MOTEURS
PATAY
LYON 8e (France)
Société Anonyme
au Capital de 3.000.000 de F

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BUILT-IN BRAKES

TYPE FM SERIES 100

WITH ELECTROMAGNETIC CONTROL

MOUNTED ON THREE-PHASE ASYNCHRONOUS MOTORS

Description

Adjustment

Maintenance

Our motors with built-in brakes consist of an electrical motor with normal electrical and mechanical features, bearing on a bracket, opposite the driving end, the bracking device.

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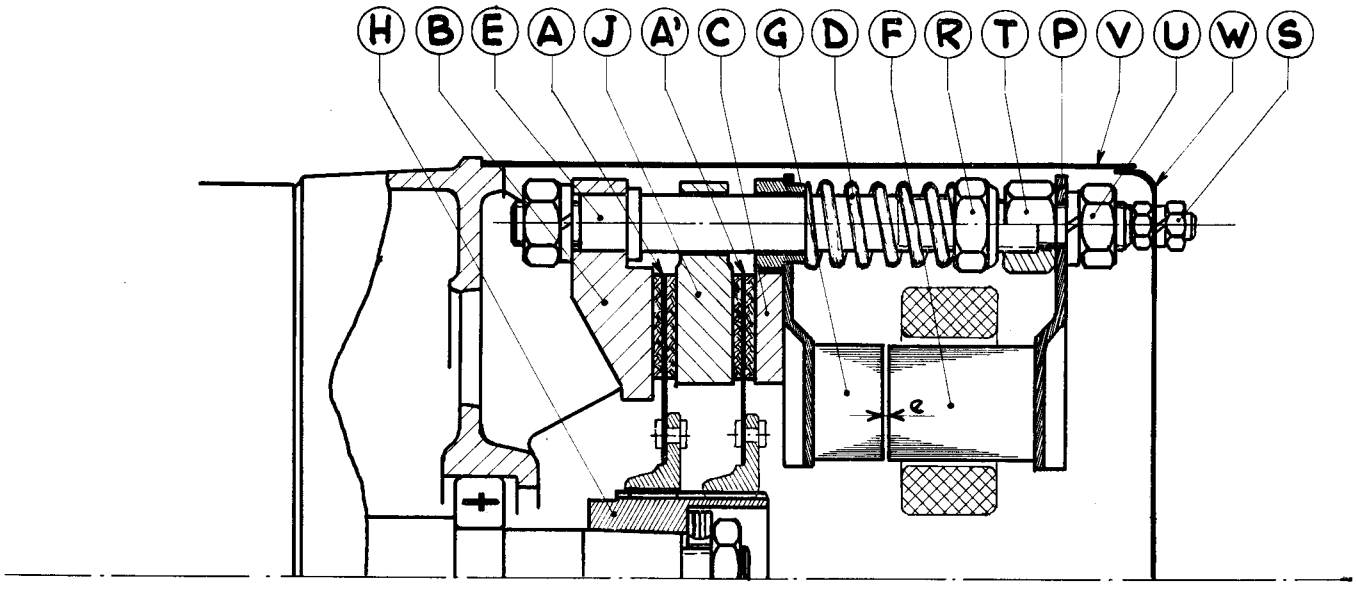
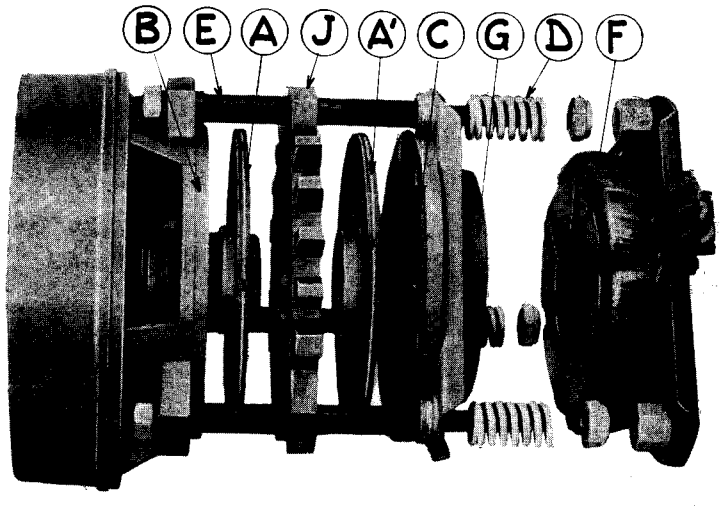
SCHEMATIC REPRESENTATION

OF THE BUILT-IN BRAKE TYPE FM SERIES 100

(WITH 2 BRAKE DISCS)



A and **A'** Brake disc (lined friction) with Ferodo or metallic lining.
B Stationary disc supporting the brake (cast iron friction plate).
C Moving disc and friction ring.
D Pressure and return spring.
E Supporting column.
F Magnetic yoke.
G Armature of the electric magnet.
H Splined sleeve fixed on motor shaft.
J Central friction ring.
P Stationary plate for supporting the yoke.
R Adjusting nuts for the tension springs.
T Adjusting nuts of the air gap.
U Brake locknuts.
V Cover.
W End cover.



BUILT-IN BRAKES TYPE FM SERIES 100

WITH ELECTROMAGNETIC CONTROL

MOUNTED ON THREE-PHASE ASYNCHRONOUS MOTORS

I. DESCRIPTION

The brake mainly consists of :

— **A brake disc** (lined friction) with FERODO or sintered Bronze linings « A » sliding on a splined sleeve « H » mounted on the second tapered shaft of the motor.

— **A stationary disc** « B », integral with the flange of the motor and bearing three columns « E » made of treated and parkerized steel.

— **A moving assembly** « C », supporting the armature « G » of the electromagnet and able to slide on columns « E ».

— **A plate** « P » fixed at the end of columns « E » and bearing the magnetic yoke « F » of the **electromagnet.**

— On each column, a return spring « D » for the moving assembly « C ». The pressure exerted by this spring determines the value of the braking résistance.

The friction surfaces of discs « B » and « C » are made of pearlitic cast iron in order to ensure the optimum friction coefficient.

— The ends of the electromagnet windings are connected with two terminal blocks fixed on plate « P ». For the various possible connections, see page 6.

2. OPERATION

a) **Stationary :** The motor and the electric magnet are not fed ; the pressure of the spring « D » keeps the disc « A » pressed between the discs « B » and « C » thus holding the motor rotor fixed.

b) **When starting :** As soon as power is fed to the motor, the electric magnet is energised, the armature « G » is attracted ; the disc « C » moves from the stationary disc « C » releasing the disc « A » allowing the motor to run freely.

c) **Braking and stopping.** As soon as the current is switched off from motor, the electric magnet being no longer fed, the armature « G » is released and the disc « C », being under the sole action of the springs « D » presses the disc « A » against the disc « B » thus ensuring the braking, then the stopping and holding of the motor shaft.

The braking time mainly depends on the following factors :

— The braking force is determined by the compression of the springs ;

— The resistance applied to the motor shaft ;

— The inertia of the driven machine.

REMARKS :

a) When a single « A » is not enough to ensure the requierd braking force, the device may comprise 1 additional disc « A' », such discs being separated by one friction plate « J » sliding on the columns « E ».

b) A brake release is available.

In order to overcome an ill-times breaking of the circuit, it is necessary to use a mechanical release.

A mechanical or electric release will make it possible to carry out an operation when the motor is stopped ; for instance : adjust a machine, place a part in position, etc... (See par. 4).

c) As the lining wears, the air gap of the electric magnet increases, the energy exerted on the armature may be insufficient ; as the working of the brake becomes defective, an adjustment must be made as detailed in paragraph 3 c.

3. ADJUSTMENTS

An adjustment must be carried out in the following cases :

— When the braking is too strong or too weak ;

— When the air gap, due to wear of the Ferodo or metallic linings, is too large.

a) **The braking is too strong :**

On each column, unscrew by 1/2 turn each of the 3 adjusting nuts « R ».

Test the motor, if the braking is still too strong repeat the operation.

If the working has become noisy, see page 5, chap. 8, par. b.

b) **The braking is too weak :**

Proceed as above, but screw the nuts « R » instead of unscrewing them.

c) **Adjustment of the air gap of the electric magnet :** The air gap is the distance between the armature and the yoke, when the electric magnet is no longer energised, the motor being at rest. The tolerance of the gap is .0315" to .0393". The wear of the lining causes this gap to increase slowly.

With the correct air gap, when energised the brake releases itself with a sharp snap and the armature remains still without vibrations.

For the adjustment of the air gap :

— Unlock the nuts « U » and « T » severals turns (screw « T » and unscrew « U »).

— Move back the plate « P » against the nuts « U ».

— Introduce into this enlarged air gap a feeler gauge .0275" thick. (It is possible to use a strip of shim steel of .0315").

— Bring the plate « P » nearer, so as to cause the yoke to press itself against the armature (and the interposed gauge) by tightening **equally** and gradually the nuts « U ».

— Tighten and lock the nuts « T ». It is then possible to remove the gauge. Make sure that the air gap is equal all round.

N.B. — For this adjustment, a gauge or .0275" is used, while the minimum air gap is .0315". Practice shows that the locking of the nuts « T » brings the air gap to the correct size.

d) **Effect of the wear of the linings :**

It must be noted that the wear of the linings causes the spring pressure to slightly decrease.

As wear takes place on the linings it will be necessary, in order to maintain a proper braking, to adjust the springs, as explained in para. b) above.

4. RELEASING THE BRAKE WHEN STATIONARY

The necessity for a brake release is explained in para. b) p. 3.

MECHANICAL RELEASE

a) **Release by lever :**

The release is achieved by means of a lever exerting a pull on the disc « C » in order to free the disc « A ».

This lever, fitted at the rear of the brake cover, can be made with a handle for hand control, or a device for control by a system of rods or by cable.

It must be noted that the effort required for releasing the brake can be important ; the direction in which the effort is exerted, the pivoting of the lever, are points to be examined in each particular case. Please consult us.

b) **Occasional unlocking by screw :**

It is carried out by screwing the nut of a bolt which pulls on the disc « C » and compresses it towards « P ».

c) **Unlocking with automatic recocking :**

This device consists of a bell-shaped cam fixed to lever and joined to disc « C ». The release is caused by turning the cam a 1/4 of a turn which then engages it with a second cam attached to Plate P. The movement of disc « C » is equal to 3/4 of the air gap of the electric magnet. As soon as power is applied, the magnet draws in disc « C » the remainder of the air gap i.e. 1/4 normal movement. This releases the first cam which, being freed, returns to its original position by means of a spring attached to the lever.

The lever is pulled back to its first position under the impulse of a spring.

The brake is then ready to work.

IMPORTANT : After handling of manual loosening system unscrew the nut 4 rotations.

ELECTRIC UNLOCKING

It is advisable to use the electric release when it is not possible to operate the machine in the absence of the normal current. In this case the motor terminals and the brake must be separately fed :

— Either by a common controller ;

— Or by a switch for the motor and a contactor for the brake ;

— Or by a set of contactors.

The star-delta starting the control of the multi-speed motors can be easily achieved by means of mechanical or electric releases.

Please consult us for these particular cases.

5. STARTING

Our motors with built-in electromagnetic brakes are delivered in working order, regulated to the required braking force or should no special requirements be wanted, for the normal power of the motor.

— The 6 motor terminals and the 6 brake terminals, are connected, as a rule, by means of an internal wiring (in this case 2 connections from inside the stator go to each of the 6 motor terminals). **Therefore, no bridging must be made on the brake terminals.** (These connections may be outside the motor, using distribution boxes).

When the motor is connected up according to the enclosed diagram, turn on and off the switch several times.

The motor must **start readily,** the armature of the electric magnet being pulled in with a sharp snap and remain **without abnormal vibrations.**

— **A too low supply voltage** may cause the brake to become noisy : the maximal admissible drop is about 15 %.

In this case, it may become necessary to release the springs slightly in order to preven working with a partially freed brake, which would cause a rapid putting out of service of the motor and brake.

— If the **braking power** is considered too strong or too weak, it is possible to improve the adjustment according to the instructions in para. 3.

For a standard brake the adjustment of the springs makes it possible to vary the braking power to approximately between 0,5 and 1,5 times the normal braking power.

6. GENERAL MAINTENANCE

The maintenance will mainly consist of keeping the correct pressure on the springs (See 3 a and 3 b) and the air gap (See 3 c) ; the frequency of the inspection depending on the service required from the brake.

— The columns « E » of stainless steel should be slightly greased.

— **AVOID OIL & GREASE GETTING ON TO THE FRICTION LINING.** — As a rule, a Ferodo lining impregnated with grease cannot be cleaned ; it is necessary to change this lining.

On the contrary the eventual replacement of the metallic linings can only be effected by ourselves.

— In case of a working in a very dusty atmosphere, a periodical cleaning may be necessary.

— See in paragraph 8 some possible working troubles and the way of remedying them.

— When improving the adjustments, the greatest precautions must be taken to equalise the springs and keep the facing surfaces parallel. It is necessary to strictly conform to the instructions in para 3.

— The replacement of a disc requires the brake to be dismantled. See « dismantling ».

— In no case (except when adjusting) the brake motor should be allowed to work without **the protective covers on the brake.**

7. DISMANTLING OF THE BUILT-IN BRAKE

It may be necessary to dismantle the brake :

1. — To have access to the motor bearing.

2. — To replace the disc :

— Remove the nuts or the lock screws of the End cover ;

— Remove the covering band ;

— On the brake terminals, disconnect the cables with the terminals of the motor (label these cables according to the numbers of the terminal block). Unscrew and remove the nuts « U » ;

— Remove the plate « P » ;

— Remove the nuts « T » and « R » ;

— Remove the springs « D » and the moving plate « C » ;

— The disc « A » can then be taken off for checking or replacement.

(When brakes with 2 or 3 discs are concerned, it will be necessary to take out the intermediate friction plates).

— At this stage of the dismantling, it is possible to reach the bearing and take the motor to pieces, without removing the stationary disc « B ».

— The reassembling is in the reverse order to the dismantling operations.

Do not forget the nut brake washers (fan-shaped washers).

Comply with the guide marks of the connection cables of the terminals ; in case of doubt « ring through » the connections. The terminals of same number must be connected together.

The adjustments must be made with the utmost care complying with the instructions of par. 3.

8. TRACING FAULTS

a) **The electric magnet is very noisy and does not « draw in » the armature.**

Possible causes :

— INSUFFICIENT SUPPLY VOLTAGE : Admissible limit of the voltage drop : 15 %.

— SINGLE-PHASE SUPPLY : Phase being cut off ; check the current supply.

— EXAGGERATED COMPRESSION OF THE SPRINGS (after braking adjustment) : Loosen the adjusting nuts.

b) **After an air gap adjustment, the brake works, but the electric magnet is very noisy.**

Possible causes :

— UNEVEN TENSION OF THE THREE SPRINGS : While the motor is in operation, press by and forward and brackward on the disc « C » (at the level of each of the springs).

If the noise decreases :

— either by pushing towards the motor : slightly tighten the corresponding spring ;

— or by pushing opposite : loosen the spring.

— UNEVEN AIR GAP (exceptional case) : The faces of the armature and of the yoke are not parallel. Adjust again the nuts « U » and « T » (par. 3 c).

— FOREIGN MATTER IN THE AIR GAP.

c) **Short-circuit when energised, phases unbalanced, exaggerated power consumption.**

Possible causes :

— CHECK, THE CONNECTIONS OF THE TERMINALS OF STATOR AND BRAKE.

— FAULTY WIRING.

d) **The electric magnet works properly (typical snap) but the braking is weak, through the spring pressure is correct.**

Possible cause :

— THE LININGS FERODO ARE GREASY : It is very difficult as a rule, to remove the grease which impregnates a lining Ferodo.

e) **Abnormal wear of the Ferodo linings, out of proportion to the service required from the brake.**

Possible causes :

— ROUGHNESS ON CAST-IRON FRICTION RINGS.

— ABRASIVE DUSTS in the ventilation air.

(It may be necessary to use a tight brake. Please consult us).

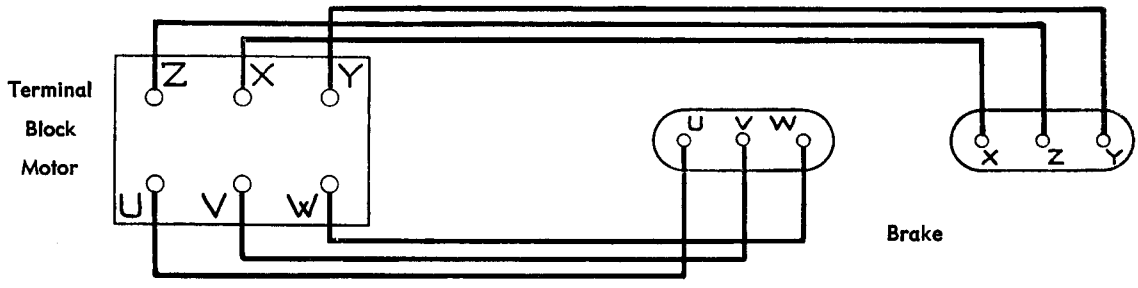
ELECTRIC WIRING OF THE MOTORS WITH BUILT-IN BRAKES

Type FM Series 100

1st. AUTOMATIC BRAKING (Common supply for the motor and the brake)

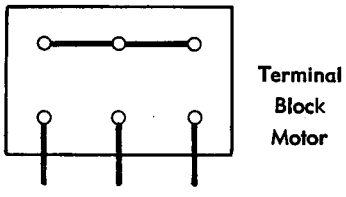
The brake is fed at the same time as the motor.
The terminals of the motor and the brake are connected together, before delivery, by means of 6 direct connections, making it possible to intervene only at the motor terminals in the case of a star or delta working.

DIAGRAM OF THE CONNECTIONS CARRIED OUT BY OURSELVES

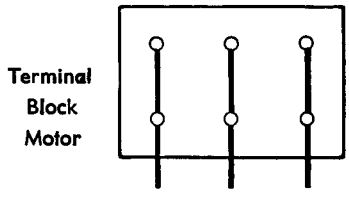


WIRING TO BE MADE FOR A SUPPLY

IN STAR



IN DELTA

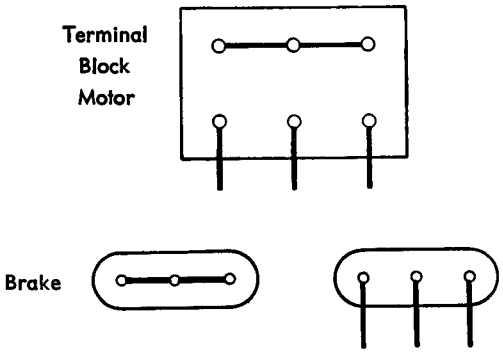


2nd. BRAKING OF CONTROLLED STOPS (Supply separated from the brake)

The brake is supplied independently from the motor.
According to the supply voltage, the wirings must be carried out as follows :

WIRING TO BE MADE FOR A SUPPLY

IN STAR



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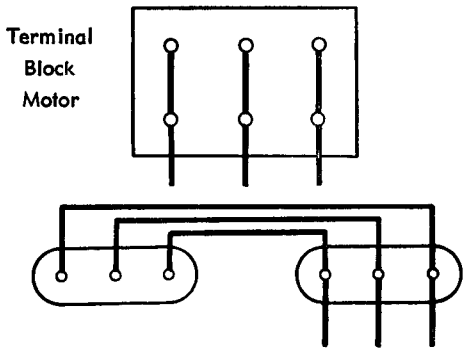

PHASES GUIDE MARKS

Motor			Brake		
Phase I	Terminals	ZW or 45	Phase I	Terminals	ZW
Phase II	—	XU or 61	Phase II	—	XU
Phase III	—	YV or 23	Phase III	—	YV

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