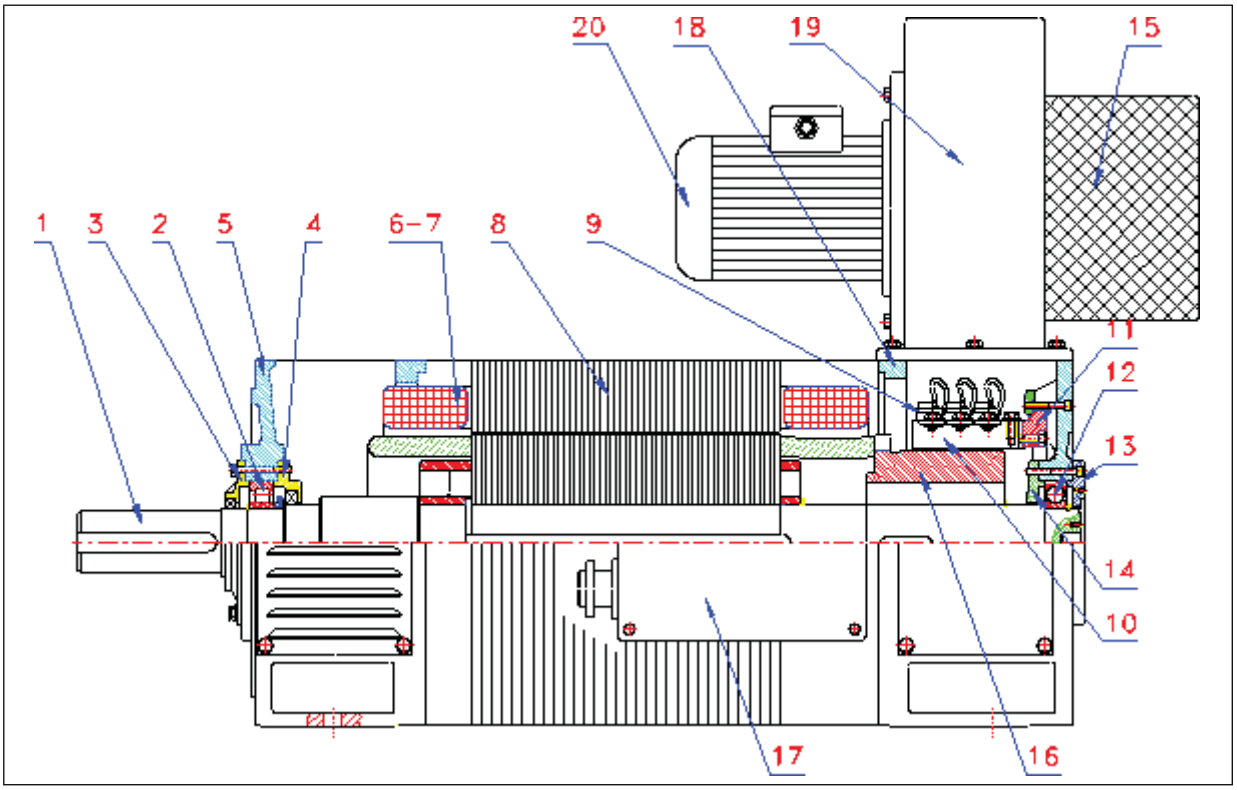
Aratron
KOMPONENTER I BEVEGELSE

FEMSAN

Operating and Maintenance Manuel – KG Series



1. WARNING !
High voltage and rotating parts can cause serious or fatal injury. Installation, operation and maintenance of DC motor should be performed by qualified personnel.

Figure 1
1 – Shaft
2 – Drive end bearing
3 – Drive end outer bearing cap *
4 – Drive end inner bearing cap *
5 – Drive end bearing bracket
6 – Main pole coils
7 – Commutating pole coils
8 – Frame
9 – Brush
10 – Brush holder
11 – Brush holder ring
12 – Opposite drive end bearing
13 – Opposite drive end outer bearing cap *
14 – Opposite drive end inner bearing cap *
15 – Fan filter support
16 – Commutator
17 – Conduit box
18 – Opposite drive end bearing bracket
19 – Blower frame
20 – Blower motor *

* Availability is subject to change depending on the model of the motor

2. INSTALLATION

The DC Motor must be installed in a place where the air outlets are free, and easy access to the brushes from the non driving end is always possible.
Keep the hot out flowing air from being recirculated.

3. MOUNTING

The DC Motor must be placed on firm foundations. Supporting surface must be level. Excessive vibration of the motor may be caused by weak foundation. After having aligned motor and machine, the base plate must be secured to the foundation with concrete. If this is not possible, the supporting structure must be firm enough to ensure freedom from vibration.

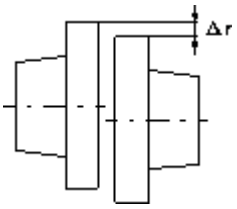
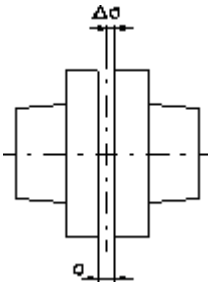
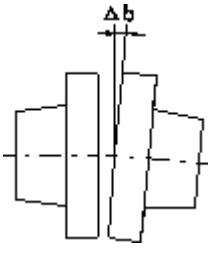
4. COUPLING

This operation is extremely important for the life of the motor and must be carried out with great care.
The B3 type motors must be secured using four screws whose diameter fits in with the base plate holes and adding two tapered dowels between two diagonally opposed feet.
The motors, type B5 and V1, must be secured to the counter flange in a similar way.

4.1. Direct Coupling

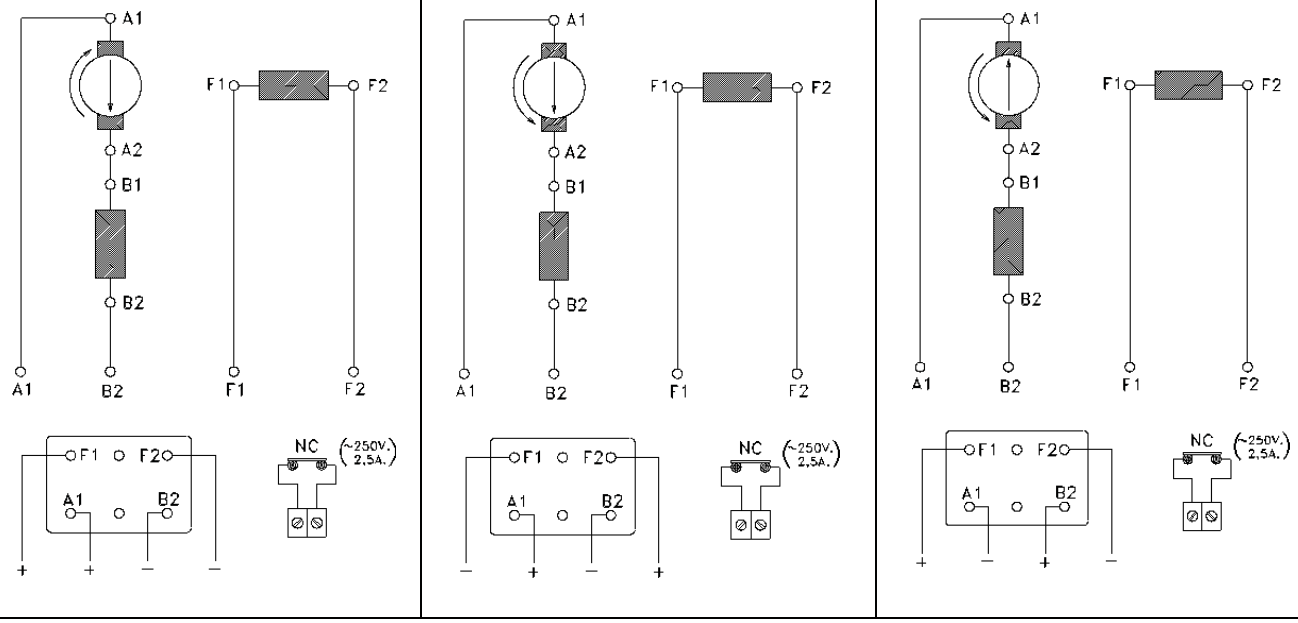
It is advisable to make use of flexible joints which can prevent the transmission of any axial stresses to the bearings.
A good alignment requires the use of comparators correctly fitted on the two shaft ends (see figure 2).
The transmission gear must have sufficient gap, allowing for axial expansions due to heat.

Figure 2

	Radial Tolerance
	Axial Tolerance
	Angular Axial Tolerance

Radial Tolerance	Axial Tolerance	Angular Axial Tolerance
Δr = ±0.1 mm	Δb = ±0.1 mm	Δa = 1 – 3 mm

4.2.	Belt Coupling
The parallelism between the shafts and the alignment of the pulleys must be as accurate as possible in order to prevent axial stresses on the bearings. The pulleys must be fitted as near as possible to the base plate of the motor. The axial length of the pulley must not exceed twice the length of the shaft extension.	

5.	STARTING	
W*ARNING !* *Before making any electrical connection be sure that the drive is switched off.* *M*ake the electrical connection of *DC* motor according to the diagrams below.		
*Sep*arate excitation *DC M*otor interconnection diagrams		
*C*lockwise rotation facing drive end	*C*ounterclockwise rotation facing drive end by field inversion	*C*ounterclockwise rotation facing drive end by armature inversion
		
For external fan connection diagram consult FE*MS*AN if necessary.		

5.1.	Inspection Before Starting
Before *p*utting the motor into o*p*eration, or after a long *p*eriod of inactivity, it is advisable to check the following : *1* – *T*est the insulation to the earth of the armature and field with the *M*egger; it must not be lower than 2 *M*Ω. 2 – *M*ake sure that the ventilating fan is connected for the line voltage and check the sense of rotation of the fan. It must corres*p*ond to the sense of the arrow stam*p*ed on the fan. *T*he brush ins*p*ection doors must always be closed; otherwise the fan motor is overloaded, which consequently may cause damage. 3 – *M*ake sure that the electrical connections have been made according to the enclosed diagram. 4 – Ins*p*ect the inside of the motor, there o*p*eration must not be any foreign articles. *T*urn the rotor by hand, it musy turn smoothly and without hindrances. 5 – *C*heck the tightness of the securing bolts on the base *p*late. 6 – *C*heck the fastening of the brush cables, they must not interfere with the brush s*p*rings. *T*he commutator surface and the grooves between segments must be clean. 7 – If the *p*urchased motor is fitted with the bearing requiring lubrication, check their correct lubrication and re*p*lenish with grease if necessary.	

5.2.	Inspection After Starting
*C*heck the following as soon as the motor has been started: *1 – L*eave the motor in o*p*eration for some hours under a moderate load and look for *p*ossible localized overheating. 2 – *C*heck the tem*p*erature of the bearings. It must not exceed 90 °*C*. 3 – *C*heck that o*p*eration is smooth and free from vibration.	

MAINT*E*NANC*E* PROGRAM		
*P*AR*T*	*OP*ERA*TIO*N	IN*T*ERVA*L*
*C*ommutator	*C*heck that the commutator is clean and that there is no burns on the segments.	Every *M*onth
	*C*heck the eccentricity.	Every 3 *M*onths
	*C*leaning the grooves between the segments.	Every Year
Brushes	*C*heck for brush wear and *p*lay in the brush holder. *U*sually the brushes last from 6 months to *1* year.	Every *M*onth
	*C*heck brush *p*ressure and connections.	Every 3 *M*onths
Bearings	*C*heck their tem*p*erature and the absence of vibrations and noise.	Every 3 *M*onths
	For lubrication bearings only : check the grease level and re*p*lenish if necessary.	Every 3 *M*onths
Insulation	*P*articularly if location is dam*p*, check the insulation value with the *M*egger : it must be never be less than *1*.5 *M*Ω	Every *M*onth
Filters	*C*heck for *p*ossible filter cloggings; wash the filtering material if necessary. After re*p*eated washes it must be re*p*laced.	Every *M*onth
*S*crews	*C*heck tightening.	Every *M*onth
	*C*heck the electrical connections : *p*oor contact may cause localized overheating.	Every 6 *M*onths
*W*indings	*O*verall cleaning. *C*heck the insulation to earth : its value must be greater than *1*.5 *M*Ω	Every Year

6.	MAINT*E*NANC*E*
A detailed *p*rogramme of maintenance is the first condition necessary to ensure good working and long working life. W*ARNING !* *Disconnect power before touchinng any internal part.*	

6.1.	*B*RUS*HE*S
A homogeneous an*d* glossy brush surface is an in*d*ex of a goo*d* commutation. *T*wo o*p*aque stri*p*s on the si*d*es are also acce*p*table. *A* fully o*p*aque or a s*p*ot o*p*aque surface in*d*icates a critical commutation an*d* therefore it must be checke*d*.	

Table 1.		
Brush *D*imensions an*d* Quantities		
Type	*D*imension	Quantity
*KG S*eries		
K.08.07.*ST*	*1*0 X 20 X 40	2
K.08.*1*0.*ST*	*1*0 X 20 X 40	2
K.09.*1*5.*ST*	*1*0 X 20 X 40	2
K.09.20.*ST*	*1*0 X 20 X 40	2
K.09.25.*ST*	*1*0 X 20 X 40	2
K.*1*0.*1*0.*ST*	*1*2.5 X 20 X 40	2 - 4
K.*1*0.*1*4.*ST*	*1*2.5 X 20 X 40	2 - 4
K.*1*0.23.*ST*	*1*2.5 X 20 X 40	2 - 4
K.*1*0.28.*ST*	*1*2.5 X 20 X 40	2 - 4
K.*1*3.*1*2.*ST*.	*1*0 X 25 X 40	4 - 8
K.*1*3.*1*6.*ST*.	*1*0 X 25 X 40	4 - 8
K.*1*3.20.*ST*.	*1*0 X 25 X 40	4 - 8
K.*1*3.25.*ST*.	*1*0 X 25 X 40	4 - 8
K.*1*3.30.*ST*.	*1*0 X 25 X 40	4 - 8
K.*1*6.*1*3.*ST*	*1*2.5 X 32 X 40	4 - 8
K.*1*6.*1*8.*ST*	*1*2.5 X 32 X 40	4 - 8
K.*1*6.26.*ST*	*1*2.5 X 32 X 40	4 - 8
K.*1*6.30.*ST*	*1*2.5 X 32 X 40	4 - 8
K.*1*6.40.*ST*	*1*2.5 X 32 X 40	4 - 8
K.*1*8.30.*ST*	(*1*0+*1*0) X 25 X 45	4 - 8 - *1*2
K.*1*8.35.*ST*	(*1*0+*1*0) X 25 X 45	4 - 8 - *1*2
K.*1*8.40.*ST*	(*1*0+*1*0) X 25 X 45	4 - 8 - *1*2
K.20.28.*ST*	(8+8) X 32 X 45	4 - 8 - *1*2
K.20.40.*ST*	(8+8) X 32 X 45	4 - 8 - *1*2
K.20.45.*ST*	(8+8) X 32 X 45	4 - 8 - *1*2
K.20.60.*ST*	(8+8) X 32 X 45	4 - 8 - *1*2
Y*G S*eries		
Y.09.09.*ST*.	8 X *1*6 X 25	2
Y.*11*.08.*ST*.	*1*0 X 20 X 27	2
Y.*11*.*1*5.*ST*.	*1*0 X 20 X 27	2
Y.*13*.*1*5.*ST*.	*1*2.5 X 20 X 40	2 - 4
*SL S*eries		
S.08.05.*ST*.		
S.08.08.*ST*.	*dep*ens on the	
S.08.*1*0.*ST*.	a*ppli*e*d* voltage	consult Femsan
S.08.*1*5.*ST*.		
S.*11*.07.*ST*.		
S.*11*.*11*.*ST*.		
S.*11*.*1*5.*ST*.		
*D*V *S*eries		
D.09.09.*ST*.	8 X *1*6 X 25	2 - 4
D.*11*.07.*ST*.	*1*0 X 20 X 27	2 - 4
D.*11*.08.*ST*.	*1*0 X 20 X 27	2 - 4
D.*11*.09.*ST*.	*1*0 X 20 X 27	2 - 4
D.*1*3.08.*ST*.	*1*2.5 X 20 X 40	2 – 4

6.2. COMMUTATOR

A commutation track dark brown color, uniform and glossy, is an indication of good operating of motor. On the other hand, if the tracks shows black stains, unevenness or burnings it must be cleaned. Besides that, the commutator ovalization must be checked, if necessary the commutator must be turned.

WARNING !

Turning must be carried out by expert personnel.

6.3. BEARINGS

In every 2000 working hours it is advisable to check the temperatures and the vibrations of the bearings. When replacing the bearings take care not to damage the bearing seat on the motor shaft. The bearings must be removed using an extractor and placed by heat. Make sure that the bearing is firmly locked in place.

Table 2.

Table of Bearing

Type	Coupling Side	Commutator Side
KG Series		
K.08.07.ST	6205 2RS C3	6204 2RS
K.08.10.ST	6205 2RS C3	6204 2RS
K.09.15.ST	6205 2RS C3	6204 2RS
K.09.20.ST	6206 2RS C3	6204 2RS
K.09.25.ST	6206 2RS C3	6204 2RS
K.10.10.ST	6208 2RS C3	6306 2RS
K.10.14.ST	6208 2RS C3	6306 2RS
K.10.23.ST	6208 2RS C3	6306 2RS
K.10.28.ST	6208 2RS C3	6306 2RS
K.13.12.ST.	6310 2RS C3	6209 2RS
K.13.16.ST.	6310 2RS C3	6209 2RS
K.13.20.ST.	6310 2RS C3	6209 2RS
K.13.25.ST.	6310 2RS C3	6209 2RS
K.13.30.ST.	6310 2RS C3	6209 2RS
K.16.13.ST	6310 2RS C3	6309 2RS
K.16.18.ST	6312 2RS C3	6309 2RS
K.16.26.ST	6312 2RS C3	6309 2RS
K.16.30.ST	6312 2RS C3	6309 2RS
K.16.40.ST	6312 2RS C3	6309 2RS
K.18.30.ST	NU 213	6213 2RS
K.18.35.ST	NU 213	6213 2RS
K.18.40.ST	NU 213	6213 2RS
K.20.28.ST	NU 314	6314 2RS
K.20.40.ST	NU 314	6314 2RS
K.20.45.ST	NU 314	6314 2RS
K.20.60.ST	NU 314	6314 2RS
YG Series		
Y.09.09.ST.	6205 2RS C3	6204 2RS
Y.11.08.ST.	6205 2RS C3	6204 2RS
Y.11.15.ST.	6205 2RS C3	6204 2RS
Y.13.15.ST.	6207 2RS C3	6206 2RS
SL Series		
S.08.05.ST.	6204 2RSC3	6203 2RS C3
S.08.08.ST.	6204 2RS C3	6203 2RS C3
S.08.10.ST.	6204 2RS C3	6203 2RS C3
S.08.15.ST.	6204 2RS C3	6203 2RS C3
S.11.07.ST.	6206 2 RS C3	6206 2RS

S.11.11.ST.	6206 2 RS C3	6206 2RS
S.11.15.ST.	6206 2 RS C3	6206 2RS
DV Series		
D.09.09.ST.	6205 2RS C3	6204 2RS
D.11.07.ST.	6205 2RS C3	6204 2RS
D.11.08.ST.	6205 2RS C3	6204 2RS
D.11.09.ST.	6205 2RS C3	6204 2RS
D.13.08.ST.	6207 2RS C3	6206 2RS

6.4. Insulation Resistance Measurement

WARNING !
*B*efore performing this measurement, disconnect *DC* driver from *DC* motor.

Insulation resistance measurement should preferably be done by using a 500 V. Megger. The reading should be taken after one minute of continuous application of test voltage. The minimum recommended value referred to 40 °C ambient temperature is 1.5 Ω for both stator and armature windings.

6.5. Windings Cleaning

Many more failures are caused by moisture and contaminats. Contaminats and oily vapors have good electrical conductivity and cause leakage currents from windings to ground or between windings. Cleanliness of windings and commutator is therefore is very important to ensure a long trouble free life to the motors

POSSIBLE MALFUNCTIONS		
PROBLEM	CAUSE	SOLUTION
Vibration when the motor is coupled	Excessive belt tension	Loosen the belt, fit a belt stretcher if necessary.
	Defective balancing of the coupled machine; coupling device out of balance	Check balancing
	Defective alignment (see figure 2)	Check coupling
Vibration when the motor is not coupled	Defective bearings	Replace bearings
	Coupling device out of balance	Balance the motor with pulley
Hissing bearing	Lack of grease; defective bearing	Lubricate or replace bearing
Excessive bearing wear	Overloaded bearing	Check radial load and the coupling device; eliminate the axial loads
The motor does not start at no load	The main field is open	Rewind main field
	The armature coils are in short circuited	Repair or rewind the armature
	Poor contact between brushes and commutator	Check the brushes and replace the worn ones
The motor runs unevenly	The armature coils are in short circuited	Repair or rewind the armature
	Commutator segments short circuited	Remove the short circuit. Remove the mica insulation between the segments
The motor does not start when coupled	Overload	Check load current
	The brushes are out of the neutral zone	Reset the neutral position
Overheating	Overload	Check voltage, armature current and excitation current
	Poor ventilation	Check filter clogging
	Commutator inspection doors are open or not closed properly	Tighten the covers
	Check power supply for possible need of choke coil ; wrong choke coil	Connect or replace the choke coil