CONTRIBUTION TO PERFECTING THE METHODS FOR THE VERIFICATION THE SENSE OF ROTATION A THREE-PHASE INDUCTION MOTORS

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Abstract: *This paper presents the contributions bricking the methods by verification the sense of rotation at induction motors with the object of to avoid the accidents in installations.*
Keywords: *sense of rotation, induction motors*

Introduction

The determination the sense of rotation is a test to make for verification sense of rotation the electric machine about national standard and correctness mark terminals.
The determination the sense of rotation is not executed to motors equipped to work the both sense of rotation.
The sense of rotation the electric machine's is dictate by the sense of rotation training motor's in case generator motor's or necessity certain sense of rotation combiner's or machinery for motor's.
Verification the sense of rotation has a special importance in case of motors which acting the installation with distinctive sense of rotation and where the action in an incorrect sense can guide to destruction installation. In practice exist sufficient examples which to make cases of damage provoked by wrong action of installation respective.
The determination the sense of rotation is realized in this way:
- if the machine not has but only axle stub, sense of rotation is the one observer sees, placed with face about basic shaft.
- if the machine has two-axle stub from the same diameter is not have axle stub, the observer must be placed in this way:

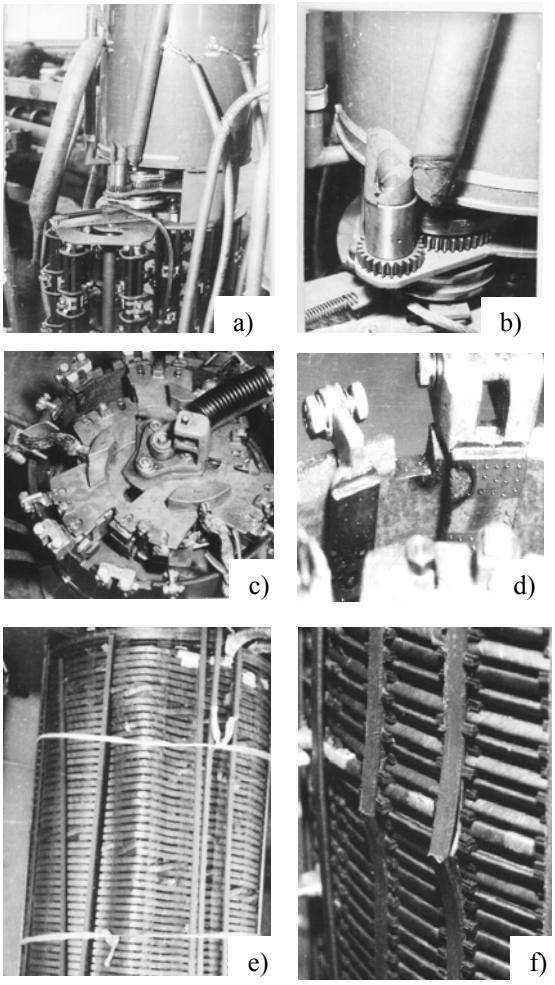

Figure 1.Damage transformer 40 MVA, 110/6KV
a) generally view helly's; b) Particular view helly's; c) generally view make-and-break mechanism's; d) particular view make-and-break mechanism's; e) winding by 6 kV; f) winding by

a) In contrary side of a motor comutator or rings slip if don't exist motor comutator and rings slip but adverse part a machine;
b) In a rings slip side if the machine has in a site motor comutator and in the other rings slip;
c) About national standard, in case when in front of agreement lead to confusions.

For the verification the sense of rotation to an induction motor is apply a symmetrical voltage system of interlinking direct to terminals stator windings motor's.

The sense of rotation of the induction motor is giving from sense of rotation the rotating field creates of stator and which the turn is giving of sense de interlinking of phases

In conclusion, sense of rotation the induction motor's can be change it interlinking of phases symmetrical voltage systems to modify. In case when don't realized the connection of the sense of rotation a rotor's and the one impose, he modify the mark a two extremity stator's winding between they as well position's in comparison with terminals [1].

Methods of verification sense of rotation three-phase induction motors

Verification sense of rotation an electric induction motor with wound rotor supposes temporary transforming the induction motors in a synchronous motor. In the object of stator winding is connect to power unit of direct current (fig.2). Power voltage mast limited to a value who lead at a rotor current.

$$I_{rot} = (0.05 \div 0.1) I_{rotn}$$

To terminals motor's he connect a device for the identification interlinking of phases (FSDI). The connection of a notation terminals disk's and notation rotor windings must be it so (fig.2): Transmitted the rotor a turning as sharp as possible in wished sense. Inducting force in stator winding and indicate of instrument can be sufficient for to have interlinking direct of voltages wishes

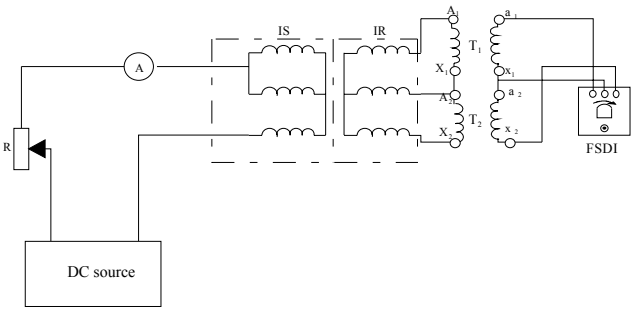

Figure 2. Montage for verification the sense of rotation of induction motor with wound rotor

In case when the identification interlinking of phases show interlinking direct of passes follow that a sense of rotation motor's at a time when feeding he effected with a symmetrical voltage system of interlinking direct, is the wished.

If the value of voltage obtained is too small, for to have the probe used two showing voltage transformer of 12-24 V/220 V erected in V for the feeding the device of identification interlinking of phases.

In case the induction motors with in short circuit rotor it used the methods presented in succession:

The feeding the stator with a small voltage, in case of high voltage of motors with 3 x 380 V, again for the low voltage of motors with a three-phase voltage system reduced.

Transmitted a torque of rotation the rotor in the wished sense and in case in which sense of rotation printed correspond whit the rotating fields, the motor it will rotate slowly in continued.

For the great motors the feeling to make through three ammeters as if is indicate in the figure 3

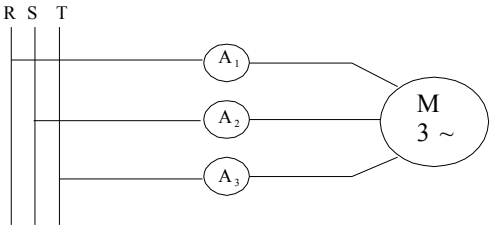

Figure 3. The feeling with small voltage the triphase induction motors

If to rotation in the wished sense she will indicate a current in decrease follow that sense of rotation correspond with the field. In contrary case the indication of apparatus will advance as effect of contrary senses of rotation. For to have the sense of rotation necessary, reverse two phases between them.

The principle of realization a the device for verification the sense of rotation the electric motor's

The solution proposes to rely on utilized an interlinking direct or indirect filter represented of principal in the figure 4.
The filter presented is creating in principal on resistive arms and a capacitive arm connected by the Y-connection. The two resistive arms are making on all two resistors 1, 1' respective 2, 2' and which represented each all a voltage divider. Capacitive arm is make from the capacity 3 with the value is give by the general resistance from two resistive arms through the relation: $R = \frac{I}{\omega C}$ when: $\omega = 2\pi f$, f- frequency of power voltage filter's.

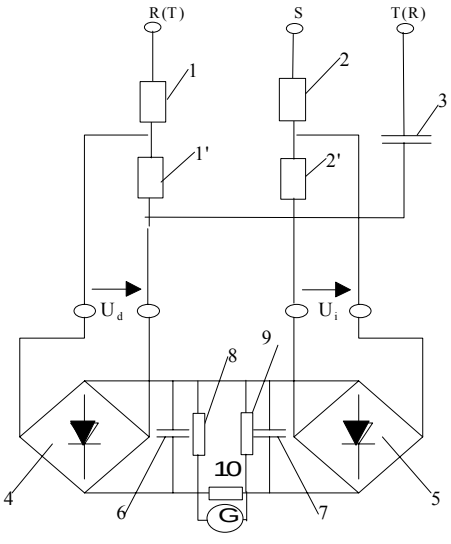

Figure 4. Interlinking direct or indirect filter

To terminals out of filter presented sprigged two voltages U_d respective U_i always unequal. In case direct interlinking (R, S, T) the sense of inequality is $U_d > U_i$, again in case reverse interlinking (T, S, R) the sense of inequality is $U_i > U_d$.
The filter presented can be utilized for verification the sense of rotation the electric motors. To know about in each induction motor exist a remanent magnetism observable through the inducting electromotive force in the windings, when the rotor is acting manually. When the sense of rotation of the rotor is the one impose at the terminals of stator winding to obtain the interlinking direct of phases(R, S, T). In case when the sense of rotation of the rotor transmitted from the manually acting is reverse the one impose then al the terminals of stator winding to obtain the interlinking reverse of phases (T, S, R).
For to check the interlinking resulted to the terminals of stator winding he utilized a interlinking direct or reverse filter presented in the figure before
The comparing the voltages U_d and U_i with the help of device of type the electric balance connected at the two out of interlinking direct or reverse of filter.
The device of type electric balance (BE) is construct of two diamond circuit 4 and 5 equipped each to out with a condenser of filtration 6 and 7, this diamond circuit is connected in opposition through the resistances 8, 9, 10. On the resistance 10 he take an electric signal which the polarity dependent by the sense of inequality the voltages U_d and U_i and which polarity is checked by the galvanometer G.

The description of the device for verification the sense of rotation of electric motors

The device, with the principle it is detailed to the point before, is destined useless in case of motors to the100 kW energy of the rotor's can be acted manually when the number of coupled brushes is $p = 1$; $p = 2$; $p = 3$ and $p = 4$.
In an exposed position before follow that structure of the filter of interlinking direct or reverse is depended by the number of the coupled brushes.

As a result of experimentally tests is found that for $p=1$ the frequency of electromotive force obtained as a result acting manually of rotor is approximately of 5 Hz then as the number of the coupled brushes to increase, increased and frequency of inducting electromotive force by remanent magnetism of the rotor.
For to make possibility the construction a device utilizable in case of three-phase induction motor that the characteristics equipped is necessarily the utilization of the four filters of interlinking direct of reverse, by one for each of the coupled brushes specified.
The diagram of principal is presented in the figure 5. Each position of the multiple-point switch correspond a certain number of the coupled brushes the motor's verification.

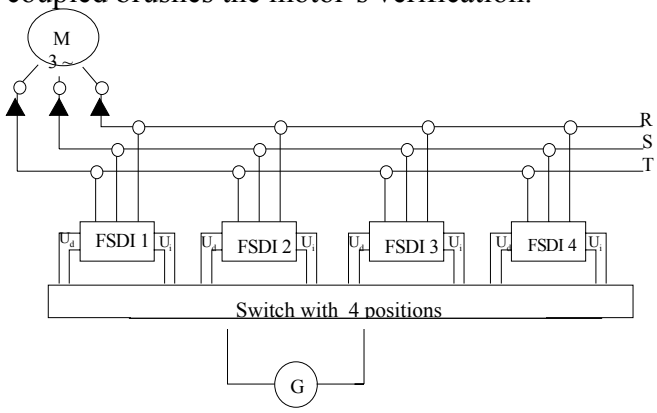

Figure 5. The diagram of principal of the device for checking the sense of rotation of electric induction

In the figure 6 is presented a photograph of experimentally model of the device realized and tested as part of Electrotechnics department of University "Stefan cel Mare" from Suceava.

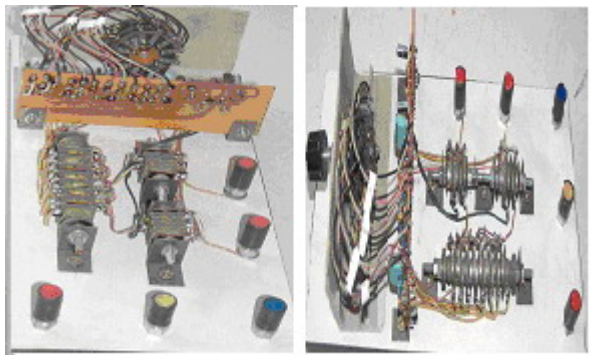

Figure 6. The experimentally model of the device for checking of the sense of rotation

Conclusions

The device presented in case the study don't necessarily a feeling of the winding motor what conduct to reduction of time necessarily of the execution the test and to a diminution of the risk of accident through electrocution.
The device presented is small sizes and small weight; it is slight transportable. The interpretation of results he realized easy and fast in this way is eliminating the risk by appreciation inexact.

References

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