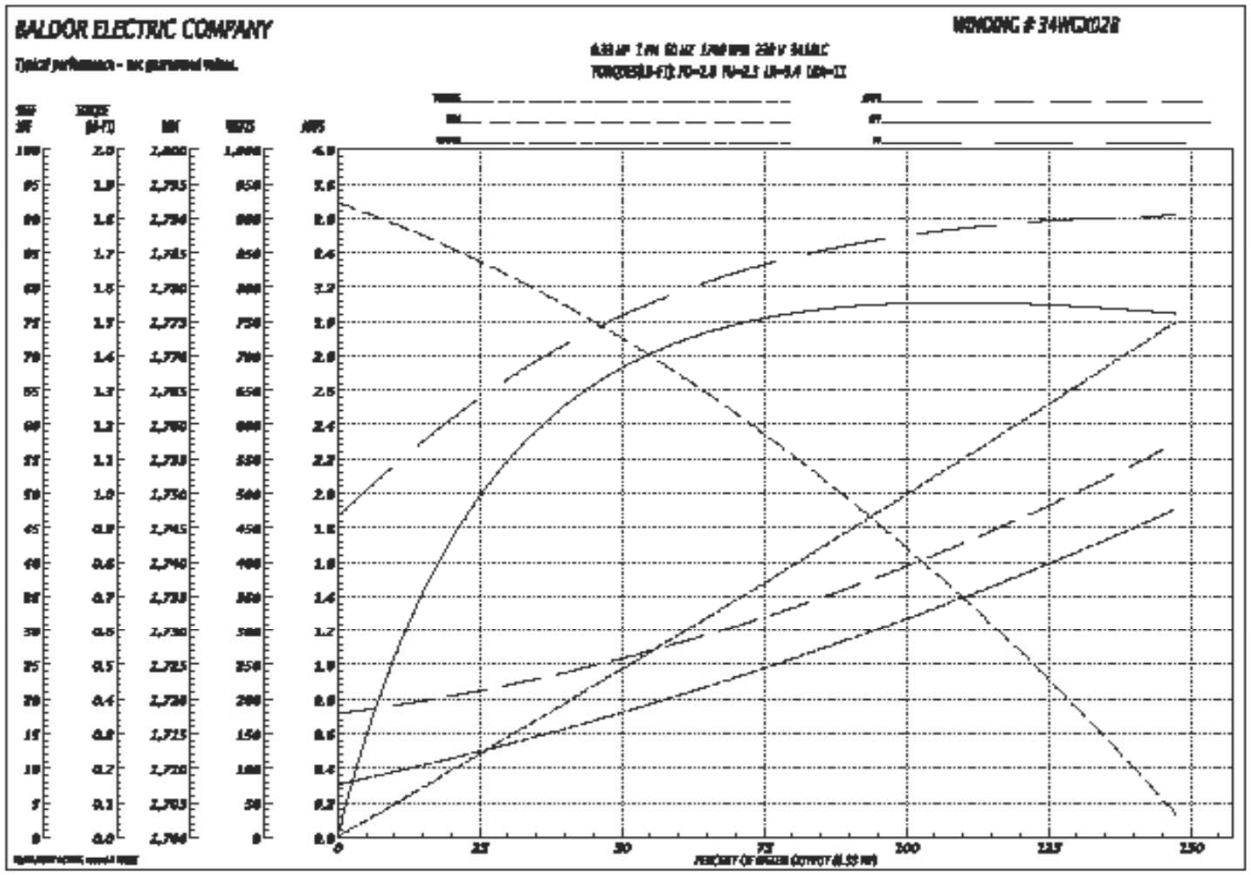
REV. DESC: REVISE TO SHOW OPTIONAL COLORS			
REV. LTR: D	BY: JLP	REVISED: 04/08/99 1:17	TDR: 01786536
SSDOOD		FILE: AAA00007414	MDL: –
		WTL: –	

BALDOR ELECTRIC Co.

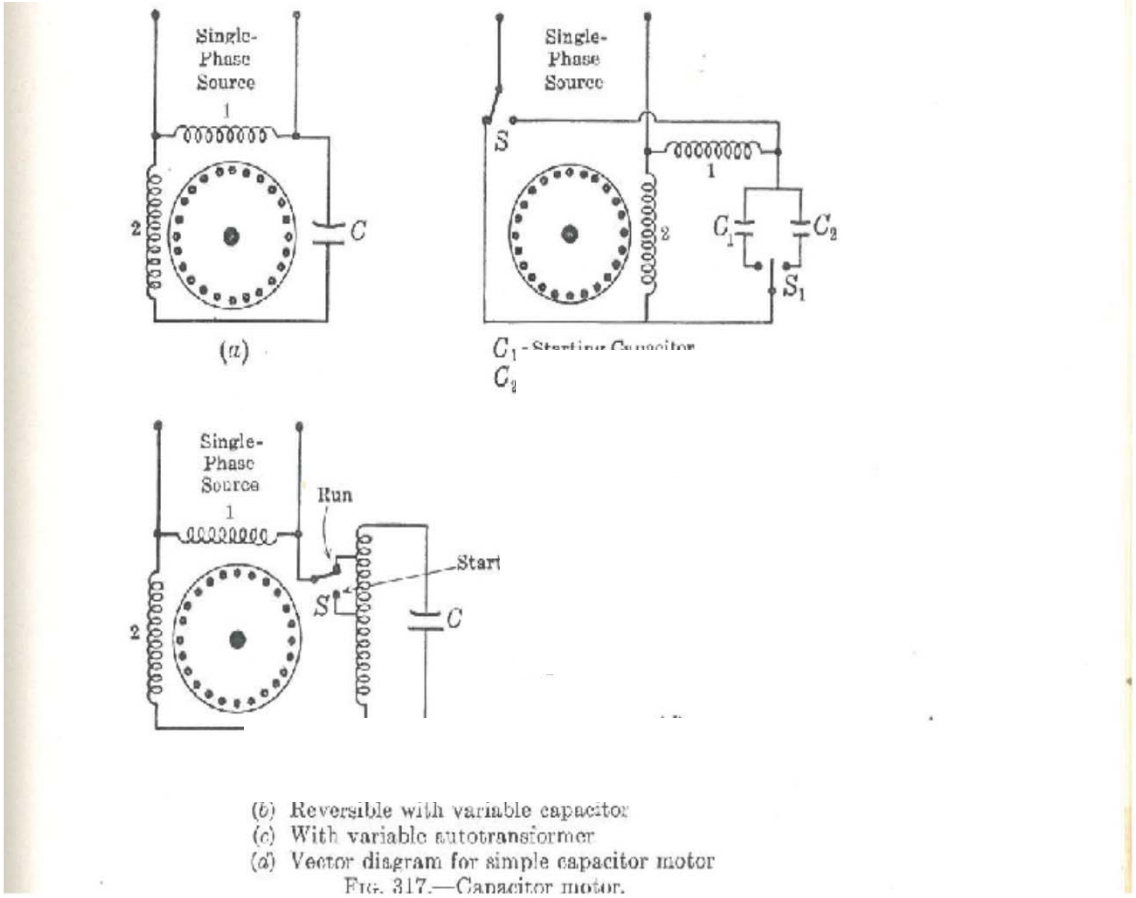
TYPE LC, DV, REV, 6 LEADS

SOME THOUGHTS ON ELECTRIC MOTORS

Performance Graph at 230V, 60Hz, 0.33HP Typical performance - Not guaranteed values



SOME THOUGHTS ON ELECTRIC MOTORS



(b) Reversible with variable capacitor
(c) With variable autotransformer
(d) Vector diagram for simple capacitor motor

FIG. 317.—Capacitor motor.

SOME THOUGHTS ON ELECTRIC MOTORS

AC INDUCTION MOTORS ARE BUILT IN STANDARD SIZES STARTING WITH ABOUT 1/6 HORSEPOWER.

THE NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION HAS ESTABLISHED STANDARD DIMENSIONS SO MOTORS OF THE SAME HORSEPOWER AND SPEED CAN BE INTERCHANGED FROM ONE MANUFACTURER TO OTHER.

SOME THOUGHTS ON ELECTRIC MOTORS

THEY ARE ALSO MADE IN STANDARD HORSEPOWER RATINGS.

1/6, 1/4, 1/3, 1/2, ¾, 1, 1-1/2, 2, 3, 5

TO LIST A FEW.

FRACTIONAL Hp's UP THRU 3 Hp ARE BUILT IN NEMA 48 & 56 FRAMES.

SOME THOUGHTS ON ELECTRIC MOTORS

ENOUGH RAMBLING ON ELECTRIC MOTORS