

## TYPE NR, LARGE CAPACITY TOTALLY ENCLOSED INDUCTION MOTORS

Totally enclosed induction motors have a wide range of application. They are used in a large quantity as prime movers in various kinds of industries which abound with injurious gases and dust, such as iron and steel works, cement factories, chemical works, etc. Various cooling methods are adopted depending on their capacities. Small machines employ a totally enclosed self-cooled type (Type PR) which makes use of natural convection of air and radiation from the cover to dissipate heat. Medium capacity units are provided with many ribs over the surface of cover and are given forced draft, being called a totally enclosed fan-cooled type (Type OR). Large capacity motors have separate coolers to increase the cooling surfaces. According to the construction, however, the cooling method varies and becomes very complicated, resulting in what is called an elaborate design. They are, therefore, likely to lead to difficult manufacture and installation, less sturdiness and more troublesome operation and maintenance. Type NR motors are designed and manufactured taking into account the various points mentioned above. They are large capacity, totally enclosed induction motors with pipe coolers of large cooling effects, being of simple construction and very good appearance.

Fig. 1 illustrates the construction of the Type NR motor. Cooling pipes made of thin iron tubes, penetrating through both side plates of the stator frame, are arranged along the circumference at the

back of the stator frame to be integral with it, assuring very sturdy construction. By means of an external fan mounted to the outside of the bearing frame, air is drawn in and forced into the cooling pipes, receiving heat inside the pipes and being exhausted outside after getting hot from the coupling side. Internal air, made hot by the heat loss of the motor, circulates by the help of an internal fan, and flows around the cooling pipes in the axial direction at the back of the stator frame, transmitting heat between inside and outside air through the wall of the cooling pipes.

One of the features of Type NR motors is that the surface area of a number of cooling pipes serve as a very large heat exchanging surface. There may be a little difference depending on the pole number and output, but they can be built of approximately 80% of materials required for the conventional design of the totally enclosed machine, which makes possible the building of larger capacity motors.

In the hitherto enclosed machine, no ventilating ducts were provided inside the core, and heat generated there is liable to stay there. On the contrary, the Type NR motors are capable of providing a number of ventilating ducts inside the core to eliminate such defects. The cooling pipe being straight, air passing through it is given considerably high speed so that tiny particle of dust are blown away without collecting there. This is one of advantages of the design.

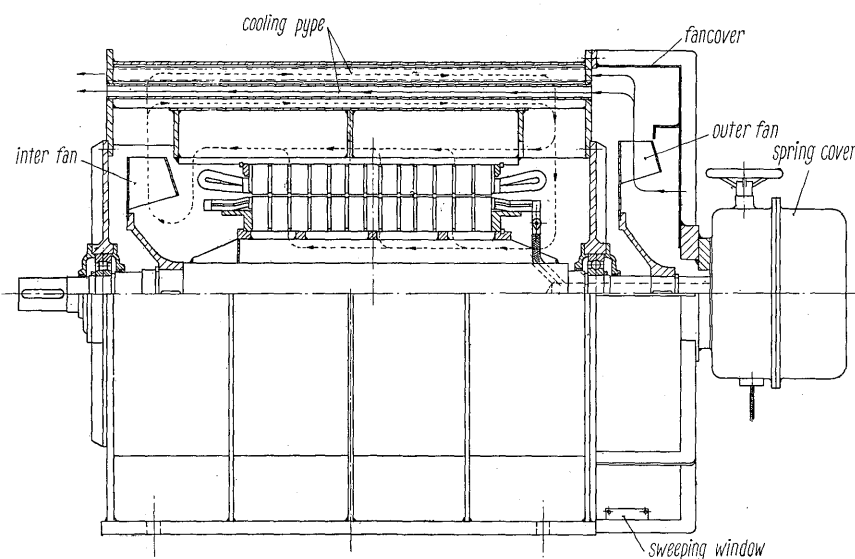


Fig. 1. Section of slip-ring rotor type NR-motor

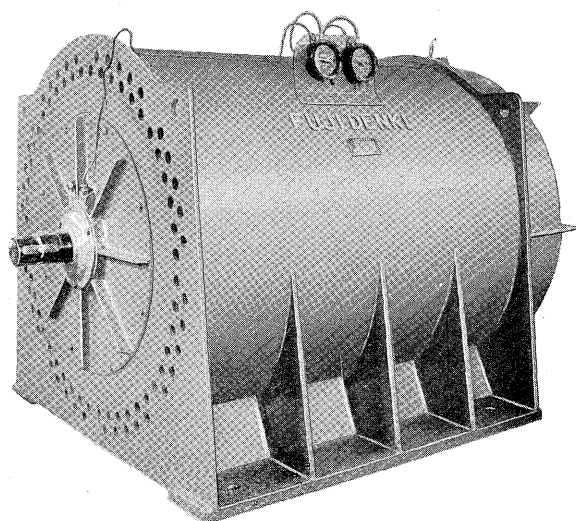


Fig. 2. 400 HP 750 r.p.m. horizontal type NR-motor

When used at a very dusty place, it may happen that dust accumulates inside of the cooling pipes after a long while to reduce the cooling effect. It is necessary to give a periodical cleaning to avoid it, which can be done simply in the similar manner as in the case of chimney cleaning from the coupling side. Dust thrown out to the external fan side can be removed by opening an exhaust outlet provided at the bottom of the external fan cover.

Being of the totally enclosed type, these motors are naturally of the dust-proof, but they have the qualities of water-proof, acid proof and gas proof as well. If necessary, they can be attached with a pressure-resisting and explosion proof slip ring cover.

The Company has built great many motors of both wound rotor type and squirrel cage rotor type, in both horizontal and vertical design and ranging over various horse-power capacity. Table 1 shows the maximum capacities of the Type NR motor. However, even capacities exceeding those given in the list can also be manufactured upon special request.

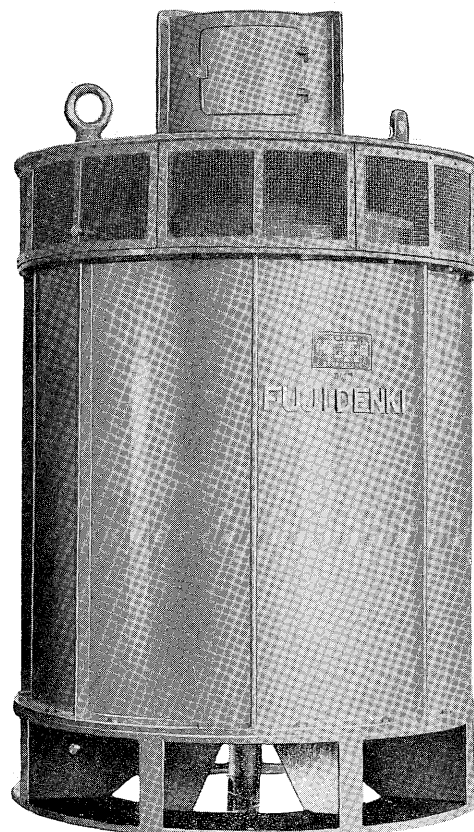


Fig. 3. 200 kW 750 r.p.m. vertical type NR-motor

Rotor type	Frequency (c/s)	Output (HP)				
		2/4 P	6 P	8 P	10 P	12 P
Squirrel cage rotor	50	1,300	1,100	900	650	520
	60	1,560	1,320	1,080	780	620
Slip-ring rotor	50	1,200	1,000	800	600	470
	60	1,440	1,200	960	720	560

Table 1. Maximum output table of standard NR-motors

## SMALL ELECTROSTATIC FILTER, TYPE KSA-31

Recently all of a sudden the attention of various circles has been centered to the utilization of filters. Fuji Electric Mfg. Co. have built this time small electrostatic filters, Type KSA-31, which have proved very satisfactory, the introduction of the same being made below.

### I. WHAT IS THE SMALL ELECTROSTATIC FILTER?

So-called electrostatic precipitation is known from the old times and its basic idea is to apply direct

current of high voltage to corona wires suspended between parallel-spaced collecting electrodes. Then active corona discharges take place around the corona wires and the space is filled with gas-ions and electrons: If dust-laden air is passed through this space, fine dust particles are instantly charged, attracted by the collecting electrodes and precipitated to the latter.

The merits of electrostatic precipitation are as follows:

1) Irrespective of the size and the property of fine particles, it offers an exceedingly high separating