



tesa[®] ACX^{plus}
APPLICATION GUIDE

Process Optimization for the Automotive Industry





Content

Part design

- 4 Target applications
- 4 Design of bonding area

Tape application

- 6 Storage and shipping conditions
- 6 Cleaning of bonding area
- 7 Adhesion promoters
- 8 Application process
- 10 Tabbing
- 11 Quality checks for finished parts

Part placement

- 12 Cleaning the car surface
- 12 Liner removal
- 12 Mounting temperature
- 13 Part positioning and alignment
- 13 Pressurizing
- 14 Wet-out test
- 15 Removing incorrectly positioned parts and tape residue



tesa® products prove their impressive quality day in, day out in demanding conditions and are regularly subjected to strict controls. All technical information and data above mentioned are provided to the best of our knowledge on the basis of our practical experience. They shall be considered as average values and are not appropriate for a specification. Therefore tesa SE can make no warranties, express or implied, including, but not limited to any implied warranty of merchantability or fitness for a particular purpose. The user is responsible for determining whether the tesa® product is fit for a particular purpose and suitable for the user's method of application. If you are in any doubt, our technical support staff will be glad to support you.

PART DESIGN

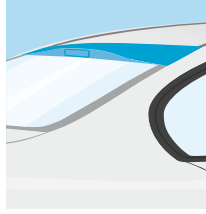
Target applications



Aeroflap



Body side molding



Brake light spoiler



Door edge molding



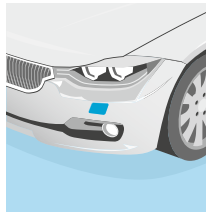
Doorsill trim



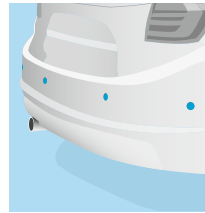
Emblem



Fender flare



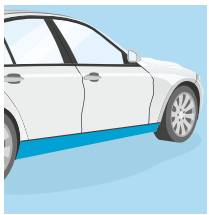
Headlight washer



Park distance sensor



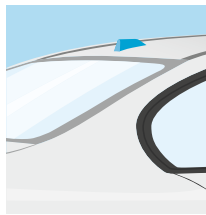
Pillar appliqué



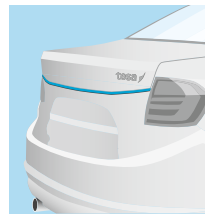
Rocker panel



Roof ditch trim



Shark fin antenna



Trunk molding



Window frame

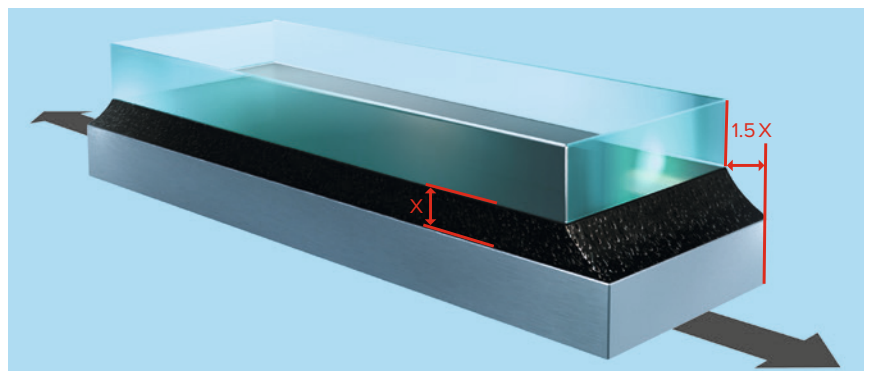
Design of bonding area

General/part-weight-to-tape ratio

The bonding area is the back of the attachment part, to which the tape is applied to by the tier. Requirements for the size of the bonding area for each part are determined by the part-weight-to-tape ratio, which is 4 g/cm^2 . To facilitate an optimal application, we recommend the bonding area to be at least 2 mm wider than the tape.

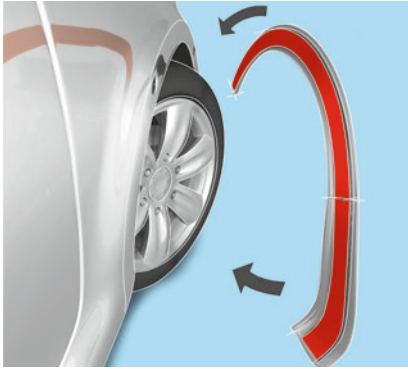
Recommended minimum tape thickness

Minimum tape thickness X is related to maximal thermal elongation Δ of bonded parts. In general the tape can compensate for different thermal elongation of up to 1.5 times of its thickness. Also incorporate part tolerances.



Surface properties

The bonding area should be a flat and smooth surface, matching exactly to its counterpart on the car. Although minor unevenness of the bonding area can be compensated by a thick tape version, it should be avoided in order to ensure optimal wet-out. In case the bonding area and the car surface are not parallel, a thicker tape or a more flexible part material should be used.

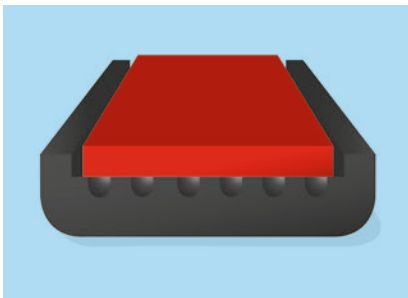


Curvatures and corners

Curvatures and corners in the bonding area in the lengthwise direction of the tape are possible. However, special attention has to be paid when applying the tape in order to ensure proper wet-out. In the widthwise direction, only minor curvatures are possible; otherwise, a die-cut should be used. Here are the limitations of the curvatures related to the tape widths:

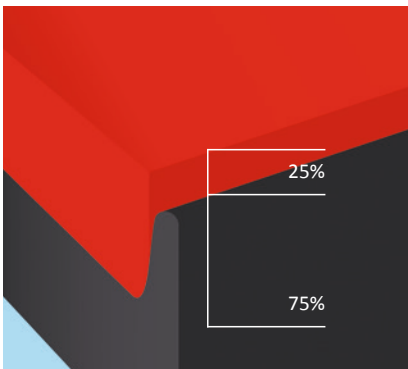
Tape width	Minimum radius of the curvature
6 mm	15 cm
9 mm	18 cm
12 mm	21 cm
15 mm	24 cm

Positioning pins are frequently used to facilitate the correct placement of the part onto the vehicle. There should be a sufficient distance between the bonding area and the positioning pins to avoid application problems.



Ribbed bonding area

In general, ribbed bonding area designs do not provide optimal conditions for tape usage due to a reduced contact area and concentrated stress at the adhesive-part interface. If you are using a ribbed bonding area, make sure that size of the contact area is still within the requirements of the part-weight-to-tape ratio.



Hider lip designs

Hider lip designs are frequently used to hide the visibility of the tape in between an attachment part and the car body. The tape's compressibility defines the maximum hider lip height and therefore the minimal visible portion of the tape while still preventing any hider lip contact with the clear coat during mounting.

Example: Using 7808 (800 μm) for emblem mounting with the recommended pressure of 20 N/cm^2 tape will result in 10% to 15% tape compression. With a safety factor of 10% the hider lip can be adjusted to leave a design gap of just 25% = 200 μm .

TAPE APPLICATION

Storage and shipping conditions

Temperature

ACX^{plus} tapes should be stored at temperatures between 15°C and 35°C.

Storage

All slit edges should be covered with suitable separators made of siliconized film. In case several rolls are piled on top of each other, use two separators per roll. Pancake rolls are stored with the circular side facing down. Log rolls should be stored in a vertical position. Avoid any contact of the liner side with packaging as this might change the thickness of the tape.

Containers

The parts should be shipped in a nondeformable box which is free of dirt and dust and can be covered to prevent any kind of contamination during transport.

Shipping

Keep the parts separated by foamed spacers and protect the tabs to prevent any accidental liner displacement and hence parts sticking together. Pack the parts tightly to keep them in a stable position; however, assure that parts will not be deformed during shipping.

Cleaning of bonding area

Instructions: when to clean the bonding area

For a flawless adhesive result, the bonding area has to be clean, dry, and free of dust, oil, and any release agent. The bonding area has to be cleaned by wiping it in one direction prior to the usage of the adhesion promoter or (if a promoter is not required) prior to the application of the tape. Note that if an adhesion promoter has been used, do not clean the surface again before tape application since this disturbs the adhesion promoter.

Instructions: how to clean the surface

Use only lint-free cloths for cleaning the surface. Ethanol and isopropanol are appropriate solvents. Conduct the cleaning with two cloths. Use one cloth with the solvent and the other for drying the surface. Check the drying cloth for contamination residues. If there are still contamination remainders on the drying cloth, repeat the process.

Adhesion promoters

Materials requiring an adhesion promoter

Most pressure sensitive tapes require an adhesion promoter on plastics like PP, PP/EPDM, PVC, and soft materials usually containing a higher amount of plasticizer such as soft EPDM used for automotive seals. Generally our special LSE-adhesive of ACXplus Primerless Line 777XX and 778XX can be used without adhesion promoter on typical PP and PP/EPDM attachment parts.

For plastics such as ABS, acrylic, and nylon, tests should be conducted for the specific application to determine whether or not an adhesion promoter is required.

Process and timing

Before an adhesion promoter is applied, make sure that the bonding area is clean and dry. Note that after promoter application, the part should not be cleaned again since this would disrupt the newly created surface. The adhesion promoter has to be fully dried before applying the tape in order to achieve maximum adhesive strength. The drying time depends on the kind of promoter and environmental conditions such as temperature and humidity.

Adhesion promoter	Surface	Application technique	Drying time	Application time
tesa® 60151	Glass	<ul style="list-style-type: none"> • Clean the surface • Moisten a clean, lint-free cloth with 60151 • Apply a thin film once in only one direction • Wipe the surface immediately with a dry, lint-free cloth once in only one direction 	30 sec. to 5 min.*	30 sec. to 5 min.
tesa® 60152	PU/HPVC	<ul style="list-style-type: none"> • Clean the surface • Uniformly coat the bonding surface with a felt-tipped applicator 	2 min. to 5 min.*	2 min. to 7 days**
tesa® 60153 Fast Cure	Universal (e.g. PP/EPDM)	<ul style="list-style-type: none"> • Clean the surface • Uniformly coat the bonding surface with a felt-tipped applicator 	30 sec. to 5 min.*	30 sec. to 7 days**

* solvent has to be flashed off ** surface has to stay free of dust

Spreading rate

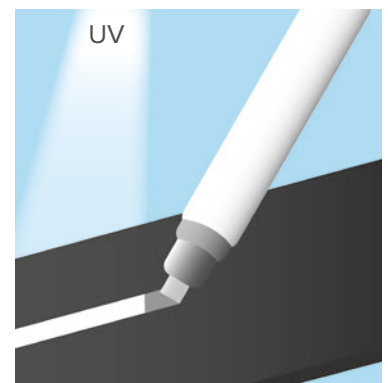
The spreading rate is approximately 15 m²/l – depending on the surface absorptivity and roughness.

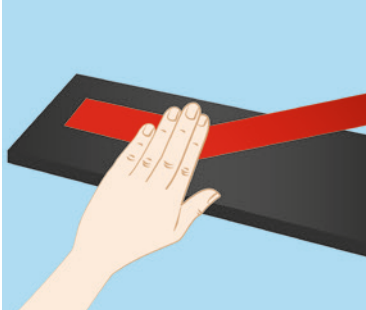
Shelf life

- Twelve months from date of manufacture when stored in the original container at room temperature.
- Use within seven days after opening.

Process instructions for 60153 application with a felt pen

- Fill pen reservoir with 20 ml tesa® 60153 Fast Cure and close tightly.
- Slowly press the felt tip five times against the original surface to wet the tip with adhesion promoter. Repeat this step until felt tip is completely soaked. But do not push too many times (10-20 max.) or too quickly (max. 1 per sec.) since this might lead to dripping.
- Press at an angle of 75°-60° with 1-2 N of force onto the surface and apply primer at 60-80 mm/sec. For optimized pressure use a scale: a “light contact” force is optimal. A slow speed like one would use when applying highlighter is suitable.
- Use a UV light to ensure an even distribution and an adequate treatment.





Application process

Tape application

Follow the instructions below in the case of manual application:

Hold the tape roll with one hand and unwind the tape approximately 30 to 40 cm. Attach the first few centimeters of the tape to the bonding area. Keep a little tension on the tape so that the rest of the tape does not touch the bonding area.

Now, starting from the same side, apply the tape to the bonding area at a constant speed, affixing it with your index finger along the bonding area. Following this procedure allows for a safe application without entrapped air.

For a more precise and convenient mounting procedure, we strongly recommend using an application tool such as a tape dispenser system. However, for any tool-aided process, it is equally important to start applying the tape from one end and then move along the bonding area in order to prevent entrapped air.

Please contact our Automotive Application Process Engineering team for your application process and system design. (info-AAC@tesa.com)

Required pressure

Pressure is essential for good adhesion since it ensures tight contact between the tape and bonding area. For optimal results we recommend uniform pressure applied with an automatic or manual roller. Inadequate pressure will cause insufficient contact with the bonding surface and impede optimal wet-out. Too much pressure, however, can deform or stretch the tape.

Recommended pressure for tape mounting:

	Linear mounting	Vertical mounting
78XX series	30 N/cm tape i.e. 3 kg per 1 cm tape width	20 N/cm ² tape i.e. 2 kg per area of 1 cm ² 2-5 sec.
77XXX series	20 N/cm tape i.e. 2 kg per 1 cm tape width	10 N/cm ² tape i.e. 1 kg per area of 1 cm ² 2-5 sec.

Tape repositioning

Due to immediate wet-out, repositioning the tape is not recommended. Removing the tape from the part is only possible shortly after the tape has been applied. Once a tape has been removed, it cannot be used again and has to be discarded.

Prevention of entrapped air

Entrapped air reduces the contact area between the tape and part such that the critical part-weight-to-tape ratio may not be achieved. Once the tape is attached to the bonding area, it is very difficult to remove entrapped air. To prevent entrapped air in the first place, follow the instructions above.

Prevention of tape stretching

General handling advice:

- Do not impose too much pressure on the tape
- Apply the tape at a constant speed without any rapid acceleration

In the case of an automatic or semiautomatic dispenser system:

- Prevent too much tension by adjusting the number of idlers
- Use an increased roller diameter

Optimal application temperature

For the application process, we recommend the temperature of both the tape and the part to be between 15°C and 35°C. At lower temperatures the tape becomes stiffer so that perfect wet-out can be difficult to achieve. In case the temperature is below 15°C, pre-heating of part and tape is recommended. At higher temperatures the tape becomes very soft, so that stretching can occur easily when the tape is pressed to the part.

Tape application to extruded parts

After the extrusion process, parts are likely to shrink to some extent. We recommend starting the tape application after the shrinkage of the part has ceased.

Risks of painting the part after tape application

When painted parts are heated in a paint oven to speed up the drying process, they tend to expand. If the part expands too much, the tape is exposed to stretch or can buckle. Tests should be conducted for each respective application in order to determine whether this issue has to be addressed.

Paint overspray on the bonding area

Paint overspray leads to a nonuniform surface, as coated material has different cohesive properties than raw plastic. Consider the following options to address this issue:

- Completely paint the back side including the bonding area. Check whether an adhesion promoter has to be used and which adhesion promoter is most suitable.
- Prevent paint overspray by masking the back when painting the front.
- If it is only slight overspray and the paint is well anchored to the part, applying tape to the overspray is possible.

Tabbing

Tabs are commonly used for removal of the liner at the OEMs when the parts are equipped with the tape at the tiers. The most reliable method is “extended liner” followed by “welded tabbing” and “adhesive tabbing.”



Extended liner

Extended liner is created by cutting off 1 to 3 cm of tape so that the remaining part of the liner can be used like a finger lift to remove the liner.

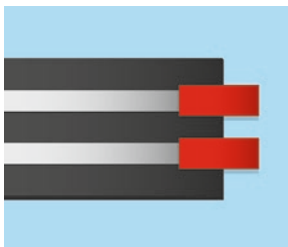


Heat tabbing film

Welded tabbing is created by heat-welding an adhesive free foil on the top part of the liner. This solution is mainly used for automatic processes applied by robots. Parameters: 155°C stamp temperature at 10 N/cm² for 1.5 seconds.

Heat Tabbing Film 50999

for PV28 Liner and PV29



Adhesive tabbing

Due to being less reliable than extended liner and heat tabbing, we recommend that each project be checked individually.

Adhesive Tabbing Tape 54999

for PV29 and 778XX PV15 Liner

Adhesive Tabbing Tape 54988

for 771XX PV28 Liner

Tips and tricks for tesa® ACX^{plus} tabbing

ACX ^{plus} application	Liner needs to be clean – free of dust and oil.
ACX ^{plus} edge cut	A straight cut is recommended (90°). A filmic liner shouldn't have been merged into the tape while cutting the strip from the roll or die-cutting process at the converter. A clear-cut edge is recommended.
Width of adhesive tab/heat stamp	About 4 mm wider than the ACX ^{plus} width to ensure that at least one if not both leading corners of the liner are in reliable contact with tabbing. This will significantly increase tabbing performance.
Positioning	Adhesive or welded part of the tabbing tape should extend beyond the tesa® ACX ^{plus} liner by minimum 2 mm. Tabbing tape should be oriented at an angle to fully cover at least one corner of ACX ^{plus} . We recommend to apply 54988 to each end of the liner to increase the liner pick up rate during assembly.
Application parameters	Application temperature: 15°C to 40°C. Use sufficient pressure and application technique to prevent any air entrapment.
Dwelling time	More than 30 min. for adhesive tabbing tapes.
Tabbing/ liner removal	Start tabbing removal at a very fast speed of about 2 m/s and at an angle much less than 180°.

Quality checks for finished parts

Part dimensions

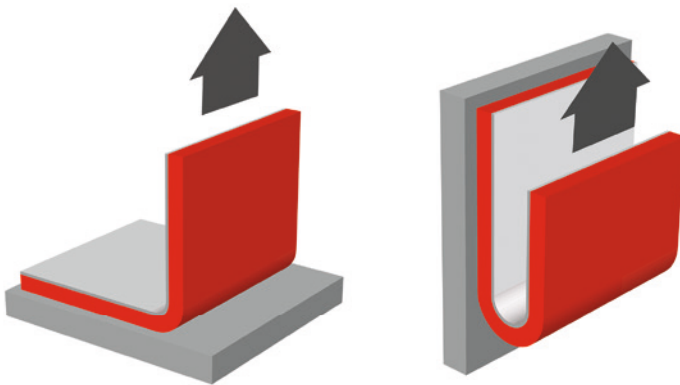
For a flawless adhesive performance, it is crucial that the part profile perfectly fits to the respective vehicle surface. When deformed parts are used at the OEM, they are forced onto the application and the stress is transferred to the tape. This can induce part lift over time.

Tape placement on the bonding area

Check if the tape is placed within the bonding area. It should not protrude from the bonding area on any side so as not to interfere with the positioning pins or be visible after being applied.

Tape adhesion to part

To test for proper bonding strength, a peel adhesion test can be conducted. As the part has to be discarded afterwards, this test can only be conducted on a sample part. Peel adhesion is the force required to peel a strip of tape from a standard test panel at a specified speed.



The test should be carried out as follows: Remove the liner from the tape and attach an aluminum foil strip to it. The aluminum strip should be at least the same width as the tape and overlap the tape on one end to create a hold.

Liner conditions

Assure that the liner is still perfectly in place and completely covers the adhesive surface. Uncovered spots may experience contamination during shipping and storage.

Entrapped air

Search the surface of the tape for bumps and raised spots as signs of entrapped air. Entrapped air reduces the bonding area and thus weakens the ultimate bonding strength between the tape and part. Reconsider your application process if you find entrapped air.

Tab effectiveness

Partly remove the liner using the tabbing tape. If you conduct this test on a production part, lift up the liner as minimally as possible and realign it with great diligence in order to prevent any kind of contamination later on. This process ensures the highest tabbing performance at the OEM.

PART PLACEMENT

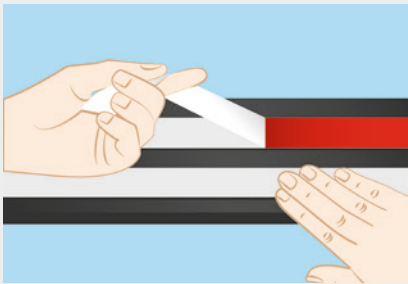
Cleaning the car surface

Instruction: when and why to clean the car surface

There should not be any lubricants, oil, or dust on the surface to ensure perfect adhesive strength. The surface should be cleaned no more than 20 minutes prior to mounting the part on the car, to avoid new contamination.

Instruction: how to clean the car surface

Use only lint-free cloths for cleaning the car surface. Ethanol and isopropanol are appropriate solvents. Conduct the cleaning with two cloths. Use one cloth with the solvent and the other for drying the surface. Check the drying cloth for contamination residues. If there are still contamination remainders on the drying cloth, repeat the process, possibly using a suitable stronger solvent.



Liner removal

Instructions: how to remove the liner

Remove the liner at nearly a 180° angle. Otherwise, it is possible that the liner will tear or a splice will fail.

In case the part has to be positioned on the car before the liner is removed, pull off the liner carefully at a constant speed at a perpendicular angle. Use your other hand to apply pressure on the area where the liner has already been removed.

Mounting temperature

Optimal temperature

For an optimal wet-out result and bonding strength, we recommend a temperature range of 15°C to 35°C for both the part and the car during the mounting process. Watch out for condensation moisture on the surface if the parts were stored in a cold location and are brought into the plant only shortly before the mounting process starts. In case the temperature is below 15°C, pre-heating of part and tape is recommended.

Required heat for application

Additional heat is not required, but can sometimes facilitate the process. If the shape of the part deviates slightly from its designed shape, heating it can make it more flexible and enable a better fit of the part to the vehicle. The fewer the stress forces on the application and thus on the tape, the better the adhesion.

Furthermore, heating the part can help to accelerate the evaporation of the condensation moisture on the tape, if the tape has been stored in a cold location.

Part positioning and alignment

Precise part positioning

For consistently flawless results, we recommend using a standardized procedure that allows for the precise positioning of the part as well as constant pressure each time. An automated (tool-aided) process helps to achieve consistency in the mounting process.

Please contact the tesa Automotive Engineering team for your application process and system design.

(info-AAC@tesa.com)

Realignment

Once the tape has made full contact with the car's surface, it is very difficult to remove and reposition the tape due to its high tack. Realignment can cause damage to both the tape and the part. We therefore do not recommend reusing parts that have been positioned incorrectly.

Pressurizing

Required pressure

Pressure is essential for good adhesion since it ensures tight contact between the tape and bonding area. For optimal results we recommend uniform pressure applied with a roller or hydraulic pressurizer. Inadequate pressure will cause insufficient contact with the bonding surface and impede optimal wet-out. Recommended pressure for part mounting:

	Linear mounting	Vertical mounting
78XX series	30 N/cm tape i.e. 3 kg per 1 cm tape width	20 N/cm ² tape i.e. 2 kg per area of 1 cm ² 2-5 sec.
77XXX series	20 N/cm tape i.e. 2 kg per 1 cm tape width	10 N/cm ² tape i.e. 1 kg per area of 1 cm ² 2-5 sec.

Tapes wider than 12mm usually have a higher tendency for air entrapment if mounted between two rigid surfaces. Pay special attention to best practice by mounting the part at a constant speed starting from one side, affixing it with a pressure roller along the bonding area.



Wet-out test

Definition of wet-out test

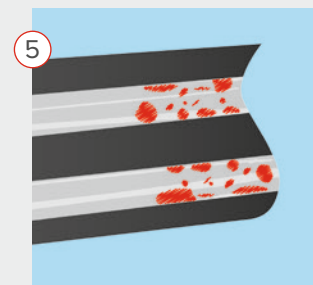
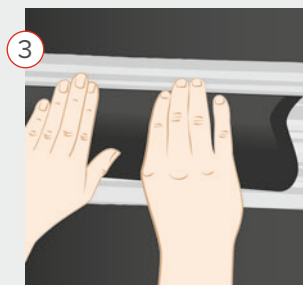
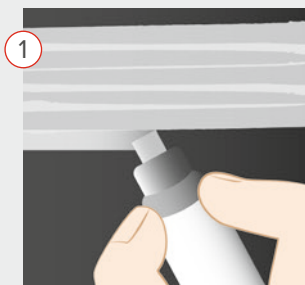
A wet-out test is commonly conducted at many OEMs to ensure the effectiveness of the application process.

It is done either before the start of production or during production. The minimum recommended wet-out result is 80%.

Instructions: how to carry out a wet-out test

In order to achieve significant results, we recommend carrying out the wet-out test on the car surface to which the part will be applied.

1. Thinly coat the area of the car to which the part will be attached with a nonpermanent marker.
2. Wait until the marker has dried to the touch.
3. Mount the part to the car, employing the regular application process.
4. Remove the part immediately after application without touching the tape surface.
5. On the tape surface you can now see the degree to which proper contact (wet-out) has happened. All areas where marker has transferred to the tape have been exposed to adequate pressure.



Furthermore we support customers with pressurization trials.

A force tracking system can document the applied force. Pressure sensors detect the achieved pressure between:

- tape and attachment part
- tape equipped attachment part and car body.

Removing incorrectly positioned parts and tape residue

Procedure

Please find below the procedure for how to remove incorrectly positioned parts and how to clean remaining tape residue. Due to high initial bonding, the repositioning of ACX^{plus} is not possible. Once tape has been removed, it cannot be used again and has to be discarded.



1 Heat up the part with an air blower to at least 80 to 100°C for minimum one minute.*



2 Coil fishing line around an object to prevent any cuts to the fingers, or put on suitable protective gloves.



3 Position the fishing line between the painted metal and the attached part while the materials are still hot.



4 Start sawing through the tape with the fishing line until the part is detached from the metal sheet.



5 Once the part is detached from the painted metal, apply PET film (62994-00137-00) to hot residue.



6 Ensure that the film is completely bonded to the adhesive residue by pressing it with your thumb. As the residue might be still hot, wear protective gloves.



7 Immediately after bonding, peel off at a 90° angle. Large adhesive areas can be removed quickly by using this method.



8 Use tesa® 60042 Adhesive Remover to clean smaller remaining adhesive residues.



9 Finish the cleaning process by wiping the surface with isopropyl alcohol and dry it with a lint-free cloth before attaching the new part.

* Note: Higher temperatures are favorable. Compatibility with the respective components needs to be checked beforehand in every case.



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).