Customer: ALPS Europe Distribution

No. 12E2006-2828

Date: May. 11, 2006

Attention:

Your ref. No.:

Your Part No.: EC12E24242A2

SPECIFICATIONS

ALPS' ;

MODEL: EC12E24242A2

Spec. No.:

Sample No.: F 3 1 3 3 9 5 4 M

RECEIPT STATUS

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B6523

Q1003#03A (EA)

No. 12E2006-2828

SPECIFICATIONS

1. THIS SPECIFICATIONS APPLY TO EC12E24242A2 ROTARY ENCODERS.

2. CONTENTS OF THIS SPECIFICATIONS.

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 protectve 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.

1. 一般事項 General

1-1 適用範囲 Scope

この仕様書は主として電子機器に用いる微小電流回路用12形薄形ロータリーエンコーダに適用する.
This specification applies to 12mm size low-profile rotary encoder (incremental type) for microscopic current circuits, used in electronic equipment.

1-2 標準状態 Standard atmospheric conditions

測定は特に指定のない限り, 次の状態で行なう.
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

但し, 疑義を生じた場合は, 次の基準状態で行なう.
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 67%
気 圧 Air pressure	: 86kPa to 106kPa

1-3 使用温度範囲

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 Construction

2-1 寸法 Dimensions

部付組立図による.
Refer to attached drawing.

3. 定格 Rating

3-1 定格電圧

Rated voltage : D.C. 5V

3-2 定格電流 (抵抗負荷)

operating current (resistive load)

各リード Each lead	: 0.5mA (MAX 5mA, MIN 0.5mA)
コモンリード Common lead	: 1mA (MAX 10mA, MIN 0.5mA)

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APPD.	CHKD.	DSGD.	TITLE
Apr. 22, '99	Apr. 22, '99	Apr. 22, '99	12形回転形エンコーダ 11mm Size Rotary encoder
K. ITO	Y. KANZAKI	H. MIURA	DOCUMENT NO. F3133954M

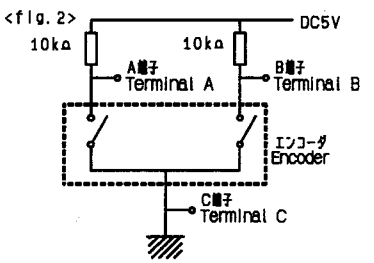
4. 電気的性能 Electrical characteristics

	項目 Item	条件 Conditions	規格 Specifications
4-1	出力信号 Output signal format	<Fig 1>	A, B2信号の全相等出力とし, 詳細は<fig. 1>の通りとする. クリック付きの場合クリック位置にてA信号は出力OFFの安定位置にあること B信号は規定せず. (破線はクリック付きの場合のクリック位置を示す. 2 Phase-different signals (SignalA, signalB) Details shown in <fig 1>. The detent position will always be aligned with A-phase but B-phase has no specific position. (The broken line shows detent position of with-detent type.
4-2	分解能 Resolution	1回転にて出力されるパルス数 Number of pulses in 360° rotation.	各相 24パルス/360° 24 pulses/360° for each phase
4-3	スイッチング特性 Switching characteristics	下記測定回路<fig. 2>を用い, 回転軸を360°・S⁻¹の速さで回転し測定する. Measurement shall be made under the condition as follows. 1)Shaft rotational speed : 360°·S⁻¹ 2)Test circuit : <fig 2>	
1)	チャタリング Chattering	コードのOFF→ONおよびON→OFFの際の, 出力1.5V~3.5Vの通過時間にて規定する. 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).	$t_1, t_3 \leq 3ms$ クリック位置でのB相信号のチャタリングは規定せず. B phase at detent position has no specification. With detent type.

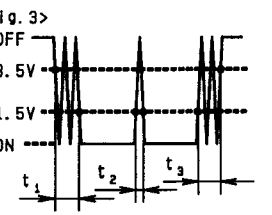
回転方向 Shaft rotational direction / 信号 Signal / 出力波形 Output

回転方向 Shaft rotational direction	信号 Signal	出力波形 Output
時計方向 C.W.	A(A-C端子間) A(Terminal A-C)	OFF / ON
	B(B-C端子間) B(Terminal B-C)	OFF / ON
反時計方向 C.C.W.	A(A-C端子間) A(Terminal A-C)	OFF / ON
	B(B-C端子間) B(Terminal B-C)	OFF / ON

<fig. 2>



<fig. 3>



(注記) コードON状態 :出力電圧が1.5V以下の状態を言う.
コードOFF状態 :出力電圧が3.5V以上の状態を言う.
(note) Code-ON area : The area which the voltage is 1.5V or less.
code-OFF area : The area which the voltage is 3.5V or more.

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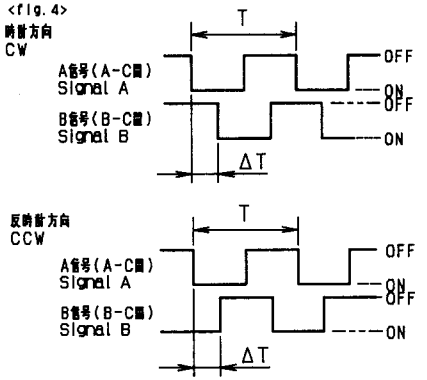
	項目 Item	条件 Conditions	規格 Specifications
2)	摺動ノイズ(バウンス) Sliding noise (Bounce)	コードONの部分の1.5V以上の電圧変動時間とし、チャタリングt_1, t_3両者との間に1mS以上の1.5V以下のON部分を有するものとする。また、摺動ノイズ間に1.5V以下の時間が1mSある場合は、別の摺動ノイズと判断する。 Specified by the time of voltage change exceed 1.5V in code-ON area. When the bounce has code-ON time less than 1ms between chatterings (t_1 or t_3), the voltage change shall be regarded as a part of chattering. When the code-ON time between 2 bounces is less than 1ms, they are regarded as 1 linked bounce.	$t_2 \leq 2$ms
3)	摺動ノイズ Sliding noise	コードOFFの部分の電圧変動 The voltage change in code-OFF area.	3.5V以上 3.5V MIN.
4-4	耐電圧 Dielectric strength	端子-取付板間にA.C. 50V1分間印加する。(リーク電流1mA) A voltage of 50VA.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	端子-取付板間にD.C. 50Vを印加する。 Measurement shall be made under the condition which a voltage of 50VD.C. is applied between individual terminals and bracket.	端子-取付板間にて10MΩ以上 Between individual terminals and bracket: 10MΩ MIN.
4-6	位相差 Phase-difference	定速で操作軸を回転する。 Measurement shall be made under the condition which the shaft is rotated in constant speed.	<fig.4>において ΔT=0.08T 以上 MIN In<fig.4>

<fig.4>



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APPD.	CHKD.	DSGD.	TITLE
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5. 機械的性能 Mechanical characteristics

	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	クリックトルク Detent torque	(クリック付きのみ適用) (Applied for with-detent type)	3~20mN·m 但し、-10°C~+5°Cでは、軸が回転すること。 Shaft rotatable at -10°C~+5°C.
5-3	クリック点数及び位置 Number and position of detents.		24点クリック 24 detents (ステップ角度 15°±3°) (Step angle:15°±3°)
5-4	軸の押し引き強度 Push-pull strength of shaft	軸の押し及び引張り方向に50Nの静荷重を10秒間加える。(PCB半田付け後) 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)	軸の変形、著しい回転ムラ、ガタ等の異常がなく電気的性能を満足すること。 Without damage to, or excessive play in shaft. No excessive abnormality in rotational feeling. And electrical characteristics shall be satisfied.
5-5	端子強度 Terminal strength	端子先端の任意の一方向に3Nの静荷重を10秒間加える。 A static load of 3N shall be applied to the tip of terminals for 10S in any direction.	著しいガタ及び接触不良を生じないこと。 Without excessive play in terminals or poor contact.
5-6	軸ガタ Shaft wobble	軸先端から5mmの位置に50mN·mの曲げ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.	1.0xL/30mmp-p以内 1.0xL/30mmp-p MAX. (Lは取付長さで比例換算する。) (L:Shaft length)
5-7	軸の垂直押し強度 Side thrust strength of shaft	軸先端から5mmの位置に20Nの静荷重を10秒間加える。(PCB半田付け後) 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)	著しいガタ及び、曲がりのないこと。又、機械的に異常のないこと。 Without excessive play or bending in shaft. No mechanical abnormality.
5-8	軸の回転方向ガタ Shaft play in rotational wobble	角度板にて測定する。 Mesure with jig for rotational angle	4°以内。 4° MAX

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	項目 Item	条件 Conditions	規格 Specifications
5-9	はんだ耐熱 Resistance to soldering heat	7項の"はんだ付け条件"による。 Specified by the clause 7 "Soldering conditions".	はんだ付け後、電気的性能を満足すること。また、著しいガタ等機械的に異常のないこと。 Electrical characteristics shall be satisfied. No mechanical abnormality such as a excessive play. 電極部はんだ受け面積の95%以上新しいはんだで覆われていること。 A new uniform coating of solder shall cover a minimum of 95% of the surface being immersed.

6. 耐久性能 Endurance characteristics.

	項目 Item	条件 Conditions	規格 Specifications
6-1	しゅう動寿命性能 Rotational life	無負荷で軸を600~1000/Hの速さで、30,000回往復回転振動作を行う。 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_1, $t_2 \leqq 5mS$ バウンス $t_2 \leqq 3mS$ Chattering t_1, $t_1 \leqq 5mS$ Bounce $t_2 \leqq 3mS$ クリック感が残っていること。 Detent feeling has to remains.
6-2	耐湿性 Damp heat	温度40±2°C, 湿度90~95%の恒温槽中に240±10時間放置後、常温, 常湿中に1.5時間放置する。 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.	規格規格(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	耐熱特性 Dry heat	温度85±3°Cの恒温槽中に240±10時間放置後、常温, 常湿中に1.5時間放置する。 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	低温特性 Cold	温度-40±3°Cの恒温槽中に240±10時間放置後、常温, 常湿中に1.5時間放置する。 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	耐落下性 Free falling	60cmの高さより製品の任意の方向から5ビニタイルを張ったコンクリートの床上に自由に落下させる。 The encoder shall be fallen freely at any posture from 60cm height to the concrete floor covered with vinyi-tile, after which measurement shall be made.	著しい変形、破損等がなく規格規格(4.1~4.5及び5.1)を満足すること。 (但し、端子部の変形は除く。) 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	耐振性 Vibration	10~55~10Hzと変化する振動(1周期1分/振幅1.5mm)をX. Y. Z. 各方向に2時間加える。 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 transversed 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).	規格規格(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. はんだ付け条件 Soldering conditions

7-1 手はんだの場合 Manual soldering

温度350°C以下，時間3秒以内
Bit temperature of soldering iron : 350°C or less.
Application time of soldering iron : within 3s.

7-2 ディップはんだの場合 Dip soldering

使用基板 : t1.6片面銅張積層板
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発泡式フラクサーにて発泡面高さは，基板板厚の半分を目安とし，かつ基板表面にフラックスの浸入がないこと．
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.

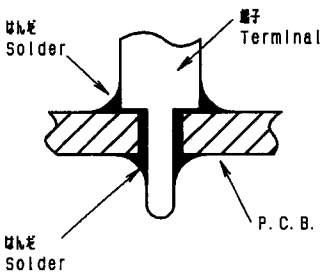
プリヒート : 基板表面温度100°C以下，時間1分以内
Preheating:
- ·Surface temperature of board: 100°C or less.
- ·Preheating time: within 1 min.

はんだ : 温度260°C±5°C，時間3秒±1秒以内
Soldering:
- ·Solder temperature: 260°C ±5°C.
- ·Immersion time: within 3±1s

以上の工程を1回または2回通過する．
Apply the above soldering process for 1 or 2 times.

8. はんだ付け時のご注意事項 Note for soldering method.

8-1 下図のようにP. C. B. の上面にはんだ付けをする配線は，お避けください．
Please avoid soldering on upper surface (the component side surface) of the PC board as shown below.



8-2 半田ディップ後の洗浄についてはエンコーダー内にフラックスが浸入する場合があり，接触不良の原因となりますのでご注意願います．
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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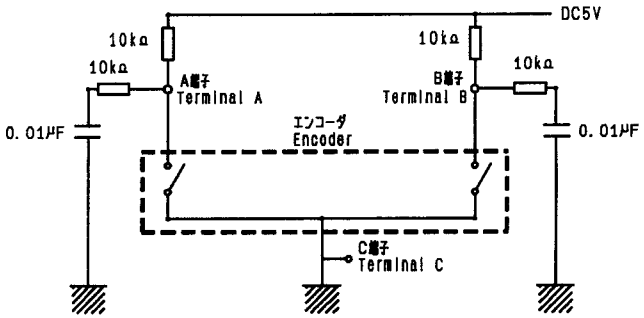
9. その他，取扱い ご注意 PRECAUTIONS IN USE

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. エンコーダーのパルスカウント処理の設計においては動作スピード，サンプリングタイム，マスキングタイム等に注意し，実装確認の上御使用願います．
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. 本製品はクリック位置にてA相はOFF状態で安定となりますので，ソフト設計時A相基準で設計願います．
A phase should be design criterion prior to B phase.
Because A phase has steady off signal at detent position.

9-4. エンコーダーのパルスカウント処理の回路は下図のフィルターをいれることを推奨します．
For your pulse count design, it should be considered to add C/R filter on your circuit shown as below.



9-5. 本製品の本体に直接水分がかかりますと，パルス波形に異常が発生する可能性がありますので，製品に直接水分がかか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 pluse output wave form.

9-6. 医療用機械，器具への本製品の御使用はお避け下さい．
Please avoid to medical instrument because this encoder is audio use.

9-7. 本製品は軸に対し過度の横押しの力が加わりますと，製品機能を損ねる恐れがありますので，あらかじめつまみにガイドを設ける等の配慮をお願いします．
Cosideration to provide protective guard for knob is highly recommended to avoid side pressure to the shaft.

9-8. 本製品は軸に対し過度の衝撃力が加わりますと，製品機能を損ねる恐れがありますので，ご注意下さい．
Excessive impact force may decrease the performance of this product.
Please pay attention to impact force.

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1. 定格容量(抵抗負荷)
Switch rating (Resistor load)　　D.C.5V10mA (1mA MIN)

2. 電気的性能 Electrical characteristics

	項目 Item	条件 Conditions	規格 Specifications
2-1	接触抵抗 Contact resistance	D.C.5V1mA電圧降下法にて測定する。 Measured by the 1mA 5V D.C. voltage drop method.	100mΩ MAX.
2-2	チャタリング Chattering	1サイクル (OFF-ON-OFF)1秒で操作させる。 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-取付金具間にD.C.50V1mAを印加する。 Measurement shall be made under the condition which a voltage of 50VD.C.1mA is applied between individual terminals and bracket.	端子-取付金具間にて10MΩ以上 Between individual terminals and bracket: 10Mm MIN.
2-4	耐電圧 Dielectric strength	端子-取付金具間に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 50VA.C. shall be applied for 1min or a voltage of 60VA.C. shall be applied for 2sec between individual terminals and bracket.(Leak current:1mA)	損傷・アーク・絶縁破壊がないこと。 Vithout damage to parts, arcing or breakdown.

注記: Note: 軸・スイッチ端子間は絶縁されております。 Shaft is insulated from switch terminal.

3. 機械的性能 Mechanical characteristics

	項目 Item	条件 Conditions	規格 Specifications
3-1	スイッチ回路・接点数 Contact arrangement		単極単投(Push on) S.P.S.T.(Push on)
3-2	スイッチ作動量 Switching		$0.5^{+0.4}_{-0.3}$mm
3-3	スイッチ作動力 Switch opration force		$3^{+1.5}_{-1}$ N

4. 耐久性能 Endurance characteristics.

	項目 Item	条件 Conditions	規格 Specifications
4-1	寿命特性 Operating life	定格荷重にて軸を毎時500回の速さで20,000回断続操作を行う。 但し、試験途中5,000で中間測定を行う。(軸押し力は10N以下) 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. Hovever, an interim measurement shall be made immediately after 5,000 times. (strength of shaft 10N max.)	接触抵抗:200mΩ以下 その他、規格値を満足すること。 Switch contact resistance:200mΩMAX. Except above items, specifications in clause 2.2~4. and 3.1~3 shall be satisfied.

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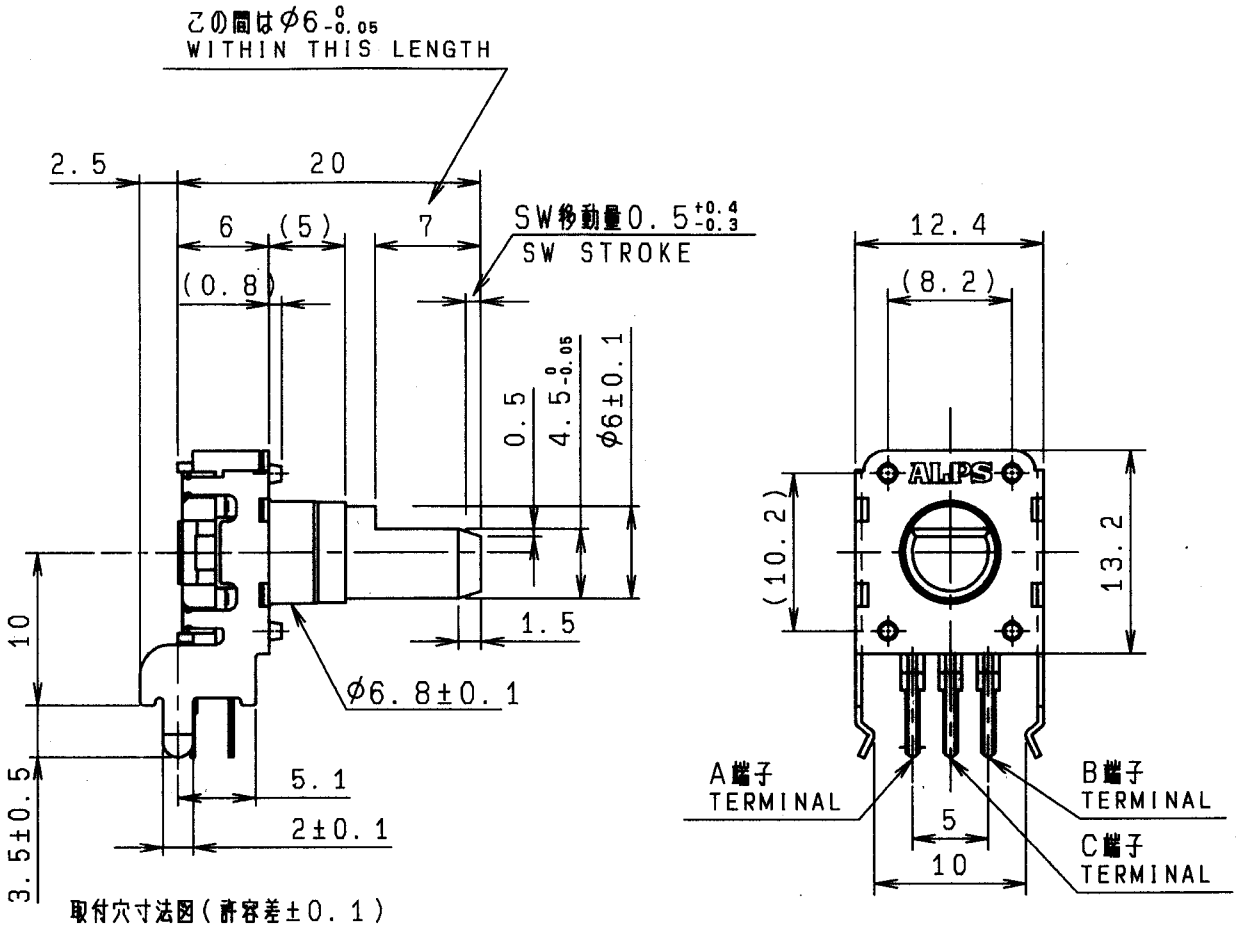
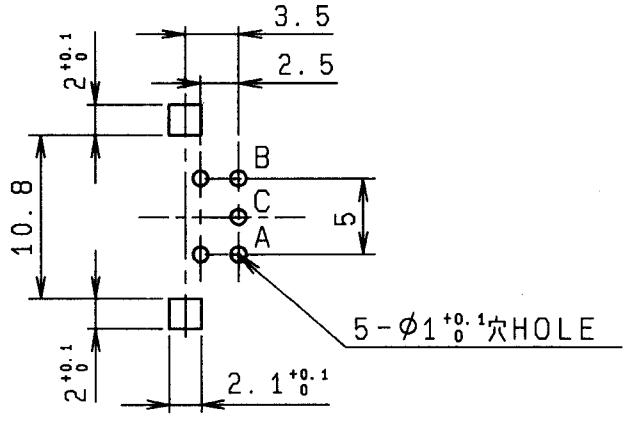
APPD.	CHKD.	DSGD.	TITLE 12形回転形エンコーダ 12mm Size Rotary encoder
Apr.22,'99 K.ITO	Apr.22,'99 Y.KANZAKI	Apr.22,'99 H.MIURA	DOCUMENT NO. F3133954M (9/9)

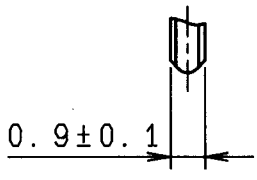


取付穴寸法図（許容差±0.1）
※挿入側より見た図
P.W.B. MOUNTING DETAIL
(TOLERANCE±0.1)
VIEWED FROM MOUNTING SIDE



基板板厚 t=1.6mm
P.C.B.

端子先端詳細図（10:1）
DETAIL OF TERMINALS



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	FINISH	
——	——	——	24パルス SHAFT COLOR:BLACK	L=20 立形 クリック付

SYMB	DATE	APPD	CHKD	DSGD

ALPS ELECTRIC CO., LTD.

DSGD. セッケイ2 H. MIURA '95-12-08	SCALE 2:1	
CHKD. M. ENDOU '95-12-08		TITLE 12形 PUSH ON SW付 薄形エンコーダー
APPD. S. MIZOBUTI '95-12-08	UNIT mm	DOCUMENT NO. LE21240A

F3133954M