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**Application Note:  
APN-06001**

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Toupandun Industrial Area,  
Jinda Cheng, Xiner Village,  
Shajing Town, Baoan District,  
Shenzhen City, PRC, 518125

*Subject:*

**UNIVERSAL CONTACT – PICK & PLACE APPLICATION**

*Description:*

*Application recommendations for pick and place of Universal Contact product range using production SMT equipment.*

**SCOPE:**

The scope of this application note is to advise about equipment set up and nozzle selection when pick and placing ITT's Universal Contact products using production SMT equipment onto Electronic PCB's. This note will also detail information about the normal status of components when packaged in tape and reel packaging materials.

**PRODUCT RANGE DETAILS:**

The Universal Contact range consists of eight contact sizes covering a connection height range of 0.8mm to 4.0mm.

- 120220-0210 – 0.8 to 1.3mm
- 120220-0202 – 1.0 to 1.8mm
- 120220-0213 - 1.0 to 1.8mm
- 120220-0161 – 1.5 to 2.5mm
- 120220-0204 – 2.0 to 3.5mm
- 120220-0212 – 2.0 to 3.5mm
- 120220-0206 – 2.5 to 4.0mm
- 120220-0211 – 3.5 to 4.6mm

Each contact is of a similar design structure and is available packaged in antistatic tape and reel packaging.

**PACKAGING TAPE:**

Universal Contacts are packaged in tape and reel packaging. All component variants are packaged in tape with the following basic dimensions.

Tape Width: 12.00+/-0.30 mm

Tape Pitch (part to part): 4.00+/-0.10 mm

Component Orientation: Parts are to be oriented with the contact point closest to the tape's round sprocket holes on the tape's trailing edge

Maximum Reel Diameter: 330 mm (13 inches)

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| Ken Taylor | Ken Taylor     | R1E-1662 | 22 February 2006 | -        |
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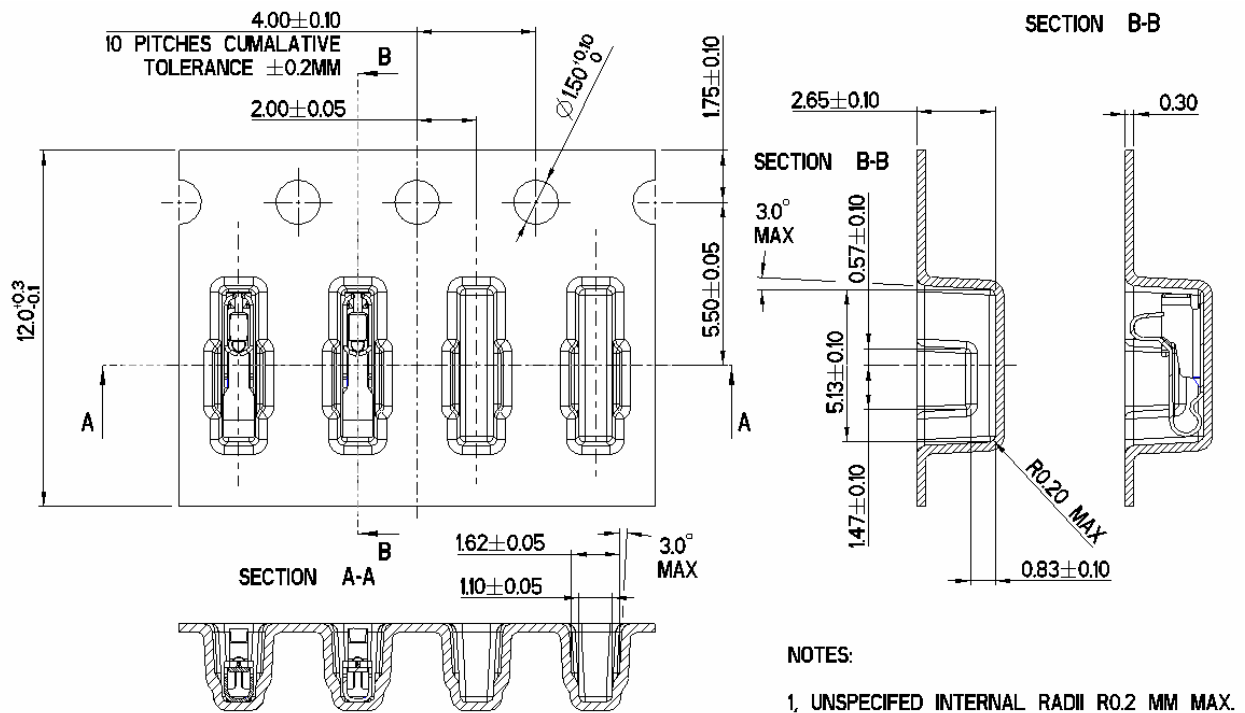
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## COMPONENT ORIENTATION IN THE TAPE POCKET:

The Universal Contact is maintained in position by a rectangular shaped pocket in the tape. This pocket shape controls the orientation of the contact so it is always pointing in the correct direction, with the contact point nearest the tape sprocket holes and the pick and place surface uppermost.

Example of tape design for 120220-0161:



The Universal Contact has a very low mass and due to this it can not be guaranteed that the component will sit fully flat in the base of the pocket when viewed in the tape. However, during the feeding and indexing of the machine, the natural vibration should settle the component down into the pocket. Should the vibration not re-position the contact fully the use of the correct nozzles and settings during pick and place will rectify this situation.

Care needs to be taken during the pick and place process to control shock and vibration from the machine. Excess shock and vibration once the cover tape is removed can cause the component to jump in the tape into an incorrect orientation.

For more detail on nozzle selection and pick and place settings see pages 4 to 7.

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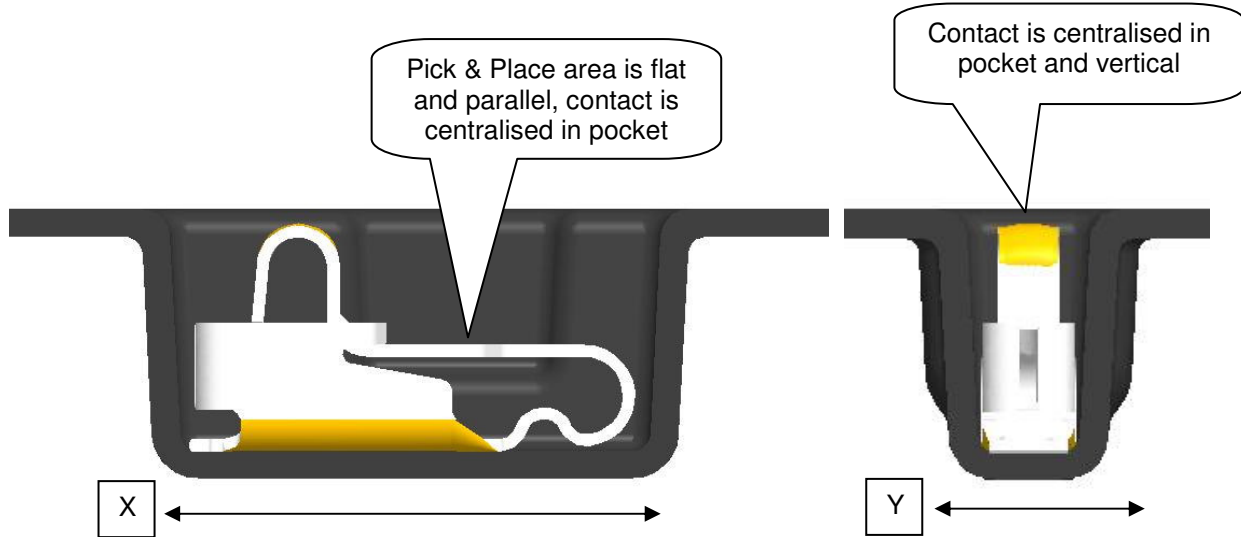
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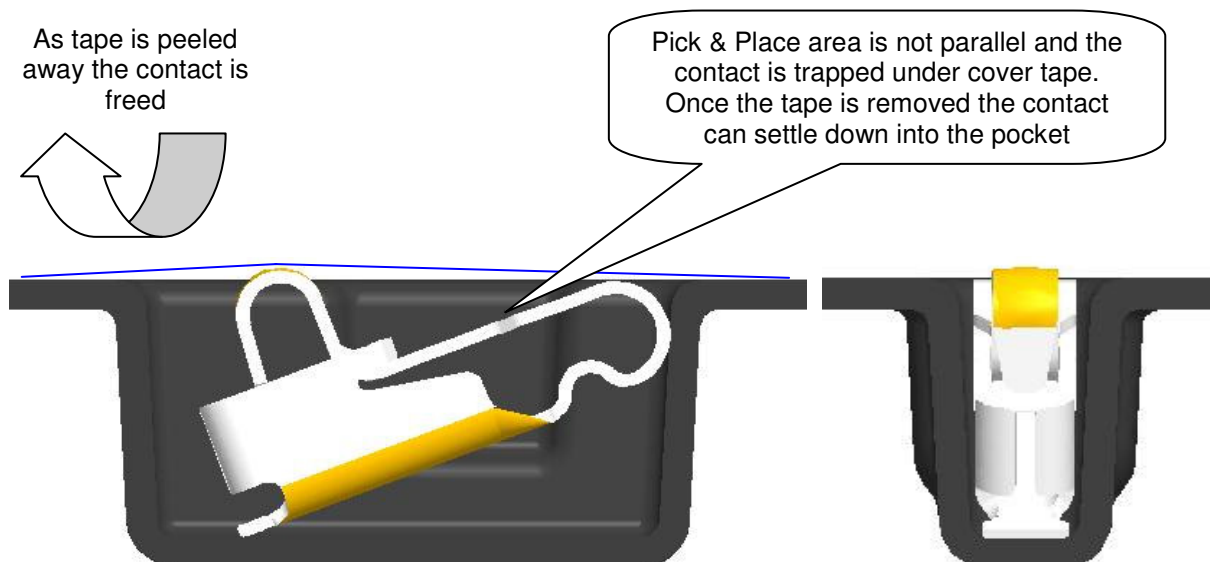
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## COMPONENT POSITION IN THE POCKET

1) Ideal position of the component in the tape pocket. The contact is sitting flat in the bottom of the pocket, centrally positioned and not tipping over to either side. The contact can move in the 'X' and 'Y' direction a little.



2) Possible out of position situation for the contact in the pocket. This can not be controlled or avoided but it can be dealt with during pick and place to enable the contact to be pick and place. The component will usually vibrate down into the pocket once the cover tape is removed and the feeder indexes. Providing the correct nozzle type is used and the correct offset position, the nozzle can be used to nudge the contact down into the pocket



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3) The contact can tip from side to side inside the pocket. This is unavoidable and will be corrected as the nozzle comes down to pick up the contacts from the pocket



**NOZZLE SELECTION AND PICK AND PLACE AREA**

The pick and place area on each contact size varies due to the contact size. Care needs to be taken to select a suitable nozzle based on the size of the pick and place area and the shape of the beam.

**Recommended Nozzle Sizes**

For pick and placing universal contacts, it is recommended to use a cylindrical, tube type nozzle and to maximise the internal diameter and cross sectional area of the vacuum area.

The nozzle recommended nozzle sizes for each contact are as follows:

| Part Number | Outside Diameter (mm) | Inside Diameter (mm) | Vacuum Cross Sectional area (mm <sup>2</sup> ) | Component Mass (g) |
|-------------|-----------------------|----------------------|--|--------------------|
| 120220-0210 | 0.90/1.00             | 0.70 min             | 0.355  | 0.00723            |
| 120220-0202 | 0.90/1.00             | 0.70 min             | 0.355  | 0.00765            |
| 120220-0213 | 0.90/1.00             | 0.70 min             | 0.355  | 0.00765            |
| 120220-0161 | 1.00                  | 0.80 min             | 0.503  | 0.0167             |
| 120220-0204 | 1.00/1.10             | 0.80 min             | 0.503  | 0.0233             |
| 120220-0212 | 1.00/1.10             | 0.80 min             | 0.503  | 0.0233             |
| 120220-0206 | 1.00/1.10             | 0.80 min             | 0.503  | 0.0266             |
| 120220-0211 | 1.00/1.10             | 0.80 min             | 0.503  | 0.0400             |

**Recommended nozzle offsets**

Each contact is a different size and therefore requires a different nozzle offset in 'X' and 'Z'. It is recommended to run a trial to find the best offset in 'X' and 'Z' for the particular type of SMT machine being used as this will differ with regard to pick and place speed, feeder type and accuracy.

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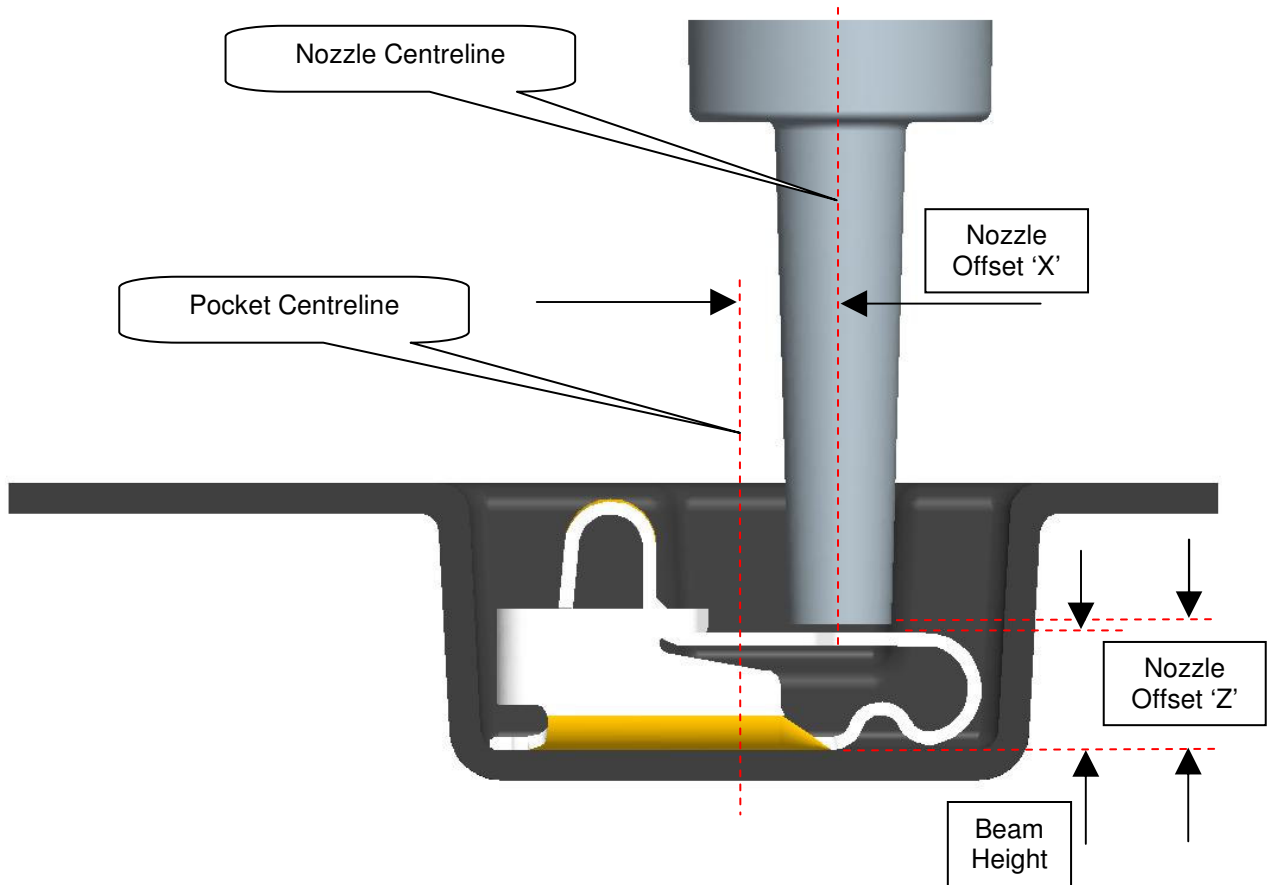
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It is recommended that when picking the contact from the tape pocket, the nozzle should **NOT** touch the contact. There should be a small gap left between the nozzle and the pick and place area and allow the vacuum force to pick the contact from the pocket.

Care should be taken when placing the contact to ensure excessive force is not applied to the contact beam by the nozzle. This could damage the contact. Maximum force which can be applied to the contact on placement is **1.5N MAXIMUM**



| Part Number | Nozzle Offset 'X' |      | Nozzle offset 'Z' |      | Beam Height |
|-------------|-------------------|------|-------------------|------|-------------|
|             | Min               | Max  | Min               | Max  |             |
| 120220-0210 | 0.44              | 0.91 | 0.72              | 0.82 | 0.67        |
| 120220-0202 | 0.32              | 0.79 | 0.81              | 0.91 | 0.77        |
| 120220-0213 | 0.42              | 0.62 | 0.81              | 0.91 | 0.77        |
| 120220-0161 | 0.30              | 1.00 | 1.20              | 1.30 | 1.16        |
| 120220-0204 | 0.77              | 1.23 | 1.55              | 1.65 | 1.50        |
| 120220-0212 | 0.77              | 1.23 | 1.55              | 1.65 | 1.50        |
| 120220-0206 | 0.77              | 1.03 | 2.05              | 2.15 | 2.01        |
| 120220-0211 | 0.70              | 0.92 | 2.65              | 2.75 | 2.60        |

These recommendations should be used to set up the SMT pick and place offsets. The offsets will require fine tuning for each machine type and speed of operation in order to gain maximum pick and place performance.

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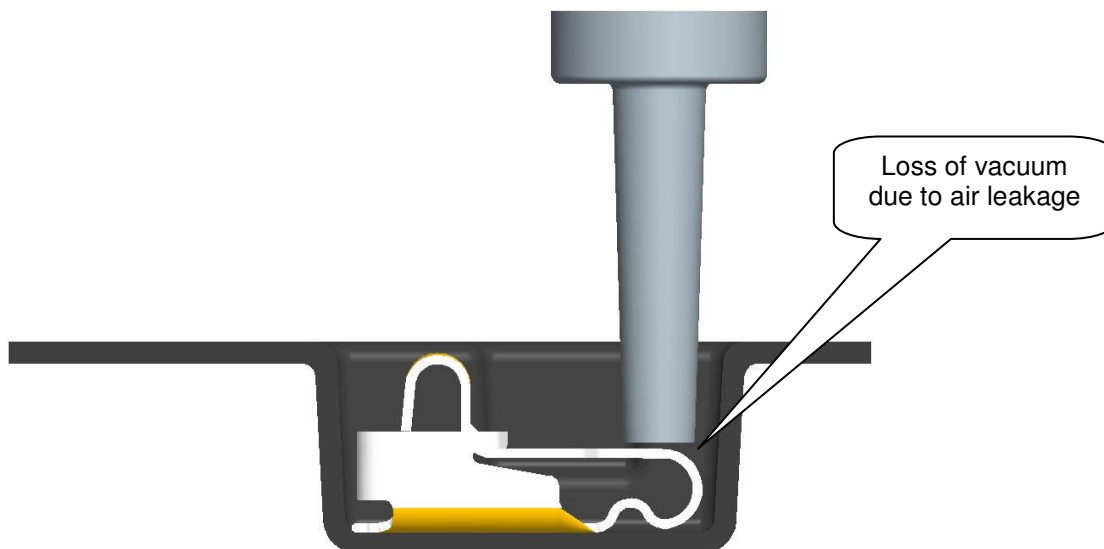
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The offsets should be carefully controlled to avoid problems with dropping or damaging parts.

If force is applied to the contact during pick up, the beam could be compressed. When the machine indexes to move the part away, the force will be removed and the component will spring away and cause a drop failure. An air gap should be maintained and allow the vacuum force to pick the contact from the pocket. The 'Z' offset can be adjusted to suit nozzle size and vacuum force to achieve this.

Offset in the 'X' direction should be carefully controlled to ensure good pick and place and avoid damage to the contact.

If the maximum offset in 'X' is exceeded the nozzle could miss the pick and place area at the end of the beam where it bends away to the solder pad. This will reduce the vacuum power and cause a pick and place failure. See following picture:



If minimum offset in 'X' is exceeded, there could be damage to the contact pre-load tag features

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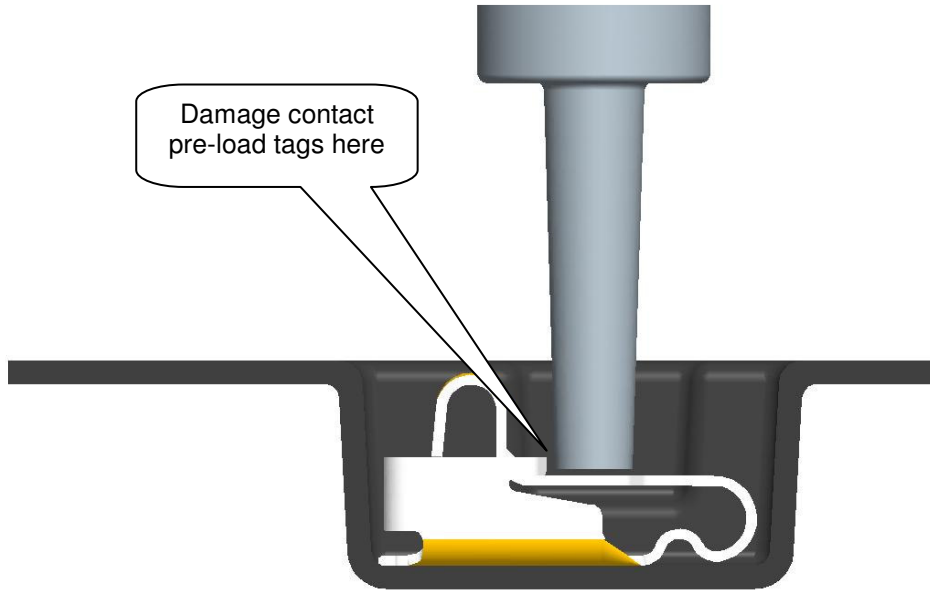


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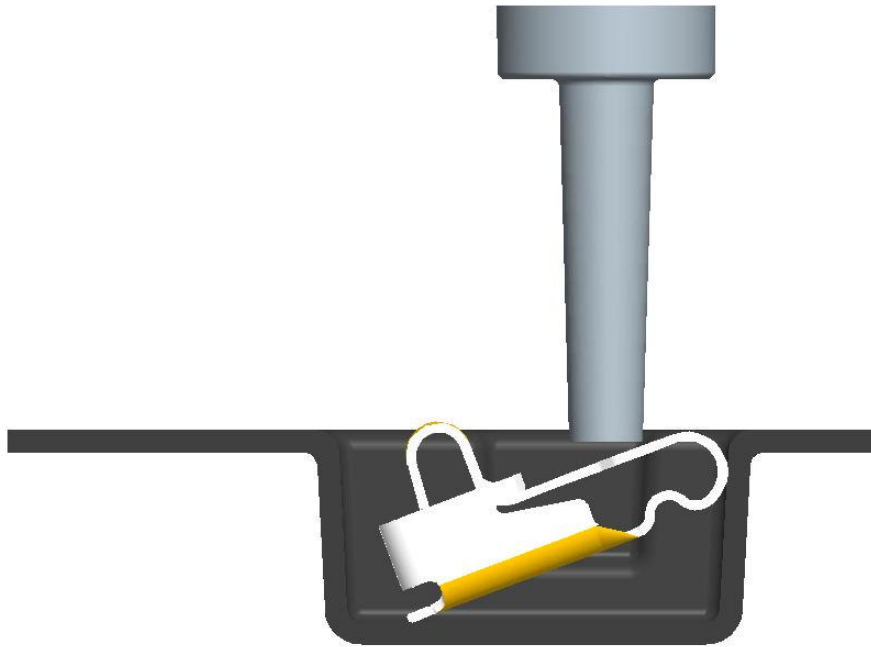
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If the contact is in a misplaced position as detailed on 'page 3', the nozzle should touch the beam during its travel down into the pocket and seat the contact down into the pocket.



Once the cover tape is removed from the pocket, if the vibration and shock of the feeding mechanism on the machine is too violent, the contacts could jump out of position in the tape, or even jump out of the pocket due to their low mass.

This situation can be controlled in the pick and place process by ensuring the shock of the tape indexing is not too violent.

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