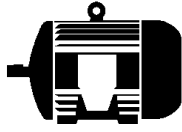


KDC Series





VALIADIS S.A.
HELLENIC MOTORS

Instruction for Operation and Maintenance of
KDC Series Medium DC Motors

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I . Introduction

Following KDC Series DC Motors, we have developed KDC series medium DC Motors. These machines operate steadily, reliably and durably thanks to the adaptation of various new technologies. They are widely used in metallurgy, rubber and plastic machinery, mining etc, to take the place of imported motors. The motors center height ranges from 355~710 mm, six specifications.

The performances of KDC Series Medium DC Motors comply with <KDC Series Medium DC Technological Requirements>, those of IEC and ISO.

II . Conditions for Operation

1. Though the motor could be installed in serious location, cooling method and protection class must be correctly selected to keep the motor properly cooled and its inner cleanness.

2. The site and the cooling air must be free from acidic, alkaline or other damaging gas to protect motor's, insulation and other vulnerable parts.

3. The motor's rated power should be confined in an altitude below 1000m, and the surrounding air temperature below 40 °C , otherwise, the operating power should be reduced.

4. If the motor's operating environment is in ship, wetland, or there's saline fog, we must be informed when other, otherwise, the motor's performance and working hours will be severely affected.

5. This series of motors can well adapt to static rectified source or powered by DC generator. If powered by static rectified source, the rectified power's pulses should be no less than six, the crest ripple factor of the source should be less than 6% under rated speed, rated voltage and rated loading current.

6. The motor's cooling methods comply with <Motor Cooling Methods>, namely, IC06,IC17, IC37 and ICW37A86.The standard air inlet should be placed on top of the transmission side (bottom, right or left side, also OK) If there's any change needed, inform us when order. If the customer wants to do some change by himself , consult our technological department beforehand.

7. The excitation current mustn't surpass the rated value for long during operation, otherwise the excitation winding will be damaged. Instant strong excitation is allowed, but the voltage must surpass 500V. At the instant of strong excitation current can surpass the rated value a bit, but not allowed when the current is stable.

8. This series of motors has two categories (Type A and Type B) as of instant overload capacity. Make sure your overload requirement when order. Their instant overload capacity as in the charts.

Type A (One minute)

Percentage of Basic speed	Percentage of Rated Current	
	Occasionally	Often
100	200(180*)	175(160*)
200	160	150
Over 300	140	125

Type B (One minute)

Percentage of Basic speed	Percentage of Rated Current	
	Occasionally	Often
100	200(180*)	175(160*)
200	200(180*)	160
Over 300	175(160*)	140



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Note*: When the motor's basic speed equals or surpasses the speed in the table below.

Motor's Center Height (mm)	355	400	450	500	560	630	710
Basic speed (r/min)	1000	900	800	710	630	560	560

III. Checking before Operation

1. Check the outer condition of the motor after removing the package, see if there are any damages caused by falling-off, collision, rainfall, etc., and see if the motor parts (tachometer generator, photoelectric encoder, centrifugal switch, cooler or air-blower, etc.) are intact. If you have any problems, consult our company right away.

2. If there's no problem outside, open the cover of the main terminal box (some models have two terminal boxes, namely, the main terminal boxes and the component box). Open the covers of both side-windows of the non-transmission end (remove the protecting paper on the shutters if the cooling method is IC06 or IC17). Check the surface of the converter (remove the protecting paper if any, place the carbon brush back) and the intact of the brush. If the surface of converter is polluted, it must be cleaned by specialist and polished with abrasive cloth carefully, meanwhile, keep the neighboring leaves well insulated. Then check the insulating resistance between windings, and ground, and check the heater if there's one. The resistance between windings and ground mustn't be less than $5M\Omega$. If so, remove the wetness with heater (start the cooler to keep ventilation at the same time). If there's no set heater, blow hot dry air inside the motor or put it into drying chamber (the chamber's temperature shouldn't surpass $80^{\circ}C$) till the resistance reaches the rated value.

IV Installation

1. Flexible couplings are adopted as transmission of power of the motor, radial force isn't allowed. If radial force transmission is required, the demanded radial force should be informed to us when order, we are entitled to provide relevant data of radial force allowed. The transmission unit must be aligned with utmost care. The radial wavering between the outer rings of the couplings should be less than 0.15 mm, running smoothly and evenly. The fixing bolts should comply with the specifications and be fastened properly in case of loosening.

2. The connecting wires must be selected accordingly. The main circuit line must be able to bear the maximum loading current of the motor in case of accident caused by overheating. The terminal signs of the main terminal box are as in chart below.

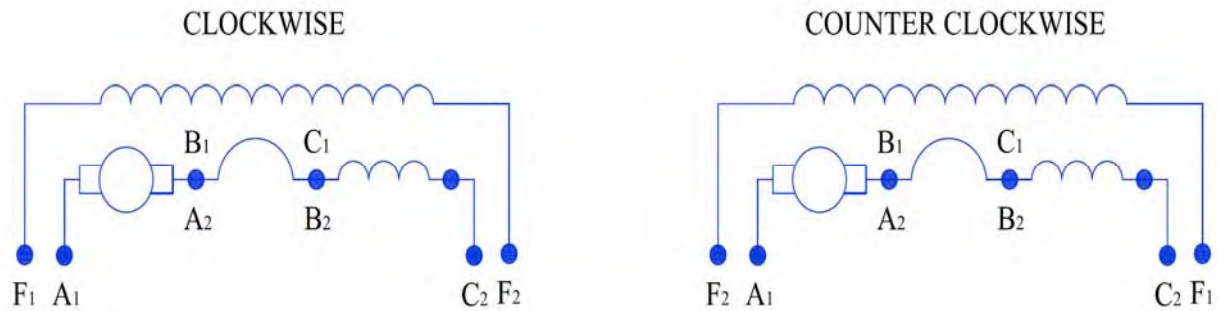
Coil name	Terminal Sign	
	+ Terminal	- Terminal
Armature Coil	A ₁	A ₂
Interpole Coil	B ₁	B ₂
Series Excitation Coil	D ₁	D ₂
Independent Excitation Coil	F ₁	F ₂
Compensation Coil	C ₁	C ₂

Illustration of connection (Rotating direction viewed from shaft extended side).



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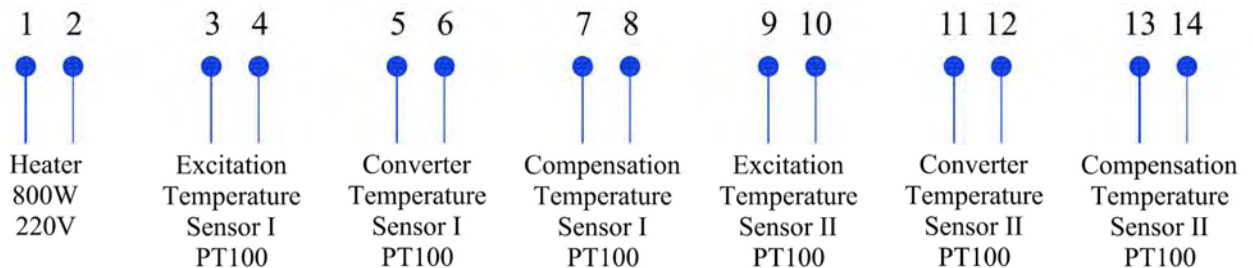
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Final confirmation according to the illustration inside the main terminal box.

3. Component terminal signs refer to illustration inside the component terminal box. Components include heater, main pole, interpole, compensation coil, etc. The terminals of temperature sensors of both bearings are on top of both covers.

Illustration of component signs



4. The terminals of cooling blower are inside its terminal box. **Take special care the blower's rotating direction in line with stipulated direction.** Lack of phases isn't allowed during operation.

5. The terminals of fan, pressure difference switch, temperature controller and heater of the air-water cooler are all inside the cooler's terminal box. Refer to the illustration inside the box for connection. **Take special care of blower's rotating direction in line with the stipulated direction. Cooling water should be led into cooler accordingly and connected with relevant flows switch or hydraulic switch** to perfect the system.

6. Ventilation pipeline must thicker than the motor's pipeline. Avoid 90° elbow in case of increasing resistance. **The air volume and pressure must comply with motor's cooling requirements in case of overheating.**

7. **The motor's grounding bolt must be linked to ground !**

8. Speed measuring components aligned with the motor's shaft (tachometer generator, photoelectric encoder, centrifugal switch, etc.) are important components, check the alignment. And check fastening of bolts and any damages during transportation and installment before wiring. Connect wires following the instruction.

V . Power Supply, Starting, Running, Stopping of Motor

1. This series of motors are suitable to static rectified source, or powered by DC generator. If powered by static rectified source, the rectified power's pulses should be no less than six. The crest ripple factor of the supply should be no less than 8.5% under rated speed, rated voltage and rated loading. In weak magnetic speed-regulating system, take the lowest excitation pressure into consideration to keep the smoothness of current in case of damages caused by losing of speed control, converter sparking and rapid wearing of carbon brush when designing excitation power supply.



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2. Switch on the power source, start the cooling system, open the cooling water valve, get through excitation and regulate the excitation current to rated value (**Strictly prohibit overloading excitation current for long!**) Start armature power supply, regulate armature voltage (keep the regulating pace as not to surpass its rated current) as to make it running at proper speed.

3. The motor's working load must comply with its capacity. The volume and duration of overload must be in line with rated values in case of damages.

4. To stop motor, remove the load as possible as can, then reduce the rotor's voltage to zero gradually, cut off rotor power, reduce excitation voltage to zero gradually, turn off excitation source. Shut off cooler 15 min later, switch off cooling water value, then cut off main power supply.

5. Instant strong excitation is allowed for this series of motors, but the voltage mustn't surpass 500 V. At the instant of strong excitation, the excitation current can surpass the rated value a bit, but not allowed when the current is stable.

VI. Special notices

- 1. The motor's case must be linked to ground!**
- 2. The rotating direction of the blower must be in line with the rotating symbol on it!**
- 3. The rotating direction of the cooler's fan must comply the rotating symbol on the cooler!**
- 4. The on and off of cooling water and the cooler's power source must be synchronized and equipped with warning system for water-cut-off and low pressure. The set value of the cooler's temperature controller is 40 °C, and the set value of pressure difference switch is no less than 400 Pa. No adjusting!**
- 5. Start the cooling system before starting the motor. Then get through the excitation power supply and then start the motor!**
- 6. No long-time overloading of excitation current!**
- 7. Clean the filters of the blower and cooler timely, keep ventilation well!**
- 8. The air volume and pressure of the ventilation must be in line with motor's requirements and equipped with protecting device for air – cut – off and low pressure!**

VII. Maintenance of motor

1. During motor's operation, keep its surface and surroundings clean.

Nothing should be placed on or about the motor. Make regular checking to ensure the base bolts fastened, frame normal, no abnormal sound, ventilation windows not blocked, cooling system working properly and grounding reliable.

When the motor is overheat or the cooling system alarms, check the cleanness of the filters of the cooling blower and the cooler, and check the flow and pressure of cooling water, as to solve the cooling problem.

2. As for constantly used motor, check the commutator regularly, at least once a month. No spark bigger than class 11/2 is allowed on the commutators surface under rated load. When the motor is not in use, check if the commutator's surface is smooth, if there's any wear and tear of the carbon brush and if the pressure of the brush holder is proper.

Maintenance of commutator:

The commutator's surface should be smooth, take measures if there's any mechanical wear or spark burns on it. Make sure the color of the oxidation layer on the commutator's surface is normal. Pay attention to the sparks on commutator and carbon brush oftentimes. Be sure there isn't any dirt on the commutator, carbon brush and brush holder.



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Maintenance of carbon brush:

There should be a good contact between commutators surface and carbon brush. Normal brush pressure is $0.15\sim 0.25\text{kgf/cm}^2$. The matching of brush and brush holder frame shouldn't be too tight. There should be a clearance of less than 0.15mm.

When the carbon brush is worn-out or broken, replace a new one of the same brand and same specifications. After assembly, grind the brush along the outside ring of the commutator with abrasive cloth till the brush has an over 75% contact surface with converter.

Special notice. Return to the original position (there's a mark) and fasten the holder after replacing or checking the brush!

3. Check the motor's terminals in the main terminal box regularly in case of loosening and damaging..

4. Maintenance of bearings:

After installation, the bearings should be lubricated every 500 working hours. The lubricant is lithium lubricant or refers to tag plate on the motor. The bearings are lubricated during operation, keep filling new lubricant till the old lubricant spilled out from the discharge exit.

Bearings' normal working temperature shouldn't be higher than $60\text{ }^\circ\text{C}$ with light, regular sound. If there's overheating or abnormal noises, check the bearings.



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VIII. Common Trouble and Troubleshooting of KDC Series Motors

Symptom	Cause	Solution
Fail to start	1.The excitation source is cut off or not connected.	1. Check and get through excitation power supply.
	2. Protecting system is not properly adjusted or locked.	2. Adjust the protecting system properly
	3. Cooling system not started beforehand.	3. According to procedure, start cooling system, then excitation, and then, motor.
	4. Control system has trouble.	4. Send for specialist to fix control system.
	5. Motor's input cable cut off.	5. Check motor's circuit.
	6. Commutator's protecting paper not removed or carbon brush fallen off.	6. Remove commutator's protecting paper or put the carbon brush into the brush box accordingly
Heavy starting current and insufficient Starting	1. Excitation current is not adjusted to rated value , cause torque not enough and heavy rotor current.	1. Adjust excitation current to rated value.
	2. Overload or the motor's speed too high, cause motor's power or torque not enough.	2. Reduce load, increase speed ratio or choose a motor suitable to the load instead.
	3. Mechanical transmission improper, cause too much loss of energy.	3. Re-assemble transmission system to ensure a good transmission.
Strong shaking of motor	1. Base bolts loosened.	1. Fasten base bolts and adjust the couplings properly.
	2. Base loosened.	2. Strengthen the base.
	3. Resonance occurred between motor base and machinery.	3. Add cushions and strengthen supporting points of base to change original frequency.
	4. The control system isn't adjusted properly, cause the current change abruptly and motor shake violently.	4. Adjust the control system properly to keep smooth current.
	5. Rotor's balance bar fallen off.	5. Re-test the rotor's balance in motion.
	6. The transmission central line of shafts not aligned.	6. Keep transmission aligned.
Over heating of motor	1. Heavy overload of excitation current .	1. Adjust excitation current to rated value.
	2. Blower filter dirty or blocked. Blower's rotating direction reversed.	2. Clean filter, correct blower's rotating direction.
	3. Rotating direction of cooler's fan reversed, filter blocked, cooling water cut off or low water pressure. The set values of temperature controller and pressure difference swith too high.	3. Correct rotating direction of cooler's fan, clean filter, check cooling water's flow and pressure, check the set values of temperature controller and pressure difference switch.



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Symptom	Cause	Solution
	4. Overload.	4. Reduce load.
Heavy sparks on carbon brush	1. Bad-contact between commutator and brush.	1. Polish brush's contact surface. Operate motor 30 minutes with light load till the brush has an over 75% contact surface with commutator.
	2. Brush holder loosened or positioned incorrectly.	2. Fasten or correct brush holder's position.
	3. Converter's surface not smooth.	3. Clean or polish converter's surface.
	4. Carbon brush worn-out.	4. Replace brush with one of the same brand and same specifications.
	5. Brush not positioned on central line.	5. Adjust brush holder to marked position.
	6. Base bolts loosened and motor shaking.	6. Fasten base bolts.
	7. The weld between rotor's coil and commutator loosened.	7. Re-weld.
	8. Interpole's coil short circuit.	8. Find out where the short circuit lies, fix it.
	9. Carbon brush's brand and specifications not comply with requirements.	9. Replace brush with required one.
	10. Heavy shaking of motor.	10. Test the rotor's balance in motion.
Smoking of motor	1. Over load of excitation current, main pole coil smoking.	1. Reduce excitation current.
	2. Heavy overload of rotor current, rotor smoking.	2. Reduce load.
	3. Smoking caused by short circuits between loops of rotor coil or main pole coil.	3. Stop operation, send for specialist to check.
	4. Motor's terminal voltage too low.	4. Raise terminal voltage.
	5. Frequent starting.	5. Prolong starting intervals.
	6. Friction between rotor and stator.	6. Check clearance between rotor and stator.
Overheating and abnormal noise of bearings	1. Overheating.	1. Check lubrication and see if there's any need to add lubricant or if the lubricant is qualified.
	2. Abnormal noise.	2. Check bearing to see if there's any wear and tear of any pollutant. Clean or replace bearing.

Important notice:

The personnel who maintain and fix KDC Series DC Motors must be trained electricians or specialists. They must have relevant knowledge and apply certain safety measures.



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