

AUTOMOTIVE WIRE HARNESS ELECTRICAL PROTECTION SOLUTIONS

EcoCAR Winter Session

February 6, 2020

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1. Our Company
2. Application Requirements
3. Choosing the Right Product
4. Working Together



OUR COMPANY



Who we are:

- One of the world's leading producers of **self-adhesive solutions** for **industry and trade, consumers and craftsmen**
 - **125 years of experience** in...
 - coating technology
 - development of adhesive masses and innovative product solutions
 - **Global market leader** in many application fields
 - About **100 new solutions** developed each year, many of them patent pending

OUR COMPANY

Core Competencies



What we stand for:

- Expertise in **development of special adhesive masses**
- Experience in the **use of complex coating methods**
- **Extensive knowledge** of the industries, customers, and trade partners involved

These form the basis for the development of innovative self-adhesive system and product solutions with high utility value for end users.



OUR COMPANY

Global Footprint



4,917
employees
worldwide

More than 500 in R&D

- **1** Headquarter
- **6** Regional Headquarters
- **14** Production Sites (Production Centers and Converting Centers)
- **56** Affiliates (incl. Regional Headquarters and Production Sites)

Source: One Sense, as of Feb 5th, 2019

Innovation is the basis of...

- our **economic success** and dynamic growth
- our successful position as a **technology leader in international competition**
- rapid adjustment to **market trends and new requirements**
- **development of tailored solutions** with high benefits to the customer



OUR PRODUCTS

Solutions for Industries Across the Globe



Solutions for Health Markets



Tablets



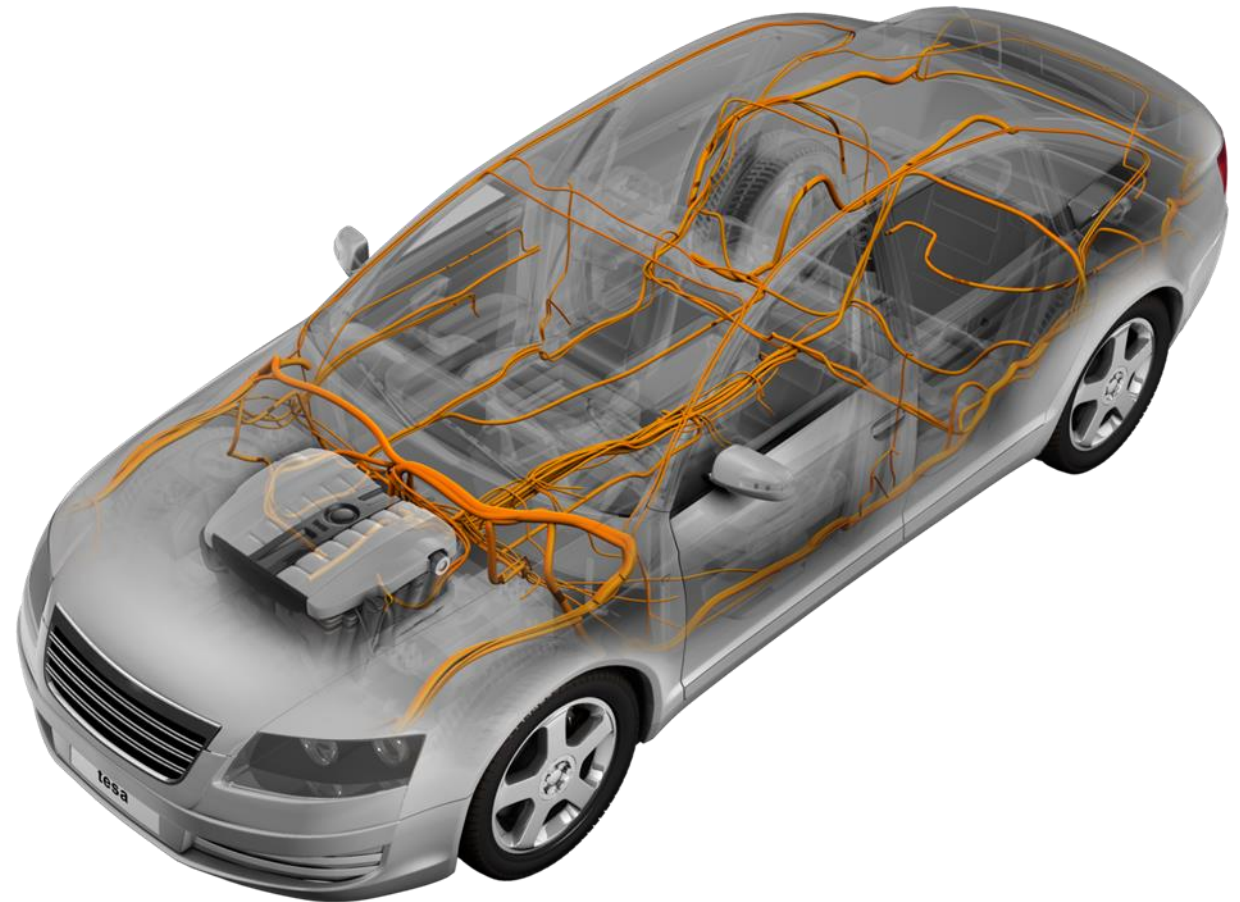
APPLICATION REQUIREMENTS

Automotive Wire Harnesses

- Comprised of >1500 individual wires
- Approximately 5 km in total length
- Need to “bundle” for handling and protection

Primary Functions of WH Coverings

- Abrasion Protection
- Flexibility
- Thermal Management
- Noise Reduction



Why is Harness Protection Important

- Harness is installed in the vehicle first – difficult rework
- Electrical malfunction = safety hazard



After the engine, the Wire Harness is the 2nd most expensive part of the car

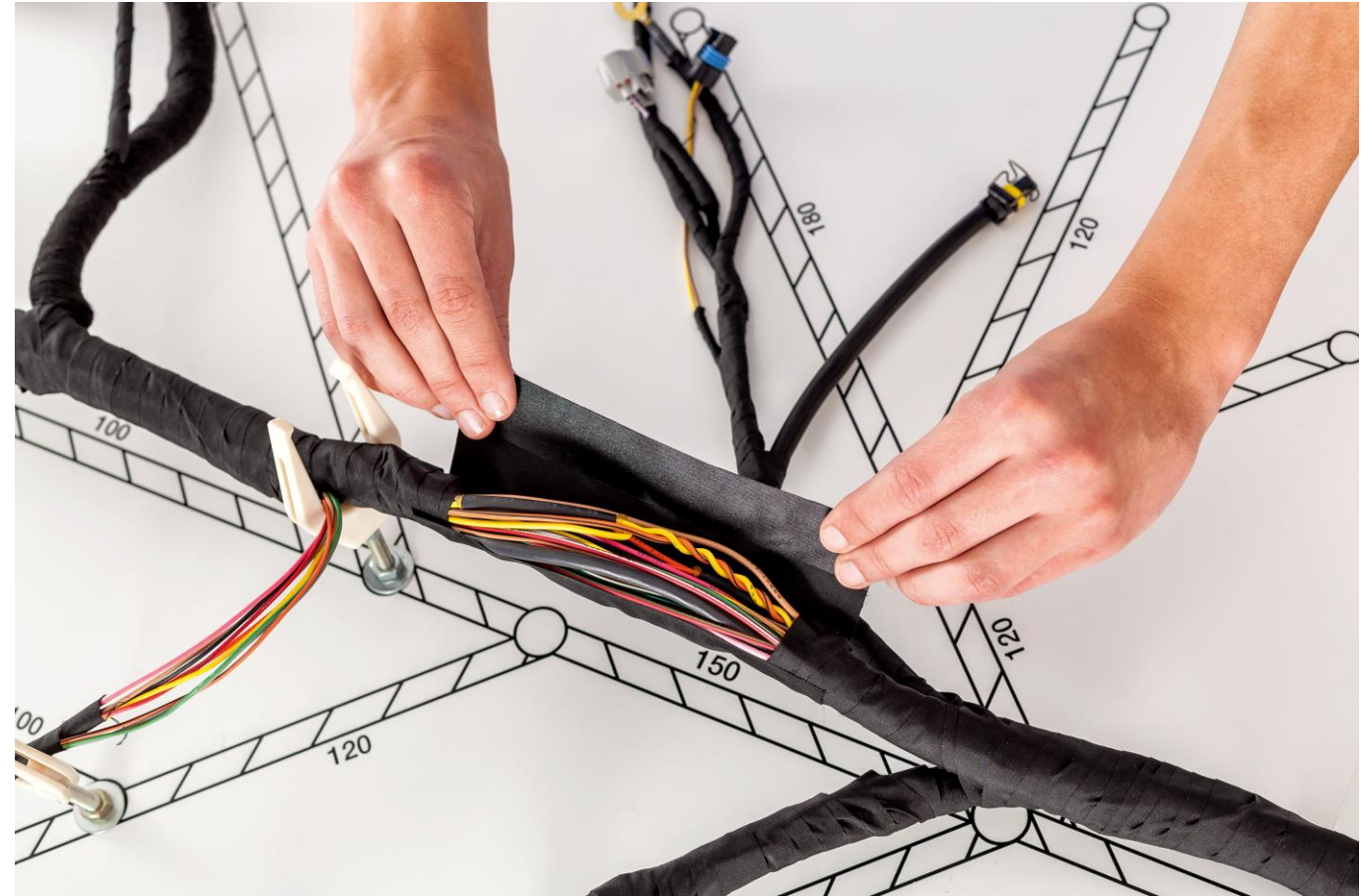
APPLICATION REQUIREMENTS

Manufacturing



How a Harness is Made is Important

- Labor to apply tape
- Performance
- Assembly plant requirements
- Tier production plant requirements



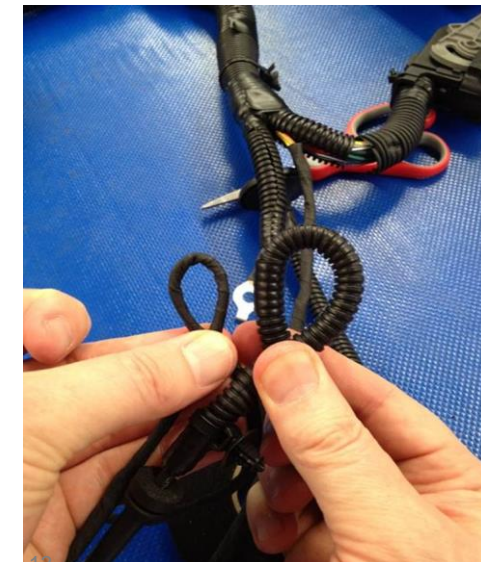
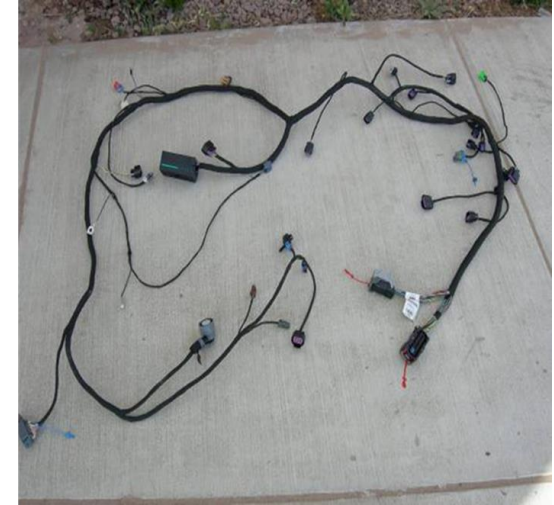
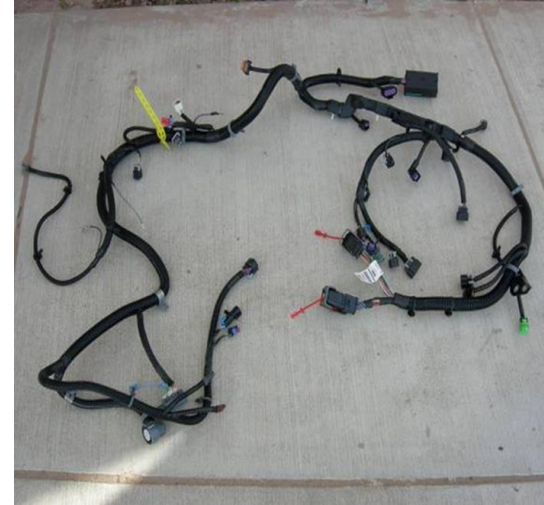
APPLICATION REQUIREMENTS

Contribution to Fuel Economy



How is Harness Protection Important to Fuel Economy

- Higher flexibility of harnesses required to route through tight spaces
- Increased need for thermal protection near heat sources
- Light weighting is paramount
 - EPA estimates a 1-2% fuel economy increase for every 100 pound removed from the vehicle
 - Tape can provide 13% component weight savings vs. convoluted tubing



CHOOSING THE RIGHT PRODUCT

CHOOSING THE RIGHT PRODUCT

Specifications



Four Main Functions of Harness Coverings

- 1) Protect against abrasion
 - 2) Insulate against heat
 - 3) Provide sound damping
 - 4) Allow harness flexibility
- First three are specifically defined by OEM & Industry test methods
 - Coverings must be tested against these methods and assigned a rating
 - OEM engineers will designate a rating class to be used on certain areas of the vehicle

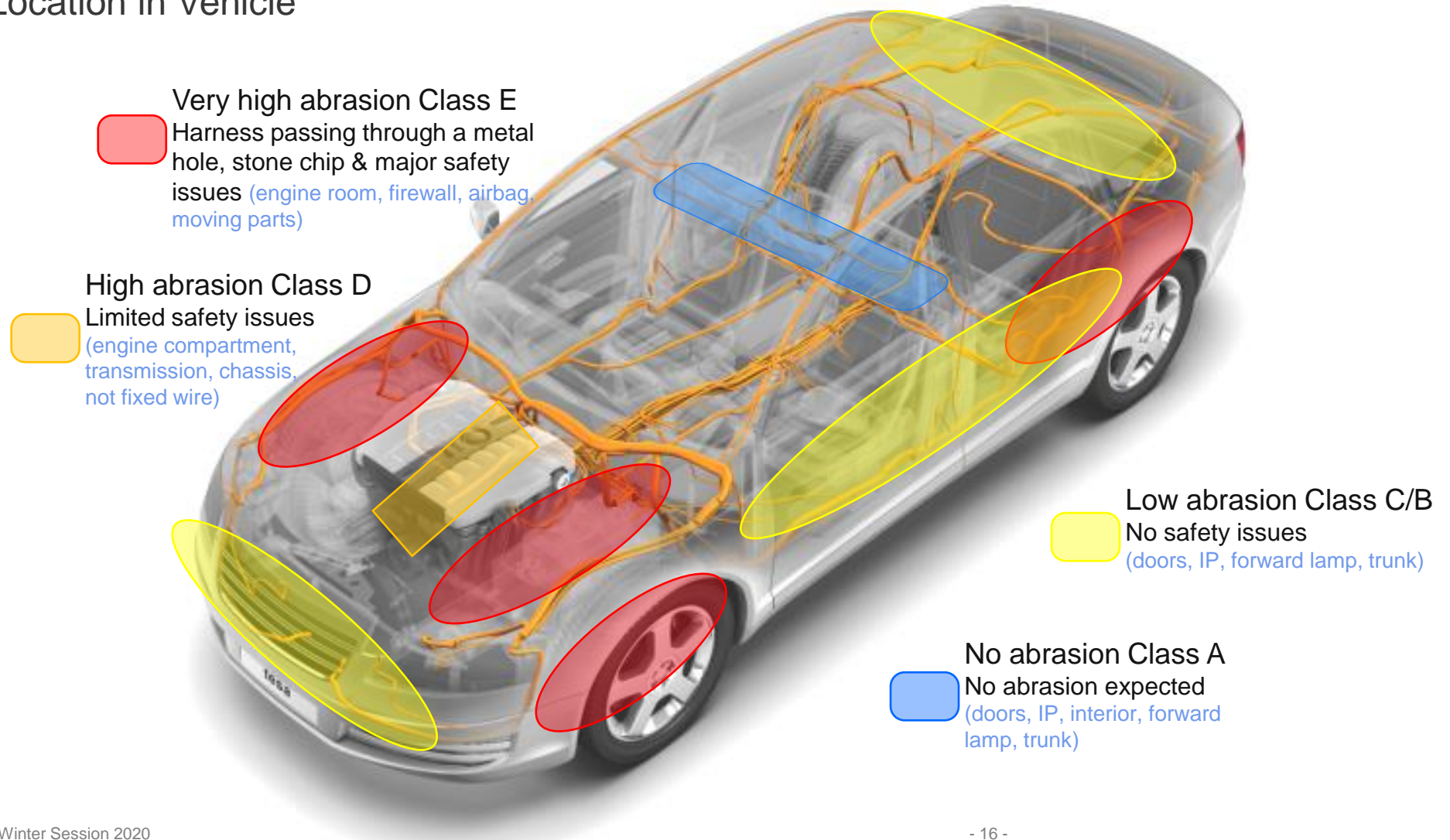


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Protect Against Abrasion



Abrasion Level by Location in Vehicle



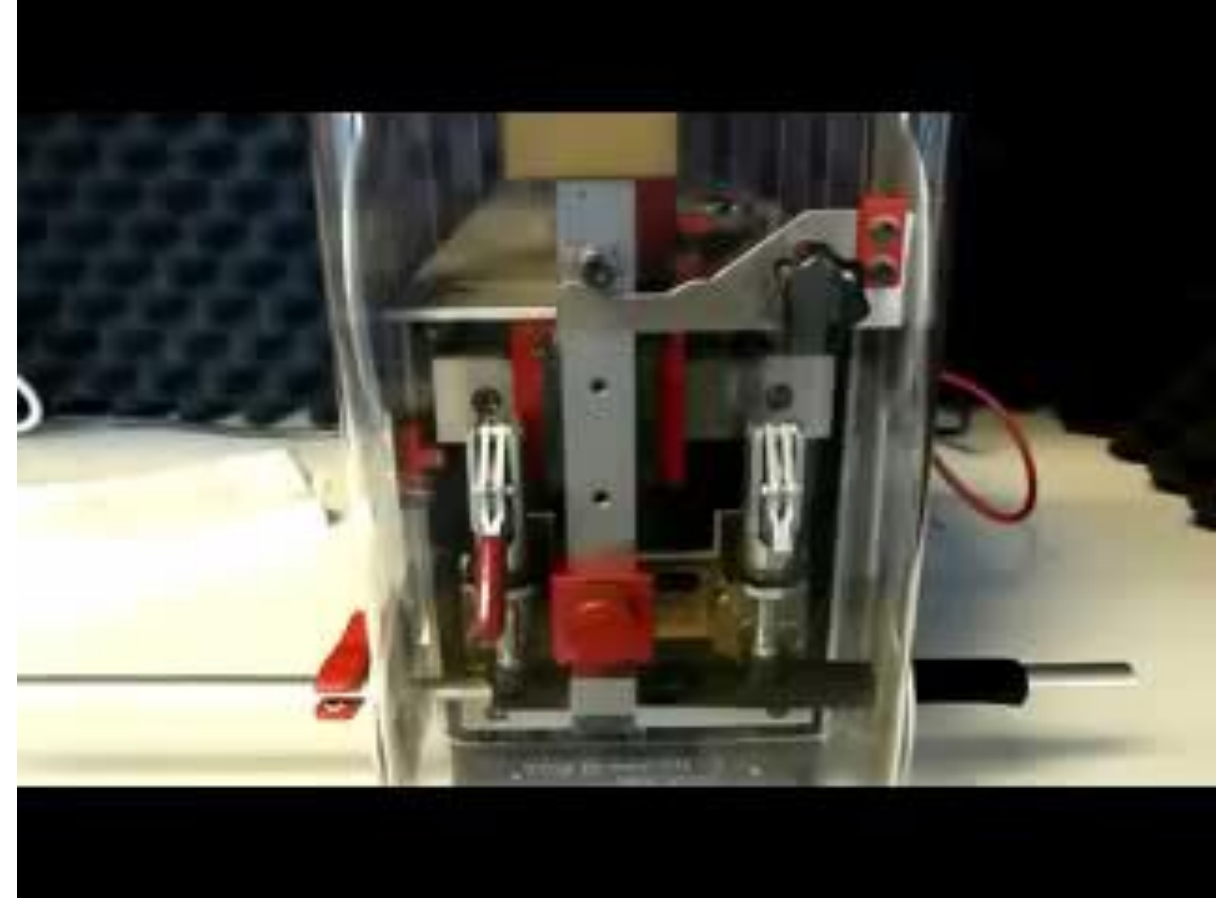
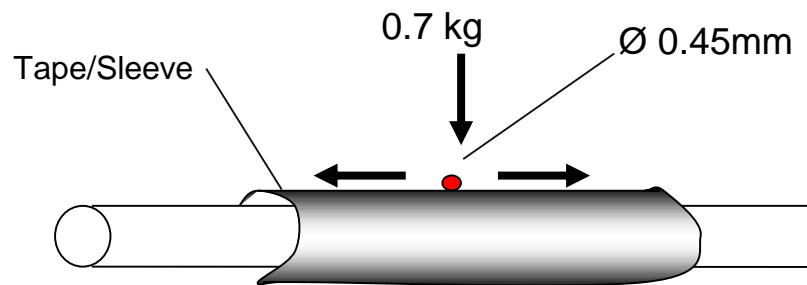
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Protect Against Abrasion



Abrasion Resistance Measurement

- Covering is wrapped around a mandrel
- A needle is rubbed back and forth on the surface of the covering
- Number of strokes required to break through the covering is measured
- Abrasion class A-F is assigned based on stroke count



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Protection Against Abrasion



Abrasion Protection Products

- PET cloth tapes & sleeves typically offer excellent abrasion resistance while reducing the footprint of the harness
- Color coding available by voltage
- Class C-E Protection

tesa 51036, Class E



tesa 51036, Class D

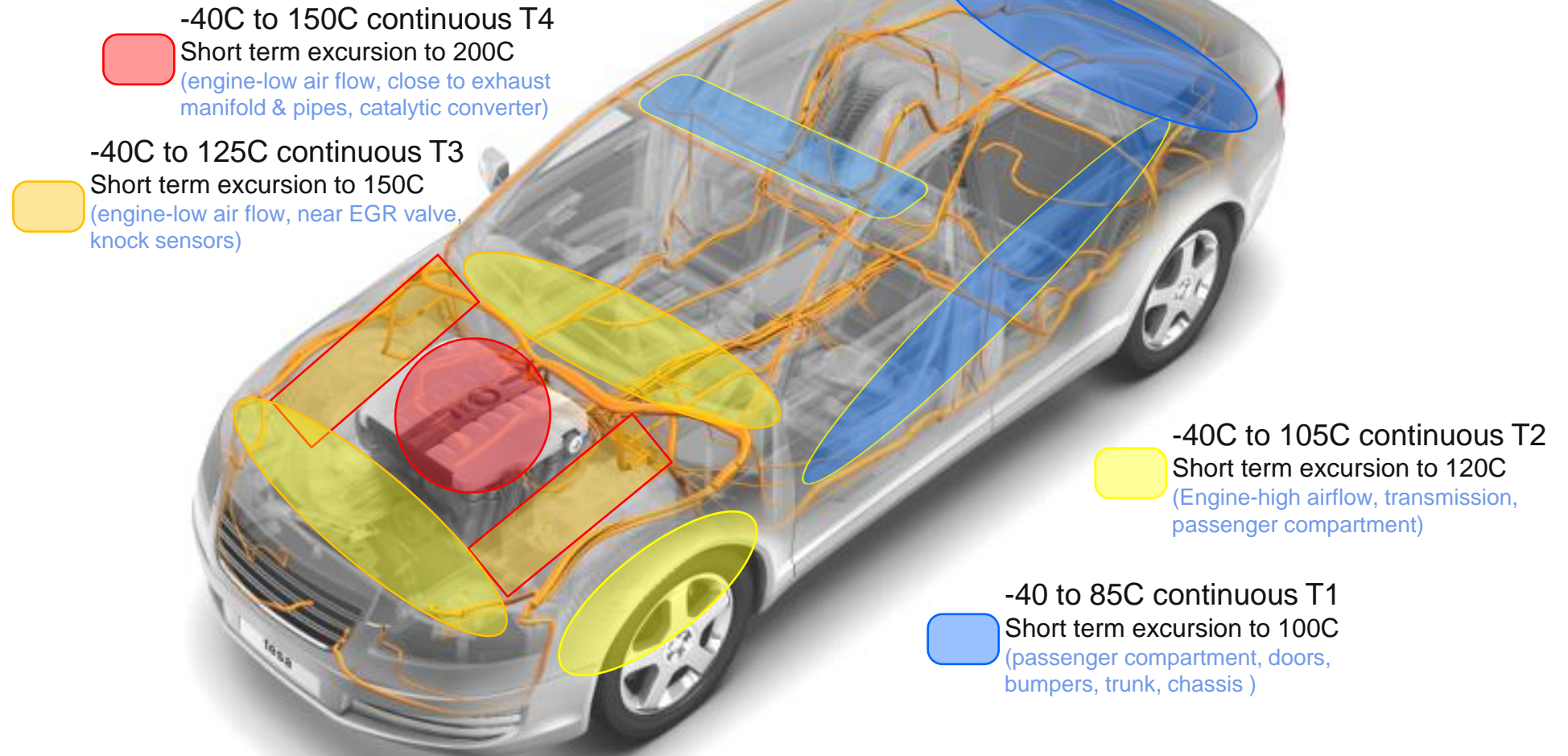


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Insulate Against Heat



Temperature Exposure by Location in Vehicle



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Insulate Against Heat



Temperature Resistance Measurement and Products

- Wire bundles are covered and placed in an oven
- Bundles are left in an oven at temperatures ranging from 85°C to 200°C
- After 3000 hours, the bundles are removed and wrapped around a mandrel
- Coverings must not crack, flag or deform in any way
- Temperature ratings are assigned 1-6 based on the highest temperature the covering can withstand
- PET tapes with Acrylic or Silicone adhesives typically have the highest temp ratings
- Tapes with synthetic or natural rubber adhesives have lower temp ratings



tesa 51036, 150° T4

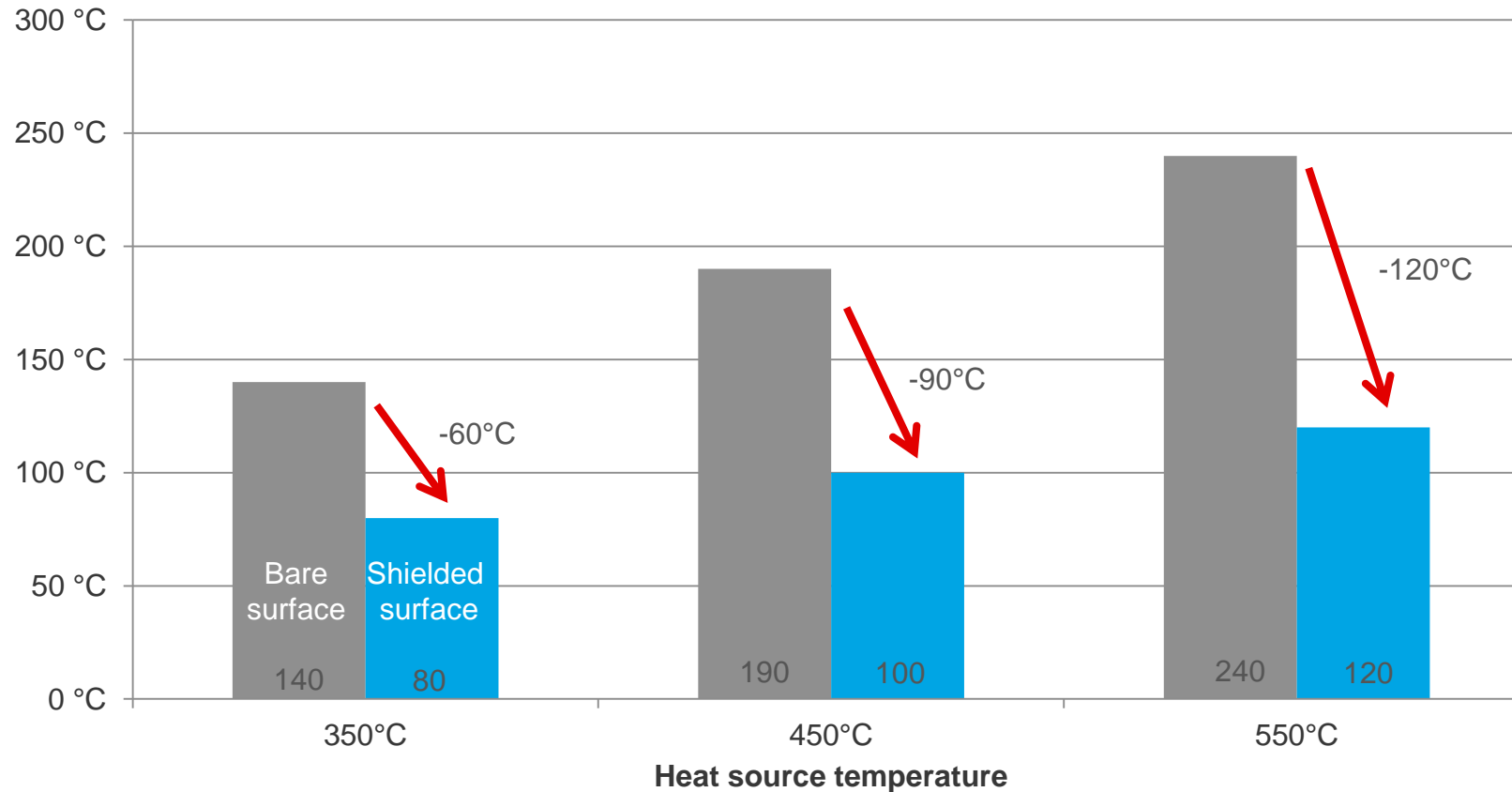
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Insulate Against Heat and Reflect Infrared Radiation



Insulation and Reflection Products

- Some circuits in the engine block require protection against infrared radiation
- Short term excursion temperatures as high as 232° C



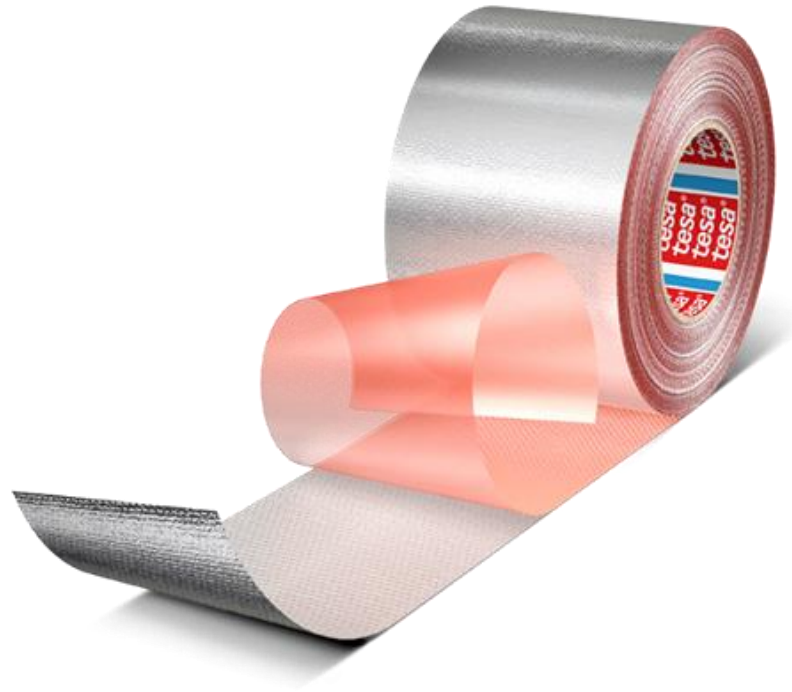
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Insulate Against Heat and Reflect Infrared Radiation

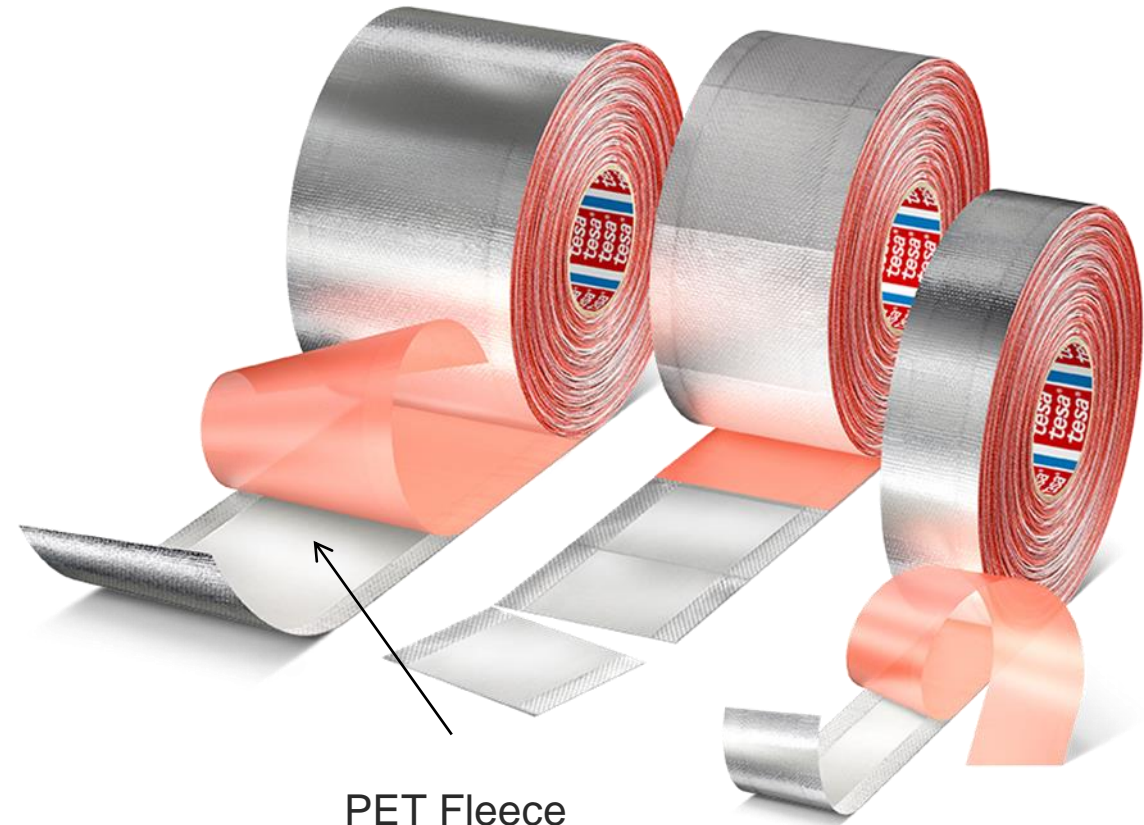


Insulation and Reflection Products

tesa 68000 PV17



tesa 68000 PV17



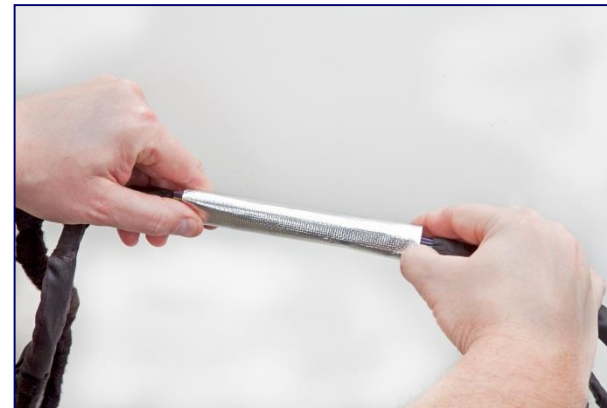
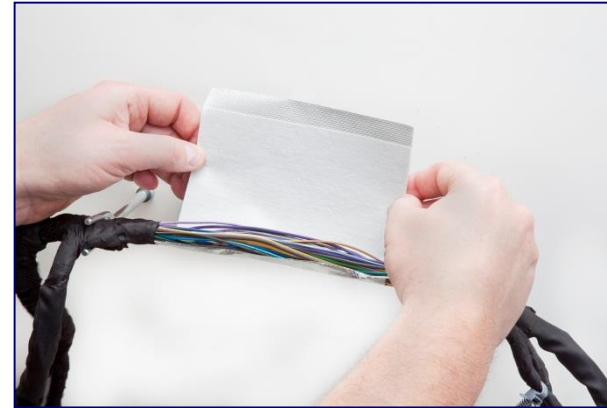
PET Fleece

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Insulate Against Heat and Reflect Infrared Radiation



Product Application Instructions

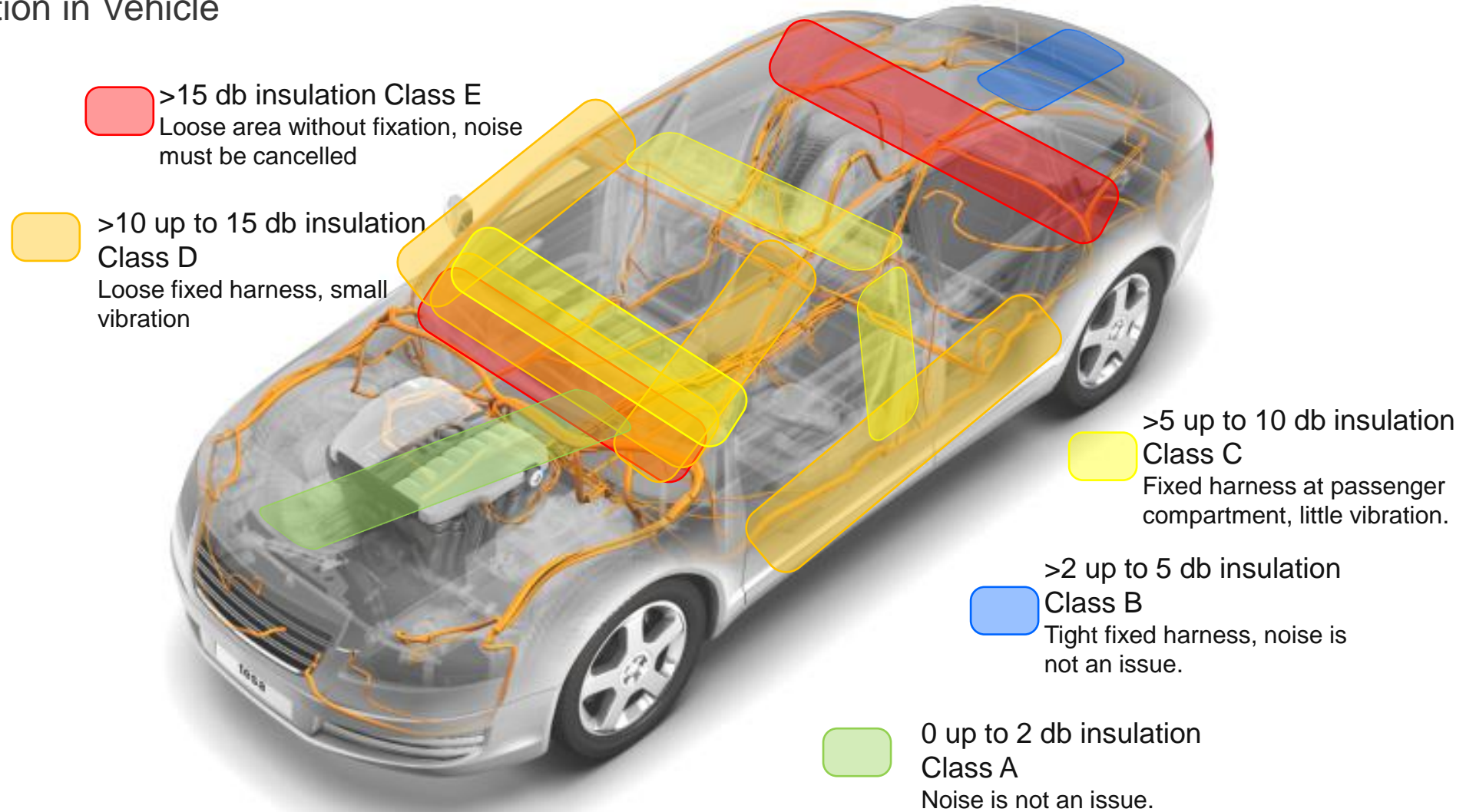


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Provide Sound Damping



Noise Levels by Location in Vehicle



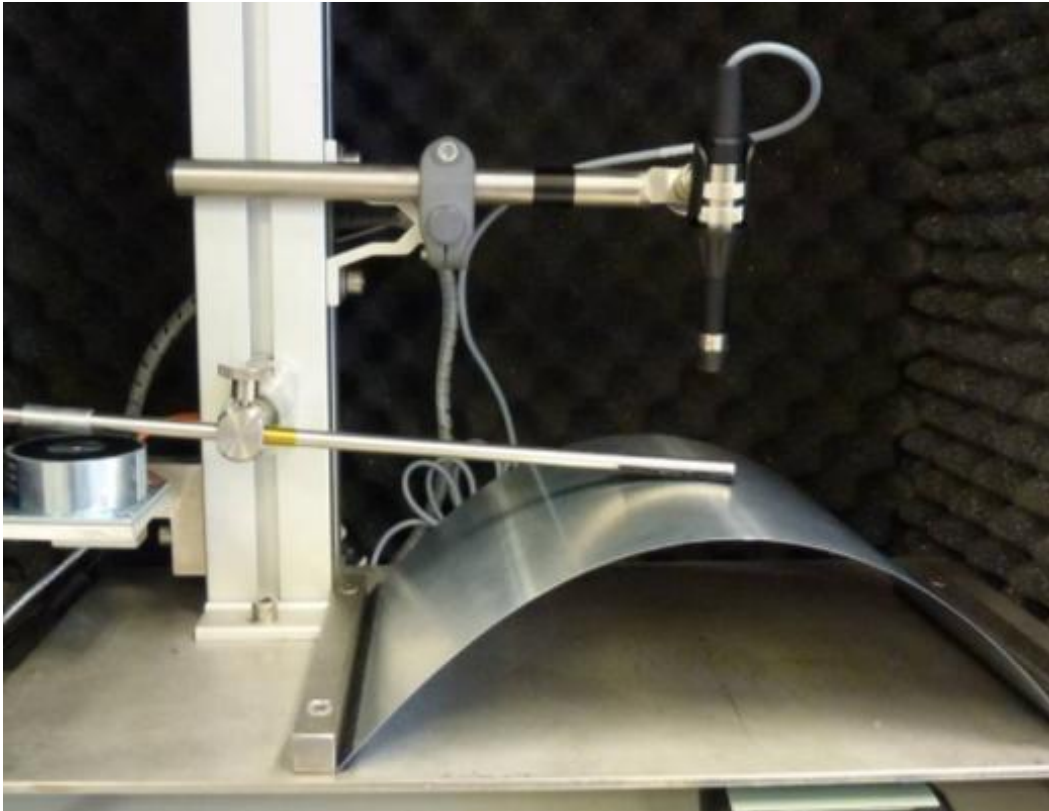
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Provide Sound Damping



Sound Damping Measurement

- Mandrel is wrapped with the covering, then allowed to fall on a metal plate
- Decibels from impact are measured and a sound damping rating is assigned



Acoustic insulation category	Requirement [dB(A)]	Backing solution
A – no	0 to \leq 2	PVC
B – little	$>$ 2 to \leq 5	Cloth
C – medium	$>$ 5 to \leq 10	Fleece
D – high	$>$ 10 to \leq 15	Thick Fleece
E – very high	$>$ 15 dB(A)	Velours

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Provide Sound Damping



Sound Damping Products

- PET fleece tapes provide best sound damping properties
- “Fuzzy” backing of PET Fleece abates noise
- Elimination of buzz, squeak and rattles in passenger compartment essential
- The thicker the fleece backing, the higher the sound absorption

tesa 51616 – thick fleece



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Allow Harness Flexibility



Harness Flexibility Products

- Harness flexibility is required to allow for easy installation at assembly plant
- Harnesses must be routed through tight spaces and in complex bends
- Full adhesive contact on wire bundles make harnesses more stiff
- Partially coated sleeves allow for higher flexibility



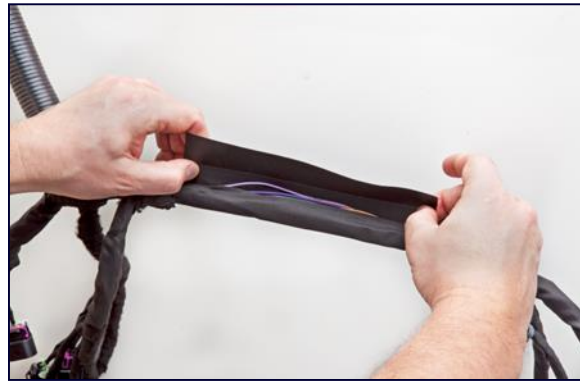
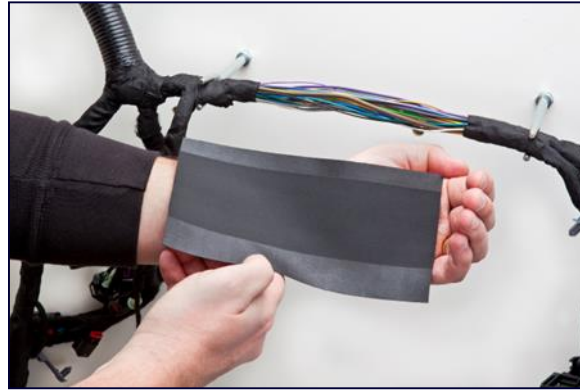
tesa 51036 PV7

PRODUCTS BY PERFORMANCE

Allow Harness Flexibility



Product Application Instructions



Sleeve is easily applied in a lengthwise manner



WORKING TOGETHER

WORKING TOGETHER

Sample Kit



Sample Kit shipped to Teams

Includes:

- 1) tesa 51036 in 2 roll widths
- 2) tesa 51036 PV7 in 5 roll widths
- 3) tesa 68000PV17 in 6 roll widths
- 4) tesa 51616 in 2 roll widths
- 5) Assembly aids

Orange samples and 68000 PV1
can be ordered on the Portal.





tesa EcoCAR Portal

- Online portal: can request custom sizes and place orders for additional coverings

<https://www.tesa.com/en-us/ecocar-sample-request>

- Download instructional information and application guides
- Ask questions or request technical support
- Workshops in future

tesa WIRE HARNESSING

Choosing the Right tesa® Wire Harness Product for Your Application

tesa tape is recognized as an industry leader in wire and cable management systems. The impressive tesa portfolio includes adhesive tape and sleeve products designed for abrasion protection, sound damping, thermal management, and flexible cable harnessing throughout the vehicle. The following product selection guide can be used as a reference for choosing the appropriate tesa product for your application.

Temperature Requirements	Abrasion Requirements	Flexibility Requirements	Product Recommendation
High (Engine Compartment) Class C or D 125 - 180°C	High (Class D or E)	High (steepest)	tesa® 58000 PV17
	High (Class D or E)	High (steepest)	tesa® 51036 PV6
	High (Class D or E)	Medium (steepest)	tesa® 51036 PV7
	Medium (Class B/C)	High (steepest)	tesa® 51036 PV9
	Medium (Class B/C)	Medium (steepest)	tesa® 51025
	Low (Class A or above)	High (steepest)	tesa® 51036 PV9
Medium (Interior Applications) Class A or B 95 - 105°C	High (Class C)	High (steepest)	tesa® 51025
	High (Class C)	Medium (steepest)	tesa® 51036 PV5
	Medium (Class B)	High (steepest)	tesa® 51036
	Medium (Class B)	Medium (steepest)	tesa® 51036 PV7
	Medium (Class B)	High (steepest)	tesa® 51036 PV9
	Medium (Class B)	Medium (steepest)	tesa® 51036 PV7

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tesatape.com/wire-harness

tesa SLEEVE SOLUTIONS

Simplified Sleeve Solutions for Enhanced Flexibility

Recommendations for Selecting Sleeve Width Based on Harness Diameter

tesa® SuperSleeve 51036 PV6	Harness Dia. [mm]	Sleeve Width [mm]	tesa® SuperSleeve 51036 PV7	Harness Dia. [mm]	Sleeve Width [mm]
	<12	67		<10	50
	12-16	85		11-20	95
	16-19	100		21-30	140
	19-24	115		31-40	190
	24-29	130		41-50	230
	33-38	150		--	--
	38-45	160		--	--
	45-49	195		--	--

High abrasion resistance due to double layer design

tesa® Sleeve 51036 PV9	Harness Dia. [mm]	Sleeve Width [mm]	tesa® Sleeve 51026 PV5	Harness Dia. [mm]	Sleeve Width [mm]
	<10	68		10-30	45
	13-15	75		>30	59
	16-23	100		--	--
	23-33	130		--	--
	33-41	155		--	--
	41-54	195		--	--
	--	--		--	--
	--	--		--	--

Abrasion protection, cost efficiency and flexibility due to single layer design

tesa® SuperSleeve 51608 PV6	Harness Dia. [mm]	Sleeve Width [mm]	tesa® Sleeve 68000 PV17	Harness Dia. [mm]	Sleeve Width [mm]
	<12	67		<10	50
	12-16	85		10-15	68
	16-19	100		16-19	80
	19-24	115		20-25	100
	24-29	130		26-35	130
	29-33	145		36-43	160
	33-38	160		--	--
	38-45	190		--	--
	45-49	195		--	--

High noise damping due to double layer design

Aluminum laminated glass cloth for radiant heat reflection

tesatape.com



THANK YOU



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.