

**Confidential**

Customer: SHENZHEN YATE UNITED  
TECHNOLOGY CO., LTD.

No. : SS-2016-0374

Date: Dec. 01, 2016

Attention:

Your ref. No.:

Your Part No.: RDC506017A

## SPECIFICATIONS

ALPS Model : RDC506017A

ALPS Spec. No. :

ALPS Sample No.: 0022041781

RECEIPT STATUS  
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Title

**ALPS**<sup>®</sup>  
ALPS ELECTRIC CO., LTD.

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E31B1

ACY04-G03A (EA)

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

1. THIS SPECIFICATIONS APPLY TO RDC506017A ROTARY POTENTIOMETER.

2. CONTENTS OF THIS SPECIFICATIONS.

5RDC501171,

RDK506001,

5RDC501031

3. MARKING

- MARKING ON ALL UNITS  
DATE CODE

• 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	ROTARY POTENTIOMETER
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1. 一般事項 General requirements

1-1 使用温度範囲 Usable temperature -40°C to +120°C

1-2 保存温度範囲 Storage temperature -40°C to +125°C

1-3 標準状態 Standard atmospheric conditions

特に規定がない限り、試験及び測定は次の状態(常温、常湿、常気圧)で行う。  
Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows.

温度 Ambient temperature 5 to 35°C  
 相対湿度 Relative humidity 45 to 85%RH  
 気圧 Air pressure 86 to 106kPa

但し、判定に疑義を生じた場合は次の条件にて行うこと。

If there is any doubt about the results, measurements shall be made within the following limits.

温度 Ambient temperature 20 ± 2°C  
 相対湿度 Relative humidity 60 to 70%RH  
 気圧 Air pressure 86 to 106kPa

2. 外観・寸法

Appearance · Dimension

2-1 外観 破損・変形などの機械的損傷がないこと。  
Appearance No mechanical damages such as breaks and deformation

2-2 寸法 組立図による。  
Dimension Specified in the product drawing.

3. 電気的特性 Electrical characteristics

No.	項目 Item	条件 Conditions	規格 Specifications
3-1	定格電圧 Rated voltage		DC 5 ± 0.5V
3-2	定格電力 Rated power		0.03W
3-3	電気的可変角度 Effective electrical angle		(80°)
3-4	全抵抗値 Total resistance	端子1 - 3間を測定。 Between terminals 1 and 3	10 kΩ ± 30%

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3-5	出力電圧直線性 Linearity	<b>基準勾配 Reference taper (Ideal line)</b> 出力電圧比50%の位置を通る傾き 100% / 80° The line shall be drawn at the 50% output point with the slope or 100%/80°. *測定は図2の測定回路を用いて行う。 *The linearity measuring circuit: See fig.2.	許容偏差 : Allowable deviation : 理想直線に対する偏差 : Allowable deviation : ±3% ( ±35°の範囲 ) ±3% ( Area : ±35° ) (出力電圧比 : 図1参照) (Output voltage ratio : See fig.1.)
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図1  
Fig.1

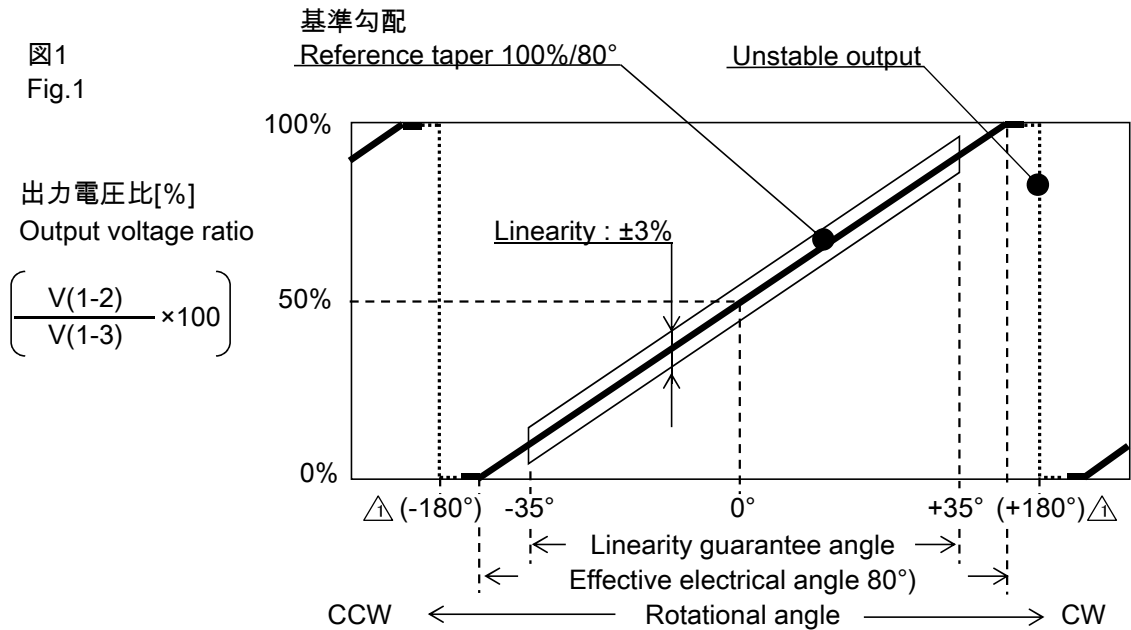
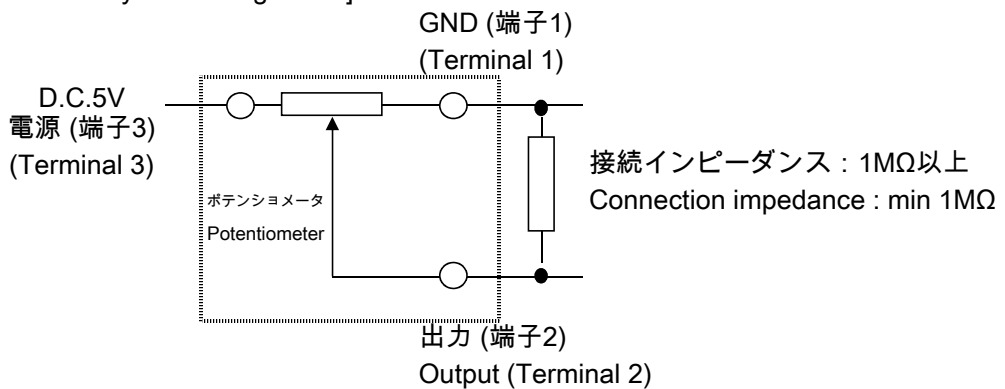


図2 [測定回路図]  
Fig.2. [The linearity measuring circuit]



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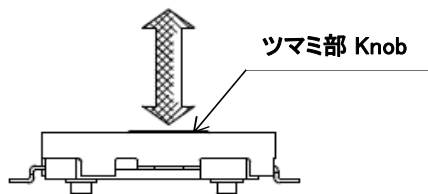
4. 機械的性能 Mechanical characteristics

4-1 回転トルク 2mN・m以下  
Rotational torque max.

ツマミ回転軸を製品に対して直角にして測定。  
The rotation shaft must be right-angled toward the product.

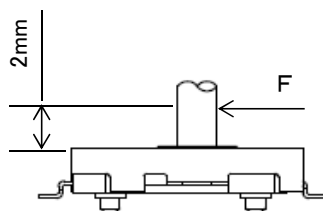
4-2 ツマミ部押し引き強度 10N 以上  
Knob push-pull strength Min. 10N

端子を基板にはんだ付けした状態にて、ツマミの回転に対して直角方向に10秒間加え、電気的性能に支障を与える機械的損傷の無いこと。  
A specified force shall be applied in the axial direction of the knob for 10seconds, with the potentiometer mounted in assembly condition.  
Electrical characteristics shall be satisfied



4-3 ツマミ側圧強度 3N 以上  
Side thrust strength on the knob Min. 3N

シャフトを挿入し、ケース上面より2mmの位置にて10秒間加え、電気的性能に支障を与える機械的損傷の無いこと。  
At first, insert the shaft.  
A specified force shall be applied in the set point and direction of the shaft for 10seconds, with the potentiometer mounted in assembly condition.  
Electrical characteristics shall be satisfied.



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5. 耐久性能 Durability

耐久試験後、標準状態に1時間以上放置後、各特性を測定すること。  
破損・変形等の機械的損傷がないこと。

The potentiometer shall be maintained at standard atmospheric conditions for minimum 1h, after which measurements shall be made.

Without mechanical damage such as breaks and deformation.

5-1 耐久試験後の特性 Characteristics after durability test.

試験後について、特に規定のない項目は初期規格を満足すること。

After test, potentiometer shall meet the initial specifications unless otherwise specified.

5-1-1 電気的性能 Electrical characteristics

- (1) 全抵抗値 初期値 ±40%  
Total resistance The variation in total resistance in reference to the value given before the test shall be within ±40%
- (2) 出力電圧直線性 ±4%  
Linearity

5-2 耐久試験条件 Durability test conditions

- 5-2-1 作動耐久試験 Rotational life
- (1) 周囲温度 標準状態  
Expose temperature Standard range of atmospheric condition
- (2) 作動範囲 出力電圧比50%の位置から±35°の範囲  
Operating angle Between ±35° from 50% output voltage ratio.
- (3) 作動速度 600 サイクル/時  
Rotational speed cycles/h
- (4) 作動回数 1,000,000 回転  
Operating cycle rotations
- (5) 電気的負荷 無負荷  
Power supply Unpowered

5-2-2 高温放置試験 High temperature soak

- (1) 槽内温度 +120±3°C  
Storage temperature
- (2) 放置時間 168時間  
Storage time hours
- (3) 電気的負荷 無負荷  
Power supply Unpowered

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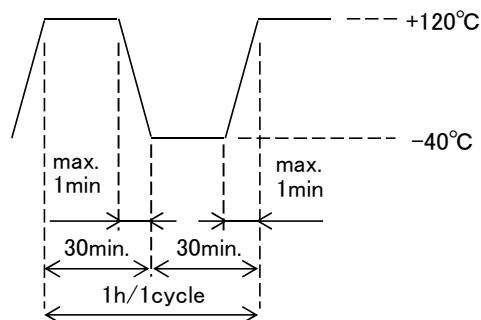
5-2-3 低温放置試験 Low temperature soak

- (1) 槽内温度 -40±3°C  
Storage temperature
- (2) 放置時間 168時間  
Storage time hours
- (3) 電氣的負荷 無負荷  
Power supply Unpowered

5-2-4 熱衝擊試験 Heat shock

- (1) 温度・時間サイクル 図3参照  
Temperature/Cycle time See Fig.3.
- (2) サイクル数 20サイクル  
Operating cycle cycles
- (3) 電氣的負荷 無負荷  
Power supply Unpowered

図3  
Fig.3.



5-2-5 耐湿試験 Humidity

- (1) 槽内温度 +60°C  
Storage temperature
- (2) 槽内湿度 +90 to 95%R.H.  
Storage humidity
- (3) 放置時間 96時間  
Storage time hours
- (4) 電氣的負荷 DC5V印加  
Power supply D.C.5V

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5-2-6 振動試験 Vibration

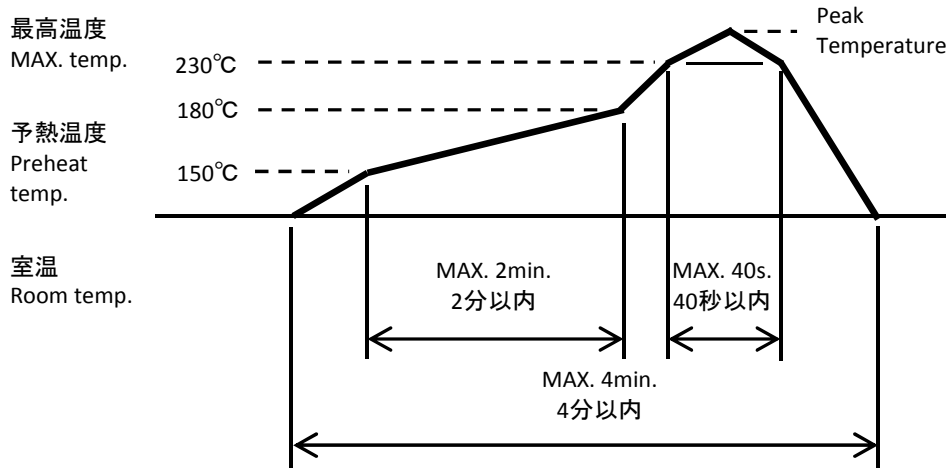
- (1) 重力加速度 Gravity 21.5 m/s<sup>2</sup>
- (2) 振動周波数 Frequency range 4000 cpm
- (3) 加振時間 Period X, Y, Z方向に各4時間  
4 hours in each of 3 mutually perpendicular planes
- (4) 電氣的負荷 Power supply 無負荷  
Unpowered

5-2-7 はんだ耐熱性 Resistance to soldering heat

プリント基板仕様 PCB specification 厚さ1.6mm、片面銅張り積層板  
t=1.6mm. One side copper clad PCB

- (1) 手はんだ Soldering iron
  - はんだごて温度 Bit temperature 350 ± 5 °C
  - はんだ時間 Application of soldering time 3<sup>+1</sup><sub>0</sub> 秒  
sec.

- (2) リフローはんだ Reflow soldering
  - \* 推奨リフロー条件  
\* Recommendation condition



リフロー回数：1回  
Maximum frequency of reflow soldering is 1.

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6-3. 設計上の注意点について About the mechanism and electrical design

6-3-1 接続インピーダンスについて About impedance

本製品は、図4のようにその出力端子をマイコンのA/Dポートに直接接続して使うことを前提に製作されています。つまり、接続インピーダンスの値はMΩオーダーを前提とし、ポテンシオメータの内部の接触抵抗をかなり高めに設定しています。よって図5のような回路でご使用になる場合は、接続インピーダンスが1MΩ以下にならないようにご配慮をお願いします。

Since this potentiometer is designed to use with its output is connected directly to the A/D port, impedance is considered to be mega ohm level, then contact resistance in the potentiometer is higher. Please refer to fig.4.

So when you use it in the circuit like fig.5, please make sure that impedance should be over than 1MΩ.

図4  
Fig.4.  
ポテンシオメータ  
Potentiometer

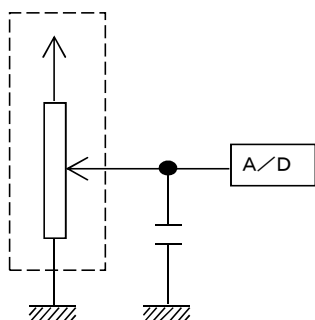
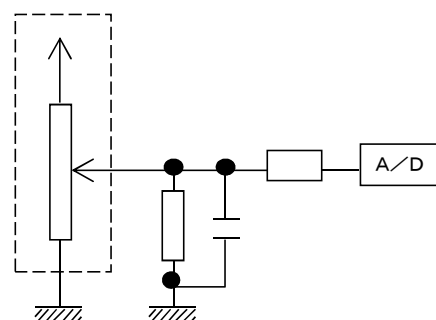


図5  
Fig.5.  
ポテンシオメータ  
Potentiometer



6-3-2 ノイズ対策について About countermeasure for noise

本製品からのデータ取り込みの際、まれに発生する取り込みミスや、外部ノイズの飛び込みと思われる、再現性の無いノイズの影響を最小限に抑えるため、ソフト上で以下のようなご配慮をお願いします。

- 例) データ取り込みは、必ず複数回行い平均を取る。
- 取り込みミスと思われるデータは無効にする判断をさせる。
- 疑義が生じた場合、再取り込みをする。上記内容を組み合わせる等。

We would like you to take the mentioned below into consideration in your software to minimize influence of non-reproducible noise and failed data from the potentiometer which might occur by any chance.

- ex) Getting data from the potentiometer should be conducted plural times, then take an average.
- Suspected data must be judged that they are invalid, then get them again.
- Combination or these actions, etc.

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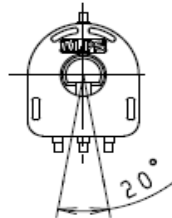
6-3-3 回転角度について

About overall rotation angle

当製品は360度回転できますが、出力はリニアリティ保証範囲でご使用を推奨いたします。  
 リニアリティ保証範囲外では出力が変化しない場合があります。  
 また、抵抗体の構造上、下図範囲(20°)における回転寿命は著しく少なくなっております。  
 従いまして、実使用時において下図範囲が駆動される使い方はお避け下さい。  
 取り付け時等における駆動は100回程度であれば問題ありません。

This potentiometer does not have end stop and possible continuous rotation more than 360 degree, however it is recommended to use output within the guaranteed angle of linearity.

The below shown area(20 degree) is not durable because of the construction. In application, therefore, please do not use the shown area as regular operation. up to 100 cycles actuation at the area for setting is allowed.



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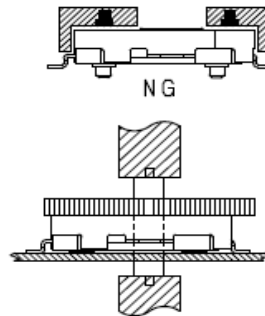
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6-3-4 本製品はその構造上、使用時状態において、本体ケースの圧縮及びツマミ部への回転動作以外の無理な力(押し圧など)を加えますと、それらの変形などにより、電気的性能の変化、及び回転トルクの増大、寿命低下、機械的破損が生じる場合があります。従いまして本製品の固定ははんだ付け部のみで行い、ツマミには回転動作以外の力が加わらないよう注意をお願い致します。  
又、やむを得ずツマミに過大な側圧がかかる場合には、ツマミへの勘合シャフトが支軸となるような取り付けをお願い致します。

Because of the construction of this potentiometer, an excessive stress, pressure to the body, or pressure or excessive force other than rotation to the hollow shaft portion may cause performance degradation in electrical, mechanical, life, or feeling.

To prevent this, please avoid any stress, pressure or force other than rotational one to the hollow shaft, and mounting/fixing the body should be by soldering pads only.

If actuation knob (provided by user) may be subjected to an excessive side force, the mating shaft must be supported with robust bearing mechanism so that the hollow shaft is free from such force.



6-3-5 ツマミのウエルドライン部について Weld line in the hollow shaft  
本製品のツマミはその材料に液晶ポリマーを採用しており、その材料特性上、下図の箇所のウエルドラインは機械的な結合はしておりません。これは、ツマミの貫通穴よりも大きな寸法のシャフトが圧入された場合に、この部分が押し広がることによってその寸法を許容することを狙ったものです。但し、この状態は当社が想定する正規の使用状態ではありませんので、万が一、このような状態となるときは性能への支障が生じないか個別でのご確認をお願い致します。

The hollow shaft material is LCP, and due to the material characteristics, the shown below portion of the shaft is not mechanically connected together.

If the larger diameter shaft than hollow size is inserted into this hollow shaft, the weld line will be enlarged to accept it so that irreversible damage can be avoided.

Since larger shaft may cause other problems in usage in spite of the above mentioned function, please use the recommended shaft size.

ウェルドライン  
Weld line



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6-4 はんだ付, 基板実装工程について About soldering process, assembly process.

6-4-1 はんだ付条件について About soldering process  
 はんだの条件の設定については、実際の量産条件で確認されるようお願いします。  
 Condition of soldering process shall be confirmed with actual production conditions.

6-4-2 取付状態について About mounting condition of potentiometer

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 potentiometers to the specified mounting surface and mount them horizontally.  
 If not mounted horizontally, these potentiometers will malfunction.

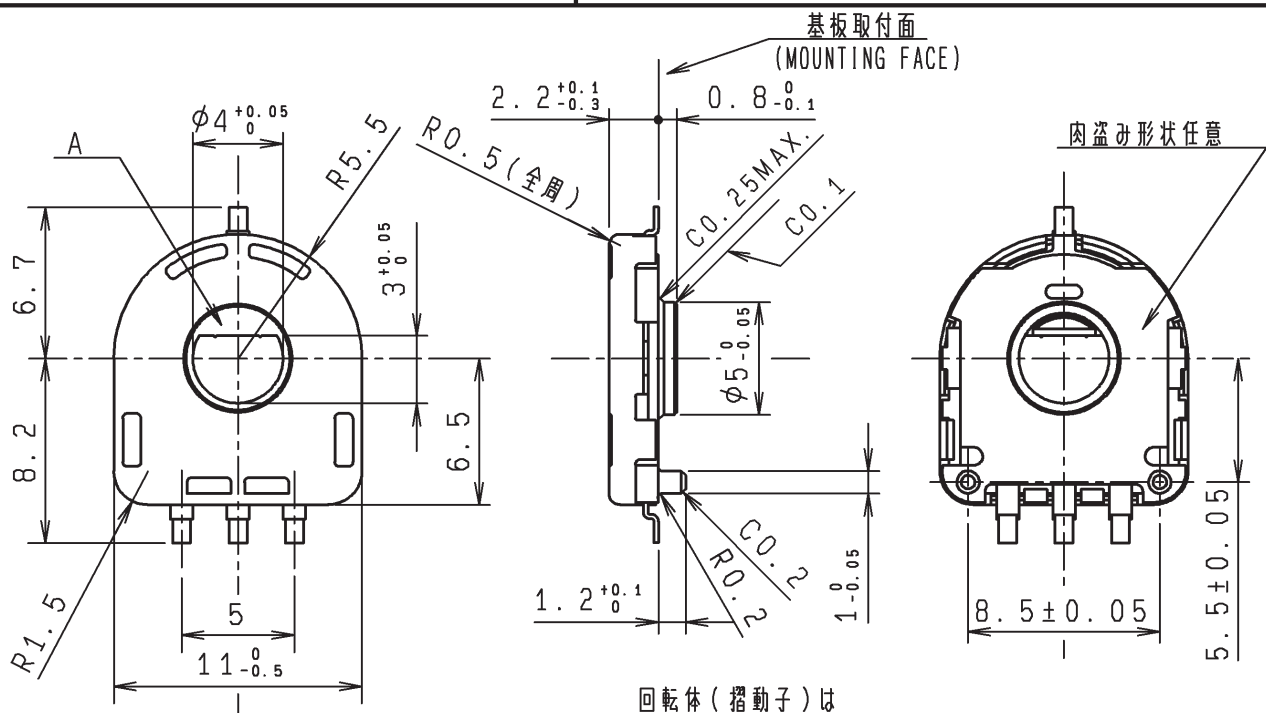
6-4-3 洗浄について About cleaning after soldering

はんだ付け後、溶剤などで製品を洗浄しないで下さい。  
 はんだ付けを2回行う場合、1回目のはんだ付け部が常温に戻ってから行って下さい。  
 Following the soldering process, do not try to clean the potentiometers with a solvent or the like.  
 If you reflow twice, please wait until the first soldering part returns at the normal temperature.

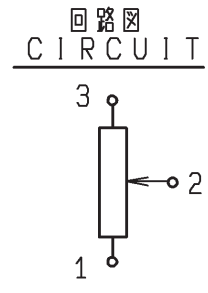
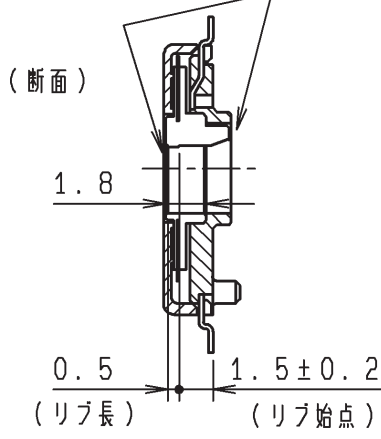
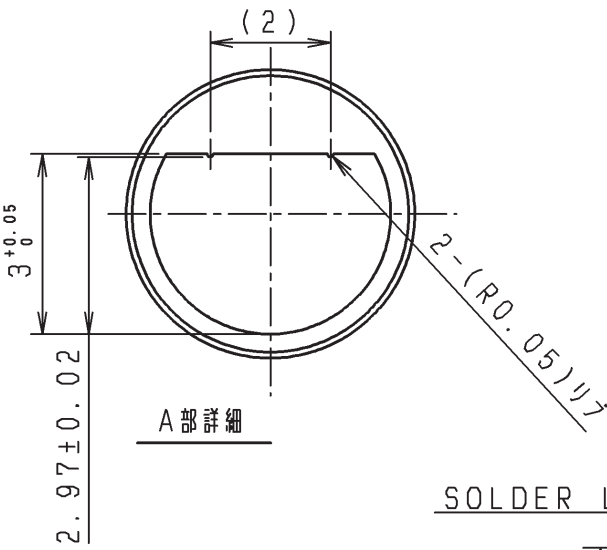
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					CENG2(G)	CENG2	CENG2	規格書 SPECIFICATIONS
					Nov.04.2015	Nov.04.2015	Nov.04.2015	DOCUMENT No.
					S.URUSHIHARA	J.KATO	Y.SHIMIZU	5RDC501171 ( 11/11)
SYMB.	DATE	APPD.	CHKD.	DSGD.				

CONFIDENTIAL

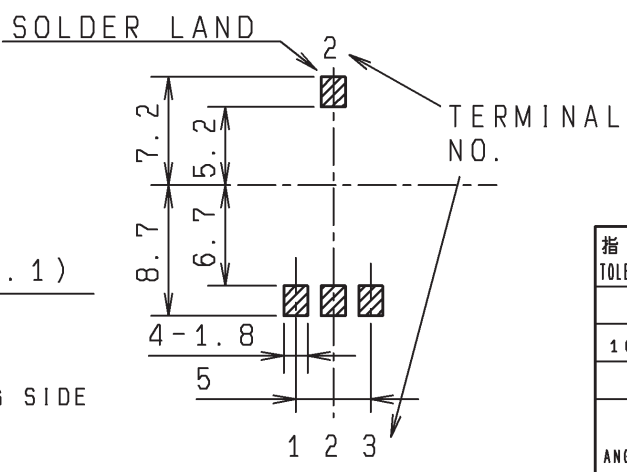


回転体(摺動子)は  
外形より凸しないこと。



半田ランド寸法図(許容差±0.1)

\*取付側より見た図  
SOLDER LAND DETAIL  
(TOLERANCE±0.1)  
VIEWED FROM MOUNTING SIDE



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	±5°

PART NO.	NAME	MATERIAL NAME / CODE	FINISH
<b>ALPS ELECTRIC CO., LTD.</b>			
DSGD.	Y. SHIMIZU	2010-05-06	SCALE 3:1
CHKD.	T. OHARA	2010-05-06	NO. _____
APPD.	Y. KATO	2010-05-06	TITLE ROTARY SENSOR
SYMB	DATE	APPD	CHKD
DSGD	Y. KATO	2010-05-06	UNIT mm
			DOCUMENT NO. RDK506001

**Confidential**

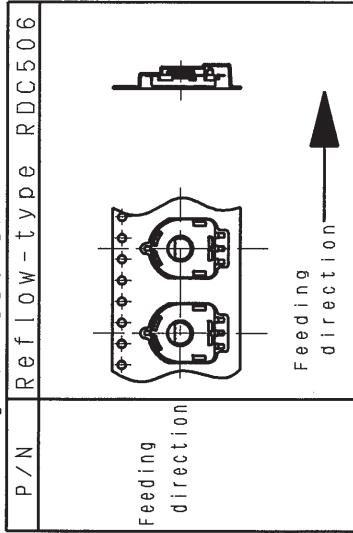
1. Composition and Material

Composition	Material
Reel	PS
Carrier tape	PP
Cover tape	PET/PE

2. Quantity

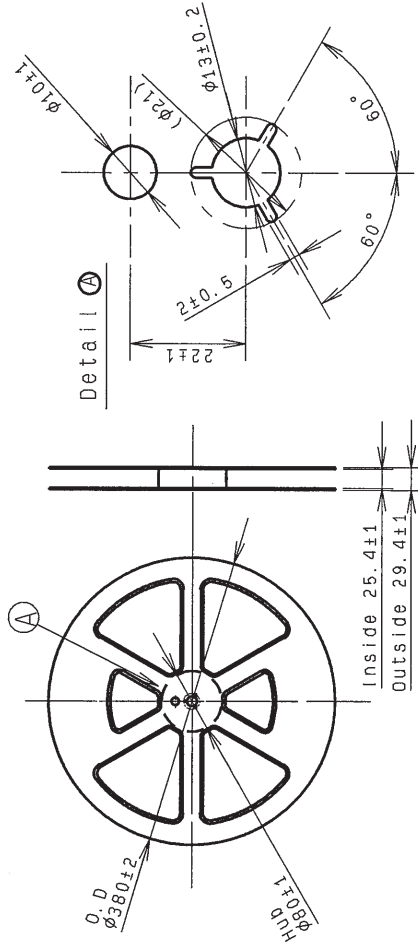
1200pcs Min./reel  
 \*Order q'ty is to be divided by this number.

3. Feeding direction

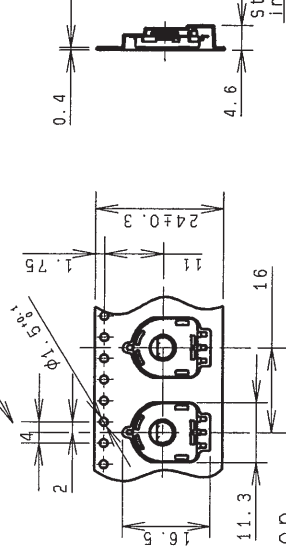


4. Dimension

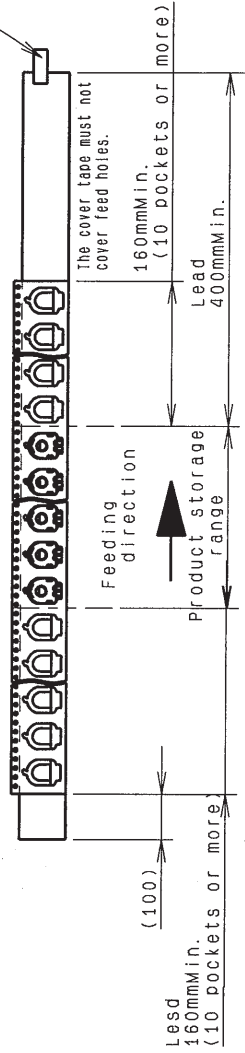
4-1. Reel (Agreed to EIAJ ET-7200B)



4-2. Carrier tape



5. Composition

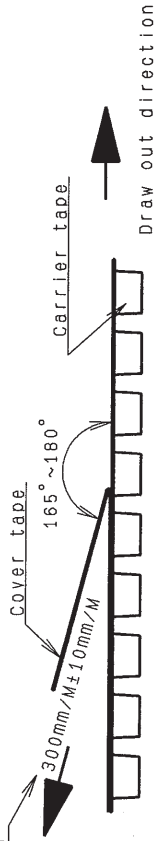


6. Others

6-1. Exfoliation strength of the cover tape

The exfoliation strength of cover tape: 0.1~1.3N  
 And cover tape must not have a wound, cut.

Peel speed



6-2. Durability of cover tape

After this packing being subjected to 40±2% with relative humidity of 90% to 95% for 500 hours, the cover tape must not deteriorate from carrier tape.

6-3. Minimum radius

The minimum radius that the carrier tape can be one only rounded without any damage is Min. R50mm.

7. Marking

Customer's part NO.      our product NO.      quantity  
 Date code                      our company name

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