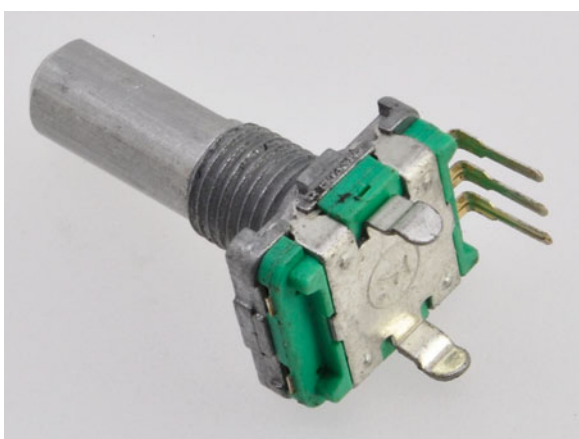


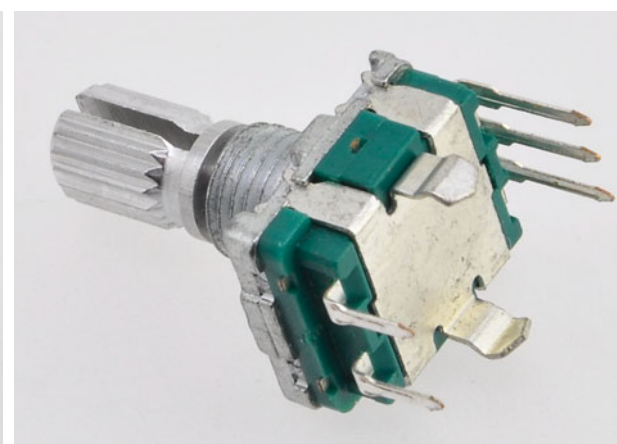
## Encoder



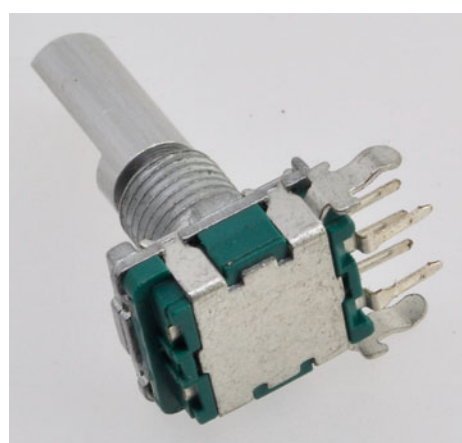
EC11-20cc-10F-S



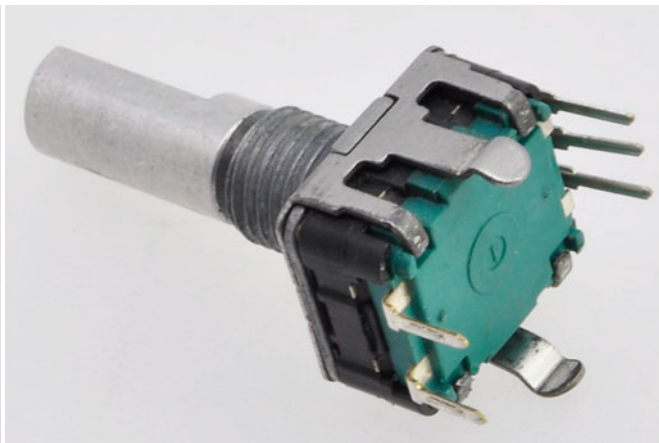
EC11-20F-N



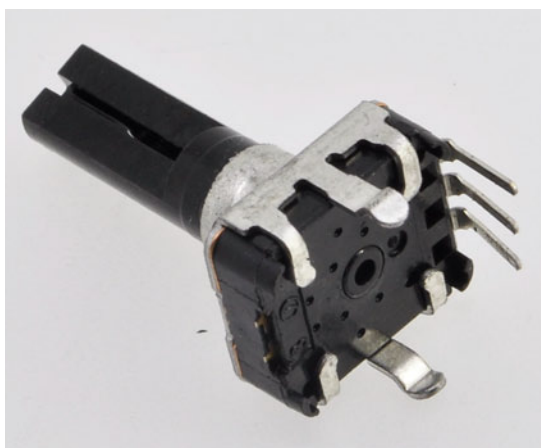
EC11-24cc-15kq-s



EC11-30cc-20F-S



EC12-20cc-20F-S



EC12-20F-N



EC12-24cc-10F-N

## General

### ◆ Scope:

This specification applies to 11mm size low-profile rotary encoder(incremental type)for microscopic current circuits,used in electronic equipment.

### ◆ Standard atmospheric conditions:

Unless otherwise specified,the standard range of atmospheric conditions for making measurements and test is as following limits:

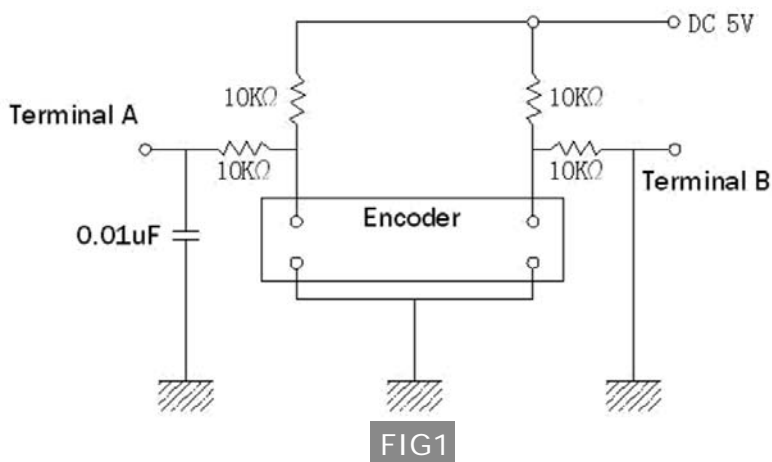
Ambient temperature: 15℃ to 35℃

Relative humidity: 25% to 85%

Air pressure: 86kpa to 106kpa

◆ Operating temperature range: -10℃ to 70℃

◆ Storage temperature range: -40℃ to +85℃



## Application Nots

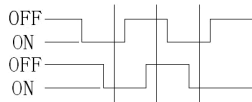
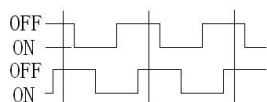
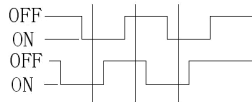
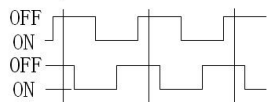
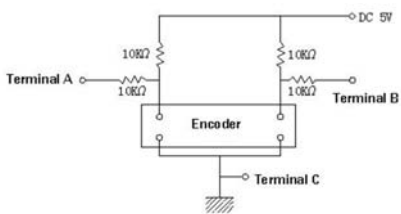
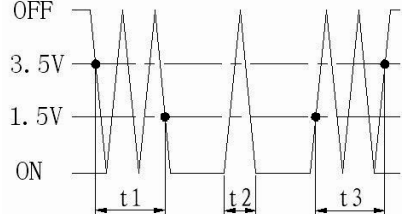
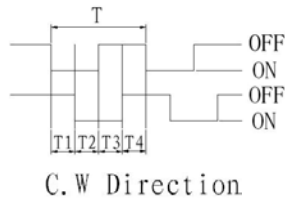
- ◆ Avoid storing the products in a place at high temperature, high humidity and in Corrosive gases. Please use this product as soon as possible with 6 months limitation. If any remainder left after packing is opened, please store it with proper moistureproofing, gasproofing etc.
- ◆ The encoder pulses count method should be designed with taking operating speed, sampling time and design of the microcomputer software into consideration.
- ◆ With this products the detent position output consult fig.5--1. Therefore make the A phase the reference at the software design stage.
- ◆ At design of the pulse count process. Using the C/R filter circuit is Recommended. (fig.1)
- ◆ Care must be taken not to expose this product to water or dew to prevent possible problem in pulses output waveform

## Rating

- ◆ Rated voltage: DC 5V
- ◆ Maximum operating current (resistive load)
  - Each lead: 0.5mA (MAX 5mA; MIN 0.5mA)
  - Common lead: 1mA (MAX 10mA; MIN 0.5mA)

## Application Nots

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ITEM	CONDITIONS		SPECIFICATIONS	
Output signal format	2 phawe different signals(signal A,signal B)Details shown in(fig.2/3)(the broken line shows detent position.)			
	Shaft rotati-onal direction	Signal	Output	
	C.W	A(Terminal A-C)		
		B(Terminal B-C)		
	C.C.W	A(Terminal A-C)		
		B(Terminal B-C)		
		fig.2	fig.3	
Resolution	Number of pulses in 360° rotation.		15Pulsrs/360° fig2 for each phase	
			20Pulsrs/360° fig2 for each phase	
Switching characteristics	Measureent shall be made under the condition aw follows. Shaft rotational speed:360°/S Test circuit:(fig.4)			
	(fig.4)		(fig.5)	
				
	Code-OFF area:The area which the voltage is 3.5V or more(fig.5)			
	Code-ON area:The area which the voltage is 1.5V or less(fig.5)			
Chattering	Specified by the signal' spassage time from 1.5V to 3.5V of each switching position(code OFF~ON or ON~OFF)		t1,t3≤5ms	
Sliding noise (Bounce)	Specified by the time of voltage change exceed 1.5V in code-ON area. when the bounce has code-ON tie sess than 1ms between chattering (t1 or t3).the voltage change shall be regarded aw a part of chattering. when the code-ON time between 2 bounces is less than 1ms.they are regarded as 1 linded bounce.		t2≤3ms	
Sliding noise	The voltage change in code-OFF area.		3.5V min	
Phase difference	Measurement shall be made under the condetion which the shaft is rotated at 60r/min		T1、T2、T3、T4≥4ms (fig.6)	
	signal A	fig.6		
	signalB			
Insulation resistance	Measurement shall be made under the condition which a voltage of 250V DC is applied between individual terminals and bushing.		100MΩ Min	
Dielectric strength	A voltage of 300V AC shall be applied for 1 minute between individual terinals and bushing		Without arcing or breakdown	
Contact resistance	Measurement shall be stalbe condition which a output signal is ON.		1Ω Max	

## Mechanical characteristics

Total rotational angle		360°(Endless)
Detent torque	Only suitable for C.C. equipment.	3~20mN.m(30~200gf.cm) Shaft rotatable at -10°C +5°C
Number of detent and position	Only suitable for C.C. equipment.	30 detents (Step angle: 12°±2°) 20 detents (Step angle: 18°±2°)
Push-pull strength of shaft	Push and pull static load of 8Kg shall be applied to the shaft in the axial direction for 10s. (After soldering of the PC board)	Without damage or excessive play in shaft. NO excessive abnormality in rotational feeling. And electrical characteristics shall be satisfied.
Shaft wobble	A momentary load of 50mN.m(500gf.cm) shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft.	Distance between mounting surface and measuring point on the shaft

## Endurance characteristics

Rotational life	The shaft of encoder shall be rotated to 30000 cycles at a speed of 600cycles/H without electrical load, after which measurements shall be made.	Contact resistance 200Ω MAX Vibration t1, t3 ≤ 5mS t1, t3 ≤ 5mS Bounce t2 ≤ 5mS t2 ≤ 5mS Detent feeling has to remain
Damp heat	The encoder shall be stored at temperature of 40±2°C with relative humidity of 90% to 95% for 48H in a thermostatic chamber. And the encoder shall be subjected to standard atmospheric conditions for 1.5H. After which measurements shall be made.	Specifications in clause all items shall be satisfied.
Dry heat	The encoder shall be stored at temperature of 80±3°C for 48H in a thermostatic chamber. And the encoder shall be subjected to standard atmospheric conditions for 1.5H. After which measurements shall be made.	Specifications in clause all items shall be satisfied.
Cold	The encoder shall be stored at temperature of -25°C±3°C for 48H in a thermostatic chamber. And the encoder shall be subjected to standard atmospheric conditions for 1.5H. After which measurements shall be made.	Specifications in clause all items shall be satisfied.
Solder ability	The terminals shall be immersed into solder bath at 235°C for 3±0.3s in the same manner as para.	A new uniform coating of solder shall cover 75% minimum of the surface being immersed.
Resistance to Soldering heat	Soldering temperature: 300°C less than application time of soldering iron: within 3s Printed wiring board: single-sided copper clad laminate board with thickness of 1.6mm.	Electrical characteristics shall be satisfied No mechanical abnormality



Item		EC10	EC11	EC12	EC16	EC22
Mechanical characteristics	Operatign Temperature	-5℃~ +35℃	-10℃~ +70℃			-10℃~ +60℃
	Total Rotational Angle	360℃				
	Operating Torque Force	20~ 80gf.cm	30~ 200gf.cm (Without starting torque)			
	Push-Pull Strength	≥0.5kgf.cm	≥5.0kgf.cm			≥4kgf.cm
Electrical characteristics	Power Rating	DC 5V 1mA	DC 5V 10mA	DC 5V 0.5mA		
	Im insulation Resistance	≤50MΩ at DC 50V 1 Minute	≤100MΩ at DC 300V 1 Minute	≤10MΩ at DC 50V 1 Minute		
	Withstand Voltage	1minute at AC 300V	1minute at AC 50V	1minute at AC 50V		
	Phase difference	ΔT=0.15T	ΔT=0.25T	ΔT=0.15T ΔT=0.25T	ΔT=0.15T ΔT=0.25T	ΔT=0.25T
Durability	Rotational Life	100,000 Cycles	30,000 Cycles			
Environmental characteristics	Cole	-20±3℃ for 96h				
	Dry heat	85±2℃ for 96h				
	Damp heat	40±2℃, 90-95%RH for 96h				
Resistance to soldering heat	Manual soldering	300℃ max. 3s max.				
	Manual soldering	260℃ max. 3s max.				
Push-on switch Specifications	Switch circuit	/	SPST		/	/
	Ttatel of witch	/	0.5±0.1mm 1.5±0.5mm	0.5±0.1mm	/	/
	Operation fore of switch	/	200~800gf.cm		/	/
	Contact resistance	/	100m For initial period;200m Ω After rotational life.		/	/