WARSAW UNIVERSITY OF TECHNOLOGY
INSTITUTE OF ELECTRICAL MACHINES
ELECTRICAL MACHINES LABORATORY

1-PHASE CAPACITOR-RUN INDUCTION MOTOR TESTS

(SI 4)

MOTOR RATING: Calculations:

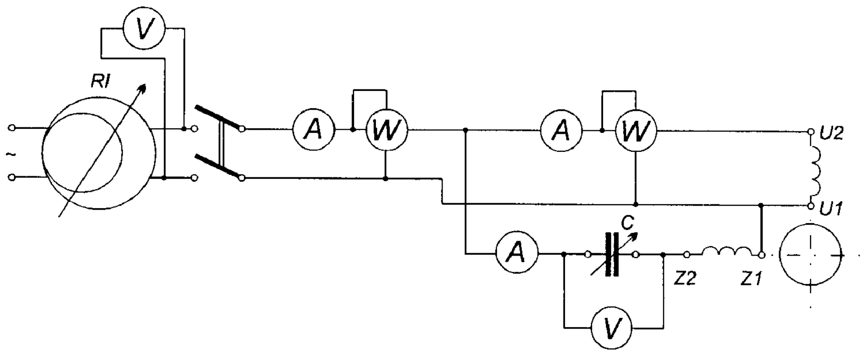
Motor type: $\cos\varphi_N$ =... T_N =...
P_N =... U_N =...
I_N =... n_N =...
C_p =... (running capacitance)
C_s =... (additional starting capacitance in auxiliary winding circuit)

Class of insul. ... Protection ...
Duty type ...

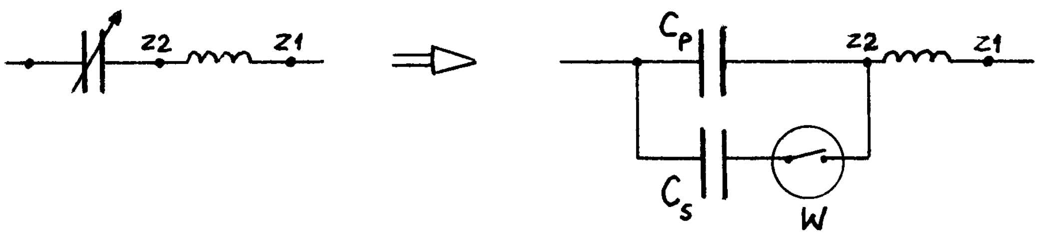
Winding connection diagram and terminals' symbols:

4.1. Starting torque (locked-rotor torque) measurements.

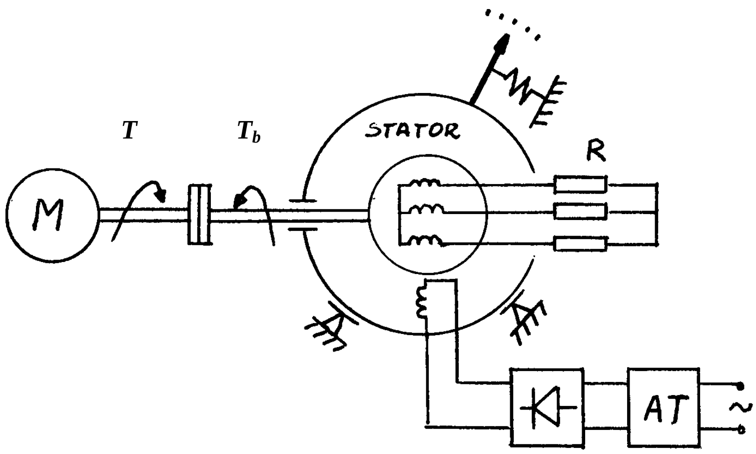
Measuring circuit and winding connection diagram:



Variable capacitance in the auxiliary winding circuit of the capacitor-run motor can be realised with the help of centrifugal switch *W* (see the figure below) which breaks the circuit of additional starting capacitance C_s after the motor run-up.



Braking of the tested motor in this experiment is realised by means of 3-phase synchronous generator with the stator suspended in bearings, loaded with 3-phase resistor set *R* and equipped with controllable exciting circuit. For the purpose of starting torque measurements the stator of the brake should be mechanically coupled (blocked) with its rotor:

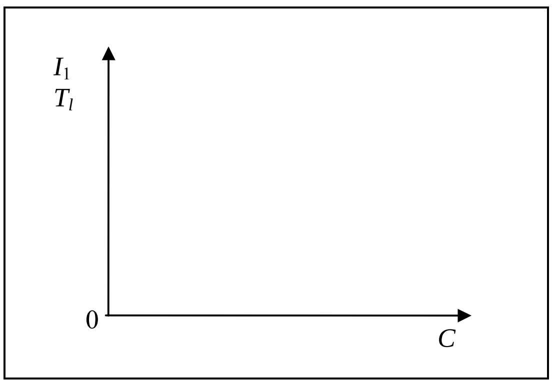


<u>*Measurements of starting torque (locked-rotor torque):*</u>

The supplying voltage should be reduced to about $0.5U_N$. For the various values of capacitance connected in the auxiliary winding circuit - within the range $(0;\ C_{\max})$ - determine the influence of C_s on the starting torque and current values.

U_1 = ... C_r = ...

No of read	C_s	I_1	I_m	I_a	U_C	T_l
	μF	A	A	A	V	N.m
1						
2						
3						



Draw the characteristics:

$I_1;\ I_m;\ I_a;\ T_l = f(C)$ $(C=C_r+C_s)$

(I_m - main winding current, I_a - auxiliary winding current).

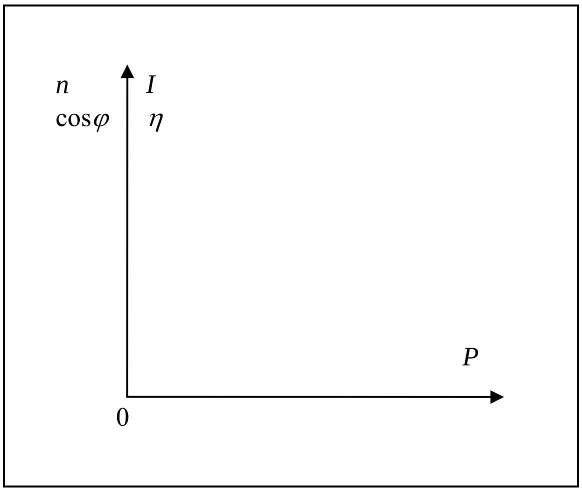
Is it possible to determine an optimum staring capacitance?

4.2. Load characteristics

Measuring circuit diagram is as shown in p. 4.1. The stator and rotor of the brake should be uncoupled. Field winding of the dynamometer should be supplied and controlled according to the required level of the load of the tested motor. For the measurement of force and torque attracting the dynamometer's stator apply the scale with digital display. The load of the motor should be varied from the no-load state to full load (you can choose this limit as: the rated motor current or the rated motor torque). Determine the load characteristics of the motor for the value of running capacitance suggested by the manufacturer.

$U_1 = U_N =$... $C_p =$ ...

No of	I_1	I_m	I_a	P_1	P_m	U_C	n	T	**cos**φ	P	η
read	A	A	A	W	W	V	rev/min	Nm	-	W	%
1											
2											
3											
...											



Draw the characteristics:

$I_1; I_m; I_a; n; \cos\varphi;\ \eta = f(P)$

and determine the rated values of current, speed, power factor and efficiency.

BIBLIOGRAPHY

1. Fitzgerald A., Kingsley C., Umans S.: *Electric machinery.* McGraw-Hill Book Co. 1985
2. Say M.G.: Alternating current machines. Pitman, 1976
3. Nasar S.A., Unnewehr L.E.: *Electromechanics and Electric Machines.* John Wiley, 1979
4. Latek W.: Teoria maszyn elektrycznych. WNT, 1987
5. Latek W.: Badanie maszyn elektrycznych w przemyśle. WNT, 1987
6. Kamiński G., Kosk J., Przyborowski W.: *Laboratorium maszyn elektrycznych.* Oficyna PW, 2005
7. Krause P. C., Wasynczuk O., Sudhoff S. D.: *Analysis of Electric Machinery and Drive Systems.* John Wiley & Sons, INC. PUBLICATION. 2002