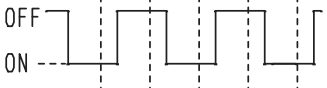
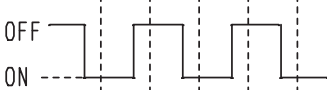
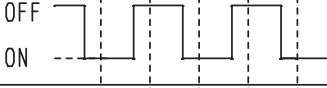
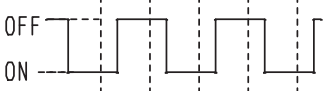


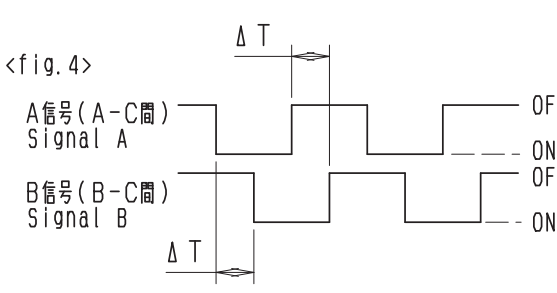
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                           |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|--------|
| CLASS No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TITLE<br>回転形エンコーダ 規格書<br>ROTATIONAL ENCODER SPECIFICATION | (SW01) |
| <div>1. 一般事項 General</div> <div>1-1 適用範囲 Scope</div> <div>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。<br/>This specification applies to 12mm size low-profile rotary encoder (incremental type) for microscopic current circuits, used in electronic equipment.</div> <div>1-2 標準状態 Standard atmospheric conditions</div> <div>試験及び測定は特に指定のない限り、次の状態で行なう。<br/>Unless otherwise specified, the standard range of atmospheric conditions for making measurements and tests is as follows:<br/>温度 Ambient temperature : 15°C to 30°C<br/>相対湿度 Relative humidity : 25% to 85%<br/>気圧 Air pressure : 86kPa to 106kPa<br/>但し、疑義を生じた場合は、次の基準状態で行なう。<br/>If there is any doubt about the results, measurements shall be made within the following limits:<br/>温度 Ambient temperature : 25 ± 1°C<br/>相対湿度 Relative humidity : 63% to 67%<br/>気圧 Air pressure : 86kPa to 106kPa</div> <div>1-3 使用温度範囲</div> <div>Operating temperature range : -40°C to +85°C</div> <div>1-4 保存温度範囲</div> <div>Storage temperature range : -40°C to +85°C</div> <div>2. 構造 Construction</div> <div>2-1 寸法 Dimensions</div> <div>添付組立図による。<br/>Refer to attached drawing.</div> <div>3. 定格 Rating</div> <div>3-1 定格容量 Rating : D.C. 5V 10mA 抵抗負荷 (最大定格) Resistive load (Maximum rating)<br/>1mA 抵抗負荷 (最小定格) Resistive load (Minimum rating)</div> <div>4. 電気的性能 Electrical characteristics</div> |                                                           |        |

|     | 項目<br>Item                      | 条 件<br>Conditions             | 規 格<br>Specifications                                                                 |                                                                                                                                                                                             |                                     |                               |                                                                                       |
|-----|---------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| 4-1 | 出力信号<br>Output signal<br>format | <Fig 1>                       |                                                                                       | A, B 2 信号の位相差出力とし、詳細は<br><fig. 1>の通りとする。<br>(破線はクリックの位置を示す・)<br>2 Phase-different signals<br>(SignalA, signalB)<br>Details shown in <fig.1>.<br>(The broken line shows<br>detent position.) |                                     |                               |                                                                                       |
|     |                                 |                               |                                                                                       |                                                                                                                                                                                             | 軸回転方向<br>Shaft rotational direction | 信 号<br>Signal                 | 出力波形<br>Output                                                                        |
|     |                                 |                               |                                                                                       |                                                                                                                                                                                             | 時計方向<br>C. W.                       | A (A-C端子間)<br>A(Terminal A-C) |  |
|     |                                 | B (B-C端子間)<br>B(Terminal B-C) |  |                                                                                                                                                                                             |                                     |                               |                                                                                       |
|     |                                 | 反時計方向<br>C. C. W.             | A (A-C端子間)<br>A(Terminal A-C)                                                         |                                                                                                        |                                     |                               |                                                                                       |
|     |                                 |                               | B (B-C端子間)<br>B(Terminal B-C)                                                         |                                                                                                        |                                     |                               |                                                                                       |

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|      |      |      |      |      | APPD.               | CHKD.         | DSGD.         | TITLE                             |
|      |      |      |      |      | Dec. 27. 2007       | Dec. 27. 2007 | Dec. 27. 2007 | ROTATIONAL ENCODER<br>12形回転形エンコーダ |
|      |      |      |      |      | S. MIZOBUCHI        | K. YOKOYAMA   | Y. SHIMIZU    | DOCUMENT NO.                      |
| SYMB | DATE | APPD | CHKD | DSGD | 5LE212-D10 (1/6)    |               |               |                                   |

| CLASS No.  |                                               | TITLE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  | (SW01)                                                                              |  |
|------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------|--|
|            |                                               | 回転形エンコータ* 規格書<br>ROTATIONAL ENCODER SPECIFICATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |                                                                                     |  |
| 項目<br>Item |                                               | 条 件<br>Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  | 規 格<br>Specifications                                                               |  |
| 4-2        | 分解能<br>Resolution                             | 1回転にて出力されるパルス数<br>Number of pulses in 360° rotation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  | 各相15パルス/360°<br>15 pulses/360°<br>for each phase<br><br>2クリック 1パルス<br>2click 1pulse |  |
| 4-3        | スイッチング特性<br>Switching characteristics         | <p>下記測定回路&lt;fig. 2&gt;を用い、回転軸を<math>360^{\circ} \cdot s^{-1}</math>の速さで回転し測定する。<br/>Measurement shall be made under the condition as follows.<br/>1) Shaft rotational speed : <math>360^{\circ} \cdot s^{-1}</math><br/>2) Test circuit : &lt;fig. 2&gt;</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>&lt;fig. 2&gt;</p> </div> <div style="text-align: center;"> <p>&lt;fig. 3&gt;</p> </div> </div> <p>(注記) コードOFF状態 : 出力電圧が2.5V以上の状態を言う。<br/>コードON状態 : 出力電圧が2.5V以下の状態を言う。<br/>(note) Code-OFF area : The area which the voltage is 2.5V or more.<br/>code-ON area : The area which the voltage is 2.5V or less.</p> |  |                                                                                     |  |
| 1)         | チャタリング<br>Chattering                          | コードのOFF→ON及びON→OFFの際の、出力2.5Vの通過時間にて規定する。<br>Specified by the signal's passage time from 2.5V or each switching position (code OFF→ON or ON→OFF).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  | $t_1, t_3 \leq 3ms$                                                                 |  |
| 2)         | 揺動ノイズ<br>(ハ・ウンス)<br>Sliding noise<br>(Bounce) | コードONの部分の2.5V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5ms以上の2.5V以下のON部分を有するものとする。また、揺動ノイズ間に2.5V以下の範囲が1ms以上ある場合は、別の揺動ノイズと判断する。<br>Specified as voltage change time exceeding 2.5V in code ON area.<br>Noise, located between chatterings $t_1$ and $t_3$ , with ON time of 5ms or more apart from both to be regarded as a bounce, $t_2$ .<br>When there is an ON time, below 2.5V, of 1ms or more in bounce $t_2$ area, the bounce to be regarded as individual ones.                                                                                                                                                                                                                                         |  | $t_2 \leq 2ms$                                                                      |  |
| 3)         | 揺動ノイズ<br>Sliding noise                        | コードOFFの部分の電圧変動<br>The voltage change in code-OFF area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  | 2.5V以上<br>2.5V MIN                                                                  |  |

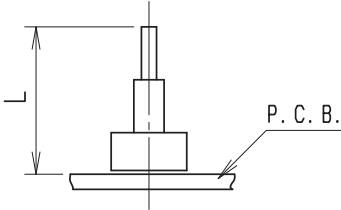
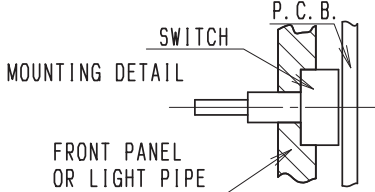
|      |      |      |      |      |                            |               |               |                                   |
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|      |      |      |      |      | <b>ALPSALPINE CO.,LTD.</b> |               |               |                                   |
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|      |      |      |      |      | Dec. 27. 2007              | Dec. 27. 2007 | Dec. 27. 2007 | ROTATIONAL ENCODER<br>12形回転形エンコーダ |
|      |      |      |      |      | S. MIZOBUCHI               | K. YOKOYAMA   | Y. SHIMIZU    | DOCUMENT NO.                      |
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| CLASS No.                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | TITLE<br>回転形エンコーダ* 規格書<br>ROTATIONAL ENCODER SPECIFICATION              |  | (SW01) |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--|--------|
| 項目<br>Item                        | 条件<br>Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 規格<br>Specifications                                                    |  |        |
| 4-4 位相差<br>Phase-difference       | <p>360°・s<sup>-1</sup>の定速にて操作軸を回転する。<br/>Measurement shall be made under the condition which the shaft is rotated in 360°・s<sup>-1</sup> (constant speed).</p> <p>&lt;fig. 4&gt;</p>  <p>注意事項：摺動接点ですので手動操作時の出力波形はご使用されるツマミ径、軸の回転速度によって変化致します。回路設計時は実装にて確認願います。<br/>Note: Above specification (4-4) is changeable. When operate by manual. Please check performance using actual circuit and knob.</p> | <fig. 4>において In<fig. 4><br>ΔT ≥ 4ms                                     |  |        |
| 4-5 絶縁抵抗<br>Insulation resistance | 端子-軸受間にD. C. 250V印加する。<br>Measurement shall be made under the condition which a voltage of 250V D.C. is applied between individual terminals and bushing.                                                                                                                                                                                                                                                                                                                               | 端子-軸受間にて100MΩ以上<br>Between individual terminals and bushing: 100MΩ MIN. |  |        |
| 4-6 耐電圧<br>Dielectric strength    | 端子-軸受間にA. C. 300V1分間又は、A. C. 360V1秒間印加する。<br>(リーク電流1mA)<br>A voltage of 300V A.C. shall be applied for 1min or a voltage of 360V A.C. shall be applied for 1s between individual terminals and bushing. (Leak current: 1mA)                                                                                                                                                                                                                                                             | 損傷・アーク・絶縁破壊がないこと。<br>Without damage to parts, arcing or breakdown.      |  |        |

## 5. 機械的性能 Mechanical characteristics

| 項目<br>Item                                        | 条件<br>Conditions                                                                                             | 規格<br>Specifications                                                                                                     |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 5-1 全回転角度<br>Total rotational angle               |                                                                                                              | 360° (エンドレス)<br>360° (Endless)                                                                                           |
| 5-2 クリックトルク<br>Detent torque                      | (をだし、回転速度60°/1秒)<br>(Rotational speed 60°/s.)                                                                | 10 ± 5 mN・m                                                                                                              |
| 5-3 クリック点数及び位置<br>Number and position of detents. |                                                                                                              | 30点クリック<br>30 detents<br>(ステップ角度 12° ± 3°)<br>(Step angle: 12° ± 3°)                                                     |
| 5-4 端子強度<br>Terminal strength                     | 端子先端の任意の方向に5Nの力を1分間加える。<br>A static load of 5N be applied to the tip of terminals for 1min in any direction. | 端子の破損、著しいカクタがないこと。<br>但し、端子の曲がりは可とする。<br>Without damage or excessive looseness of terminals. Terminal bend is permitted. |

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|      |      |      |      |      |                             |               |               | DOCUMENT NO.       |
| SYMB | DATE | APPD | CHKD | DSGD |                             |               |               | 5LE212-D10 (3/6)   |

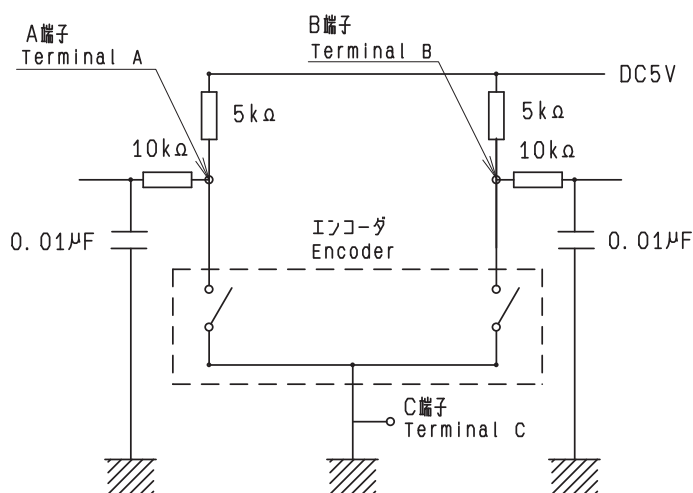
| CLASS NO.                                           |                                                                                                                                                                                                                                                                                                                        | TITLE 回転形エンコータ 規格書<br>ROTATIONAL ENCODER SPECIFICATION                                                                           |  | (SW01) |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--|--------|
| 項目<br>Item                                          | 条件<br>Conditions                                                                                                                                                                                                                                                                                                       | 規格<br>Specifications                                                                                                             |  |        |
| 5-5 軸の押し引き強度<br>Push-pull strength of shaft         | 軸の押し及び引き方向に100Nの力を10秒間加える。<br>(セット実装状態)<br>Push and pull static load of 100N shall be applied to the shaft in the axial direction for 10s.<br>(After installing)                                                                                                                                                       | 軸の破損、著しいガタのないこと。<br>感触に異常がないこと。<br>Without damage or excessive play in shaft.<br>No excessive abnormality in rotational feeling. |  |        |
| 5-6 軸ガタ<br>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。<br>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.<br>                                                      | 0.5×L/30mmp-p以内<br>0.5×L/30mmp-p MAX.<br><br>Lは取付長さで比例計算する。<br>L: Measurement point from mounting surface of bushing             |  |        |
| 5-7 軸のスラスト方向ガタ<br>Shaft play in axial direction     |                                                                                                                                                                                                                                                                                                                        | 0.2mm 以下<br>0.2mm MAX.                                                                                                           |  |        |
| 5-8 軸の回転方向力タ<br>Rotation play at the click position | 角度板にて測定する。<br>Measure with jig for rotational angle.                                                                                                                                                                                                                                                                   | 3° 以内<br>3° MAX.                                                                                                                 |  |        |
| 5-9 取付け上の注意<br>Notice for mounting                  | 右図の様にスイッチ本体を押えてご使用下さい。セット側でスイッチ本体の引き及び回転方向の力「イト」が無い場合は、はんだ付けだけの固定となり、はんだ付け信頼性及びスイッチ本体強度が不安定となる可能性があります。<br>Hold the bushing use front panel or light pipe.<br>Because this switch not has thread. If don't hold the bushing, the switch maybe become intermittent rough mounting after soldering by knob stopper face. |                                             |  |        |

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| CLASS No.                                                            |                             | TITLE                                                                                                                                                                                                                                                                                                                                                                                                                |               |                                                                                                                                                                                                                                                                                                                                |                                   |
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|                                                                      |                             | 回転形エンコータ* 規格書                                                                                                                                                                                                                                                                                                                                                                                                        |               | (SW01)                                                                                                                                                                                                                                                                                                                         |                                   |
|                                                                      |                             | ROTATIONAL ENCODER SPECIFICATION                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                |                                   |
| 6. 耐久性能 Endurance characteristics.                                   |                             |                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                                                                                                                                                                                                                                                                                                                                |                                   |
|                                                                      | 項目<br>Item                  | 条 件<br>Conditions                                                                                                                                                                                                                                                                                                                                                                                                    |               | 規 格<br>Specifications                                                                                                                                                                                                                                                                                                          |                                   |
| 6-1                                                                  | しゅう動寿命性能<br>Rotational life | 無負荷で軸を毎時1000サイクルの速さで、30,000サイクル断続動作を行う。<br>但し、試験途中15,000で中間測定を行う。(1サイクルは、360°1往復)<br>The shaft of encoder shall be rotated to 30,000 cycles at a speed of 1000cycles per hour without electrical load, after which measurements shall be made.<br>However, an interim measurement shall be made immediately after 15,000 cycles.<br>(1 cycle: rotate 360° CCW rotate 360° CW)                                        |               | チャタリング* $t_1 \leq 5\text{mS}$<br>Chattering $t_1 \leq 5\text{mS}$<br>クリックトルクは<br>初期規格値に対し $\pm 10\%$ 以内のこと<br>Detent torque:Relative to the previously specified value. $\pm 10\%$ MAX<br>その他初期規格を満足すること。<br>4. 1~4. 3, 4. 5~4. 6, 5. 1, 5. 3<br>Specifications in clause 4. 1~4. 3, 4. 5~4. 6, 5. 1, 5. 3 shall be satisfied. |                                   |
| 6-2                                                                  | 耐湿性<br>Damp heat            | 温度 $60 \pm 2^\circ\text{C}$ 、湿度90~95%の恒温湿槽中に $240 \pm 10$ 時間放置後、<br>常温、常湿中に1. 5時間放置する。<br>The encoder shall be stored at a temperature of $60 \pm 2^\circ\text{C}$ with relative humidity of 90% to 95% for $240 \pm 10\text{h}$ in a thermostatic chamber.<br>And then the encoder shall be subjected to standard atmospheric conditions for 1. 5h, after which measurement shall be made.                          |               | クリックトルク<br>初期規格値に対し $\pm 30\%$ 以内のこと<br>Detent torque:Relative to the previously specified value. $\pm 30\%$ MAX<br>その他初期規格を満足すること。<br>4. 1~4. 6, 5. 1, 5. 3<br>Specifications in clause 4. 1~4. 6, 5. 1, 5. 3 shall be satisfied.                                                                                             |                                   |
| 6-3                                                                  | 耐熱特性<br>Dry heat            | 温度 $85 \pm 3^\circ\text{C}$ の恒温槽中に $240 \pm 10$ 時間放置後、常温、常湿中に1. 5時間放置する。<br>The encoder shall be stored at a temperature of $85 \pm 3^\circ\text{C}$ for $240 \pm 10\text{h}$ in a thermostatic chamber.<br>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<br>Cold                | 温度 $-40 \pm 3^\circ\text{C}$ の恒温槽中に $240 \pm 10$ 時間放置後、常温、常湿中に1. 5時間放置する。<br>The encoder shall be stored at a temperature of $-40 \pm 3^\circ\text{C}$ for $240 \pm 10\text{h}$ in a thermostatic chamber.<br>And then the encoder shall be subjected to standard atmospheric conditions for 1. 5h, after which measurement shall be made.                                                                           |               |                                                                                                                                                                                                                                                                                                                                |                                   |
| 6-5                                                                  | 耐振性<br>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。<br>The following vibration shall be applied to the encoder, after which measurement shall be made:<br>The entire frequency range, from 10Hz to 55Hz and return to 10Hz, shall be transversed in 1 min.<br>Amplitude(total excursion): 1. 5mm.<br>This motion shall be applied for a period of 2h in each of 3 mutually perpendicular axes.<br>(A total of 6h) |               |                                                                                                                                                                                                                                                                                                                                |                                   |
| 6-6                                                                  | 耐落下性<br>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。<br>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.                                                                                                                                                                                                           |               | 初期規格を満足すること。<br>4. 1~4. 6, 5. 1~5. 8<br>Specifications in clause 4. 1~4. 6, 5. 1~5. 8 shall be satisfied.<br>(但し、端子部の変形は除く。)<br>(Except the deformation of terminals)                                                                                                                                                          |                                   |
| <div style="text-align: center;"> <b>ALPSALPINE CO., LTD.</b> </div> |                             |                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                                                                                                                                                                                                                                                                                                                                |                                   |
|                                                                      |                             | APPD.                                                                                                                                                                                                                                                                                                                                                                                                                | CHKD.         | DSGD.                                                                                                                                                                                                                                                                                                                          | TITLE                             |
|                                                                      |                             | Dec. 27. 2007                                                                                                                                                                                                                                                                                                                                                                                                        | Dec. 27. 2007 | Dec. 27. 2007                                                                                                                                                                                                                                                                                                                  | ROTATIONAL ENCODER<br>12形回転形エンコーダ |
|                                                                      |                             | S. MIZOBUCHI                                                                                                                                                                                                                                                                                                                                                                                                         | K. YOKOYAMA   | Y. SHIMIZU                                                                                                                                                                                                                                                                                                                     | DOCUMENT NO.                      |
|                                                                      |                             | 5LE212-D10 (5/6)                                                                                                                                                                                                                                                                                                                                                                                                     |               |                                                                                                                                                                                                                                                                                                                                |                                   |
| SYMB                                                                 | DATE                        | APPD                                                                                                                                                                                                                                                                                                                                                                                                                 | CHKD          | DSGD                                                                                                                                                                                                                                                                                                                           |                                   |

## その他、取扱い上のご注意 PRECAUTIONS IN USE

- 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
- 2) エンコータのハ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.
- 3) エンコータのハ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.



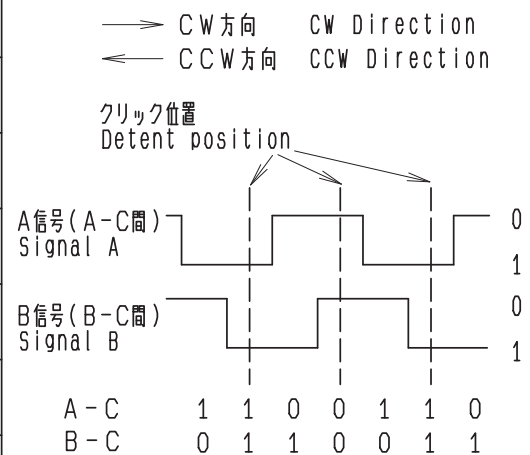
- 4) 本製品の本体に直接水分がかかりますと、ハルス波形に異常が発生する可能性がありますので、製品に直接水分がかからないよう配慮願います。  
Care must be taken not to expose this product to water or dew to prevent possible problem in pluse output wave form.
- 5) 本製品はオーディオ機器、映像機器、家電機器、情報機器、通信機器などの一般電子機器用に設計、製造したものです。生命維持装置、宇宙航空機器、防災防犯機器などの高度な安全性や信頼性が求められる用途に使用される場合は、貴社にて適合性の確認を頂くか、当社へご確認ください。  
This product has been designed and manufactured for general electronic devices, such as audio devices, visual devices, home electronics, information devices and communication devices.  
In case this product is used for more sophisticated equipment requiring higher safety and reliability, such as life support system, space & aviation devices, disaster prevention & security system, please make verification of conformity or check on us for the details.

|      |      |      |      |      |                             |               |               |                          |
|------|------|------|------|------|-----------------------------|---------------|---------------|--------------------------|
|      |      |      |      |      | <b>ALPSALPINE CO., LTD.</b> |               |               |                          |
|      |      |      |      |      | APPD.                       | CHKD.         | DSGD.         | TITLE ROTATIONAL ENCODER |
|      |      |      |      |      | Dec. 27. 2007               | Dec. 27. 2007 | Dec. 27. 2007 | 12形回転形エンコーダ              |
|      |      |      |      |      | S. MIZOBUCHI                | K. YOKOYAMA   | Y. SHIMIZU    | DOCUMENT NO.             |
| SYMB | DATE | APPD | CHKD | DSGD | 5LE212-D10 (6/6)            |               |               |                          |

|           |       |
|-----------|-------|
| CLASS No. | TITLE |
|-----------|-------|

- 1) エンコータ\*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.

| 出力変化順序 —————>          |   |   | 回転方向判定 |                |
|------------------------|---|---|--------|----------------|
| Order of output signal |   |   |        |                |
| A-C                    | 1 | 0 | 0      | CW方向           |
| B-C                    | 1 | 1 | 0      | CW Direction   |
| A-C                    | 0 | 1 | 1      | CW方向           |
| B-C                    | 0 | 0 | 1      | CW Direction   |
| A-C                    | 1 | 1 | 0      | CCW方向          |
| B-C                    | 1 | 0 | 0      | CCW Direction  |
| A-C                    | 0 | 0 | 1      | CCW方向          |
| B-C                    | 0 | 1 | 1      | CCW Direction  |
| A-C                    | 1 | 0 | 1      | 無効             |
| B-C                    | 1 | 1 | 1      | Not applicable |
| A-C                    | 1 | 1 | 1      | 無効             |
| B-C                    | 1 | 0 | 1      | Not applicable |
| A-C                    | 0 | 1 | 0      | 無効             |
| B-C                    | 0 | 0 | 0      | Not applicable |
| A-C                    | 0 | 0 | 0      | 無効             |
| B-C                    | 0 | 1 | 0      | Not applicable |



クリック位置より、A信号が先に変化後、B信号が変化した時にCW方向と判定。  
クリック位置より、B信号が先に変化後、A信号が変化した時にCCW方向と判定。  
どちらかの信号が変化しない時は、無効とする。

From detent position, phase A changes first then phase B change follows,  
it means CW direction.  
If either phase has no change it is not valid.

|  |  |  |  |  |                            |            |            |              |
|--|--|--|--|--|----------------------------|------------|------------|--------------|
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|  |  |  |  |  | APPD.                      | CHKD.      | DSGD.      | TITLE        |
|  |  |  |  |  | M-ENG2                     | M-ENG2     | M-ENG2     |              |
|  |  |  |  |  | S.MIZOBUCHI                | K.HIROSE   | H.MIURA    | DOCUMENT NO. |
|  |  |  |  |  | 2012-01-30                 | 2012-01-30 | 2012-01-30 | 4LE-30       |



|                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                                                                                                                                                                                                                                                                                                                             |      |      |                                                                                                                                                              |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| CLASS No.                                                                                                                                                                                                                                                                                                                                                                         |                                   | TITLE<br>フッシュモーメンタリスイッチ規格書<br>PUSH MOMENTARY SWITCH SPECIFICATION                                                                                                                                                                                                                                                           |      |      | (SW02)                                                                                                                                                       |  |
| 1. 定格容量 (抵抗負荷)<br>Switch rating (Resistor load) D. C. 5V 10mA 抵抗負荷(最大定格) Resistive load(Maximum rating)<br>1mA 抵抗負荷(最小定格) Resistive load(Minimum rating)                                                                                                                                                                                                                          |                                   |                                                                                                                                                                                                                                                                                                                             |      |      |                                                                                                                                                              |  |
| 2. 電気的性能 Electrical characteristics                                                                                                                                                                                                                                                                                                                                               |                                   |                                                                                                                                                                                                                                                                                                                             |      |      |                                                                                                                                                              |  |
|                                                                                                                                                                                                                                                                                                                                                                                   | 項目<br>Item                        | 条 件<br>Conditions                                                                                                                                                                                                                                                                                                           |      |      | 規 格<br>Specifications                                                                                                                                        |  |
| 2-1                                                                                                                                                                                                                                                                                                                                                                               | 接触抵抗<br>Contact resistance        | D. C. 5V1mA電圧降下法にて測定する。<br>Measured by the 1mA 5V D.C. voltage drop method.                                                                                                                                                                                                                                                 |      |      | 100mΩ MAX.                                                                                                                                                   |  |
| 2-2                                                                                                                                                                                                                                                                                                                                                                               | チャタリング*<br>Chattering             | 1サイクル (OFF-ON-OFF) 1秒で動作させる。<br>Switch is operated at the rate of 1 cycle 1s.<br>The 1 cycle shall be OFF-ON-OFF.                                                                                                                                                                                                           |      |      | 10ms以下<br>Less than 10ms                                                                                                                                     |  |
| 2-3                                                                                                                                                                                                                                                                                                                                                                               | 絶縁抵抗<br>Insulation resistance     | 端子-軸受間にD. C. 250V印加する。<br>Measurement shall be made under the condition which a voltage of 250VD.C. is applied between individual terminals and bushing.                                                                                                                                                                    |      |      | 端子-軸受間に100MΩ以上<br>Between individual terminals and bushing: 100MΩ MIN.                                                                                       |  |
| 2-4                                                                                                                                                                                                                                                                                                                                                                               | 耐電圧<br>Dielectric strength        | 端子-軸受間にA. C. 300V1分間又は、A. C. 360V1秒間印加する。<br>(リーク電流1mA)<br>A voltage of 300VA.C. shall be applied for 1min or a voltage of 360VA.C. shall be applied for 1s between individual terminals and bushing. (Leak current:1mA)                                                                                                    |      |      | 損傷・アーク・絶縁破壊がないこと。<br>Without damage to parts, arcing or breakdown.                                                                                           |  |
| 注記:<br>Note: 軸・スイッチ端子間は絶縁されております。<br>Shaft is insulated from switch terminal.                                                                                                                                                                                                                                                                                                     |                                   |                                                                                                                                                                                                                                                                                                                             |      |      |                                                                                                                                                              |  |
| 3. 機械的性能 Mechanical characteristics                                                                                                                                                                                                                                                                                                                                               |                                   |                                                                                                                                                                                                                                                                                                                             |      |      |                                                                                                                                                              |  |
|                                                                                                                                                                                                                                                                                                                                                                                   | 項目<br>Item                        | 条 件<br>Conditions                                                                                                                                                                                                                                                                                                           |      |      | 規 格<br>Specifications                                                                                                                                        |  |
| 3-1                                                                                                                                                                                                                                                                                                                                                                               | スイッチ回路・接点数<br>Contact arrangement |                                                                                                                                                                                                                                                                                                                             |      |      | 単極単投(Push on)<br>S. P. S. T. (Push on)                                                                                                                       |  |
| 3-2                                                                                                                                                                                                                                                                                                                                                                               | スイッチ移動量<br>Switching stroke       |                                                                                                                                                                                                                                                                                                                             |      |      | 0.5±0.3 mm                                                                                                                                                   |  |
| 3-3                                                                                                                                                                                                                                                                                                                                                                               | スイッチ作動力<br>Switch operation force |                                                                                                                                                                                                                                                                                                                             |      |      | 3+1.5N<br>-1                                                                                                                                                 |  |
| 4. 耐久性能 Endurance characteristics.                                                                                                                                                                                                                                                                                                                                                |                                   |                                                                                                                                                                                                                                                                                                                             |      |      |                                                                                                                                                              |  |
|                                                                                                                                                                                                                                                                                                                                                                                   | 項目<br>Item                        | 条 件<br>Conditions                                                                                                                                                                                                                                                                                                           |      |      | 規 格<br>Specifications                                                                                                                                        |  |
| 4-1                                                                                                                                                                                                                                                                                                                                                                               | 動作寿命特性<br>Operating life          | 無負荷にて軸を毎時1000回の速さで30,000回連続動作を行う。<br>但し、試験途中15,000で中間測定を行う。押し圧:10N以下<br>The shaft of switch shall be 30,000 times at a speed of 1000times per hour without electrical load, after which measurements shall be made.<br>However, an interim measurement shall be made immediately after 15,000 times.<br>Push force:10N MAX. |      |      | 接触抵抗:200mΩ以下<br>その他、初期規格を満足すること。<br>Switch contact resistance:200mΩMAX.<br>Except above items, specifications in clause 2.2~4, and 3.1~3 shall be satisfied. |  |
| 5. その他 Note                                                                                                                                                                                                                                                                                                                                                                       |                                   |                                                                                                                                                                                                                                                                                                                             |      |      |                                                                                                                                                              |  |
| 5-1 軸にツマミを取り付け、センターから10mmの位置で押しに時に引っ掛り感の無いこと。<br>No sticky feel shall be observed when the knob on the shaft is pushed at 10mm off the center.                                                                                                                                                                                                                                    |                                   |                                                                                                                                                                                                                                                                                                                             |      |      |                                                                                                                                                              |  |
| <div><div>ALPSALPINE CO.,LTD.</div><div><div>APPD.</div><div>CHKD.</div><div>DSGD.</div><div>TITLE<br/>フッシュモーメンタリスイッチ<br/>PUSH MOMENTARY SWITCH</div></div><div><div>Dec. 22. 2005</div><div>Dec. 22. 2005</div><div>Dec. 22. 2005</div><div>DOCUMENT NO.</div></div><div><div>R. HIROTA</div><div>H. HAYASHI</div><div>S. MIZOBUCHI</div><div>5LE2124-D1 (1/1)</div></div></div> |                                   |                                                                                                                                                                                                                                                                                                                             |      |      |                                                                                                                                                              |  |
| SYMB                                                                                                                                                                                                                                                                                                                                                                              | DATE                              | APPD                                                                                                                                                                                                                                                                                                                        | CHKD | DSGD |                                                                                                                                                              |  |



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て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.

|      |      |      |      |      |                            |               |               |                                              |
|------|------|------|------|------|----------------------------|---------------|---------------|----------------------------------------------|
|      |      |      |      |      | <b>ALPSALPINE CO.,LTD.</b> |               |               |                                              |
|      |      |      |      |      | APPD.                      | CHKD.         | DSGD.         | TITLE    ご使用上の注意 （フ <sup>o</sup> ッッシュスイッチ付き） |
|      |      |      |      |      | Oct. 22. 2015              | Oct. 22. 2015 | Oct. 22. 2015 | Precautions in use (with push switch)        |
|      |      |      |      |      | S.Urushihara               | J. Yashiro    | H. Miura      | DOCUMENT NO.                                 |
| SYMB | DATE | APPD | CHKD | DSGD |                            |               |               | C - 5                      ( 1 / 1 )         |

1. はんだ付け条件 Soldering conditions

1-1 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.

1-2 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流入がないこと。  
 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.

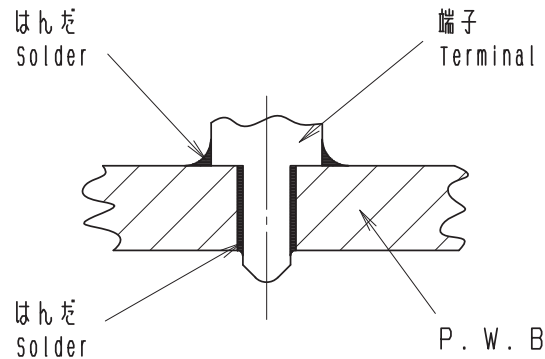
はんだ : 温度260° C±5° C、時間3秒±1秒以内  
 Soldering:  
 ・Solder temperature: 260°C ±5°C.  
 ・Immersion time: within 3±1s

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.

|      |      |      |      |      |                            |               |               |              |
|------|------|------|------|------|----------------------------|---------------|---------------|--------------|
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|      |      |      |      |      | Dec. 22. 2005              | Dec. 22. 2005 | Dec. 22. 2005 |              |
|      |      |      |      |      | R. HIROTA                  | H. HAYASHI    | S. MIZOBUCHI  | DOCUMENT NO. |
| SYMB | DATE | APPD | CHKD | DSGD |                            |               | L - D 1       | ( 1 / 1 )    |

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.の上面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.



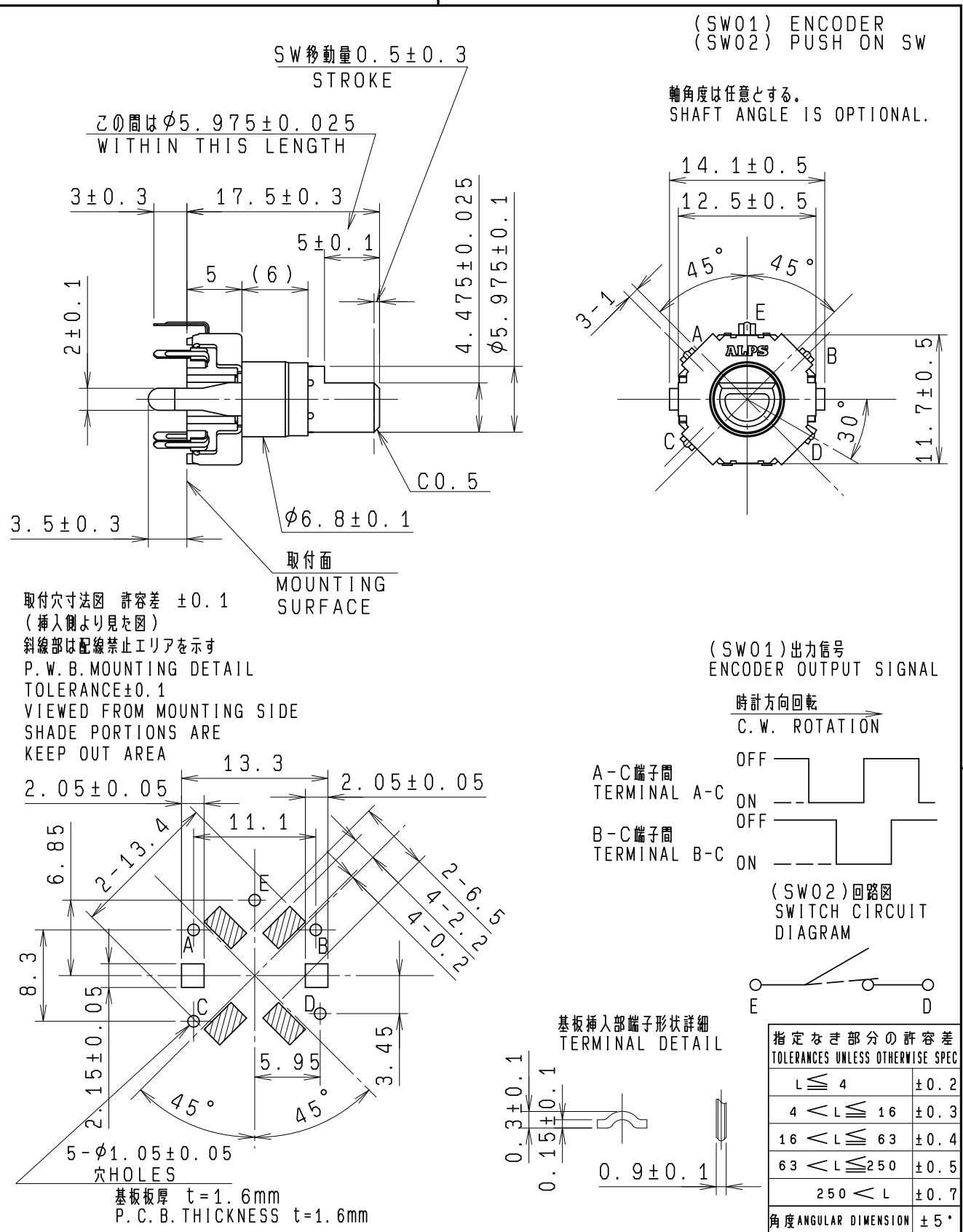
- 2) 基板に挿入される金属足ははんだ付けしてご使用願います。  
Please solder all inserted metal terminals and bracket to a PWB.
- 3) はんだ付け後、溶剤などで製品を洗浄しないで下さい。  
After soldering , please not to wash or clean products by liquid such as solvent or any similar.
- 4) Selective solderingの場合は、Dip solderingと条件が異なりますので、  
事前に貴社設備で充分確認の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 flaxerの場合は、製品の実装側からflax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.

|      |      |      |      |      |                            |               |               |                                                                |
|------|------|------|------|------|----------------------------|---------------|---------------|----------------------------------------------------------------|
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|      |      |      |      |      | 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)<br>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、接着剤、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℃、常湿25%～85%の環境条件に限りです。  
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.

|      |      |      |      |      |                            |               |               |                                            |
|------|------|------|------|------|----------------------------|---------------|---------------|--------------------------------------------|
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|      |      |      |      |      | APPD.                      | CHKD.         | DSGD.         | TITLE                                      |
|      |      |      |      |      | Oct. 15. 2015              | Oct. 15. 2015 | Oct. 15. 2015 | ご使用上の注意（共通）<br>Precautions in use (Common) |
|      |      |      |      |      | S.Urushihara               | K. Sasaki     | Y. Ashida     | DOCUMENT NO.                               |
| SYMB | DATE | APPD | CHKD | DSGD |                            |               |               | C-4 (1/1)                                  |



|          |          |           |        |                      |
|----------|----------|-----------|--------|----------------------|
|          |          |           |        | 30C/15P<br>(SW02) 3N |
| PART NO. | MATERIAL | SPEC/NAME | FINISH | 重クリック品               |

| ALPSALPINE CO., LTD. |      |            |                         |                                                                                       |                               |
|----------------------|------|------------|-------------------------|---------------------------------------------------------------------------------------|-------------------------------|
|                      |      |            | DSGD.                   | SCALE                                                                                 | NO.                           |
|                      |      |            | K. YOKOYAMA 2008-05-21  | 2 : 1                                                                                 |                               |
|                      |      |            | CHKD.                   |  | TITLE                         |
|                      |      |            | S. MIZOBUCHI 2008-05-21 |                                                                                       | 12形1軸 PUSH ON<br>SW付エンコーダ*組立図 |
|                      | OR   | 2007-12-17 | Y, K S, M K, Y          | UNIT                                                                                  | DOCUMENT NO.                  |
| NO.                  | SYMB | DATE       | APPD.                   | mm                                                                                    |                               |
|                      |      |            | Y. KANZAKI 2008-05-21   |                                                                                       | LE2124D06                     |