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Attention:

Your ref. No.:

Your Part No.: EC12E1224201

## SPECIFICATIONS

ALPS';

MODEL: EC12E1224201

Spec. No.:

Sample No.: F 3 5 1 7 2 1 3 M

### RECEIPT STATUS

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**ALPS**<sup>®</sup>  
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B6523

Q1003#03A (EA)

# S P E C I F I C A T I O N S

1. THIS SPECIFICATIONS APPLY TO EC12E1224201 ROTARY ENCODERS.

2. CONTENTS OF THIS SPECIFICATIONS.

F3517213M

LE21240L

3. MARKING

- MARKING ON ALL UNITS  
DATE CODE

## • CAUTION

Regardless of the suggested applications of these products being introduced in the specifications, when using them for equipment and devices requiring a high degree of safety, respective manufacturers will please preserve safety of the planned equipment and devices by providing necessary protective circuits and redundancy circuits and reconfirm if safety is being duly preserved.

Products being introduced in the specifications have been designed and manufactured for applications to ordinary electronic equipment and devices such as the AV equipment, electric home appliances, office machines and communications equipment. Consequently, when employing these products for applications requiring a high degree of safety and reliability such as the medical equipment, aviation and aircraft equipment, space equipment and burglar alarm equipment, the using manufacturers will please thoroughly study the proprieties of these products for the planned applications.

Although we are exerting our best efforts to maintain the quality of these products, we cannot guarantee that they will never cause short circuiting and open circuitry. Therefore, when designing an equipment or device with which the priority is given to the safety, you will please carefully study the influences to the whole equipment of a single function failure of Potentiometers and Encoders in advance to make out a fail-safe design providing.

4. 電氣特性 Electrical characteristics

項目 Item	条件 Conditions	規格 Specifications
4-1 出力信号 Output signal format		A. B2信号の振幅は出力とし、標準出力 <fig. 1>の通りとする。 B. クリック時の高周波クリックの発生は、 A. 項目はOFFの文字を指定すること B. 項目は指定せず。(標準出力クリック発生 時の高周波クリックを指す。 2. Pulse-different signals (Signals, signals) Details shown in fig. 1. The output position will be specified by the A. pulse and B. pulse has no specific position. (The broken line shows output position of with-debait type.)
4-2 分解能 Resolution	回転方向 C. C. W. 直進方向 C. C. W.	1. 回転方向出力は、パルス Number of pulses in 360° rotation 2. 直進方向出力は、パルス Number of pulses in 360° translation
4-3 Zノイズ特性 Switching characteristics		<fig. 2> DC5V 10kΩ 10kΩ Terminal A Terminal B Encoder Terminal C t <sub>1</sub> t <sub>2</sub> t <sub>3</sub> <fig. 3> OFF 3.5V 1.5V ON t <sub>1</sub> t <sub>2</sub> t <sub>3</sub>
1) チャタリング Chattering		(注) コーデン : 出力電圧が1.5V以上の状態を指す。 コーデOFF状態 : 出力電圧が3.5V以上の状態を指す。 (note) CODE-ON area : The area which the voltage is 1.5V or more. CODE-OFF area : The area which the voltage is 3.5V or more. t <sub>1</sub> t <sub>2</sub> t <sub>3</sub> 3ms コードOFF-ONとON-OFFの時間、出力は、5V-3.5Vの範囲で指定する。 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). t <sub>1</sub> t <sub>2</sub> t <sub>3</sub> 3ms コードOFF-ONとON-OFFの時間、出力は、5V-3.5Vの範囲で指定する。 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).

SYMB	DATE	APPD.	CHKD.	DSGD.	
APPD.	CHKD.	DSGD.	TITLE		
Apr. 22, '99	Apr. 22, '99	Apr. 22, '99	1.2 移回転数エコーダ		
K. ITO			Y. KANZAKI H. MIURA		
F 3517213M			DOCUMENT NO.		
			F 3517213M		
			(2/9)		

1. 一般事項  
1-1 適用範囲 Scope  
この装置は主に電子機器に用いられる標準的な12桁のロータリエンコーダ(インクリメンタル型)の  
microscopic current circuits used in electronic equipment.

1-2 標準状態 Standard atmospheric conditions  
測定は標準状態で行われ、次の状態で示す。  
Unless otherwise specified, the standard range of atmospheric conditions for making measurements  
and tests is as follows:  
温度 Ambient temperature : 15°C to 35°C  
相対湿度 Relative humidity : 25% to 85%  
気圧 Air pressure : 86kPa to 106kPa  
もし、異なる標準状態を必要とする場合は、次の結果は保証されません。  
If there is any doubt about the results measurements shall be made within the following limits:  
温度 Ambient temperature : 20 ± 1°C  
相対湿度 Relative humidity : 63% to 87%  
気圧 Air pressure : 86kPa to 106kPa

1-3 動作温度範囲 Operating temperature range : -10°C to +70°C  
1-4 保存温度範囲 Storage temperature range : -40°C to +85°C

2. 構造  
2-1 寸法 Dimensions  
詳細は別図を参照してください。  
Refer to attached drawing

3. 定格  
3-1 定格電圧 Rated voltage : D.C. 5V  
3-2 動作電流 (抵抗性負荷) Operating current (resistive load)  
コモン-1 各端子間 : 0.5mA (MAX 5mA, MIN 0.5mA)  
コモン-2 共通端子間 : 1mA (MAX 10mA, MIN 0.5mA)

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項目 Item	条件 Conditions	規格 Specifications
2) 音ノイズ (ノイズ) Silding noise (Bounce)	コードONのとき、5V以上の電圧変動を認め、チャタリング $t_1$ 、 $t_2$ の間の電圧変動は1ms以上の $t_2$ と、 $t_1$ の間の電圧変動は1msと規定する。 Specified by the time of voltage change exceed 1.5V in code-ON area. When the bounce has code-ON time less than $t_1$ ms between chatterings ( $t_1$ or $t_2$ ), the voltage change shall be regarded as a part of chatter ing. When the code-ON time between 2 bounces is less than $t_1$ ms, they are regarded as 1 linked bounce.	$t_2 \geq 1ms$ $t_1 \geq 1ms$
3) 音ノイズ Sliding noise	コードOFFの時の電圧変動 the voltage change in code-OFF area.	3.5V以上 3.5V MIN
4-4) 電気的 Dielectric strength	電子-電極間電圧A. C. 50V/1分間維持する。(1-9ノイズ) (mA) A voltage of 50V A.C. shall be applied for 1min between individual terminals and bracket. (Leak current 1mA)	絶縁破壊のないこと。 Without arcing or breakdown.
4-5) 絶縁抵抗 Insulation resistance	電子-電極間電圧D. C. 50Vの間隔する。 Measurement shall be made under the condition which a voltage of 50V D.C. is applied between individual terminals and bracket.	電子-電極間電圧で10MΩ以上 between individual terminals and bracket: 10MΩ MIN
4-6) 位相差 Phase-difference	定速で動作を回転する。 shaft is rotated in constant speed <Fig. 4> 回転方向 CW A信号 (A-C) 信号 Signal A B信号 (B-C) 信号 Signal B 回転方向 CCW A信号 (A-C) 信号 Signal A B信号 (B-C) 信号 Signal B	$\Delta T = 0.08T$ 以上 Incl. 4

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APPD.	CHKD.	DSGD.	TITLE
Apr. 22, '99	Apr. 22, '99	Apr. 22, '99	1.2 形回転スイッチ 12mm Size Rotary encoder
K. ITO Y. KAWAZAKI H. MIURA			DOCUMENT NO.
			F 3517213M

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項目 Item	条件 Conditions	規格 Specifications
5-1) 全回転角度 Total rotational angle		360° (エンドレス) 360° (Endless)
5-2) リリキトルク Detent torque	(リリキ付の型番) (Applied for with-detent type)	3~20mN·m 軸心、-10° C ~ +15° C では、軸が回転する。 Shaft rotatable at -10° C ~ +15° C.
5-3) リリキ位置及び位置 Number and position of detents.		12 位置 12 detents (ステップ角 30° ± 3°) (Step angle: 30° ± 3°)
5-4) 軸の押し引き強度 Push-pull strength of shaft	軸の押し引き方向に250mNの静荷重を10秒間加える。(PCB半田付け時) Push and pull static load of 50N shall be applied to the shaft in the axial direction for 10s. (After soldering of the PC board)	軸の破損、歪み、回転不良、ノイズ等 Without damage to, or excessive play in shaft abnormality in rotational. Tel. ing. And electrical characteristics shall be satisfied.
5-5) 端子強度 Terminal strength	端子強度の試験の一方向に23Nの静荷重を10秒間加える。 A static load of 23N shall be applied to the tip of terminals for 10s in any direction.	歪み、破損、軸の破損等を生じないこと。 Without excessive play in terminals or poor contact.
5-6) 軸の揺れ Shaft wobble	軸先端から55mmの位置に50mN・mのモーメントを加える。 A momentary load of 50mN·m shall be applied at the point 5mm from the tip of the shaft in a direction perpendicular to the axis of shaft.	1. 0.1/30mmp-p以内 1. 0d/30mmp-p MAX. (Lは軸長に等しい。) (L: Shaft length)
5-7) 軸の推力強度 Shaft thrust strength	軸先端から55mmの位置に20Nの静荷重を10秒間加える。(PCB半田付け時) A load of 20N 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)	歪み、破損、軸の破損等を生じないこと。 Without excessive play or bending in shaft. No mechanical abnormality.
5-8) 軸の回転方向の揺れ Shaft play in rotational wobble	角速度計で測定する。 Measure with Jig for rotational angle	4° 以内 4° MAX

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6. 耐久試験 Endurance characteristics.

項目 Item	条件 Conditions	規格 Specifications
6-1 回転寿命 Rotational life	最高稼働速度600~1000/Hの範囲で、30,000回回転試験動作を行う。 The shaft of encoder shall be rotated to 30,000 cycles at a speed of 600-1000/H without electrical load, after which measurements shall be made.	チャタリング t <sub>c</sub> ≤ 5ms バウンス t <sub>b</sub> ≤ 3ms Chattering t <sub>c</sub> ≤ 5ms Bounce t <sub>b</sub> ≤ 3ms クリップ幅が落ちていないこと。 detent. Feelling has to remain.
6-2 湿度熱 Damp heat	湿度40±2°C、湿度90~95%の範囲で240±10時間稼働。常温、常温中1.5時間静止する。 The encoder shall be stored at a temperature of 40±2°C with relative humidity of 90% to 95% for 240±10H in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5h, after which measurement shall be made.	規格書(4.1~4.5及び5.1)を満足すること。 Specifications in Clause 4.1-4.5 and 5.1 shall be satisfied.
6-3 乾燥熱 Dry heat	湿度85±3°Cの範囲で240±10時間稼働。常温、常温中1.5時間静止する。 The encoder shall be stored at a temperature of 85±3°C for 240±10H in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5h, after which measurements shall be made.	
6-4 低温熱 Cold	湿度-40±3°Cの範囲で240±10時間稼働。常温、常温中1.5時間静止する。 The encoder shall be stored at a temperature of -40±3°C for 240±10H in a thermostatic chamber. And then the encoder shall be subjected to standard atmospheric conditions for 1.5h, after which measurement shall be made.	
6-5 落下 Free falling	60cmの高さより任意の方向が5ビニールを穿つコッククリトの高さに自由落下させる。 The encoder shall be fallen freely at any posture from 60cm height to the concrete floor covered with vinyl-tile, after which measurement shall be made.	細かい凹傷、破損等が無く管理層(4.1~4.5及び5.1)を満足すること。 (但し、端子部の劣化は除く) No excessive deformation or damage. (Except the deformation of terminals.) And specifications in Clause 4.1-4.5 and 5.1 shall be satisfied.
6-6 振動 Vibration	10~55~10HZと書き交る範囲(1周長4分/幅1.5mm)をX、Y、Z各方向2周回転させる。 The following vibration shall be applied to the encoder, after which measurement shall be made: The entire frequency range, from 10HZ to 55HZ and return to 10HZ, shall be traversed in 1 min. AMPLITUDE(total excursion): 1.5mm. This motion shall be applied for a period of 2H in each of 3 mutually perpendicular axes (A total of 6H).	規格書(4.1~4.5及び5.1)を満足すること。 Specifications in Clause 4.1-4.5 and 5.1 shall be satisfied.

7. 品質保証  
Specified by the clause 7 "Soldering conditions".

項目 Item	条件 Conditions	規格 Specifications
7-1 溶接抵抗 Resistance to soldering heat	7.1の"溶接条件"に記述されているように、溶接作業を行う。 Specified by the clause 7 "Soldering conditions".	電気的性質に異常は生じないこと。 Eiectrical characteristics shall be satisfied. 機械的異常(過度の歪み、剥離、破損等)が生じないこと。 No mechanical abnormality such as a excessive play, abnormality in soldering, etc. 新しい均一な塗装が形成されること。 A new uniform coating of solder shall cover a minimum of 95% of the surface being immersed.

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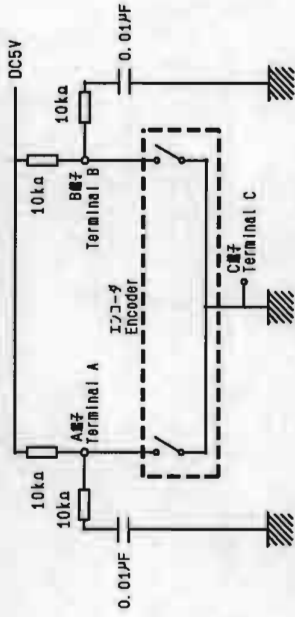
SYMB	DATE	APPD	CHKD	DSGD	TITLE	DOCUMENT NO.
		APPD.	CHKD.	DSGD.	12 形回転エンコーダ 12mm Size Rotary encoder	F 3517213M
		Apr. 22, '99	Apr. 22, '99	Apr. 22, '99		(5/9)
		K. ITO	Y. KANZAKI	H. MIURA		



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9. その昔、取扱い上の注意 PRECAUTIONS IN USE

- 9-1. 保管は高温、多湿の場所及び腐食性ガス中を避けて下さい。  
During operation, storage in high temperature and humidity, and in corrosive gas, should be avoided
- 9-2. エンコーダの「A」相のカウント基準の遅延は高周波動作モード、サンプリングタイム、マスクングタイム等にて注意し、実装時の上書きを避けて下さい。  
In case of pulse count process design, operational speed, sampling time, and masking time etc should be taken into the consideration.  
Please check above matter at first on your circuit for the secure reason.
- 9-3. 本製品はクリアリットル位置でA相はOFF状態で空転させ、ソリッドステート基準で調整します。  
A phase should be design criterion prior to B phase.  
Because A phase has steady off signal at detent position.
- 9-4. エンコーダの「0」相のカウント基準の遅延は高周波動作モードを避けて下さい。  
For your pulse count design, it should be considered to add C/R filter on your circuit shown as below.



- 9-5. 本製品の本体に直書き水分が分かります。小の水分蒸発現象が発生する可能性があります。製品に直書き水分が分らないよう配慮願います。  
Care must be taken not to expose this product to water or dew to prevent possible problem in pulse output wave form.
- 9-6. 医療用器械、器具への本製品の設置は避けて下さい。  
Please avoid to medical instrument because this encoder is audio use.  
Consideration to provide protective guard for knob is highly recommended to avoid side pressure to the shaft.
- 9-7. 本製品は衝撃及び過度の清掃の力が加わります。製品性能を減らす恐れがあります。あらかじめつまみボタンを避ける等の配慮をお願いします。  
Consideration to provide protective guard for knob is highly recommended to avoid side pressure to the shaft.
- 9-8. 本製品は衝撃及び過度の清掃の力が加わります。製品性能を減らす恐れがあります。過度の衝撃、力による製品性能を減らす恐れがあります。過度の衝撃、力による製品性能を減らす恐れがあります。過度の衝撃、力による製品性能を減らす恐れがあります。  
Excessive impact, force may decrease the performance of this product. Please pay attention to impact force.

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7. soldering conditions Manual soldering

7-1 半田ごとの場合 Manual soldering  
温度350°C以下、時間3分以内  
Bit temperature of soldering iron : 350°C or less.  
Application time of soldering iron : within 3s.

7-2 チップごとの場合 Dip soldering  
チップ長さ: t1.6以内  
Printed wiring board: Single-sided copper clad laminate board with thickness of 1.6mm.

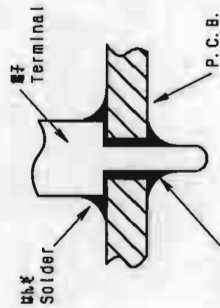
フラックス : 比重0.82以上のフラックスを用いた塗布剤で塗布し、塗布剤の厚さを調整し、チップと基板の間にフラックスの浸入を防ぐこと。  
Flux:  
- Specific gravity: 0.82 or more.  
- Flux shall be applied to the board using a bubble foaming type fluxer.  
- The board shall be soaked in the flux bubble only to the middle of its thickness.  
- Flux shall not come into contact with the component side surface.

プリヒート : 温度260°C以下、時間1分以内  
Preheat ing:  
- Surface temperature of board: 100°C or less.  
- Preheating time: within 1 min.

はんだ : 温度260°C±5°C、時間3分±1分以内  
Soldering:  
- Solder temperature: 260°C ±5°C.  
- Immersion time: within 3min

以上の工程を1回または2回繰り返す。  
Apply the above soldering process for 1 or 2 times.  
8. はんだ付け時の注意事項 Note for soldering method.

8-1 上層のP.C.B.の上層にはんだ付けする場合は、はんだを注ぎ、  
Please avoid soldering on upper surface (the component side surface) of the PC board as shown below



8-2 半田ごとの場合、チップの裏面にフラックスが浸入する場合があります。  
Please avoid cleaning of PCB board because the flux used during the dip soldering process may enter the encoder and cause poor contact

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1. 定格容量 (定格電流) D. C. 5V10mA (1mA MIN)  
Switch rating (Resistor load)

2. 電気的性質 Electrical characteristics

項目 Item	条件 Conditions	規格 Specifications
2-1 接点抵抗 Contact resistance	D. C. 5V10mA電圧降下法にて測定する。 Measured by the 1mA 5V D. C. voltage drop method.	100mA MAX.
2-2 チャタリング Chattering	1サイクル (OFF-ON-OFF) 1秒で動作させる。 Switch is operated at the rate of 1 cycle 1 sec. The 1 cycle shall be OFF-ON-OFF.	10msec以下 Less than 10msec
2-3 絶縁抵抗 Insulation resistance	端子-端子間にてD. C. 50V1mA印加する。 Measurement shall be made under the condition which a voltage of 50V D. C. 1mA is applied between individual terminals and bracket.	端子-端子間にて10MΩ以上 Between individual terminals and bracket: 10MΩ MIN.
2-4 耐圧 Dielectric strength	端子-端子間にてA. C. 50V1分間又は、A. C. 60V2秒間印加する。 (リーク電流1mA) A voltage of 50V A. C. shall be applied for 1min or a voltage of 60V A. C. shall be applied for 2sec between individual terminals and bracket. (Leak current: 1mA)	漏電・アーク・絶縁破壊がないこと。 Without damage to parts, arcing or breakdown.

注記:  
Note:  
シャフト端子間は絶縁処理をしております。  
Shaft is insulated from switch terminal.

3. 機械的性質 Mechanical characteristics

項目 Item	条件 Conditions	規格 Specifications
3-1 ショット着脱 Contact arrangement		押し入れ (Push ON) S. S. 1. (Push on)
3-2 ショット厚さ Switching		0.5 <sup>+0.02</sup> <sub>-0.01</sub> mm
3-3 ショット作動力 Switch operation force		3 <sup>+0.5</sup> <sub>-1</sub> N

4. 耐久性能 Endurance characteristics.

項目 Item	条件 Conditions	規格 Specifications
4-1 寿命試験 Operating life	接点間に電圧を5000回印加して20,000回動作させる。 印入電圧は5.000V印加する。(繰り返しは10MHz) The shaft of switch shall be 20,000 times at a speed of 500times per hour without electrical load, after which measurements shall be made. Immediately after 5,000 times, an interim measurement shall be made (strength of shaft 10N max.)	寿命規格: 200msec以下 その他の規格は別紙を参照。 Switch contact resistance: 200msec MAX. Except above items, specifications in clause 2-2, 4, and 3-1-3 shall be satisfied.



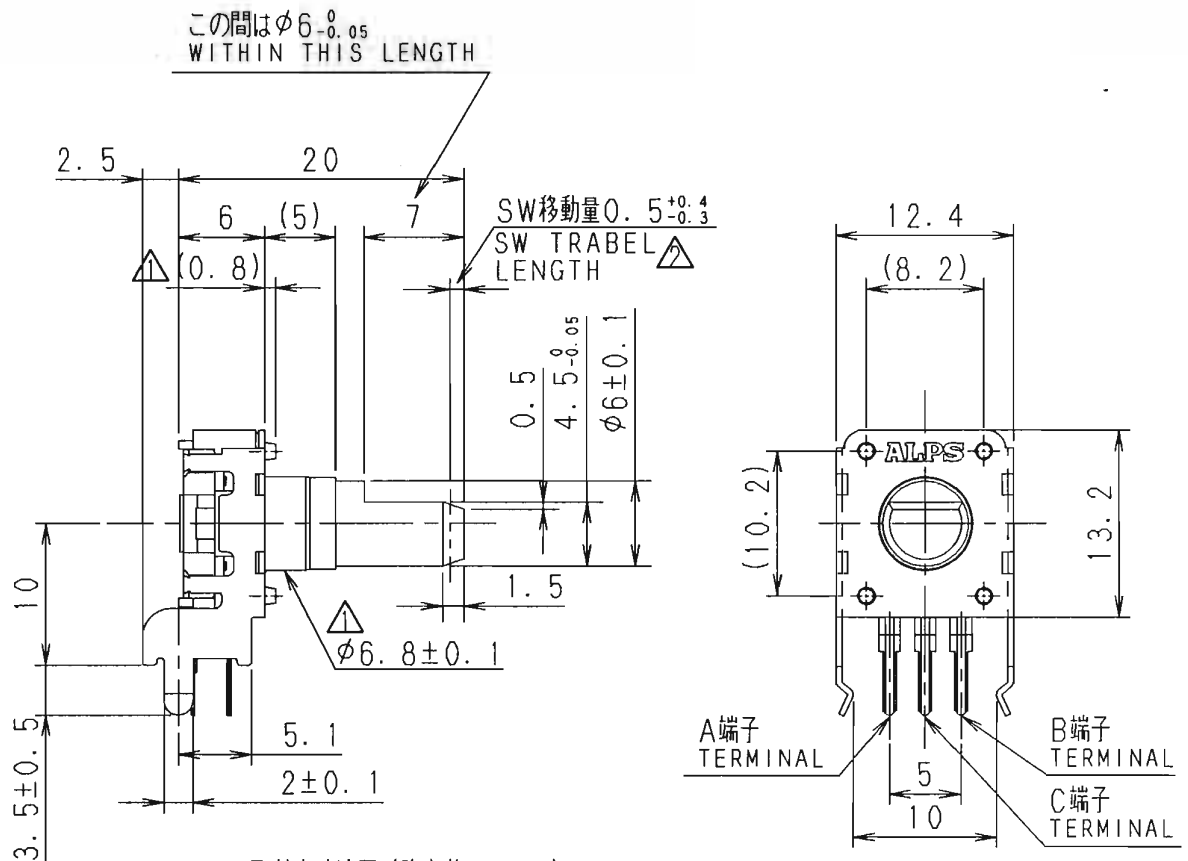
ALPS ELECTRIC CO., LTD.  
1.2形回転エンコーダ  
12mm Size Rotary encoder

APPD. CHKD. DSGD.  
Apr. 22, '99 Apr. 22, '99 Apr. 22, '99

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SYMB DATE APPD. CHKD. DSGD.

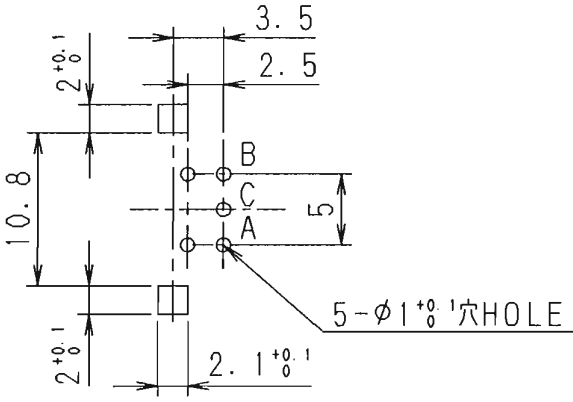


取付穴寸法図 (許容差±0.1)

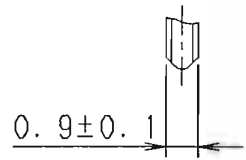
\*挿入側より見た図  
P. W. B. MOUNTING DETAIL  
(TOLERANCE±0.1)  
VIEWED FROM MOUNTING SIDE

端子先端詳細図 (10:1)

△DETAIL OF TERMINALS



基板板厚 t = 1.6mm  
P. C. B.



指定なき部分の許容差 TOLERANCES UNLESS OTHERWISE SPEC	
L ≤ 10	±0.3
10 < L < 100	±0.5
100 ≤ L	±0.8
角度 ANGULAR DIMENSION	±5°

PART NO.		NAME		MATERIAL NAME / CODE		12パルス 12PLUSE SHAFT COLOR:BLACK		L=20 立形 クリック付		
<b>ALPS ELECTRIC CO., LTD.</b>										
DSGD. セツケイ2-8501351				H. Shimomura98-01-29		SCALE 2:1		NO.		
CHKD.				S. Inoue 98-02-02		TITLE 12形薄形エンコーダ		DOCUMENT NO. LE21240L		
APPD.				K. Kawasaki98-02-02						
△2	99/11/25	K.	IY.	KH.	D	UNIT mm				
△2	99/8/25	K.	KK.	IY.	K					
SYMB	DATE	APPD	CHKD	DSGD						