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### HOT MELTS EXPLAINED

Users of hot melt should perform their own tests to satisfy themselves that the adhesive selected, with adequate controls in place to ensure correct usage, will suit their requirements. Generally, testing of a bond should not be made until at least 24 hours after the application.

Hot melt glues are thermoplastic polymer based materials in solid form which contain no solvents, VOC's or water and are non-hazardous, FDA approved and leave no risk of mould or odours in finished product. In use, they are heated and applied molten to one surface of the parts to be glued, when the surfaces are pressed

together the hot melt quickly cools to form an almost instant bond. Hot melt Adhesives can be formulated using several different base polymers. The choice of polymer affects adhesion, temperature resistance, chemical resistance and cost.

#### Ethylene Vinyl Acetate (EVA)

A commonly used polymer suitable for both packaging and product assembly formulations. It is economical and effective at service temperatures from -30°C to 80°C.

#### Polyamide (PA)

Polymer used to formulate adhesives with better resistance to chemicals and temperature extremes, typically -60°C to 130°C

#### Polypropylene (PP)

Polymer used for adhesives with specific adhesion properties such as delayed setting time and often used for many formulations. Effective service temperatures from -20°C to 110°C

used for spray formulations. Effective at service temperatures from -30°C to 110°C

#### Polyurethane (PUR)

Polyurethane Reactive Hot melt initially sets like a conventional hot melt by losing heat and solidifying. Following this, the PUR absorbs a small amount of moisture from the surrounding materials or atmosphere and cross links. This is a permanent chemical change that takes several days which increases both heat and chemical resistance. Since a small amount of moisture is required for this reaction to take place it is better if at least one substrate is porous. If moisture is only available from the edge of the bond then cross linking will be slow and unreliable. However, additional water should not be applied to a surface before bonding as this will overwhelm the reactive component of the adhesive and prevent cross linking. TECBOND® Speciality glues are packed in individual cartridges with re-sealable caps.

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### STRUCTURAL BONDING

Over recent years, developments have allowed many product assembly applications to benefit from the efficiencies of hot melt adhesives. High performance bonding is now possible on a variety of substrates; however final bond strength will vary depending upon the following criteria:

#### 1. Service Temperature

Hot melts are thermoplastic and consequently become brittle at low temperatures and soft at high temperatures. The strength of a bond will vary with both the amount and rate of load at different temperatures because of the nature of hot melts,

#### 2. Amount of adhesive applied

Bond strength will vary with the amount of glue and application method. Puddles of glue retain heat longer and spread more than thin lines therefore giving more glued area and more time to join substrates whilst the glue remains hot.

#### 3. Time taken to assemble

Hot melt starts to cool as soon as it is applied and if the assembly is not completed quickly enough bond strength will suffer. This is known as a "cold bond" and although initial results appear acceptable, the bond can deteriorate over a 24-hour period. The higher the temperature of the glue when the bond is made, the better the strength.

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### TERMINOLOGY

#### Open Time

The open time is the period available to make a satisfactory bond after the hot melt adhesive has been applied. This can be as short as a second or two or be up to several minutes.

The maximum open time of a hot melt adhesive is dependent upon these factors:

1. The formulation chosen.
2. The application temperature and the method of application.
3. The type of substrate, its surface temperature and ambient conditions.

For maximum bond strength, it is important to get the parts together as soon as the adhesive has been applied. The different factors that affect open time mean it is not practical to quote exact times, therefore the open times of TECBOND® hot melt adhesives are broadly classified into three groups: Short (1-15 seconds), Medium (15-30 seconds) and Long (30-60 seconds).

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#### Viscosity

Values shown have been measured using standard ASTM D3236.

When solid hot melt is heated it melts, the higher the temperature the more liquid the glue becomes. This liquid state is known as the viscosity, expressed in centipoises and measured with a viscometer. TECBOND® hot melts can be dispensed at varying temperatures therefore their viscosity is expressed broadly as: Low (500-3000cps), Medium (3000-6000cps) and High (6000-15000cps).

Low viscosity glue flows freely and can increase gun output, reduce stringing and give closer bonds. It is less suitable for porous materials such as foam or fabric.

High viscosity glue may reduce gun output but is suitable for uneven surfaces, where gap filling is required.

High viscosity glue may reduce gun output but is suitable for uneven surfaces or where gap-filling or low-sag qualities are needed. Choosing a more powerful tool would improve output when using high viscosity glues.

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### Heat Resistance

Values shown have been measured using standard BS5350 Part H3.

Hot melt adhesives are thermoplastic and, as such, their performance alters with temperature. One of the more noticeable changes is the loss of bond strength alongside increasing temperature. Heat resistance is a measure of bond strength for hot melt adhesives, relating to the temperature (in °C) at which a standardised sample, when subjected to a constant load, fails. Ring and Ball Softening Point (the point at which the adhesive becomes liquid - usually a higher value than the heat resistance figure for any given adhesive) is often quoted for hot melt and should not be misinterpreted as a measure of heat resistance. Because bond strength can be influenced by several other factors (i.e. type of adhesive, length of time exposed to elevated temperature, magnitude and direction of the load imposed on the bond line, and the nature of the substrates being bonded), the quoted heat resistance figures of TECBOND® hot melts should only be used as a general guide when comparing different adhesives. It should not be assumed that the adhesives will be able to withstand the quoted temperatures in all cases. The user should determine the suitability of an adhesive for their particular application.

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### GLUE GUN USE

To ensure the best performance from your gun follow these tips:

1. ALWAYS allow the gun to warm up to operating temperature and do not apply force to the trigger before it is ready. Most guns are ready in 5-7 minutes, spray guns need at least 10 minutes. A new gun should be loaded with glue BEFORE switch-on and the glue gradually pushed through the gun, using light pressure on the trigger, as it heats. This expresses air from the chamber and avoids cold glue melting immediately on contact with the heater housing.
2. ALWAYS use the gun stand supplied, an optional stand or suspension hook if available because the gun heater housing contains molten glue. The gun should NEVER be laid on its side as this could cause the glue to "puddle" and cause melt back into the cooler part of the gun. If this happens, the gun could suffer internal damage.
3. ALWAYS unplug the gun if it is not going to be used for 40 minutes or more. To cool the gun more quickly and aid easier start-up the next time it is used, disconnect from the power supply when work is complete and while the gun is cooling use the trigger to extrude about half a cartridge / stick of molten glue through it.
4. ALWAYS wipe any excess molten glue from around the nozzle at the end of each work session with a cloth as this will prevent build up of glue deposits which can char. This should be done while the gun is still hot. Always wear protective gloves.
5. NEVER withdraw a part melted glue cartridge / stick from the back of the gun.
6. NEVER remove the nozzle from a cold gun as thread damage could result. Warm the gun first and always wear protective gloves. Most integral gun stands incorporate a nozzle remover.

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### HEALTH & SAFETY ADVICE

Hot Melt adhesives pose virtually no hazards to health when used in normal industrial practice but because they are used in a molten state at high temperatures, there is a risk of thermal burns.

Skin contact with molten hot melt should be avoided and precautions should be taken against accidental splashes of adhesive. The use of overalls, cotton gloves and safety glasses can help minimise the risk of burns.

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### Skin Contact

Skin affected by molten hot melt should be plunged into cold water immediately and left until the burning sensation subsides. If no tap is accessible have a bucket of clean cold water available. If fingers are coated with hot melt, move them to prevent a tourniquet effect as it cools.

Do not remove the adhesive when molten as it could remove skin leaving a raw wound. Even when solid remove with care as this may still occur. If difficult to remove, with medical approval, olive oil or liquid paraffin should be soaked into a cotton wool pad and placed over the affected area. This will slowly soften the adhesive into the pad. When hot melt is removed treat as a normal burn.

Solid cold hot melt is harmless to the skin. Wash hands with soap and water.

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#### Eye contact

Treat solid hot melt as inert particles and irrigate copiously with clean fresh water. For molten hot melt irrigate with cold water and seek medical advice immediately.

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#### Inhalation

Vapours given off during normal operation are not considered toxic, but if overheated, chemical breakdown of the components may occur releasing a complex mixture of organic materials, some of which may be toxic or irritant. Ensure hot melts are run at the recommended operating temperatures and use in a well-ventilated area.

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#### Removal of hot melt from components

Assembled components can be separated by heating the assembly gradually until the glue softens enough to be removed. Residues of EVA and Polypropylene based hot melt can be removed with white spirit. Residues of Polyamide based hot melt can be removed with acetone. Prior to cross linking, PUR adhesive can be removed with white spirit or acetone but once cross linking is complete, removal is very difficult.

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#### Fire

Hot Melts are only combustible in a fire and to extinguish use dry powder or CO2 extinguisher. Do not use water.

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#### STORAGE

Store in a clean dry place at a temperature between 5°C-30°C with boxes closed. Do not expose to direct sunlight or localised heat sources such as radiators or hot pipes.

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#### GLUE USAGE



- Bead 1.5mm gives about 560 metres per kilo
- Bead 3.0mm gives about 153 metres per kilo
- Bead 6.0mm gives about 67 metres per kilo
- Bead 10.0mm gives about 46 metres per kilo
- Bead 12.5mm gives about 31 metres per kilo



- A drop of adhesive gives about 6600 per kilo
- A small dot of adhesive gives about 3390 per kilo
- A medium dot of adhesive gives about 1520 per kilo
- A large dot of adhesive gives about 735 per kilo

#### TYPICAL SPRAY COVERAGE

Using 420-43 adhesive dispensed with a 6300 tool at 90 psi

Using 420 to estimate dispensed with a 3000 bar at 50 psi

RED nozzle (PA6056) spraying 55mm width gives about 120 metres per kilo

YELLOW nozzle (PA6060) spraying 65mm width gives about 140 metres per kilo

BLUE nozzle (PA6064) spraying 75mm width gives about 120 metres per kilo

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