3M™ Dual Lock™ Reclosable Fasteners

Improving the Quality of Life through mobility

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Agenda

- Features & Advantages
- Performance Characteristics
- Stem Densities
- Stem Combinations
- Products
- Design Considerations
- Key Design Parameters
- Roll Goods vs. Piece Parts
- Contact Us
Features and Advantages

3M™ Dual Lock™ Reclosable Fasteners offer the potential for:

- Blind attachment
- Audible engagement
- Ease of assembly & high productivity

Dual Lock Reclosable Fasteners:

- Are reclosable up to 1,000 times
- May be suitable for low energy surfaces

Dual Lock Reclosable Fasteners offer:

- Sound isolation through reduced transmission of vibration
- Flexible usage
  - Individualization & design freedom
  - Late commercialization
Performance Characteristics

- **Environmental Effects:**
  - Recommended temperature range under static load conditions: -20°F (-29°C) to +200°F (+93°C)

- **Water (Humidity) Resistance**
  - Excellent moisture resistance once bonded to substrate

- **Solvent Resistance**
  - Backing resistance to most common solvents
  - Adhesive could be affected

- **Plasticizer Resistance**
  - Reasonable resistance to plasticizers
  - Should always perform testing to verify resistance to plasticizer

- **Flammability**
  - Meets FMVSS 302 flammability
3M™ Dual Lock™ Reclosable Fasteners are available in three stem densities:

- Type 400 (400 stems/inch\(^2\))
- Type 250 (250 stems/inch\(^2\))
- Type 170 (170 stems/inch\(^2\))
Stem Combinations

<table>
<thead>
<tr>
<th>Typical Initial System Dynamic Tensile Strength</th>
<th>(3M^{TM}) Dual Lock™ Reclosable Fastener engaged to Dual Lock Reclosable Fastener</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 170 to Type 250</td>
<td></td>
</tr>
<tr>
<td>Initial Engagement (\text{lbf/sq. inch (N/cm}^2)</td>
<td>13 ((9.0))</td>
</tr>
<tr>
<td>Initial Disengagement (\text{lbf/sq. inch (N/cm}^2)</td>
<td>27 ((18.5))</td>
</tr>
<tr>
<td>Type 250 to Type 250</td>
<td></td>
</tr>
<tr>
<td>Initial Engagement (\text{lbf/sq. inch (N/cm}^2)</td>
<td>22 ((15.2))</td>
</tr>
<tr>
<td>Initial Disengagement (\text{lbf/sq. inch (N/cm}^2)</td>
<td>43 ((29.6))</td>
</tr>
<tr>
<td>Type 170 to Type 400</td>
<td></td>
</tr>
<tr>
<td>Initial Engagement (\text{lbf/sq. inch (N/cm}^2)</td>
<td>21 ((14.5))</td>
</tr>
<tr>
<td>Initial Disengagement (\text{lbf/sq. inch (N/cm}^2)</td>
<td>43 ((29.6))</td>
</tr>
<tr>
<td>Type 250 to Type 400</td>
<td></td>
</tr>
<tr>
<td>Initial Engagement (\text{lbf/sq. inch (N/cm}^2)</td>
<td>31 ((21.4))</td>
</tr>
<tr>
<td>Initial Disengagement (\text{lbf/sq. inch (N/cm}^2)</td>
<td>60 ((41.4))</td>
</tr>
</tbody>
</table>

- **Stem combinations that are not recommended:**
  - **Type 170 to Type 170** – Disengagement forces are too low to make it a viable reclosable fastening system.
  - **Type 400 to Type 400** – Engagement force so high that it causes ergonomic issues and disengagement forces are too high that it damages mushroom heads and/or attachment system when disengaged (use only for permanent/non-reclosable applications).
  - **Type 250 to Type 250** – Can experience “Mirror Imaging” when engaging two Type 250 pieces less 0.75 inches wide or less. Recommend that customer engages Dual Lock parts in perpendicular/cross direction.
Product Availability

- 3M™ Dual Lock™ Reclosable Fasteners with Pressure Sensitive Adhesive (PSA)
- 3M™ Dual Lock™ Reclosable Fasteners with Non-woven Backing
- 3M™ Dual Lock™ Reclosable Fasteners Ultrasonic Bondable Parts
- 3M™ Dual Lock™ Reclosable Fasteners Piece Parts
  - Slide-Ins
  - Button Style
  - Cantilever
  - Tree Stem
  - Rigid Backed
3M™ Dual Lock™ Reclosable Fasteners with Pressure Sensitive Adhesive (PSA)

- Available in 3 stem densities (Types 170, 250 & 400)
- Conformable acrylic foam adhesive bonded to Dual Lock Fastener backing
- Adhesive comes in several thicknesses
- Sold as a roll good
- Able to be die-cut into various size parts
3M™ Dual Lock™ Reclosable Fasteners with Non-woven Backing

- Available in 3 stem densities (Types 170, 250 & 400)
- Conformable reinforced non-woven backing bond bonded to Dual Lock Fastener backing
- Attached to substrate with hot melt adhesive
- Sold as a roll good
- Able to be die-cut into various size parts
3M™ Dual Lock™ Reclosable Fasteners

Ultrasonic Bondable Parts

- Nominally 0.130” (3.30 mm) thick
- Designed for ultrasonic bonding to PP & TPO substrates
3M™ Dual Lock™ Reclosable Fastener Piece Parts

- Slide-Ins
- Button Style
- Cantilever
- Tree Stem

Slide-In Parts
(for brackets)

Button Style Parts
(for key hole slots)

Cantilever Parts
(for sheet metal)

Tree Stem Parts
(for round holes)
3M™ Dual Lock™ Reclosable Fasteners
Rigid Back Piece Parts

- Nominally 0.200” (5.08 mm) thick
- Designed for mechanical attachment using screws, rivets, etc.
- Available in limited shapes and sizes
Design Considerations

- Attachment Method
  - Several different attachment methods to meet customer requirements

- Engaged Stack-up (Gap)
  - Overall thickness of 3M™ Dual Lock™ Fasteners when engaged

- Relative Position of Dual Lock Fasteners (parallelism)
  - Critical to have Dual Lock Fasteners parallel in installed position
Assembly Requirements

- Application procedures
  - Especially important for pressure sensitive adhesive applications

- Ergonomics
  - Predominately the force required to engage 3M™ Dual Lock™ Fasteners. Engagement force is:
    - Determined by stem density combinations
    - Directly proportional to the fastening area of the parts
    - Impacted by the rigidity of the mounting substrate, location where the force is applied and the direction of the force applied
Key Design Parameters

- Attachment Method
- Loading on 3M™ Dual Lock™ Reclosable Fasteners
- Engaged Stack-up (Gap)
Attachment Methods

- **3M™ Dual Lock™ Reclosable Fasteners with Pressure Sensitive Adhesive**
  - Easy in concept to apply, but many times proves difficult for implementation
  - Loading characteristics adversely affected by environmental conditions
  - Need good application assembly process for success

- **3M™ Dual Lock™ Reclosable Fasteners Non-Woven Backing**
  - Attached to substrate with hot melt adhesive
  - Works well on fibrous substrates (i.e., headliner materials)

- **3M™ Dual Lock™ Reclosable Fastener Ultrasonic Bondable Parts**
  - Works with PP and TPO substrates
  - Robust attachment method (~ 10 - 11 lbs. force per weld)
  - Requires ultrasonic welding equipment

- **3M™ Dual Lock™ Reclosable Fastener Piece Parts**
  - Robust attachment methods (not affected by environmental conditions... except for tree stem parts)
  - Easy to install (low insertion force)
  - No training or application process required
Loading on 3M™ Dual Lock™ Parts

2 Types of Loading

- **Dynamic Loading**
  - The amount of force it takes to engage/disengage the mushroom heads
  - Listed in technical data sheets as “Dynamic Engagement/Disengagement Force”
  - Dynamic disengagement of mushroom heads vary slightly based on the Dual Lock attachment method used

- **Static Loading**
  - The amount of constant force/load the Dual Lock attachment system can support before failing
  - Especially important for PSA, hot melt and tree stem attachments
  - Listed in technical data sheets as “Static Holding Power”
  - PSA and hot melt parts static loading capabilities are greatly limited by high temperature, substrate and the application process
3M Automotive

Suggested Maximum Static Loading
3M™ Dual Lock™ Fasteners with Pressure Sensitive Adhesive

Based on feedback from automotive customers and real-world factors not considered in 3M’s lab testing, 3M suggested maximum static loadings are:

<table>
<thead>
<tr>
<th>Static Force</th>
<th>Examples</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile</td>
<td>![Tensile Image]</td>
<td>500 grams (1.1 lbs)</td>
</tr>
<tr>
<td>Shear</td>
<td>![Shear Image]</td>
<td>333 grams (0.73 lbs)</td>
</tr>
<tr>
<td>Cleavage</td>
<td>![Cleavage Image]</td>
<td>250 grams (0.55 lbs)</td>
</tr>
</tbody>
</table>
Engaged Stack-up (Gap)

- Two types of force (Force Modes) for engaged stack-up:
  - Compression
  - Tension

- Consult the 3M™ Dual Lock™ Reclosable Fasteners Piece Parts Design Guide to calculate engaged stack-up

**Compression Mode**

Neutral thickness = A

**Neutral**

Pulled thickness = A + 0.4mm

**Tensile Mode**

Pushed thickness = A - 0.4mm

Neutral thickness = A

Pulled thickness = A + 0.4mm
Choosing the appropriate 3M™ Dual Lock™ Reclosable Fastener for your application...

**Roll Goods**

- **Advantages**
  - Decrease the amount of up-front engineering design for mounting system to substrate
  - Parts can be cut to size
  - Lower price/part than piece parts
  - A good option for running change fixes

- **Disadvantages**
  - Requires dwell time for the adhesive to build
  - Requires operator training and development of an application process
  - Attachment is affected by environmental conditions

**Piece Parts**

- **Advantages**
  - Easy to install (low insertion force) and easy to replace
  - Does not require dwell time
  - Training or development of an application process is not required
  - Robust attachment method

- **Disadvantages**
  - Requires up-front engineering design for mounting system to substrate
  - Limited availability of sizes
  - Higher price per part initially than roll goods
Contact Us

For more information about 3M™ Dual Lock™ Reclosable Fasteners

- Contact your 3M sales representative
- Go to www.3M.com/autosolutions
Thank You!