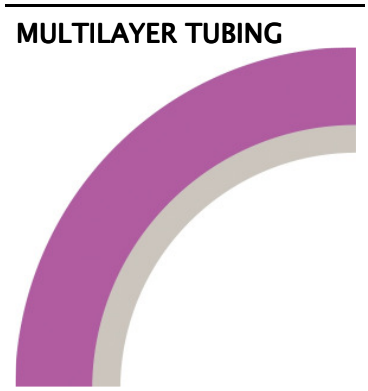
EVONIK INDUSTRIES

Product Information

MULTILAYER TUBING NRG 6.1



Multilayer tubing NRG 6.1 is a 2-layer tube consisting of an outer layer of VESTAMID®NRG 6001nc (plasticized, impact modified polyamide 12), and an inner barrier layer of ETFE based polymer Neoflon™ EFEP RP-5000. This MLT has been developed in a cooperation between Daikin Industries and Evonik Industries for umbilical tubing in offshore applications with excellent chemical resistance against hydrocarbon media. Even the swelling and length change due alcohols are significant lower than common polyamide monowall tubes. This leads to better mechanical properties during service. The permeation of alcohols is reduced by a factor of more than 10 compared to monowall tubing. The inner EFEP-layer is free of extractable oligomers !

MLT NRG 6.1 can be manufactured by conventional coextrusion technology. However, corrosion protected equipment is recommended for processing of the fluoropolymer. MLT NRG 6.1 can be manufactured as a straight and a corrugated tube. Thermoforming and assembling of MLT NRG 6.1 is done with the same techniques used for monowall tubing. The mechanical properties are essentially equivalent to those of the long proven polyamide monowall tubing.

Properties of MLT NRG 6.1

Properties acc. to common ISO and DIN standards

Tubing design: Tubing size 10x 1 mm; layers from outside to inside

0.80 mm VESTAMID NRG 6001 nc

0.20 mm NEOFLON™ EFEP RP-5000

Properties	standard	Unit	NRG 6.1
Tensile strength	ISO 527	MPa	32
Strain at break		%	> 150
Burst pressure	DIN 53358	MPa	50
Reference stress	DIN 73378		
as molded		MPa	23
after 5000h, 60°C , FAM B (with 15% methanol)		MPa	21
Cold impact test (ball impact at -40°C)			
as molded	DIN 73378	Number of breaks	0 / 10
as molded	SAE J844	Number of breaks	0 / 10
as molded	SAE J2260	Number of breaks	0 / 10
after 5000h, 60°C , FAM B (with 15% methanol)	SAE J2260	Number of breaks	0 / 10
Adhesion (bonding)	DIN 53357		
as molded		N/cm	nsp[1)]
after 5000h, 60°C , FAM B (with 15% methanol)		N/cm	nsp[1)]
after 3000h, 100°C , mineral oil (diesel, B20)		N/cm	nsp[1)]
Swelling (length change)	-		
after 1000h , 60°C , FAM B (with 15% methanol)		%	< 1.7
Extractables (inner surface; EFEP) (tube 10 x 1mm)			
extraction 168h / 60°C / methanol	Evonik Method	mg / m	< 1
Permeation resistance against Methanol	SAE J 30		
at 40°C		g/m² day	1.2
at 60°C		g/m² day	8.5
at 90°C		g/m² day	82
Resistance to $ZnCl_2$	SAE J 2260	-	pass

[1)] no separation possible

The table shows representative values measured on tubing 10 x 1 mm. The tubing was produced on a laboratory equipment at a line speed of 15 to 20 m/min. Higher line speeds may influence especially tensile strength, elongation at break and cold impact resistance. This must be checked.