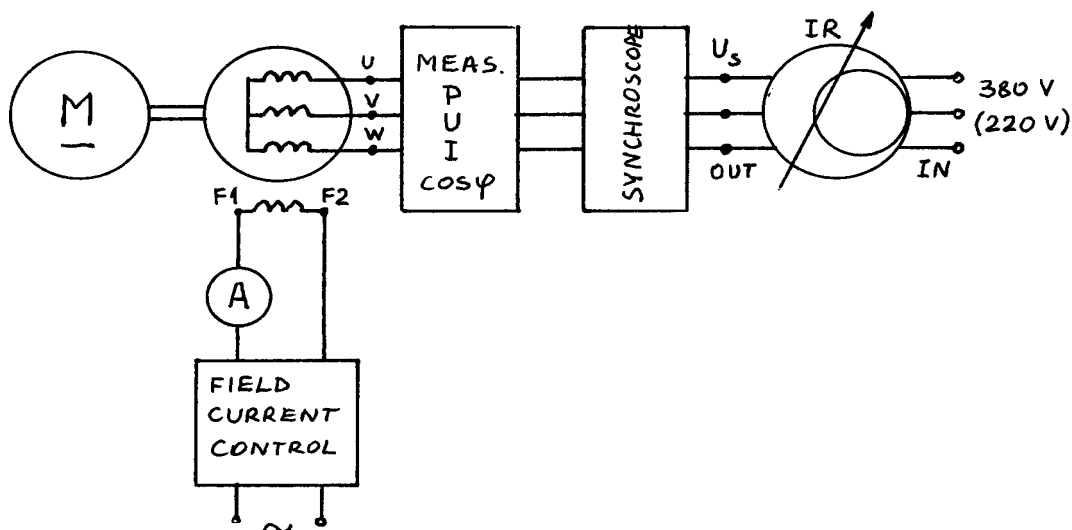


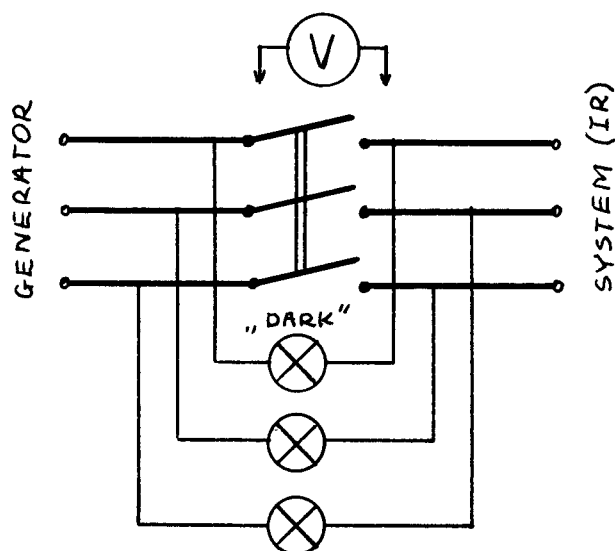
SYNCHRONOUS GENERATOR TESTS (SYN3)

3. LOAD CHARACTERISTICS OF SYNCHRONOUS GENERATOR

Measuring circuit:



Circuits of the synchroscope (rotating light with „dark” bulb arrangement):



Notice! Before closing the main switch of the synchroscope all conditions of correct synchronization must be checked and fulfilled,

The load characteristics of synchronous generator are being determined at the machine connected to the system (the mains). The system is represented by the output terminals (OUT) of induction regulator. Voltage U_s can be (with the help of induction regulator):

- kept at the constant value (INFINITE BUS-BAR),
- varied according to the needs.

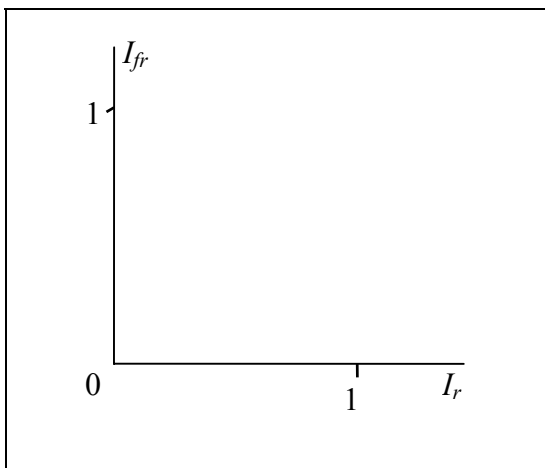
3.1. Field current regulation characteristics: $I_{fr} = f(I_r)$ for $U = \text{const} = U_N$; $\cos\varphi = \text{const}$.

The characteristics are to be determined for three following values of the power factor:

- $\cos\varphi = \cos\varphi_N = 0.8$ lagging;
- $\cos\varphi = 1$;
- $\cos\varphi = 0.8$ leading.

After connection of the generator to the system (after synchronization), the active power delivered to the mains should be increased gradually (by means of driving motor regulation) and for each reading point the field current should be adjusted so as the required value of power factor is achieved. The voltage U_s also requires to be regulated so as $U_s = U_N$.

$U = \dots$		$(I \leq I_N)$									
No.of read.	$\cos\varphi$	I_f	I_U	I_V	I_W	P_a	P_b	I	I_r	I_{fr}	P
	-	A	A	A	A	W	W	A	p.u.	p.u.	W
1											
2											
3											
...											



In common coordinates draw the characteristics

$$I_{fr} = f(I_r)$$

for a), b) and c) power factor values.

3.2. Voltage regulation characteristics (external characteristics)

$U_r = f(I_r)$ for $I_{fr} = \text{const} = I_{f0Nr}$ and $\cos\varphi = \text{const}$

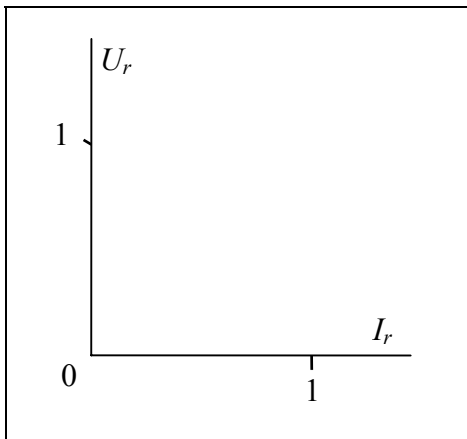
The characteristics are to be determined for three following values of the power factor:

- $\cos\varphi = \cos\varphi_N = 0.8$ lag.;
- $\cos\varphi = 1$;
- $\cos\varphi = 0.8$ lead.

After connection of the generator to the system, the active power delivered to the mains should be increased gradually (by means of driving motor regulation) and for each reading point the

voltage U_s should be adjusted so as the required value of power factor is achieved. The field current for all readings remains constant.

No of read.	$\cos\varphi$	I_f	U	I_U	I_V	I_W	P_a	P_b	I	I_r	U_r	P
	-	A	V	A	A	A	W	W	A	p.u.	p.u.	W
1												
2												
3												
...												



In common coordinates draw the characteristics:

$$U_r = f(I_r)$$

for a), b) and c) power factor values.

From the characteristic drawn for rated power factor determine per cent value of the voltage regulation.

4. DETERMINATION OF THE FIELD CURRENT AT ZERO-POWER-FACTOR AND RATED CURRENT AND VOLTAGE I_{f00N} ($\cos\varphi = 0$ lag., $I = I_N$, $U = U_N$)

After synchronizing generator with the mains regulate the active power delivered to the system and the machine field current as to achieve - for rated voltage - the armature current being of rated value and purely reactive (inductive; lagging). Measure the value of this field current:

$$I_{f00N} = \dots \text{ A ; } \quad I_{f00Nr} = \dots \text{ p.u.}$$

With the help of o.c.c. and s.c.c. determine the value of Potier reactance X_P in Ω and X_{Pr} in p.u.

Finally draw the Potier diagram and determine the rated field current of generator I_{fN} and I_{fNr} . (see excerpts from the Polish or IEC Standards).

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