



Thermal Resistant Sleeving

1 Scope

1.1 Material Description. This standard describes the requirements for different Types of thermally insulating and reflective sleeving materials for protecting various components from radiant heat sources. The products qualified to this specification are categorized into various material Types. Products shall be comprised of either a textile based substrate or a metal foil substrate, or any combination of the two (2) substrates permanently bonded. The material composite shall be suitable for use in applications located throughout the vehicle, but, most often within the engine compartment. Dependent on the construction of the laminating layers, Types may be used as reflective and/or insulating thermal sleeves.

1.1.1 Classification. Material constructions qualified to this specification are identified under Type and Class. Type defines the composition of the protective sleeving and class defines the environmental temperatures to be withstood for 72 h. The Excursion Temperatures, as defined in Table 1, correspond to the temperatures classes and are as follows:

- Class 1 150 °C
- Class 2 175 °C
- Class 3 200 °C
- Class 4 235 °C
- Class 5 482 °C
- Class 6 600 °C
- Class 7 315 °C
- Class 8 300 °C

Sleeving material construction types that meet higher temperature classes can also be used for lower temperature applications. See Table 1 for applicable temperature classes. Layers are to be mechanically or chemically bonded to avoid separation over lifetime.

1.1.2 Materials Types shall be selected depending on the application. Applicable product details, such as material thickness, shall be called out on associated product drawings.

Note: Continuous and Excursion temperature limits are defined in the Vehicle Technical Specifications (VTS). The cold resistance test for all types of hoses is defined at -40 °C.

1.2 Symbols. Not applicable.

1.3 Applicability. For all heat protection sleeving, either insulating or reflecting.

Table 1: Material Composition, Temperature Class and Thermal Performance ^{Note 1}

Types	Material Heat Reflecting Surface	Material Supporting Substrate	Excursion Temperature (72 h)	Long Term Heat Resistance (3024 h)	Thermal Performance	Applicable Temperature Classes
Type 1	Aluminium foil or aluminized film foil	100% Polyethylene Terephthalate (PET) substrate; braided, woven or non-woven	+150 °C ± 3 °C	+125 °C ± 3 °C	Reflective	1
Type 2	Aluminium foil or aluminized film foil	Fiberglass/PET polyester substrate; woven or braided	+175 °C ± 3 °C	+150 °C ± 3 °C	Reflective	1, 2
Type 3	Aluminium foil	100% Fiberglass substrate; braided, woven or non-woven	+200 °C ± 3 °C	+175 °C ± 3 °C	Reflective	1, 2, 3
Type 4A	Aluminium foil	100% Fiberglass; braided or woven	+235 °C ± 3 °C	+200 °C ± 3 °C	Reflective	1, 2, 3, 4
Type 4B		100% Fiberglass substrate; braided, woven or non-woven, impregnated with silicone rubber			Insulative	
Type 4C		Inner layer of knitted fiberglass substrate, middle layer of aramid, outside layer of silicone rubber coated			Insulative	
Type 4D	Aluminium foil	Inner layer of woven, braided or knitted fiberglass yarns and PPS monofilament;			Reflective	
Type 4E	Aluminium foil	Inner layer of woven, braided or knitted fiberglass yarns and PET monofilament			Reflective	
Type 4F	Aluminium foil	Inner layer of woven, braided or knitted fiberglass yarns and non-woven organic fibers			Reflective	
Type 8		Inner layer of fiberglass braid coated with silicone rubber containing aluminum pigments, outer layer of impregnated braided fiberglass	+300 °C ± 3 °C	+235 °C ± 3 °C	Insulative	1,2,3,4,8

Types	Material Heat Reflecting Surface	Material Supporting Substrate	Excursion Temperature (72 h)	Long Term Heat Resistance (3024 h)	Thermal Performance	Applicable Temperature Classes
Type 7A	Aluminium or aluminized film foil	100% Aramid Fiber, braided woven or non-woven	315 °C ± 3 °C	+250 °C ± 3 °C	Reflective or Insulative	1, 2, 3, 4, 7,8
Type 7B	Reflective Coating	High Temperature polyamide based substrate			Reflective	
Type 7C		100% Fiberglass substrate; braided, woven or non-woven, impregnated with silicone rubber			Insulative	
Type 5A	Aluminium foil outer layer	Aluminium foil inner layer with or without a woven fiberglass substrate	+482 °C ± 3 °C	+250 °C ± 3 °C	Reflective or Insulative	1, 2, 3, 4, 5, 7
Type 5B		100% Fiberglass; woven or braided impregnated with silicone rubber.			Insulative	
Type 6A	Stainless Steel Foil	Stainless steel foil inner layer; woven fiberglass mechanically bonded and sealed	+600 °C ± 3 °C	+250 °C ± 3 °C	Reflective or Insulative	1, 2, 3, 4, 5,6, 7
Type 6B	Stainless Steel Foil	100% Fiberglass Substrates; woven or braided; impregnated with silicon or acrylic adhesive.				
Type 6C	Stainless Steel Foil	Woven, knit or braided substrate comprised of fiberglass, silica or basalt fibers				

Note 1: Former Type 4A and Type 4B were combined to Type 4 with revision B.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

FMVSS 302	ISO/IEC 17025	SAE J2302
ISO 188	ISO 23529	UL 94 V-0

2.2 GM Standards/Specifications.

GMW3059	GMW3235	GMW14700	GMW16955
GMW3205	GMW3286	GMW14914	
GMW3232	GMW14270	GMW15634	