

Confidential

Customer: ALPS ELECTRONICS HONG KONG LTD

No. : KK-2016-2024

Date: Aug. 29, 2016

Attention:

Your ref. No.:

Your Part No.: M/EM11B16140AD

SPECIFICATIONS

ALPS Model : EM11B16140AD

ALPS Spec. No. :

ALPS Sample No.: 0022702490

RECEIPT STATUS
RECEIVED

By. Date

Signature

Name

Title

ALPS[®]
ALPS ELECTRIC CO., LTD.

DSG'D *H. Miura*

APP'D *S. Wushikara*

ENG. DEPT.

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E318Y

ACY04-G03A (EA)

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

1. THIS SPECIFICATIONS APPLY TO EM11B16140AD ROTARY ENCODERS.

2. CONTENTS OF THIS SPECIFICATIONS.

5LM211-01, 4LE-37

C-2, C-4, C-5

LM211401F

3. MARKING

- MARKING ON ALL UNITS
DATE CODE

4. REMARKS

- FURNISH PACKAGE
NUT:1 WASHER:1

• CAUTION

1. For the export of products which are controlled items subject to foreign and domestic export laws and regulations, you must obtain approval and/or follow the formalities of such laws and regulations.

2. Products must not be used for military and/or antisocial purposes such as terrorism, and shall not be supplied to any party intending to use the products for such purposes.

3. Unless provided otherwise, the products have been designed and manufactured for application to equipment and devices which are sold to end-users in the market, such as AV (audio visual) equipment, home electric equipment, office and commercial electronic equipment, information and communication equipment or amusement equipment. The products are not intended for use in, and must not be used for, any application of nuclear equipment, driving control equipment for aerospace or any other unauthorized use.

With the exception of the above mentioned banned applications, for applications involving high levels of safety and liability such as medical equipment, burglar alarm equipment, disaster prevention equipment and undersea equipment, please contact an Alps sales representative and/or evaluate the total system on the applicability. Also, implement a fail-safe design, protection circuit, redundant circuit, malfunction protection and/or fire protection into the complete system for safety and reliability of the total system.

4. Before using products which were not specifically designed for use in automotive applications, please contact an Alps sales representative.

5. Please store the product without open package, keep same condition as delivery, under normal temperature and humidity, prevent direct sunlight, and corrosive gas exposure then use product as soon as you can within about six months after delivery. Once you open package, please use plastic bag which is used for packaging and prevent product from exposure of outside air then store the product under same condition as above.

6. About characteristics and conditions for test or measurement are not mentioned in this document should be examined by each product specification in order to specify them.

CLASS No.	TITLE 回転形エンコーダ 規格書 ROTATIONAL ENCODER SPECIFICATION
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項目 Item	条件 Conditions	規格 Specifications
3-5 出力 Output	位相差測定時の軸回転速度：360°/s. Shaft rotating speed for measuring :360°/s. 	(1) 位相差 T ₁ , T ₂ , T ₃ , T ₄ は 100μs. 以上のこと。 Phase difference: T ₁ , T ₂ , T ₃ and T ₄ shall be 100μs. or more. (2) クリック付タイプのパルスカウント はA相がHiの時のB相の立上りまたは 立下がりにて行って下さい。 For pulse counting of detent type, please use rise or down point of signal B while signal A is Hi.
3-6 パルス数 Number of pulses	1回転にて出力されるパルス数。 Number of pulses in 360° rotation.	各相 16パルス/360° 16 pulses /360°
3-7 信号立上り/ 立下がり時間 Response time		1.3μs. (TYP.)
3-8 絶縁抵抗 Insulation resistance	エンコーダの端子-取付板間にD. C. 100V 1mA 印加する。 Measurement shall be made under the condition which a voltage of 100V D.C. 1mA is applied between encoder's terminals and the bracket.	100MΩ以上 100MΩ MIN.
3-9 耐電圧 Dielectric strength	エンコーダの端子-取付板間にA. C. 250V、1分間又は、A. C. 300V、2秒間印加する。(リーク電流1mA) A voltage of 250V A.C. shall be applied for 1min or a voltage of 300V A.C. shall be applied for 2s between encoder's terminals and bracket. (Leak current:1mA)	損傷・アーク・絶縁破壊がないこと。 Without damage to parts arcing or breakdown.

4. プッシュモーメンタリスイッチの電気的特性
Electrical characteristics of the push momentary switch

項目 Item	条件 Conditions	規格 Specifications
4-1 定格 Rating		5mA 5V D. C.
4-2 最大定格 Maximum rating		50mA 12V D. C.
4-3 導通抵抗 Contact resistance	D. C. 5V5mA 電圧降下法にて測定。 Measured by the 5mA 5V D.C. voltage drop method.	500mΩ 以下 500mΩ or less
4-4 バウンス Bounce	下図の回路で測定する。動作速度：3~4回/秒 Measured by the following circuits. Operating speed:3~4time/s. 	5ms. 以下 5ms. or less

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APPD. 3G	CHKD. 3G	DSGD. 3G	TITLE 回転形エンコーダ ROTATIONAL ENCODER
K. ITO	K. YAMAZAKI	S. SUDA	DOCUMENT NO.
1999/09/14	1999/09/14	1999/09/14	5LM211-01 (2/7)

SYMB	DATE	APPD	CHKD	DSGD
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CLASS No.		TITLE 回転形エンコーダ 規格書 ROTATIONAL ENCODER SPECIFICATION																
項目 Item	条件 Conditions	規格 Specifications																
7-4 耐寒性 Cold	<p>温度$-40\pm 3^{\circ}\text{C}$の恒温槽中に96 ± 4時間放置後取り出し、表面の水分を拭き取り常温常湿中に1.5時間放置後測定する。</p> <p>The encoder shall be stored at a temperature of $-40\pm 3^{\circ}\text{C}$ for 96 ± 4 hours in a thermostatic chamber. Then the encoder shall be taken out of the chamber and its surface moisture shall be removed. And then the encoder shall be maintained at standard atmospheric conditions for 1.5 hours, after which measurements shall be made.</p>	<p>(1) クリックトルク: $10\pm 6\text{mN}\cdot\text{m}$ Detent torque: $10\pm 6\text{mN}\cdot\text{m}$</p> <p>(2) バウンス: 10ms. 以下 Bounce: 10ms. or less</p> <p>(3) その他初期規格を満足の事。 Except above items, initial specifications shall be satisfied.</p>																
7-5 耐湿性 Damp heat	<p>温度$40\pm 2^{\circ}\text{C}$、湿度90~95%の恒温湿槽中に96 ± 4時間放置後取り出し、表面の水分を拭き取り常温常湿中に1.5時間放置後測定する。</p> <p>The encoder shall be stored at a temperature of $40\pm 2^{\circ}\text{C}$ with relative humidity of 90% to 95% for 96 ± 4 hours in a thermostatic chamber. Then the encoder shall be taken out of the chamber and its surface moisture shall be removed. And then the encoder shall be maintained at standard atmospheric conditions for 1.5 hours, after which measurements shall be made.</p>	<p>(1) クリックトルク: $10\pm 6\text{mN}\cdot\text{m}$ Detent torque: $10\pm 6\text{mN}\cdot\text{m}$</p> <p>(2) バウンス: 10ms. 以下 Bounce: 10ms. or less</p> <p>(3) その他初期規格を満足の事。 Except above items, initial specifications shall be satisfied.</p>																
7-6 温度サイクル Change of temperature	<p>下表に示した温度サイクルを連続5回行った後、常温常湿中に1.5時間放置後測定する。</p> <p>The encoder shall be subjected to 5 successive change of temperature cycles, each as shown in table below. Then the encoder shall be maintained at standard atmospheric conditions for 1.5 hours, after which measurements shall be made.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Step 段階</th> <th>Temperature 温度</th> <th>Duration 放置時間</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>$-40\pm 3^{\circ}\text{C}$</td> <td>30 min 分</td> </tr> <tr> <td>2</td> <td>Standard atmospheric conditions 常 温</td> <td>10 to 15 min 分</td> </tr> <tr> <td>3</td> <td>$85\pm 3^{\circ}\text{C}$</td> <td>30 min 分</td> </tr> <tr> <td>4</td> <td>Standard atmospheric conditions 常 温</td> <td>10 to 15 min 分</td> </tr> </tbody> </table>	Step 段階	Temperature 温度	Duration 放置時間	1	$-40\pm 3^{\circ}\text{C}$	30 min 分	2	Standard atmospheric conditions 常 温	10 to 15 min 分	3	$85\pm 3^{\circ}\text{C}$	30 min 分	4	Standard atmospheric conditions 常 温	10 to 15 min 分	<p>(1) クリックトルク: $10\pm 6\text{mN}\cdot\text{m}$ Detent torque: $10\pm 6\text{mN}\cdot\text{m}$</p> <p>(2) バウンス: 10ms. 以下 Bounce: 10ms. or less</p> <p>(3) その他初期規格を満足の事。 Except above items, initial specifications shall be satisfied.</p>	
Step 段階	Temperature 温度	Duration 放置時間																
1	$-40\pm 3^{\circ}\text{C}$	30 min 分																
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3	$85\pm 3^{\circ}\text{C}$	30 min 分																
4	Standard atmospheric conditions 常 温	10 to 15 min 分																
7-7 耐振性 Vibration	<p>10~55~10 Hzと変化する振動(1周期1分/振幅1.5mm)をX・Y・Z方向に各2時間加える。(計6時間)</p> <p>The following vibration shall be applied to the encoder, after which measurement shall be made. The entire frequency range, from 10 Hz to 55 Hz and return to 10 Hz, shall be transversed in 1 min. Amplitude (total excursion) : 1.5 mm This motion shall be applied for a period of 2 hours in each of 3 mutually perpendicular axes (a total of 6 hours).</p>	<p>(1) クリックトルク: $10\pm 6\text{mN}\cdot\text{m}$ Detent torque: $10\pm 6\text{mN}\cdot\text{m}$</p> <p>(2) バウンス: 10ms. 以下 Bounce: 10ms. or less</p> <p>(3) その他初期規格を満足の事。 Except above items, initial specifications shall be satisfied.</p>																

					ALPS ELECTRIC CO., LTD.					
					APPD. 3G	CHKD. 3G	DSGD. 3G	TITLE 回転形エンコーダ ROTATIONAL ENCODER		
					K. ITO	K. YAMAZAKI	S. SUDA	DOCUMENT NO.		
					1999/09/14	1999/09/14	1999/09/14	5LM211-01 (5/7)		
SYMB	DATE	APPD	CHKD	DSGD						

CLASS No.	TITLE 回転形エンコーダ 規格書 ROTATIONAL ENCODER SPECIFICATION
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項目 Item	条件 Conditions	規格 Specifications
7-8 耐落下性 Free falling	60cmの高さより製品の任意の方向からビニタイルを張ったコンクリートの床上に自由落下させる。 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.	著しい変形、破損等がなく初期規格を満足すること。 (但し、端子の変更は除く。) No excessive deformation or damage. (Except the deformation of terminals.) And initial spec. shall be satisfied.
7-9 はんだ耐熱 Resistance to soldering heat	8項の"はんだ付け条件"に依る。 Specified by the clause 8 "Soldering conditions".	絶縁体の変形、破損のないこと。 感触に異常のない事。 There shall be no deformation or cracks in molded part. No excessive abnormality in rotational feeling.

8. はんだ付け条件 Soldering conditions

8-1 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.

8-2 ティップはんだの場合 Dip soldering

使用基板は板厚t=1.6mmの片面又は両面銅張り積層板とする
PCB: One or both side copper claded laminated board which 1.6mm thickness.

フラックスは比重0.82以上のものを用い発泡式フラクサーにて基板板厚の3分の2まで塗布する。

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 2/3 of PCB thickness.

プリヒートは、基板表面温度100°C以下、時間1分以内とする
Preheating:
・Surface temperature of PCB: 100°C or less.
・Preheating time: within 1 min.

はんだは温度260°C以下、時間3秒以内とする
Soldering:
・Solder temperature: 260°C or less
・Immersion time : Within 3s.

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.

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SYMB	DATE	APPD	CHKD	DSGD	1999/09/14	1999/09/14	1999/09/14	5LM211-01 (6/7)		

CLASS No.

TITLE

回転形エンコーダ 規格書
ROTATIONAL ENCODER SPECIFICATION

9. 取り扱い時の注意事項 Notes

9-1 当製品はホールICを使用しています。静電破壊にご注意願います。

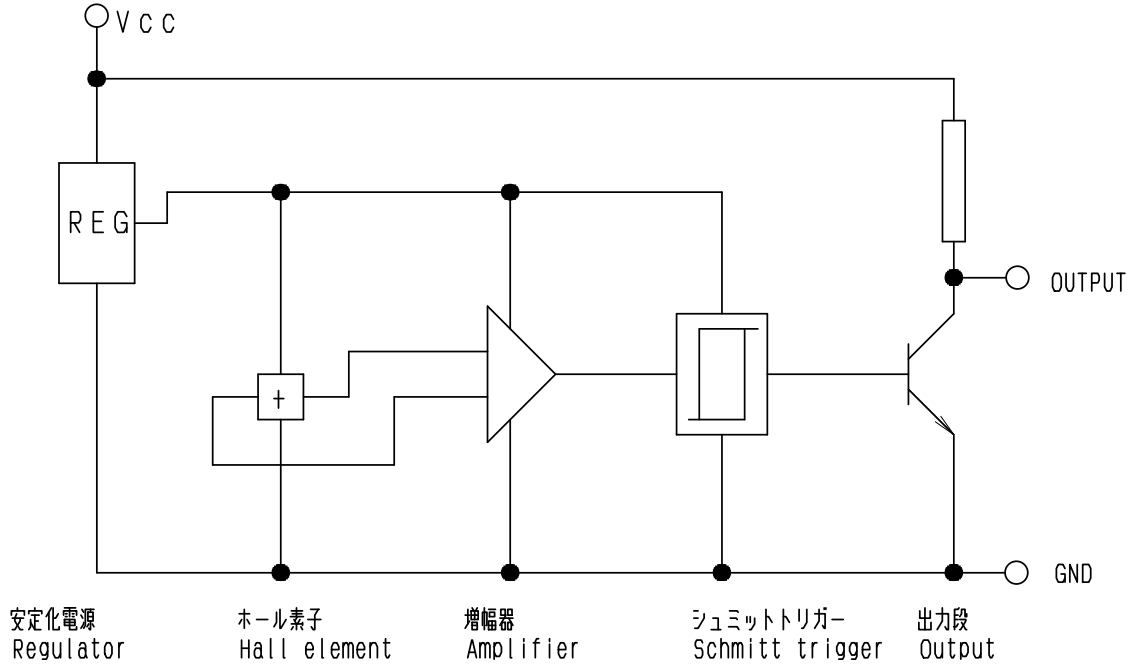
The encoder is using Hall IC. Electrostatic may break IC.

9-2 下図は当製品に使用しているホールICの内部ブロック図を示したものです。

回路設計時の参考として下さい。

Following figure shows block diagram of this encoders Hall IC.

Please refer for your circuit design.



9-3 取付板のスナップ端子又は軸受は静電破壊を避けるため、グラウンドに接続してご使用願います。

The snap-in terminal of the bracket or bush shall be connected to the ground to prevent electrostatic break.

9-4 ホールICの破壊を避けるため、端子はすべて接続してから電源を供給願います。

All terminals shall be connected before supplying voltage otherwise HALL IC may be broken.

9-5 本製品は軸受けをネジ止めにて固定しご使用願います。

Please mount the encoder to the chassis by tightening the nuts to the bushing.

9-6 誤動作を避けるため、 $\pm 5 \times 10^{-4}$ テスラ以下の磁場環境でご使用願います。

To prevent output error, environmental magnetic field must be less then $\pm 5 \times 10^{-4}$ Tesla

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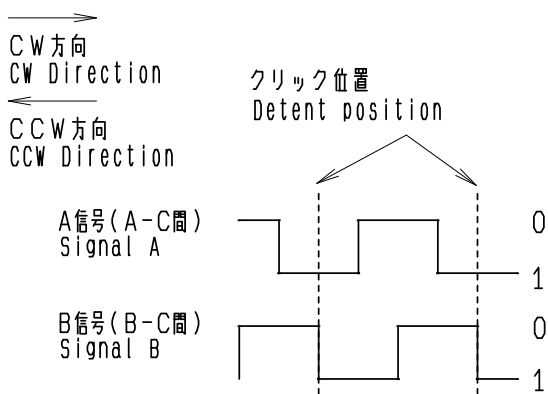
APPD. 3G	CHKD. 3G	DSGD. 3G
K, ITO	K, YAMAZAKI	S, SUDA
1999/09/14	1999/09/14	1999/09/14

TITLE 回転形エンコーダ ROTATIONAL ENCODER
DOCUMENT NO. 5LM211-01 (7/7)

SYMB	DATE	APPD	CHKD	DSGD
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CLASS No. _____	TITLE _____	
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1) エンコーダの回路処理は、下図の読取方法を推奨します。
For pulse count, recommendation is below.



	CW方向	CCW方向
A-C	1 → 0	1 → 0
B-C	1 → 0	0 → 1

A信号が1→0と変化した時、B信号の変化が1→0であればCW方向である。
When phase A change is 1→0 and phase B change is 1→0, means CW direction.

A信号が1→0と変化した時、B信号の変化が0→1であればCCW方向である。
When phase A change is 1→0 and phase B change is 0→1, means CCW direction.

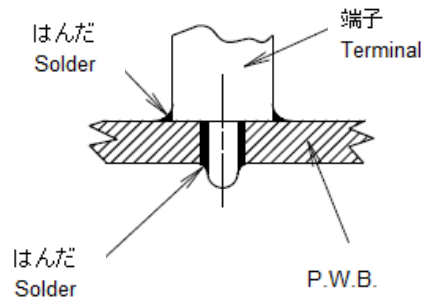
A-C	0	1	1	1	0	0	1	1	1
B-C	0	0	-	1	1	0	0	-	1

					ALPS ELECTRIC CO., LTD.				
		APPD.	CHKD.	DSGD.	TITLE _____				
		M-ENG2	M-ENG2	M-ENG2					
		S. MIZOBUCHI	K. HIROSE	H. MIURA	DOCUMENT NO.				
		2012-03-07	2012-03-07	2012-03-07	4LE-37 (1/1)				
SYMB	DATE	APPD	CHKD	DSGD					

1C / 1P
A相ON規定有り
B相規定無し 標準位相差

1. はんだ付けに関するその他注意事項
Other precautions for Soldering

- 1) 図のようにP.W.Bの上にはんだ付けをする配線は、お避け下さい。
Please avoid soldering on upper surface of P.W.B. as shown below.



- 2) 基板に挿入される金属足ははんだ付けしてご使用願います。
Please solder all inserted metal terminals and bracket to a P.W.B.
- 3) はんだ付け後、溶剤などで製品を洗浄しないで下さい。
After soldering , please not to wash or clean products by liquid such as solvent or any similar.
- 4) Selective solderingの場合は、Dip solderingと条件が異なりますので、
事前に貴社設備で充分確認の上条件設定をお願いします。
Please thoroughly test and decide appropriate parameters for soldering by your soldering equipment under actual condition of production.
(for example , parameters for selective soldering can be different from for wave soldering.)
- 5) Spray fluxerの場合は、製品の実装側からfluxが浸入しないようにして下さい。
If you use spray fluxer equipment , please prevent the flux from entering the inside of product from mounting side.

					ALPS ELECTRIC CO., LTD.			
					APPD.	CHKD,	DSGD.	TITLE
					Oct.22.2015	Oct.22.2015	Oct.22.2015	その他注意事項 (DIP/手はんだ) Other precautions (DIP/Manual soldering)
					S. Urushihara	K. Sasaki	Y. Ashida	DOCUMENT No.
SYMB.	DATE	APPD.	CHKD.	DSGD.				C-2
								(1/1)

1. ご使用上の注意 precautions in use

- 1) 当製品は密閉構造ではありませんので、使用環境によって外部ガスが製品内部に侵入し接点障害を起こす場合があります。同一セット内に以下の様な部材を使用しないで下さい。

- ・硫化、酸化ガスを発生する部材(例:ゴム材,接着材,合板,潤滑剤,梱包材)
- ・低分子シロキサンガスを発生する部材(例:シリコン系ゴム,潤滑剤,接着剤)

As this product does not have hermetical structure , it is possible gas from outside get inside of product and may cause contact failure depends on using environment. Please avoid using following materials. If you have to use any of material in parentheses , please pay special attention and confirm it does not influence to products through tests under actual using conditions.

- materials which may generate sulfide gas or oxidized gas.
(rubber , glue , adhesive , plywood , packaging material)
- materials which may generate low-molecular-weight siloxane gas.
(silicone base rubber , lubricant ,glue)

- 2) 高湿度環境下,又は結露する環境下,液体が製品にかかる環境下では、端子間の電流リークが発生する恐れがありますのでご使用にならないで下さい。

Please not to use this product under the atmosphere with high humidity , with possibility of dew condensation or of direct splash of liquid. Because it may cause leak between terminals.

- 3) ツマミを挿入する際に、軸に規定荷重以上の力や衝撃荷重が加わると製品が破壊する場合があります。ツマミの寸法や 挿入治具の圧力管理は、規定荷重以下で挿入できる設定の配慮をお願いします。

The product may have malfunction if excessive stress or impact than specified value is applied when insert knob to the shaft.

Please fix appropriate dimension for knob or fix insertion force of knob of mounting equipment which can avoid excessive stress to the product than specified value.

- 4) 使用温度範囲の上限、下限付近で長期間の連続使用はできません。

動作寿命の規定は常温15℃～35℃、常温25%～85%の環境条件に限ります。

使用温度範囲の上限、下限付近で長期間の連続動作を行う場合は、機種毎に仕様規定が可能かどうか確認が必要になります。

This product can't be continuously used under high operating temperature or low operating temperature specified in this document. Unless otherwise specified , the durability is specified only under normal conditions , temperature 15 to 35 degree Celsius and related humidity 25 to 85%.

When this product is operated at temperature near from upper or lower limit of operating temperature range , feasibility must be examined by each product specification.

- 5) 製品本体を規定の取付面まで挿入して水平になるように取付けて下さい。

水平にならないまま取付けますと、動作不良の要因となります。

Insert these switches to the specified mounting surface and mount them horizontally.

If not mounted horizontally, these switches will malfunction.

- 6) 塵埃が多い環境で使用されますと塵埃が開口部から入り出力不良や動作不良の原因と

なることがありますのでセット設計時に予めご配慮ください。

If this product is used under dusty conditions , dust or debris may get inside of product from openings and possible to cause output failure or malfunction.

Please consider protections against dust when surrounding parts of the product are designed.

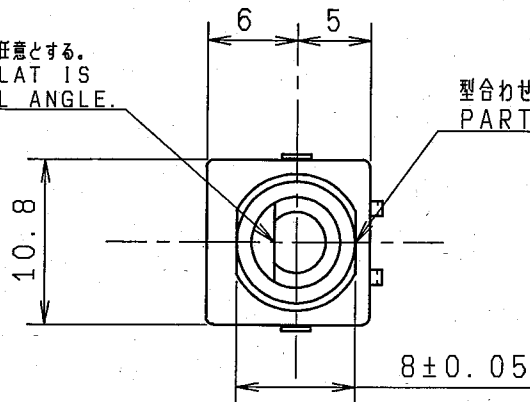
					ALPS ELECTRIC CO., LTD.			
					APPD.	CHKD,	DSGD.	TITLE
					Oct.15.2015	Oct.15.2015	Oct.15.2015	ご使用上の注意 (共通)
					S. Urushihara	K. Sasaki	Y. Ashida	Precautions in use (Common)
								DOCUMENT No.
SYMB.	DATE	APPD.	CHKD.	DSGD.				C-4
								(1/1)

1. ご使用上の注意
precautions in use

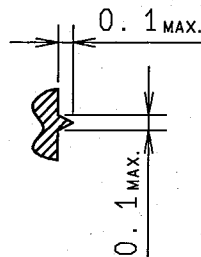
- 1) プッシュスイッチ付きの製品は、軸が押されたままの状態では梱包や保管をされますとスイッチ部に支障をきたす恐れがありますのでご配慮下さい。
For product variety with push switch , please pay attention to storage condition because if shaft is being pushed for long time during storage or after built in final products , the switch function may have malfunction.
- 2) プッシュスイッチ付きの製品は、軸をプッシュした状態で軸を回転するとスイッチ部に支障をきたす恐れがあります。
For product variety with push switch , if shaft is rotated while shaft is pushed , it may cause deterioration to push switch functions.
- 3) プッシュスイッチ付きの製品は、軸に挿入したツマミの中心を押すようにして下さい。
ツマミの直径が大きい場合、ツマミの縁を押すと感触が変化したり、作動力が過大に強くなる恐れがあります。
For product variety with push switch , please design knob to encourage end-user to push center of knob which is fixed to the shaft of product. Because if the area near from edge of knob is pushed , it may bring a bad influence , such as unexpected heavy operating force to switch operation feeling especially knob has large diameter.

					ALPS ELECTRIC CO., LTD.			
					APPD.	CHKD,	DSGD.	TITLE
					Oct.22.2015	Oct.22.2015	Oct.22.2015	ご使用上の注意 (プッシュスイッチ付き) Precautions in use (with push switch)
					S.Urushihara	J.Yashiro	H.Miura	DOCUMENT No.
SYMB.	DATE	APPD.	CHKD.	DSGD.				C-5 (1/1)

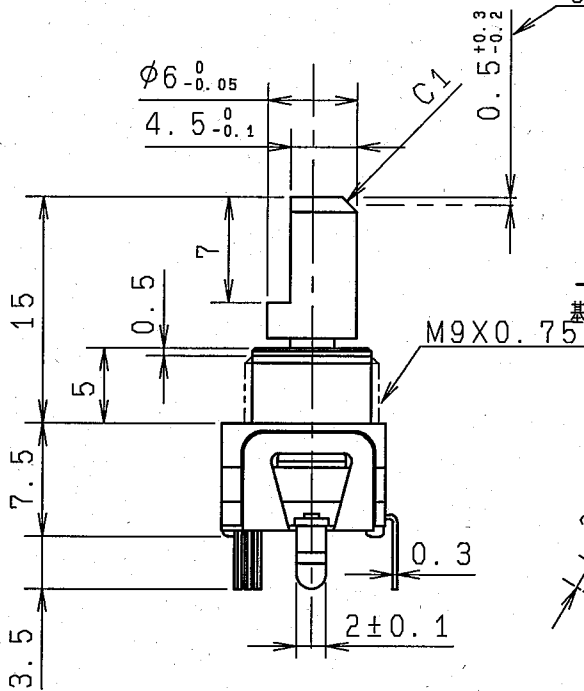
スリ差し角度は任意とする。
SHAFT FLAT IS
OPTIONAL ANGLE.



型合わせ部
PARTING LINE

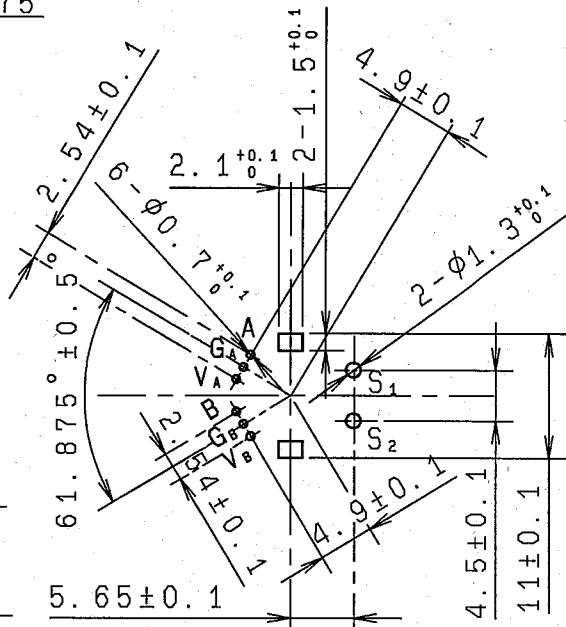
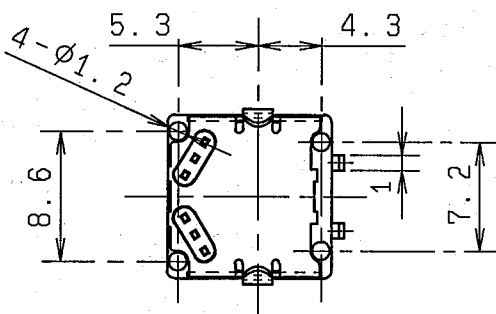


SW 移動量
SW STROKE

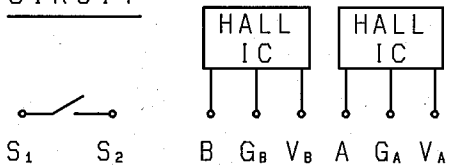


取り付穴寸法図 (挿入側より見た図)
P. W. B. MOUNTING HOLES
(VIEWED FROM MOUNTING SIDE)

基板板厚 P. W. B. THICKNESS $t=1.6\text{mm}$



CIRCUIT



$V_A, V_B \dots$ POWER SUPPLY
 $G_A, G_B \dots$ GROUND
 $A, B \dots$ OUTPUT

指定なき部分の許容差 TOLERANCES UNLESS OTHERWISE SPEC	
$L \leq 10$	± 0.3
$10 < L < 100$	± 0.5
$100 \leq L$	± 0.8
角度 ANGULAR DIMENSION	$\pm 5^\circ$

軸材質: 黄銅
SHAFT MATERIAL: BRASS

PART NO.

MATERIAL

SPEC/NAME

FINISH

ALPS ELECTRIC CO., LTD.

DSGD. H. KIMURA 2006-05-26

SCALE N. 1

NO.

CHKD.



TITLE MAGNETIC ENCODER WITH PUSH ON SW

APPD.

G. Ohya 2006-05-29

UNIT mm

DOCUMENT NO.

LM211401F

NO. SYMB DATE APPD CHKD DSGD

5.8g

O R

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