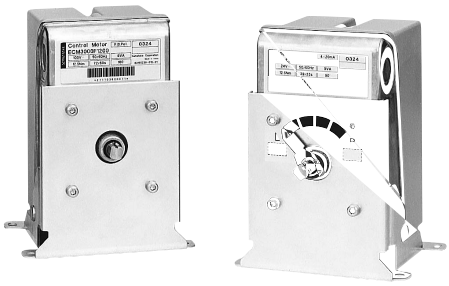
Control Motor
ECM3000
User's Manual



Thank you for purchasing the Control Motor ECM3000.
This manual contains information for ensuring correct use of the ECM3000. It also provides necessary information for installation, maintenance, and troubleshooting.
This manual should be read by those who design and maintain equipment that uses the ECM3000.
Be sure to keep this manual for ready reference.

RESTRICTIONS ON USE

This product has been designed, developed and manufactured for general-purpose application in machinery and equipment.
Accordingly, when used in applications outlined below, special care should be taken to implement a fail-safe and/or redundant design concept as well as a periodic maintenance program.

- Safety devices for plant worker protection
- Start/stop control devices for transportation and material handling machines
- Aeronautical/aerospace machines
- Control devices for nuclear reactors

Never use this product in applications where human safety may be put at risk.

REQUEST

Ensure that this User's Manual is handed over to the user before the product is used.
Copying or duplicating this User's Manual in part or in whole is forbidden. The information and specifications in this User's Manual are subject to change without notice.
Considerable effort has been made to ensure that this User's Manual is free from inaccuracies and omissions. If you should find any inaccuracies or omissions, please contact Yamatake Corporation.
In no event is Yamatake Corporation liable to anyone for any indirect, special or consequential damages as a result of using this product.

SAFETY PRECAUTIONS

Safety precautions are for ensuring safe and correct use of this product, and for preventing injury to the operator and other personnel or damage to property. You must observe these safety precautions. Also, be sure to read and understand the contents of this user's manual.

⚠ WARNING
Warnings are indicated when mishandling this product might result in death or serious injury to the user.

⚠ CAUTION
Cautions are indicated when mishandling this product might result in minor injury to the user, or only physical damage to this product.

⚠ WARNING

- Be sure to turn the power OFF before mounting, removing, or wiring the ECM3000 or opening the cover.
  Touching electrically charged parts such as power terminals by mistake might cause electric shock.

⚠ CAUTION

- To ensure correct and safe operation of the ECM3000, always follow this user's manual, as well as user's manuals for equipment and system to be combined with the ECM3000.
- Installation, wiring, inspection, adjustment, and maintenance of the ECM3000 must be carried out only by authorized engineers who have the knowledge and technical skill regarding the customer's system and the ECM3000.
- Use the ECM3000 within the operating ranges recommended in the specifications of this manual.
  Failure to do so might cause trouble or faulty operation.
- Do not install the ECM3000 at locations shown below.
  Doing so might cause faulty operation.
  - Locations where hazardous chemicals, corrosive gas or briny / salty air exists.
  - Locations where the ECM3000 is exposed to high temperatures.
  - Locations where moisture or water droplets exist.
  - Locations where the ECM3000 is exposed to vibrations for a long period.
  - Locations where the ECM3000 is exposed to the direct sunlight.
- Do not use the ECM3000 as a step foothold.
  Doing so might cause damage to the ECM3000 or personal injury.
- Wire the ECM3000 according to electrical wiring standards. Also wire the ECM3000 using specified electric cables according to standard installation methods.Failure to do so might cause trouble or faulty operation.
- The motor may become hot during operation.
  Do not touch the motor opening the cover immediately after turning the power OFF.
  Doing so might cause burn hazard.
- Do not touch any moving part when power ON or during operation. Doing so might cause injury.
- To connect with the linkage, select angular stroke 160˚ motor.
  Failure to do so might cause faulty operation. In the case of 90˚stroke motor, the full open or full close cannot be performed.
- If it is predicted that the safety of the system cannot be kept, fail-safe design such as use of double controllers or installation of limiter, or redundant design must be taken into consideration.
- When you discard the ECM3000, discard it as an industrial waste following rules and regulations stipulated by your local self-governing body.

1. OVERVIEW

The ECM3000 is a control motor designed to control various equipment in the industrial application. Two kinds of models are available: one is angular stroke 90˚ motor for burner control and the other is angular stroke 160˚ motor for valve control of hot and cold water, and steam. Three kinds of control signal input type are available: relay contact, 4 to 20mAdc, and resistance. And three kinds of power supply voltage type are available, 24Vac, 100Vac, and 200Vac. Additionally, a power supply unit applicable to a voltage range of 85 to 264Vac is also available for the 4 to 20mAdc input type. The ECM3000 contains a standard bracket accessory for replacing Yamatake's older motors.

2. MODEL SELECTION GUIDE

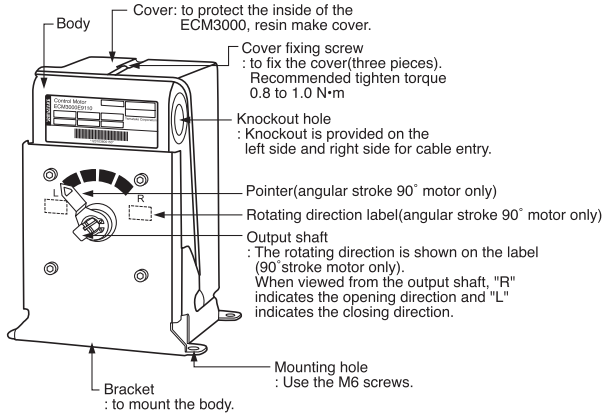
Model No.	Product specifications							Auxilary switch (option)
	Power supply voltage	Control signal input	Anguler stroke	Stroke timing 50Hz	Stroke timing 60Hz	Torque	Remarks	
ECM3000D01✻0 *	24Vac	Relay contact	90˚	39s	33s	12.5N•m	ON-OFF control action	4 switches can be built-in
ECM3000D11✻0 *	100Vac	Relay contact						
ECM3000D21✻0 *	200Vac	Relay contact						
ECM3000E01✻0 *	24Vac	Resistance					Feedback potentiometer built-in	
ECM3000F01✻0 *	24Vac	Relay contact						
ECM3000F11✻0 *	100Vac	Relay contact						
ECM3000F21✻0 *	200Vac	Relay contact						
ECM3000G01✻0 *	24Vac	4 to 20mAdc						
ECM3000G91✻0 *	85 to 264Vac	4 to 20mAdc		39s				
ECM3000F03✻0 *	24Vac	Relay contact		20s	16s	6N•m	High-speed motor type feedback potentiometer built-in	
ECM3000D0200	24Vac	Relay contact	160˚	69s	58s	12.5N•m	ON-OFF control action	None
ECM3000E0200	24Vac	Resistance					Feedback potentiometer built-in	
ECM3000F0200	24Vac	Relay contact						
ECM3000F1200	100Vac	Relay contact						
ECM3000F2200	200Vac	Relay contact						
ECM3000G0200	24Vac	4 to 20mAdc						
ECM3000G9200	85 to 264Vac	4 to 20mAdc		72s				
ECM3000F0400	24Vac	Relay contact		35s	29s	6N•m	High-speed motor type feedback potentiometer built-in	

*An auxiliary switch (4 units) can be built into the angular stroke 90˚ motor by specifying a model No.
Meaning of ✻ in model No. 0: Auxiliary switch is not built-in.
1: 4 auxiliary switches built-in.

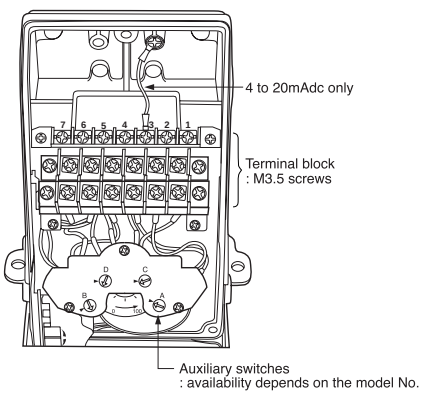
! Handling Precautions

The high-speed motor type must be used within a duty ratio (operation ratio) of 40%.

3. PART NAMES AND FUNCTIONS



!Handling Precautions
• Factory setting of the output shaft: 0% position



4. MOUNTING

■ Mounting locations

Do not install the ECM3000 at locations specified in Safety Precautions.
Additionally, when installing the ECM3000 outdoors, an appropriate protective device, such as protective cover must be installed.

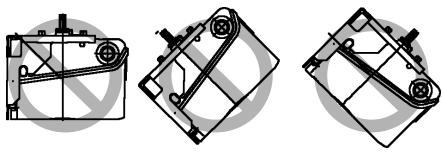
! Handling Precautions

- Pay special attention so that any foreign matter or moisture content does not enter from the output shaft. In an application that the ECM3000 is combined with the control valve, such as fluid control, condensed moisture content is transferred along with the valve and might enter the internals of the motor.

■ Mounting direction

- **Angular stroke 90˚ motor**
  This type can be mounted in a desired direction with its motor output shaft pointing horizontally or vertically upward.

- **Angular stroke 160˚ motor**
  This type can be mounted with a desired direction that the motor with its output shaft placed horizontally.
  Do not mount this type with its motor output shaft pointing vertically upward.



5. WIRING

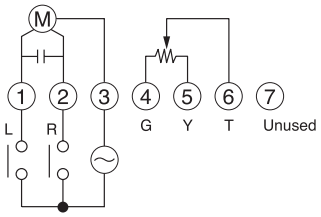
For wiring, open knockout hole (22mm dia.) location on the side panel of the body.
Wiring must be done according to the terminal label indicated on the respective terminals. Connect each core using M3.5 insulated crimp type terminal lugs.

! Handling Precautions

- Do not use unused terminals as relay terminals.
- Always ensure to fix the cover after the wiring.
- Do not lay the power and signal cables together in the same conduit.
- Keep the power line cables 50cm or more away from the signal cables.
- Unavoidably, if the power and signal cables are routed together in the same conduit, it is recommended to use shielded cables for the signal cables as mentioned below.
- Make sure that fragments when a knockout hole is opened, do not enter inside of the control motor.

● **Cables to be used**
Use JIS C3307 600V insulated wire or equivalent for the power line cables. For the signal cables, use JCS4364 instrument cable or equivalent.

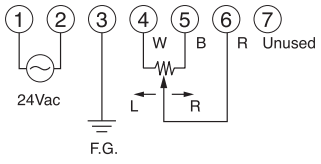
● **Relay contact input (24Vac power supply) (Nominal 135Ω feedback potentiometer)**



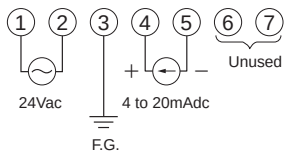
! Handling Precautions

- In case of ON-OFF control action type, terminal Nos. 4, 5, and 6 are not connected.

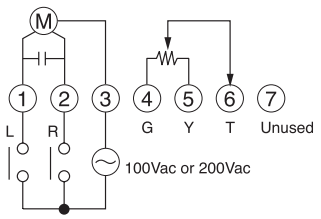
● **Resistance (Nominal 135Ω) input (24Vac power supply)**



● **4 to 20mAdc input (24Vac power supply)**



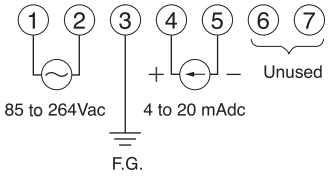
● **Relay contact input (100Vac/200Vac power supply) (Nominal 135Ω feedback potentiometer)**



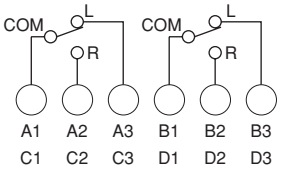
! Handling Precautions

- Connect the power supply voltage according with the model No.
- Set the parameters of the controller, for example derivative time (D) is set to 0 second or dead band is widened, so that the internal relay of the controller does not repeat ON and OFF excessively due to hunting during motor operation.
  If the internal relay operates excessively, the life of the motor or the relay of the controller on the host side might be shortened. If the frequent operation cannot be avoided, an auxiliary relay must be installed between the motor and the controller.

● **4 to 20mA input (85 to 264Vac power supply)**



● **Auxiliary switch (4 units)**



(Note) The internal switch connections are the same as A1 to B3.

6. INSPECTION AND MAINTENANCE

■ Inspection method

Item	Cycle	Method
Appearance check	Once every 6 months	• Check for loose screw • Check the actuator for damage
Running condition	Once every 6 months	• Check for smooth actuator operation • Check for any abnormal noise or vibrations
Daily inspection	As required	• Check for any abnormal noise or vibrations • Check for smooth actuator operation • Check that no hunting occurs in the actuator

■ Maintenance method

Visual check the actuator operation once every six months. If any trouble is found, take corrective actions appropriately.

Symptoms	Check item	Corrective action
• Does not rotate	• The wiring and line break • Power supply voltage	• Check the wiring • Check the power supply voltage
• Stopped during operation	• Loose terminals	• Re-tighten the terminals
• Auxiliary switch does not operate (Model with optional auxiliary switch)	• Auxiliary cam switch status • The wiring status and break down	• Redo the settings • Check the wiring
• Feedback potentiometer does not operate (Model with optional feedback potentiometer)	• potentiometer resistance • The wiring and line break • Loose terminals	• Redo the settings • Check the wiring • Re-tighten the terminals
• Control sensitivity drops • Motor torque drops	• The wiring and line break • Loose terminals • Power supply voltage	• Check the wiring • Re-tighten the terminals • Check the power supply voltage

7. SPECIFICATIONS

■ Specifications

Item	Specifications
Operation mode	ON-OFF or position proportioning (Fixed according to model No.)
Control signal input	Relay contact, 4 to 20mAdc, Nominal 135Ω resistance (Fixed according to model No.)
Nominal value of feedback potentiometer	135Ω
Max. applied voltage of potentiometer	5Vdc
Input impedance	50Ω ± 5%(for 4 to 20mAdc input signal)
Angular stroke	90˚ or 160˚(Fixed according to model No.)
Motor timing	39/33s (Relay contact, angular stroke 90˚ motor, no-load, 50/60Hz) 69/58s (Relay contact, angular stroke 160˚ motor, no-load, 50/60Hz)
Output torque	12.5N•m (High-speed motor type: 6N•m)
Power supply voltage	24Vac, 100Vac, 200Vac, 85 to 264Vac(50/60Hz) (Fixed according to model No.)
Power consumption (During operation)	9VA (Relay contact, resistance type) 14W (4 to 20mAdc, 85 to 264Vac type) 14VA (high-speed motor type)
Standard operating conditions	23± 2˚C, 50± 10%RH
Ambient temperature	-20 to +60˚C
Ambient humidity	5 to 95%RH(non-condensing)
Vibration resistance	4.9m/s^2
Insulation resistance	Between power supply terminals and casing, between input terminals and casing: 5MΩ or more by 500Vdc megger
	Between auxiliary switch terminals and casing: 20MΩ or more by 500Vdc megger
Dielectric strength	Between power supply terminals and casing, between input terminals and casing: 500Vac for 60s (24Vac type), 1200Vac for 60s (100Vac type), 1500Vac for 60s (200Vac type, 85 to 264Vac type).
	Between auxiliary switch terminals and casing: 1500Vac for 60s.
Auxiliary switch (Option)	4 units
Auxiliary switch contact rating	250Vac, 5A (resistive load)
Auxiliary switch position factory setting	Close → Open (A, C):Position of 9˚±5˚ Open → Close (B, D): Position of 81˚±5˚
Setting range of auxiliary switch	Output opening range of 5 to 95%
Protection	Splash-proof structure IP54 or equivalent Waterproof cable gland must be used.
Materials	Case: Die-cast aluminium Cover: Polycarbonate resin with GF Bracket: Steel
Mass	Approx. 3kg

■ Optional parts

Name		Part No.
Crank arm		N-3128
Damper arm		J-26026G-ARM
Valve linkage		Q455C, D
Damper linkage		Q605A, D, E
Base kit for V51E		83165292-001
Extension unit*	Auxiliary switches (4 units built-in)	83165271-004
	Auxiliary potentiometer for 90˚ type	83165272-001
	Auxiliary potentiometer for 160˚ type	83165272-002

* Only one type of extension unit can be mounted on the model without internal auxiliary switch.

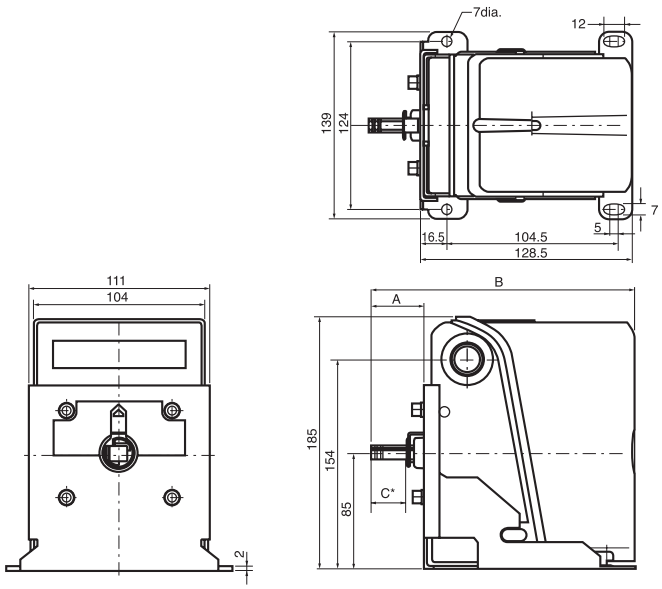
■ Handling Precautions

- The output of the auxiliary potentiometer cannot be connected to the M904E Modutrol motor.

■ External dimensions

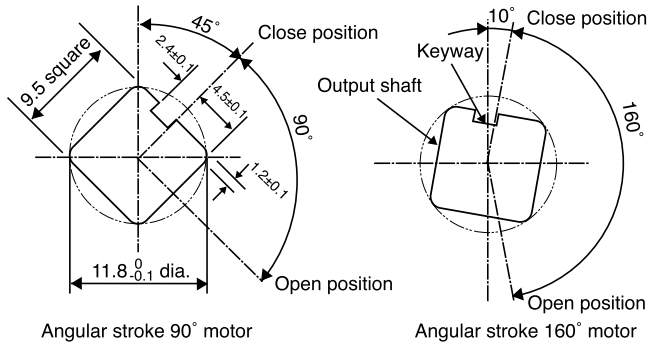
Unit:mm

Angular stroke	A	B	C
90˚ type	32.5	161.6	22
160˚ type	20.5	149.6	12



* Size C shows the length of the output shaft (9.5 square).

● 0% position of the output shaft (view from the output shaft)



Angular stroke 90˚ motor　　Angular stroke 160˚ motor

■ Handling Precautions

- The length of the output shaft may vary depending on the model No.
- The pointer is provided only on the angular stroke 90˚ motor.

YAMATAKE　*Specifications are subject to change without notice.*

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