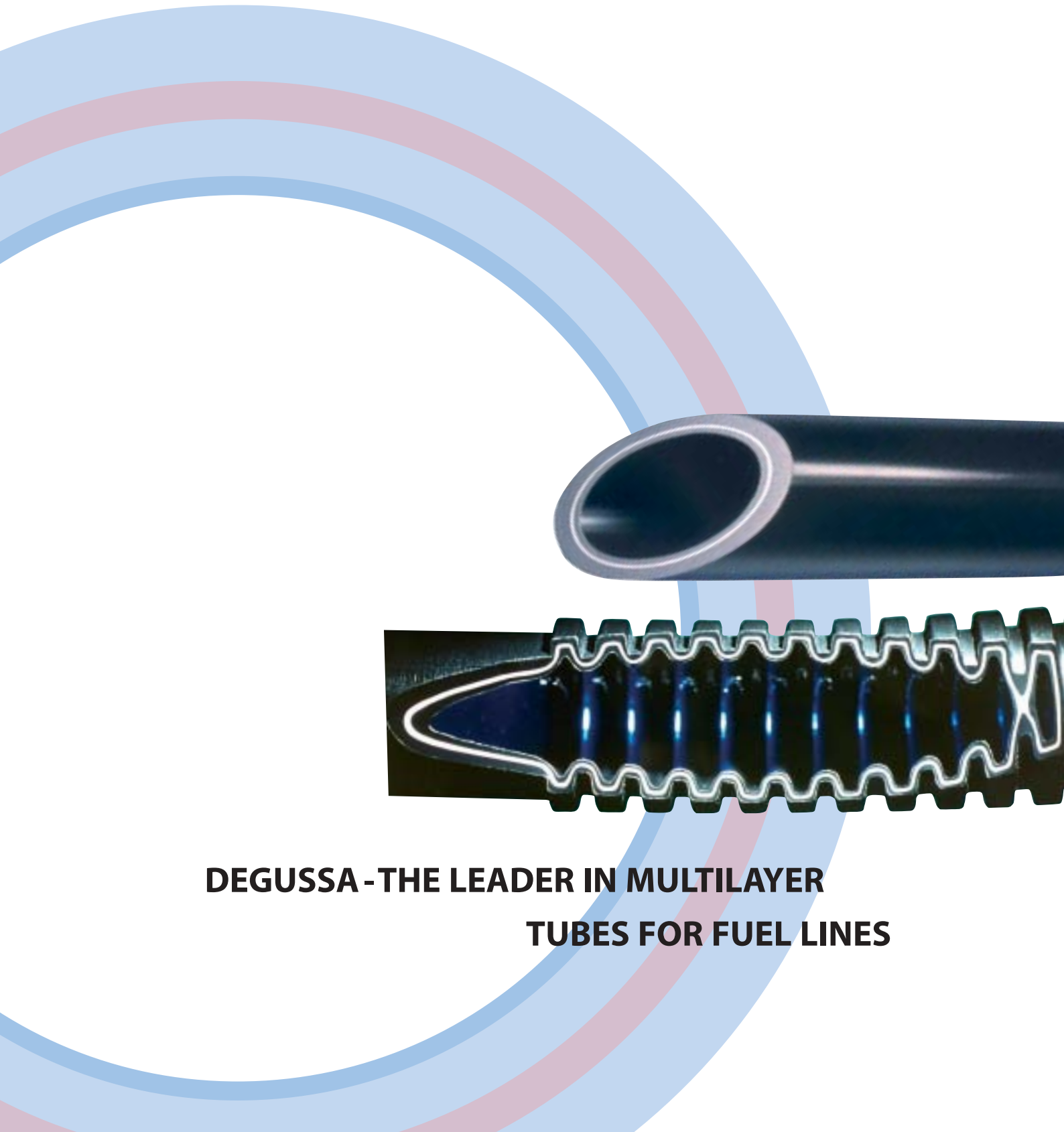


degussa.

creating essentials



**DEGUSSA - THE LEADER IN MULTILAYER
TUBES FOR FUEL LINES**

Lower Hydrocarbon Emissions

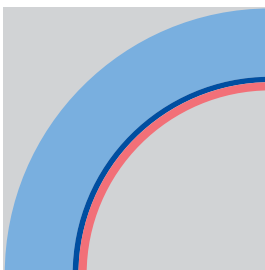
As the market leader in materials for plastic fuel lines, Degussa AG's High Performance Polymers Business Unit has developed a series of patented multi-layer tubing (MLT) systems.

VESTAMID®, the world's most popular polyamide 12 for mono-wall fuel lines, is used as a material in multi-layer tubes. How well the barrier effect works against permeation by hydrocarbons depends on which barrier material is used. The barrier layers are made of

- polyvinylidene fluoride (PVDF) - DYFLOR®
- ethylene perfluoroethylenepropene copolymer (EFEP) – NEOFLON™
- polybutylene terephthalate (PBT) - VESTODUR®
- ethylene vinyl alcohol (EVOH)

Today, fuel lines are made of MLTs to meet current and future requirements:

- reduce hydrocarbon emissions
- properly handle electrostatic charges
- increase corrosion resistance



MLT 2000.1

MLT with very good permeation resistance against alcohol-containing fuels, moderate cold impact performance and excellent chemical resistance

- VESTAMID (PA 12)
- VESTAMID (PA 12 adhesive)
- DYFLOR (PVDF)

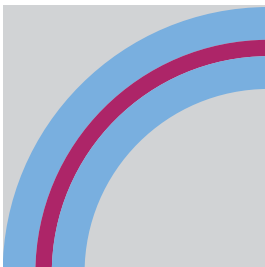


MLT 7000.1*

MLT with very good permeation resistance against alcohol-containing fuels and superior chemical resistance of inner tube surface

- VESTAMID (PA 12)
- NEOFLON™ (EFEP)

*joint promotion with Daikin Industries, Ltd., Japan



MLT 2030.1

MLT with very good permeation resistance against alcohol-containing fuels and excellent cold impact performance

- VESTAMID (PA 12)
- DYFLOR (PVDF, modified)
- VESTAMID (PA 12)

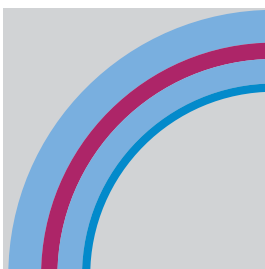


MLT 7040.1*

Conductive MLT with very good permeation resistance against alcohol-containing fuels and superior chemical resistance of inner tube surface

- VESTAMID (PA 12)
- NEOFLON™ (EFEP, conductive)

*joint promotion with Daikin Industries, Ltd., Japan



MLT 2040.2

Conductive MLT with very good permeation resistance against hydrocarbons and excellent cold impact performance

- VESTAMID (PA 12)
- DYFLOR (PVDF, modified)
- VESTAMID (PA 12)
- VESTAMID (PA 12, conductive)

Difference in barrier effect and price

A developer of MLTs basically has to work with the following constraints:

- best possible barrier effect
- lowest possible price
- guarantee of physical and chemical properties.

The use of fluoropolymers is unavoidable if very low permeation values are required for fuels containing methanol. But, the material costs for fluoropolymers are normally the most expensive. Our MLT designs with PVDF barrier layers are the systems of choice by the U.S. automotive industry and are responsible for lowering fuel line emissions by more than 95%.

Our latest MLT systems with EVOH barrier layers are the most cost-efficient. They feature a good barrier effect especially against ethanol-containing fuels.

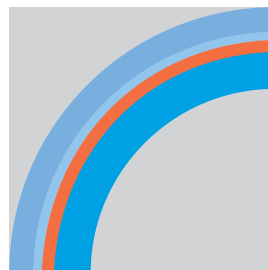
Automobile manufacturers and system suppliers have to decide which MLT satisfies their own requirements at the best cost-performance ratio. To support our customers in this decision, we work closely with them in the application of MLT systems, thereby ensuring that the materials and MLT design will meet the requirements of the automobile manufacturer.



MLT 140.2

Conductive MLT for applications requiring performance of PA 12 monowall tubes

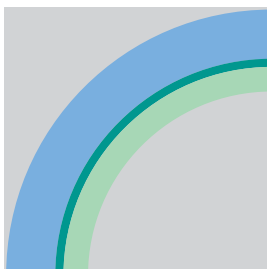
- VESTAMID (PA 12)
- VESTAMID (PA 12, conductive)



MLT 4300.1

MLT with very good permeation resistance against ethanol-containing fuels, good cold impact performance, but limited chemical resistance

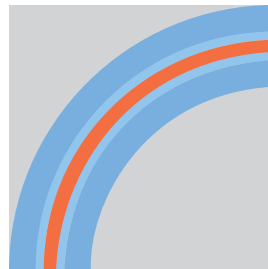
- VESTAMID (PA 12)
- VESTAMID (PA adhesive)
- EVOH
- VESTAMID (PA 6)



MLT 1000.1

MLT with improved permeation resistance against alcohol-containing fuels, good cold impact performance, but limited chemical resistance

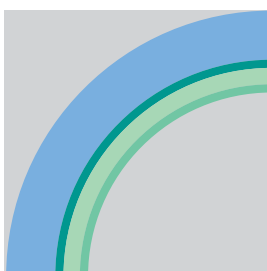
- VESTAMID (PA 12)
- VESTODUR (PBT adhesive)
- VESTODUR (PBT)



MLT 4500.1

MLT with very good permeation resistance against ethanol-containing fuels and excellent cold impact performance

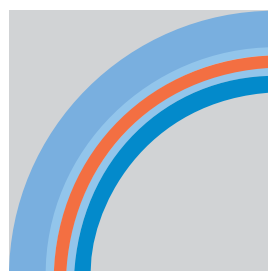
- VESTAMID (PA 12)
- VESTAMID (PA adhesive)
- EVOH
- VESTAMID (PA adhesive)
- VESTAMID (PA 12)



MLT 1040.2

Conductive MLT with improved permeation resistance against alcohol-containing fuels, good cold impact performance, but limited chemical resistance

- VESTAMID (PA 12)
- VESTODUR (PBT adhesive)
- VESTODUR (PBT)
- VESTODUR (PBT, conductive)



MLT 4540.1

Conductive MLT with very good permeation resistance against ethanol-containing fuels and excellent cold impact performance

- VESTAMID (PA 12)
- VESTAMID (PA adhesive)
- EVOH
- VESTAMID (PA adhesive)
- VESTAMID (PA 12, conductive)

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