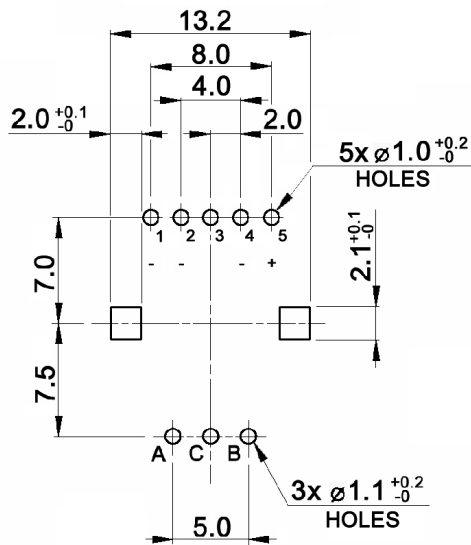
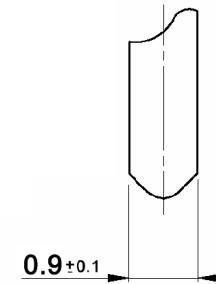


h	LM	LT
20	20.3	13.0
25	25.3	18.0

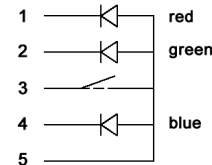
P.C.B. MOUNTING
(TOLERANCE ±0.1)
VIEWED FROM MOUNTING SIDE
t=1.4mm



TERMINAL DETAIL



CIRCUIT DIAGRAM



Compliance: RohS III (2015/863/EU)

Tolerances: ≤10: ±0.3mm 10-100: ±0.5mm		Date	Name	MERP12-242hM	
		12/09	dr		
Case height	06/22	dr	knitter-switch		30 19 83
Revised	10/12	dr			
Output signal format	03/11	dr			
LED specification	01/11	dr			
Modifications	Date	Name			Page
					1/11

General

1.1 Application : This specification applies to the 12mm size rotary encoder (incremental) for microscopic current circuits used in electronic equipment.

1.2 Standard atmospheric conditions

Unless otherwise specified the standard range of atmospheric conditions for making measurements and tests is as follows :

- Ambient temperature : 15°C to 35°C
- Relative humidity : 25% to 85%
- Air pressure : 86kpa to 106kpa

If there is any doubt the results, measurement shall be made within the follow limits :

- Ambient temperature : 20°C±2°C
- Relative humidity : 60% to 70%
- Air pressure : 86kpa to 106kpa

1.3 Operating temperature range : -10°C to +65°C

1.4 Storage temperature range : -40°C to +85°C

1.5 Construction and dimensions : Refer to attached drawing.

1.6 Rating

1.6.1 Rated voltage : D.C 5V

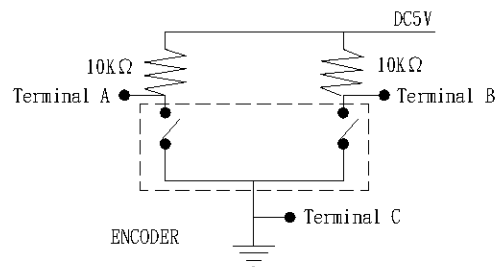
1.6.2 Operating current (resistive load)
Each bit : 0.5mA

Electrical characteristics

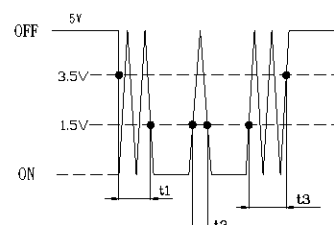
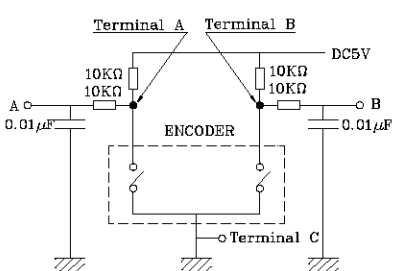
NO.	Items	Test conditions	Specifications
2.1	Resolution	Number of pulses in 360° rotation.	24 pulses / 360° for each phase. (1 click 1 pulse)

					<i>NOTE</i>	APPD	CHKD	DSDG
						2009/08/28	2009/08/28	2009/08/28
SYMB	DATE	APPD	CHKD	DSGD		KSD	KSD	KSD

NO.	Items	Test conditions	Specifications	
2.2	Output signal format		2 Phase-different signals (Signal A. & signal B) Details shown in <fig.1>. (The broken line shows detent position of with-detent type.)	
		<fig.1>		
		Shaft rotational direction	Signal	Output 360° constant speed: 360°
		C. W.	A (Terminal A-C)	
			B (Terminal B-C)	
C. C. W.	A (Terminal A-C)			
	B (Terminal B-C)			
2.3	Switching characteristics	Measurement shall be made under the condition as follows. (1) Shaft rotational speed : 360°/S (2) Test circuit : <fig.2> <fig.2>		



					NOTE	APPD	CHKD	DSGD
						2009/08/28	2009/08/28	2009/08/28
						KSD	KSD	KSD
SYMB	DATE	APPD	CHKD	DSGD				

NO.	Items	Test conditions	Specifications
2.4	Sliding Noise	<p>Details shown in <fig.3>. Specified by the signal's passage time from 3.5V to 1.5V or from 1.5V to 3.5V of each switching position (code OFF →ON or ON→OFF).</p> <p>Note : To avoid chattering (t1,t3), please consider masking time and adding C/R filters on your circuit for pulse count design, as show in <fig.4></p>	$t1 \cdot t3 \leq 3ms$
		<p>Details shown in <fig.3>. Specified by the time of voltage change exceed 1.5V in code-ON area. When the bounce has code-ON time less than 1 ms between chattering (t1 or t3), the voltage change shall be regarded as a part of chattering. When the code-ON time between 2 bounces is less than 1 ms. they are regarded as 1 linked bounce.</p>	$t2 \leq 2ms$
		Sliding noise	3.5V (MIN)
		The voltage change in code-OFF area.	
		<p><fig. 3></p>  <p>(t1,t3) : Masking time to avoid chattering.</p> <p>Code-OFF area : The area which the voltage is 3.5V or more. Code-ON area : The area which the voltage is 1.5V or less.</p>	<p><fig. 4></p> 

					NOTE	APPD	CHKD	DSDG
						2009/08/28 KSD	2009/08/28 KSD	2009/08/28 KSD
SYMB	DATE	APPD	CHKD	DSGD				

NO.	Items	Test conditions	Specifications
2.5	Phase-difference	<p>Measurement shall be made under the condition which the shaft is rotated in 360°/S (constant speed).</p> <p><fig.5></p> <p>Rotational direction →</p>	<p>in <fig.5> $\Delta T \geq 3.5 \text{ msec}$</p>
		<p>※The test is conducted with equipment at constant speed : 360°/S according to Spec. Item 2.4 & 2.5, and the test result could be different from the result by manual test.</p> <p>※In order to prove the interoperability between the firmware and the encoder, please test the part in real condition.</p>	
2.6	Insulation resistance	Measurement shall be made under the condition which a voltage of 250V D.C. is applied between individual terminals and attaching plate.	Between individual terminals and attaching plate : 100MΩ MIN.
2.7	Dielectric strength	A voltage of 300V A.C. shall be applied for 1 min or a voltage of 360V A.C. shall be applied for 2 sec between individual terminals and attaching plate. (Leak current : 1mA)	Without damage to parts arcing or breakdown.

					NOTE	APPD	CHKD	DSDG
						2009/08/28 KSD	2009/08/28 KSD	2009/08/28 KSD
SYMB	DATE	APPD	CHKD	DSGD				

Mechanical characteristics

NO.	Items	Test conditions	Specifications
3.1	Total rotational angle		360°(Endless)
3.2	Detent torque		30~200gf.cm
3.3	Number and position of detents.		24 detents (Step angle : 15°±3°)
3.4	Terminal strength	A static load of 300gf be applied to the tip of terminals for 1 minute in any direction.	Without damage or excessive Looseness of terminals. Terminal bend is permitted
3.5	Push-pull strength of shaft	Push and pull static load of 5Kgf shall be applied to the shaft in the axial direction for 10 sec. (After installing)	Without damage or Excessive play in shaft. No excessive abnormality in rotational feeling.
3.6	Shaft wobble	A momentary load of 500gf.cm shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft.	1.0xL/30 mmp-p (MAX) L : Shaft length.
3.7	Side thrust strength of shaft	A load of 2Kgf shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft. (After soldering of the PC board)	Without damage or Excessive play in shaft. No excessive abnormality in rotational feeling.
3.8	Rotation play at the click position	Measurement with jig for rotational angle.	(MAX)

					NOTE	APPD	CHKD	DSDG
						2009/08/28 KSD	2009/08/28 KSD	2009/08/28 KSD
SYMB	DATE	APPD	CHKD	DSGD				

12mm ROTATIONAL WITH SWITCH ENCODER SPECIFICATION

DOCUMENT NO.	Rev	PAGE
	1.1	7/11

Endurance characteristics

NO.	Items	Test conditions	Specifications
4.1	Rotational life	The shaft of encoder shall be rotated to 30,000 cycles at a speed of 600~1000 cycles per hour without electrical load, after which measurement shall be made. (1 cycle : rotate 360° C.C.W. rotate 360° C.W.)	Chattering: $t1, t3 \leq 5ms$ Bounce: $t2 \leq 3ms$ Phase-difference: $\Delta T \geq 2.5msec$ Detent feeling has to remain. (Applied for detent type) Except above items, specifications in clause 2.1~7 and 3.1~8 shall be satisfied.

					<i>NOTE</i>	APPD	CHKD	DSDG
						2009/08/28 KSD	2009/08/28 KSD	2009/08/28 KSD
SYMB	DATE	APPD	CHKD	DSGD				

Soldering condition

NO.	Items	Test conditions	Specifications
5.1	Manual soldering	Bit temperature of soldering iron : 350°C or less Application time of soldering iron : within 3s.	There shall be no deformation or cracks in molded part. No excessive abnormality in rotational feeling.
5.2	Dip soldering	Printed wiring board : Both-sided copper clad laminate board with thickness of 1.6mm. Flux : *Specific gravity: 0.82 or more. *Flux shall be applied to the board using a bubble foaming type fluxed. *The board shall be soaked in the flux bubble only to the 2/3 of its thickness. Preheating : *Surface temperature of board : 100°C or less. *Preheating time: within 2 min. Soldering : *Solder temperature : 260±5°C *Immersion time : 5±1 sec. Apply the above soldering process for 1 or 2 times.	There shall be no deformation or cracks in molded part. No excessive abnormality in rotational feeling.

					NOTE	APPD	CHKD	DSDG
						2009/08/28 KSD	2009/08/28 KSD	2009/08/28 KSD
SYMB	DATE	APPD	CHKD	DSGD				

12mm ROTATIONAL WITH SWITCH ENCODER SPECIFICATION

DOCUMENT NO.	Rev	PAGE
	1.1	9/11

Switch Electrical characteristics

NO.	Items	Test conditions	Specifications
6.1	Contact resistance	Measured by decides the electric current D.C. voltage drop method.	100 mΩ (MAX)
6.2	Chattering	Switch is operated at the rate of 1 cycle 1 sec. The 1 cycle shall be OFF-ON-OFF.	10 msec (MAX)
6.3	Insulation resistance	Measurement shall be made under the condition which a voltage of 250V D.C. is applied between individual terminals and attaching plate.	Between individual terminals and attaching plate : 100MΩ MIN.
6.4	Dielectric strength	A voltage of 300V A.C. shall be applied for 1 min or a voltage of 360V A.C. shall be applied for 2 sec between individual terminals and attaching plate. (Leak current : 1mA)	Without damage to parts arcing or breakdown.
6.5	Switch rating (Resistor load)		D.C. 5V 10mA (1mA MIN)
Note : Shaft is insulated from switch terminal.			

					<i>NOTE</i>	APPD	CHKD	DSDG
						2009/08/28 KSD	2009/08/28 KSD	2009/08/28 KSD
SYMB	DATE	APPD	CHKD	DSGD				

12mm ROTATIONAL WITH SWITCH ENCODER SPECIFICATION

DOCUMENT NO.	Rev	PAGE
	1.1	10/11

Switch Mechanical characteristics

NO.	Items	Test conditions	Specifications
7.1	Contact arrangement		S. P. S. T (PUSH ON)
7.2	Switching stroke		0.5 (+0/-0.3) mm
7.3	Switch strength		450±200 gf

Switch Endurance characteristics

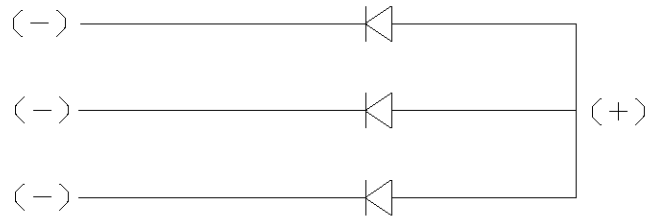
NO.	Items	Test conditions	Specifications
8.1	Operating life	The shaft of switch shall be 20,000 times without electronically load, after which measurements shall be made.	Switch contact resistance : 200mΩ MAX. Switch strength : Relative to the previously specified value +10%/-30%. Except above items Specification in clause 6.1~4 and 7.1~3 shall be satisfied.

					<i>NOTE</i>	APPD	CHKD	DSDG
						2009/08/28 KSD	2009/08/28 KSD	2009/08/28 KSD
SYMB	DATE	APPD	CHKD	DSGD				

L. E. D. COMMON SPECIFICATIONS

DOCUMENT NO.	Rev	PAGE
		11/11

Circuit :



L. E. D. Characteristic :

1. Reverse Voltage : 5V
2. Operating Temperature : -40°C~+85°C
- 3.

Emitted color		Power dissipation (mW)	DC Forward Current (mA)	Test conditions IF=20 mA	
				Forward voltage (V)	
				Typ	MAX
Red/Green/Blue	Red	60	25	2.0	2.4
	Green	110	25	3.3	3.7
	Blue	110	25	3.3	3.7

SYMB	DATE	APPD	CHKD	DSGD	NOTE	APPD	CHKD	DSGD	
							2009/12/14	2009/12/14	2009/12/14