# ULTIMATE BONDING WITH HEAT ACTIVATED FILMS

## Our Tape Solutions for Extreme Requirements

# tesa® HAF

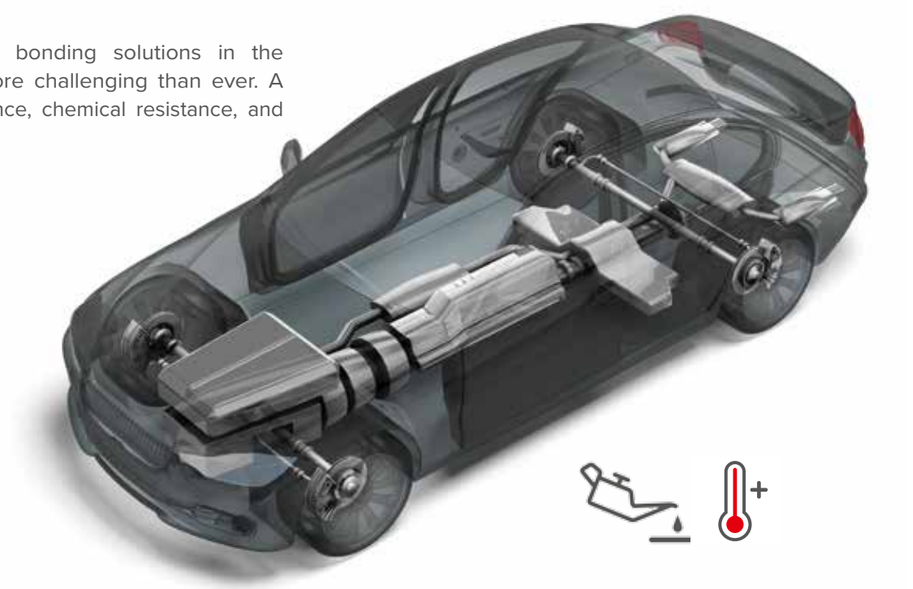
## For Highest Bonding Requirements

As world market leader for many application areas and with over 125 years of experience in coating technology as well as the production of self-adhesive system solutions, we have developed an in-depth understanding of our customers' processes and requirements.

This allows us not only to offer high-level technical support, but to always choose the right product for each individual application.

Today's demands towards bonding solutions in the automotive industry are more challenging than ever. A special focus lies on resilience, chemical resistance, and high-level bonding strengths.

The Heat Activated Film tesa® HAF is especially designed for highest bonding requirements in situations where standard adhesive tapes reach their limits, thereby allowing the implementation of new designs and ideas.



### What is tesa® HAF?

tesa® HAF is not tacky at room temperature. The reactive adhesive film is only activated by adding temperature and a bonding strength of up to 30 N/mm² can be achieved. After full curing tesa® HAF shows an **excellent resistance against oil and chemicals even at high temperatures.**

tesa® HAF is available in two versions:

1. **Heat Activated Film (HAF)**
   tesa® HAF has an adhesive layer containing nitrile rubber and a phenolic resin. By supplying heat, a chemical reaction is started that creates a securely bonded system. The softening point is 70°C. By reaching 120°C, the curing process is irreversible. When the curing process is completed, the reactive tesa® HAF is **resistant to temperatures up to 350°C** and can withstand a variety of different chemicals.

2. **Low Temperature Reactive HAF (LTR HAF)**
   tesa® LTR HAF is based on a reactive adhesive that is activated at low temperature. The softening point is 50°C . By reaching 75°C a chemical reaction starts to form a securely bonded system. LTR HAF is designed for **structural bonding of materials** that are sensitive to high temperature and pressure.

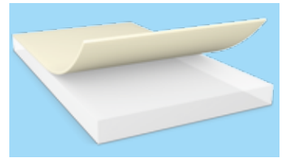


### tesa® HAF – Assortment at a glance

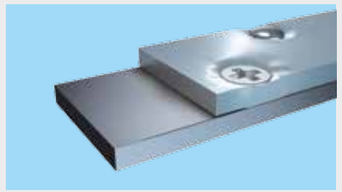
Every tesa® HAF product is specifically developed for the market requirements and offers the following advantages on a variety of substrates:

**HAF:**
- Extremely high bonding strengths up to 30 N/mm²
- High resilience
- Resistance against oil and solvents
- Aging/UV/temperature resistant after curing
- Even and precise bonding
- Fast and clean solution
- Suitable for die-cutting

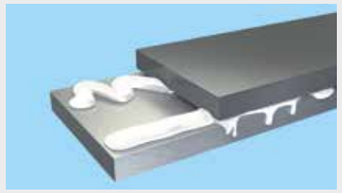
**LTR HAF:**
- High bonding strengths
- Outstanding push-out, peel, and shock resistance
- Structural bonding of materials sensitive to heat and pressure
- Low VOC

| Product description | HAF | LTR HAF |
|---|---|---|
| |  |  |
| Adhesive mass | Nitrile rubber and phenolic resin | Reactive adhesive activated by low temperature |
| Liner | Glassine paper | PE-coated paper liner |
| Color | Amber | Translucent |
| Available thicknesses | 30 µm<br>45 µm<br>60 µm<br>125 µm<br>200µm<br>270 µm | 50 µm<br>100 µm |
| Bonding temperature | 180–230°C | 75–110°C |
| Shelf life | 12 months* | 6 months* |
| Properties | • Reactive adhesive<br>• Very high bonding strength even on small areas<br>• Excellent chemical and aging resistance | • Reactive adhesive<br>• Peel and shock resistance<br>• Suitable for heat- and pressure-sensitive materials |

* Under recommended storage conditions



tesa® HAF – Advantages over mechanical fixation
- No corrosion/rust
- Stress is distributed evenly on bonded surface
- Lighter and thinner materials can be bonded
- More attractive appearance of surfaces
- Improved resistance to vibration fatigue
- Sealing against water/dust



tesa® HAF – Advantages over glue
- Visual advantage (cleaner edge, less oozing)
- Decoupling of production process possible
- Outsourcing of tape applications to OES and activation at OEM
- Precise application die-cuts
- No contamination of machines
- Adding functionality by application of laminates (conductivity)

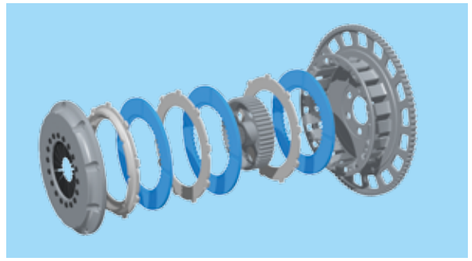
# PRECISELY ADJUSTED

## The Right Solutions for Every Requirement

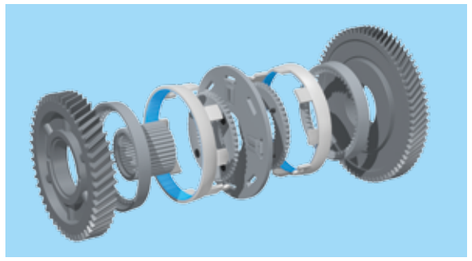
### tesa® HAF – Application examples

**Bonding of friction materials in clutches and transmissions**
Where temperature variation, steady mechanical load, and chemicals cause high stress, a reliable bond is needed.

Requirements:
- Temperature resistance of up to 350°C after full curing of HAF
- High cohesiveness at frictional heat
- High chemical resistance against oil and fuel
- Long-term stability at high load
- No interference with bonded substrates
- Bonding with exact edges



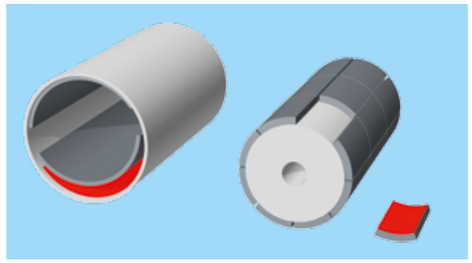
Bonding of friction material like carbon fiber to clutch discs



Bonding of friction material like carbon fiber to synchronizer rings

**Bonding of magnets to rotors**
In electric motors, where changing loads apply, permanent magnets are often used to create a magnetic field.

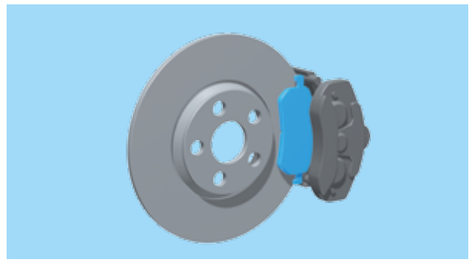
Requirements:
- Long-term stability also at high load
- High chemical resistance
- A constant and even adhesive layer
- High heat resistance
- High stability at small bonding surface



Bonding of magnets to rotors for electric motors

**Bonding of brake shims for disc brakes**
In order to reduce noise resulting from a brake process, brake shims are bonded to the brake pad backing plate with an adhesive layer.

Requirements:
- High temperature resistance
- Good damping properties
- Suitability for die-cutting
- Long-term stability at high load
- Good adhesion to rubber, metal, and coated backing plates



Bonding of brake shims to the brake pad backing plate

**Bonding of fabrics with LTR HAF**
For the bonding of heat-sensitive materials like leather and fabrics LTR HAF is the right solution.

Requirements:
- Low VOC for car interior
- Good adhesion to fabrics and heat-sensitive materials
- Clean process
- Flexible feel after application
- Short curing time

Bonding of leather to spacer fabric for dashboard covers

### Application support

In addition to product consulting, our technical experts offer on-site support and, if requested, customer-specific analyses and assessment under laboratory conditions in our research center:

- Professional equipment like laminating machines and heat presses
- State-of-the-art testing facilities
- Climatic chambers for stress tests under predefined climatic conditions
- Comprehensive databases regarding test methods and applications

# PRODUCT INFORMATION

## tesa® HAF – In comparison

tesa® HAF offers bonding strengths comparable to liquid high-performance adhesives and is **five times stronger** than conventional double-sided adhesive tape solutions.

| | Advantages | tesa® reactive HAF | Double-sided tape solutions | Liquid high-performance adhesive |
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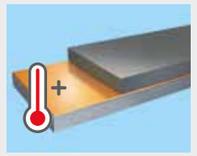
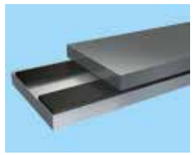
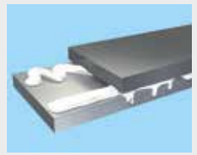
| | |  |  |  |
| Performance and reliability | Adhesive strength<br>• Shear strength<br>• Bonding strength | ●●●● | ●●● | ●●●● |
| | Reliability under extreme environmental conditions<br>• Resistance to chemicals and oil<br>• Resistance to high temperatures | ●●●● | ●● | ●●●● |
| | Sealing function<br>• Prevention of contamination by dust and humidity | ●●●● | ●●●● | ●●●● |
| Processing | No oozing<br>• Very precise bonding also on narrow bonding areas<br>• No adhesive residues<br>• Defined adhesive thickness | ●●●● | ●●●● | ● |
| | Fast and easy application<br>• Higher production output<br>• No or short curing times<br>• Process decoupling possible | ●●● | ●●●● | ● |
| | Suitable for die-cutting | ●●●● | ●●●● | – – |
| | Healthy working environment and clean production sites | ●●● | ●●●● | ● |

●●●● Very good ●●● Good ●● Medium ● Weak

### Test method

For tesa® HAF the dynamic shear strength is measured as this is the primary load type for constructive bonding.

For further details on the test method, see illustration.

| | |
|---|---|
| Material: | Aluminum to aluminum |
| Bonding area: | 2 $cm^2$ |
| Application process: | Adjustment of pressure, time, and temperature |
| Climate: | 23 ±1°C |
| Humidity: | 50 ± 5% |
| Speed: | 10 mm/min |

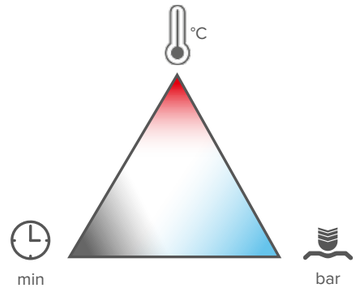
Test results in $N/mm^2$



## tesa® HAF – Application process

For the application of HAF, the adjustment of the parameters time, temperature, and applied pressure is of high importance:

- The process time can be reduced by increasing the temperature.
- For reactive HAF, it is important to increase the pressure at higher temperatures to avoid bubble

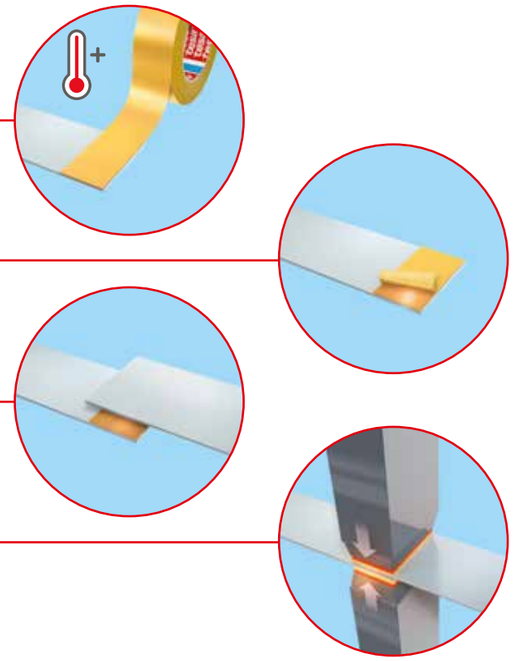



The following illustration shows reference values for the application process of tesa® HAF

| | Reactive HAF | LTR HAF |
|---|---|---|
| **Pre-lamination** | | |
| Processing methods | Hot-roll laminator<br>Heat press | Hot-roll laminator<br>Heat press |
| Machine settings | 90°C–140°C<br>0.5–2.5 bar<br>0.5–10 m/min | 50°C–60°C<br>1–3 bar<br>0.5 m/min |
| **Bonding** | | |
| Application | Heat press | Heat press |
| Typical machine settings | 180°C–230°C<br>>6 bar<br>10–180 sec | 75°C–110°C<br>2–4 bar<br>10–480 sec |
| Optional: post-curing | 180°C–230°C<br>No pressure<br>30–60 min | At room temperature<br>24 hours |

Application process example for tesa® HAF with heat press:

1. Pre-lamination
2. Liner removal
3. Positioning of substrates
4. Bonding by time, temperature, and pressure
5. Optional: post-curing

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Our management system is certified according to the standards ISO 9001, ISO/TS 16949, and ISO 14001. All our products delivered to automotive customers are listed in the International Material Data System (IMDS).

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