

Tubes made from  
high-performance plastics



**elringklinger**  
Engineered Plastics

# Range of products for industry-specific applications: Tubes made from POLYTETRAFLON™-PTFE, Moldflon™-PTFE, -PFA, -FEP, -PEEK, -PEI, -ECTFE, -ETFE, and -PVDF

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**Tubes that meet the highest demands in medical and laboratory technology, pharmaceuticals, and analytics**

**PTFE tubes**

**Heat shrinkable tubing, rollcovers**

**Thermoplastic tubes**

## ***Innovations made of high-performance plastics***

With seals and design elements, ElringKlinger Kunststofftechnik has been the technology leader for over 50 years. We develop and produce bespoke, practical solutions made of PTFE, PTFE compounds and other high performance plastics which are often integrated with other more complex systems and supplied to customers around the world. Our sophisticated solutions fulfill the toughest requirements in the real world economically, reliably and safely making a significant contribution to the success of our customers.

## ***Tubes for maximum performance and functional reliability***

Tubes made from high-performance plastics—e.g., from POLYTETRAFLON™-PTFE, Moldflon™-PTFE, -PFA, -FEP, -PEEK, -PEI, -ECTFE, -ETFE, and -PVDF—offer significant advantages thanks to their unique, application-specific properties for demanding applications in many industries. What sets them apart?

- High thermal stability and chemical resistance
- Outstanding sliding characteristics
- Anti-adhesive
- Good electrical properties
- Physiological safety
- Sterilizability
- Approvals for food, pharmaceuticals, and medicine

## ***Tubes for demanding industry applications***

Customers in the following sectors rely on our tubes:

- Medical technology
- Analytics and laboratory technology
- Pharmaceuticals
- Machine and plant design
- Automotive
- Electro-plating
- Food technology
- Measurement and control technology
- Chemistry
- Aerospace
- Electrical engineering

Besides a comprehensive range of standard solutions, we offer individually designed plastic components for a broad spectrum of applications.



**Material properties**

### *Development, technical application support and problem-solving, sales*

We offer comprehensive consultation services:

- From development and production to sales and service
- Technical application support
- Provision of prototypes for testing
- Test benches for prototype verification
- Project support from the initial prototype to series production

We support you in creating your design and fulfilling your application requirements. Using a specialist team of engineers, we help customers develop new products and systems which are supported by an unrivaled manufacturing capability.

### *Quality and environmental policy*

Top quality and active environmental protection are prerequisites for the sustainable success of ElringKlinger Kunststofftechnik in the market. We are certified in accordance with

- IATF 16949:2016
- DIN EN ISO 14001
- EN ISO 13485
- GMP (“Good Manufacturing Practice”)

### **Design limits:**

The information provided here has been collected with great care on the basis of many years of experience. However, no guarantee can be provided for the data, because proper function can be ensured only if the particular conditions of each individual case are taken into consideration. The material properties are typical for the material class. Please see the relevant material data sheets. We always recommend that you have a prototype created and carry out tests. Our development department will be happy to assist you.

### **Diagrams:**

The data in the diagrams are based on comparison values determined by ElringKlinger Kunststofftechnik. They were derived under specially defined conditions, and cannot be applied exactly to other applications or dimensions. The diagrams allow basic comparisons of the properties and influencing parameters.

### *Performance that gives you a head start*

- Tailor-made technical and cost-effective solutions made of high-performance plastics with precisely defined property profiles
- In-house development and test labs for materials, products, and systems
- In-house raw material development and compounding
- Moldflon™ injection molding processing of PTFE and other high-performance plastics
- Product tests for securing of serial production
- Continuous optimization of manufacturing processes and methods for quality assurance



# Tubes that meet the highest demands in medical and laboratory technology, pharmaceuticals, and analytics



As a development partner to internationally leading medical equipment manufacturers, we offer sophisticated solutions. Our products are characterized by their reliability and safety for patients and staff. With our industry orientated sales team specifically trained in medical technology applications, clean room production and manufacturing know-how, we are able to offer creative solutions for new product development opportunities.

## *From the idea to series production*

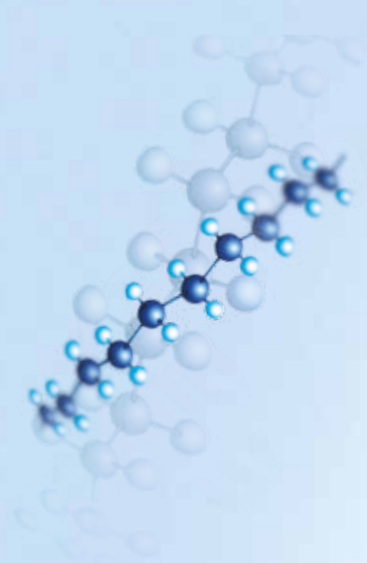
- Application support: technical and commercial
- Specially created prototypes for the first relevant test situations
- Test benches for prototype verification
- Project management and manufacturing conditions in accordance with IATF 16949:2016 and EN ISO 13485
- Production, testing, cleaning, and packaging under controlled conditions
  - Standard production conditions in accordance with GMP (“Good Manufacturing Practice”)
  - Controlled zone (cleanliness class 2)
  - Clean room in accordance with ISO Class 8

- Biological evaluation of products in accordance with EN ISO 10993
- Approved materials for manufacturing medical tubes
- Support for regulatory affairs

## *Approvals and conformities*

- Certificate of compliance with USP Class VI
- Compliance with REACH Regulation (EC) No 1907/2006 (Candidate List of SVHC)
- Conformity with Directive 2011/65/EU (RoHS 2)
- Conformity with FDA 21 CFR 177.1550
- PTFE “Medical Grade”
- Thermoplastic high-performance plastics such as Moldflon™-PFA, -FEP, and -PEEK
- Radiopaque
- For more details, see the material properties chapter

## *Materials for medical tubes*



### **Need more information?**

Give us a call:

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# Medical tubes for diagnosis and treatment in endoscopy and minimally invasive surgery

## *Applications*

- Gastroenterology
- Laparoscopy
- Proctology
- Gynecology
- Bronchoscopy
- ENT medicine
- Orthopedics

## *Designs*



### ***Multilumen tubes, profiles, special shapes***

- Design and number of lumens individually configurable
- Good sliding characteristics
- Pressure tested and puncture resistant
- Tempered without shrinkage
- Biocompatible in accordance with EN ISO 10993



### ***Color-coded and labeled tubes***

- Individual design (colored rings, logos, measurement scales)
- No color layer on surface
- High wear resistance
- Shade is individually configurable, e.g., in accordance with the RAL or Pantone color scale
- Biocompatible dye in accordance with EN ISO 10993
- UV resistance
- Optimal visual recognition for positioning in the body
- Possible sterilization processes: autoclave, EtO
- Radiopaque



*Trocar sleeve for minimally invasive surgery. This device with spiral PTFE tube allows operations to be carried out with a relatively small amount of blood loss.*



### **Colored tubes**

- Dielectric
- Insulation
- Thin walls
- Microtubes
- Narrow tolerances
- Shade is individually configurable, e.g., in accordance with the RAL or Pantone color scale
- Biocompatible dye in accordance with EN ISO 10993



### **Corrugated tubes**

- High flexibility thanks to spiral surface
- Kink-resistant
- Individual design
- High dimensional accuracy thanks to a special manufacturing process
- Very good sliding characteristics
- Tempered without shrinkage
- Biocompatible in accordance with EN ISO 10993
- Sterilizable with EtO and superheated steam



### **Reprocessing of tubes**

- Cross section tapering with constant or variable inner diameter
- Expansion and flange shapes
- Processing of tube ends (radii, slants, closures)
- Drilling
- 3D forming
- Surface activation to allow bonding with other materials



### ***Porous tubes***

- Material ePTFE
- Porosity and characteristics can be configured to the specific application
- Reduced barrier effect
- Increased mechanical flexibility
- Can contain fillers such as carbon black
- Product relevant characteristic parameters include air conductivity and water pressure resistance. These are determined on the basis of the requirements for the component

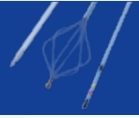


### ***Heat shrinkable tubing, dual heat shrinkable tubing***

We offer thin-walled heat shrinkable tubing (e.g., “kink free” heat shrinkable tubing) with narrow tolerances (see the Heat shrinkable tubing chapter, page 16). Other individual heat shrinkable tubing variants on request.



# Tubes for pharmaceuticals, analytics, and laboratory technology



There is a wide range of possible applications for our tubes in the areas of pharmaceuticals, analytics, and laboratory technology. For example:

- Analysis and measurement devices for chromatography and laboratory technology
- Product lines in miniplant systems
- Dosing lines for reaction vessels
- Applications in dental technology

## Applications

- Degassing of liquids, e.g., in liquid chromatography (HPLC)
- Disinfection of liquids
- Water supply and extraction
- Transport of aggressive media such as acids, bases, gases, and solvents
- Dissipation of electrical charge in potentially explosive atmospheres
- Cladding of moving mechanical parts
- Sheathing for measurement sensors and heating elements
- Tempering of liquids

## Designs



### **ESD (Electrostatic Discharge) tube**

- Dissipating electrostatic charge
- Transparent design also available
- Small diameters on request



### **Tube bundles**

- Ultrapure PTFE tubes without additives that interfere with analysis (e.g., plasticizers)
- Precise manufacturing
- Small diameters on request
- Small wall thicknesses for defined gas diffusion
- Kink-resistant
- Maximum surface area
- Biocompatible in accordance with EN ISO 10993



### **Knitted coils**

- Linear flow movement created by alternating changes of direction
- Constant, pulsation free reagent flow
- Smoothing of the parabolic velocity curve
- Chemically inert
- Easy to clean
- Different tube variants and sizes available

## **Modules and assemblies according to customer requirements**

Please contact us if you have any questions about additional solutions or modules for medical technology.



# POLYTETRAFLON™-PTFE tubes for your applications



## *Broad spectrum of applications for PTFE tubes*

PTFE is a highly popular fluoropolymer because of its exceptional chemical, thermal, and dielectric properties. Its almost universal chemical resistance and large working temperature range of  $-200^{\circ}\text{C}$  to  $+260^{\circ}\text{C}$  for continuous operation make it suitable for a broad spectrum of applications. Thanks to these properties, POLYTETRAFLON™-PTFE tubes are increasingly used in the chemical, electrical, and mechanical industries, as well as in medical technology.

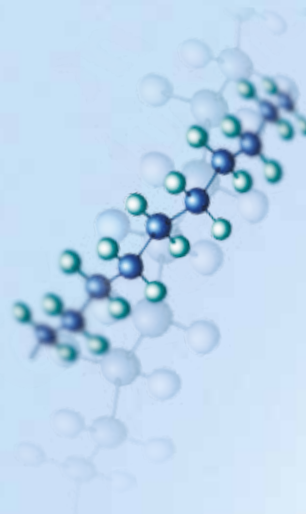
## *Paste-extruded tubes in a large number of variants*

In paste extrusion, paste-like PTFE is mixed with a lubricant in a cartridge, preformed, and then pressed through a nozzle. It then undergoes an external sintering process, which takes place over a relatively long distance. During this process, 100% of the lubricant evaporates. Various PTFE pastes with different properties are currently on the market.

ElringKlinger Kunststofftechnik therefore offers high standard qualities as well as application specific properties that can be tailored to customer requirements. In the standard qualities, different raw materials can be used.

## *Customized properties with PTFE compounds*

The use of modified PTFE types and PTFE compounds allows the typical properties of virgin PTFE to be precisely tailored to specific requirements. Typical fillers include glass, graphite, bronze, or color pigments (black, orange, red, etc.). Tubes made from PTFE compounds with varying filler contents are available on request.



### **Need more information?**

Give us a call:

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## Application examples: POLYTETRAFLON™-PTFE tubes

### **Chemical industry**

- For analysis or measuring devices in chromatography and laboratory technology as well as for sheathing for measurement sensors in chemical plant engineering
- For transport of food products, oils, resins, and paints
- For transport of aggressive media such as acids, bases, gases, and solvents

### **Plant design, e.g., paint shops**

In paint spray shops where pressure-tested tubes are used because of the specific operating conditions.

### **Electrical engineering**

- Insulation of high-voltage cables
- Cladding of electrical heating elements, as a protective layer in electro-plating and microelectronics

### **Mechanical applications**

The low friction coefficient of PTFE allows cladding of Bowden cables, for example. Applications in the automotive industry are gaining in importance because of the high ambient temperature, e.g., in the manufacture of wire harnesses and in emissions reduction.

### **Liquid chromatography**

Ultrapure POLYTETRAFLON™-PTFE tubes without aromatic compounds that interfere with analysis.

### **Medical and laboratory technology**

Because it is physiologically harmless, PTFE can be used in the medical sector (see also pages 4–9).

## Examples of special solutions



Helical tubes made from POLYTETRAFLON™-PTFE, Moldflon™-PFA and -PVDF



Profiles with different geometries and dimensions



Blow-molded tubes—cable protection for lambda sensors



Curved tubes, e.g., for transmissions



Corrugated tubes made from Moldflon™-PTFE, -PFA, -FEP, or MFA



**POLYTETRAFLON™-PTFE tubes in standard dimensions**

Internal Ø in mm	Wall thickness	Part no.	Internal Ø in mm	Wall thickness	Part no.
0.50	0.75	062.782	2.70	0.4	066.125
0.60	0.25	062.804	3.00	0.45	064.106
0.70	0.65	062.898	3.00	1	064.203
0.90	0.3	062.936	4.00	0.5	064.262
1.00	0.25	062.979	4.00	1	064.270
1.00	0.3	063.002	4.50	0.75	216.801
1.00	0.4	063.010	5.00	0.5	064.327
1.00	0.5	063.096	5.00	1	064.335
1.00	1	063.177	6.00	0.5	064.378
1.15	0.3	063.231	6.00	1	064.386
1.40	0.4	063.320	7.00	0.5	064.424
1.50	0.5	063.452	8.00	0.5	386.073
1.50	0.75	063.460	8.00	1	064.467
2.00	0.5	063.525	9.00	1	064.483
2.00	1	063.541	9.00	1.5	224.480
2.50	0.75	063.835	10.00	1	064.491
2.50	1	063.843	14.00	1	064.556
2.70	0.25	063.878			

Standard dimensions also available in our online shop: [www.ek-kt.de/shop](http://www.ek-kt.de/shop)

**Technical details**

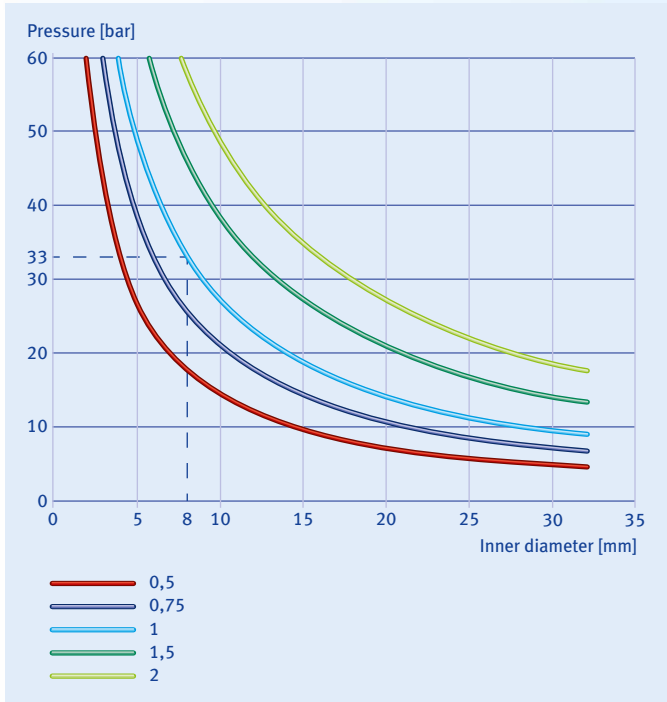
**Tolerances for paste-extruded virginal PTFE tubes, in accordance with the pro-K guidelines.**

Internal Ø in mm	Tolerance in mm	Wall thickness in mm	Tolerance
3– 5	±0.20	0.10–0.30	±0.05
> 5– 7	±0.25	> 0.30–0.60	±0.10
> 7–10	±0.30	> 0.60–1.00	±0.15
> 10–15	±0.35	> 1.00–2.00	±0.20
> 15–20	±0.40	> 2.00–4.00	±0.40
> 20–30	±0.50	> 4.00–6.00	±0.50
> 30–40	±0.60		
> 40		on request	

Narrowing of tolerances for functional reasons is possible, subject to consultation.

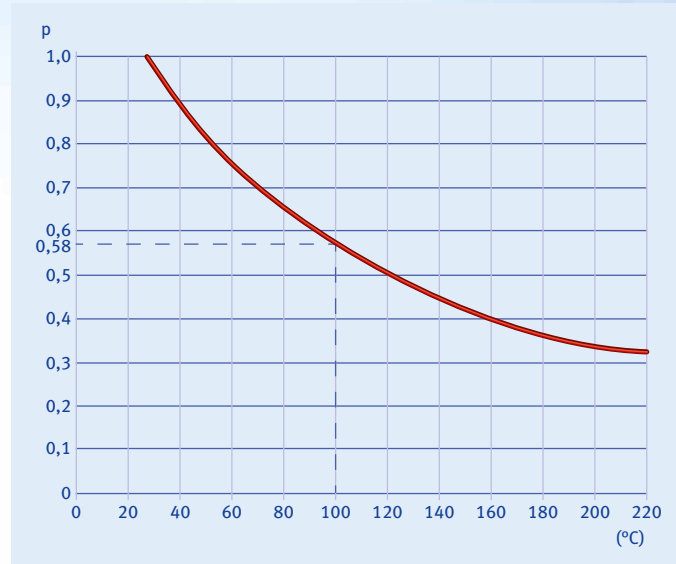
# Technical details

## Burst pressure at room temperature (depending on wall thickness [mm])



Calculating the operating pressure at room temperature  
 Example: Internal Ø 8 mm, wall 1 mm  
 Value on burst pressure curve = 33 bar  
 Safety factor = 3 = divide by 3 = 33:3 = 11 bar operating pressure RT

## Temperature correction curve Burst pressure



Example:  
 Internal Ø 8 mm, wall 1 mm at 100°C  
 Operating pressure at RT = 11 bar  
 Value on temperature curve = 0.58  
 Calculation: 11 bar x 0.58 = 6.4 bar max. operating pressure at 100°C

These calculated values are used as guide values and do not take into account any other contributing factors such as ambient pressure or temperature. The burst pressure may be further increased by means of special process control and materials. Contact us for more information.



**POLYTETRAFLON™-PTFE tubes in AWG (American Wire Gauge) sizes**

AWG no.	Internal Ø in mm			Wall thickness in mm tolerance		
	Nominal Ø	min. Ø	max. Ø	thick-walled	thin-walled	standard-walled
30	0.3	0.25	0.38	0.23 ± 0.05	0.15 ± 0.05	0.23 ± 0.05
28	0.4	0.33	0.48	0.23 ± 0.05	0.15 ± 0.05	0.23 ± 0.05
26	0.5	0.41	0.56	0.23 ± 0.05	0.15 ± 0.05	0.23 ± 0.05
24	0.6	0.51	0.69	0.30 ± 0.075	0.15 ± 0.05	0.25 ± 0.075
23	0.65	0.58	0.76	0.30 ± 0.075	0.15 ± 0.05	0.25 ± 0.075
22	0.7	0.65	0.81	0.30 ± 0.075	0.15 ± 0.05	0.25 ± 0.075
20	0.9	0.81	1.02	0.40 ± 0.075	0.15 ± 0.05	0.30 ± 0.075
19	1.0	0.91	1.12	0.40 ± 0.075	0.15 ± 0.05	0.30 ± 0.075
18	1.1	1.01	1.24	0.40 ± 0.075	0.15 ± 0.05	0.30 ± 0.075
17	1.2	1.14	1.37	0.40 ± 0.075	0.15 ± 0.05	0.30 ± 0.075
16	1.4	1.29	1.55	0.40 ± 0.075	0.15 ± 0.05	0.30 ± 0.075
15	1.5	1.45	1.70	0.40 ± 0.075	0.15 ± 0.05	0.30 ± 0.075
14	1.7	1.63	1.88	0.40 ± 0.075	0.20 ± 0.05	0.30 ± 0.075
13	1.9	1.83	2.08	0.40 ± 0.075	0.20 ± 0.05	0.30 ± 0.075
12	2.2	2.06	2.31	0.40 ± 0.075	0.20 ± 0.05	0.38 ± 0.075
11	2.4	2.31	2.57	0.40 ± 0.075	0.20 ± 0.05	0.38 ± 0.075
10	2.7	2.59	2.84	0.40 ± 0.075	0.20 ± 0.075	0.30 ± 0.075
9	3.0	2.89	3.15	0.51 ± 0.100	0.20 ± 0.05	0.38 ± 0.075
8	3.4	3.28	3.58	0.51 ± 0.100	0.20 ± 0.05	0.38 ± 0.075
7	3.8	3.66	4.01	0.51 ± 0.100	0.20 ± 0.05	0.38 ± 0.075
6	4.2	4.11	4.52	0.51 ± 0.100	0.25 ± 0.075	0.38 ± 0.075
5	4.7	4.62	5.03	0.51 ± 0.100	0.25 ± 0.075	0.38 ± 0.075
4	5.3	5.18	5.69	0.51 ± 0.100	0.25 ± 0.075	0.38 ± 0.075
3	6.0	5.82	6.32	0.51 ± 0.100	0.25 ± 0.075	0.38 ± 0.075
2	6.7	6.55	7.06	0.51 ± 0.100	0.25 ± 0.075	0.38 ± 0.075
1	7.5	7.34	7.90	0.51 ± 0.100	0.25 ± 0.075	0.38 ± 0.075
0	8.4	8.26	8.81	0.51 ± 0.100	0.25 ± 0.075	0.38 ± 0.075

- All tubes are available in production lengths on spools or cut into tube sections.
- Our standard dimensions are generally available from stock.
- POLYTETRAFLON™ tubes are manufactured in metric and imperial dimensions.
- Customer-specific dimensions and packaging variants are available on request.

**Pigmentation is available in the following colors:**

- Black
- Green
- Brown
- Blue
- Red
- Orange





# Heat shrinkable tubing and rollcovers—reliable protection



## Heat shrinkable tubing made from POLYTETRAFLON™-PTFE and Moldflon™-FEP, -PFA, and -PVDF

We manufacture heat shrinkable tubing from POLYTETRAFLON™-PTFE and Moldflon™-FEP, -PFA, and -PVDF. It can be used to protect against moisture, chemical liquids, corrosion, and high temperatures. When a moisture proof connection or media tight closure is required, dual heat shrinkable tubing is the number one choice. The most common shrinkage rates are:

- 2:1 or 4:1 for PTFE
- 1.3:1 and 1.6:1 for FEP
- 1.3:1 for PFA
- 2:1 for PVDF

Manufacturing special sizes to meet specific customer requirements is our forte.

## Rollcovers made from Moldflon™-FEP or -PFA

Moldflon™ rollcovers are used worldwide wherever hot, sticky or staining goods are moved. We provide application specific technical advice as well as professional custom covering of customer supplied rollers.

## Advantages

### Heat shrinkable tubing

- Almost universal resistance to chemicals
- Very good sterilizability
- Anti-adhesive
- Large operating temperature range
- Use of FDA- or USP Class VI-compliant raw materials
- Transparency, translucency
- Coloration: up to 10 different base colors
- Seal welding available
- The functional life of the coated/covered components is many times longer

### Rollcovers

- Very smooth surface
- Greater wall thicknesses may compensate for any unevenness in the roller

- Etched and non-etched variants (non-etched variant allows additional pasting onto the roller)
- Good adherence of the cover
- Easier cleaning

## Application examples

### Heat shrinkable tubing

- Measurement and control technology
- Medical technology
- Chemical, automotive, and food industries
- Electro-plating
- Aerospace
- Sheathing for cables, antennas, sensors, and probes

### Rollcovers

- Textile industry
- Paper industry
- Packaging and food industries

## Need more information?

Give us a call:

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or e-mail:

[sales.ektp@elringklinger.com](mailto:sales.ektp@elringklinger.com)

## Recommended shrinking temperature in °C (approx. values)

Approximate temperatures in °C	PTFE	FEP	PFA	Dual PTFE + FEP	Dual PTFE + PFA	PVDF
Shrinking temperature	330	190	220	330	330	175
Melting temperature	327	275	310	275	310	165–178
Operating temperature	260	205	260	205	260	-55–+175

\* Melting temperature of PTFE = gel point



# Technical details: Heat shrinkable tubing

## Polytetraflon™-PTFE heat shrinkable tubing 2:1 – AWG sizes



POLYTETRAFLON™ and Moldflon™ heat shrinkable tubing can be produced in various base colors, including in accordance with the RAL or Pantone color scale. Please note that the chemical stability of colored heat shrinkable tubing changes. Benefit from our consultancy.

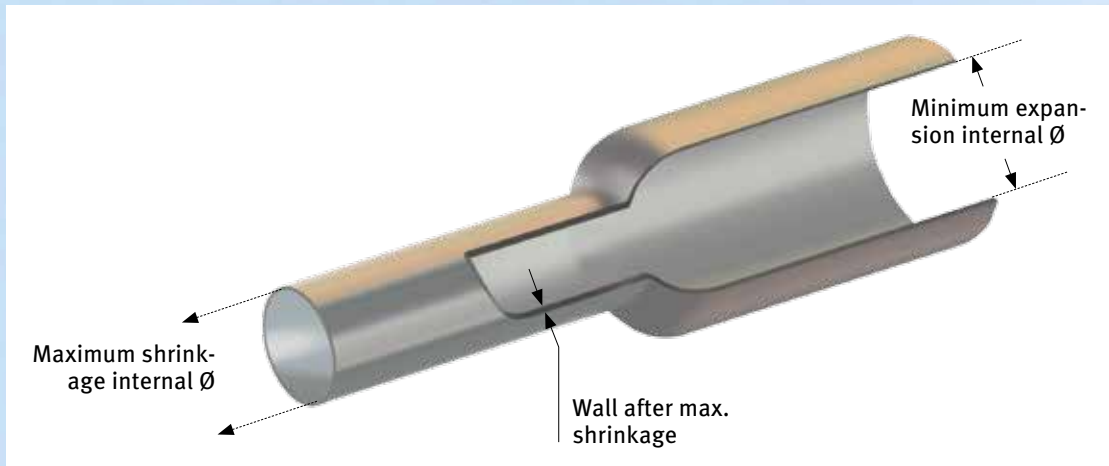
### AWG sizes

PTFE heat shrinkable tubing 2:1 – Dimensions in mm									
Wall thickness after maximum shrinkage									
Size	ID expanded minimum	ID after max. shrinkage	SW = thick-walled	Wall thickness tolerance	TW = stan-dard-walled	Wall thickness tolerance	LW = thin-walled	Wall thickness tolerance	Recommended object diameter
2S AWG 34	0.60	0.25	0.23	±0.06	0.23	±0.05	0.10	±0.05	0.30– 0.50
2S AWG 32	0.76	0.30	0.23	±0.06	0.23	±0.05	0.15	±0.05	0.40– 0.65
2S AWG 30	0.86	0.38	0.23	±0.06	0.23	±0.05	0.15	±0.05	0.45– 0.75
2S AWG 28	0.97	0.46	0.23	±0.06	0.23	±0.05	0.15	±0.05	0.60– 0.85
2S AWG 26	1.17	0.56	0.23	±0.06	0.23	±0.05	0.15	±0.05	0.65– 1.05
2S AWG 24	1.27	0.64	0.30	±0.08	0.25	±0.05	0.15	±0.05	0.75– 1.15
2S AWG 22	1.40	0.80	0.30	±0.08	0.25	±0.05	0.15	±0.05	0.90– 1.30
2S AWG 20	1.52	0.97	0.40	±0.08	0.31	±0.05	0.15	±0.05	1.10– 1.40
2S AWG 19	1.65	1.10	0.40	±0.08	0.31	±0.05	0.15	±0.05	1.20– 1.50
2S AWG 18	1.93	1.17	0.40	±0.08	0.31	±0.05	0.15	±0.05	1.30– 1.80
2S AWG 17	2.15	1.38	0.40	±0.08	0.31	±0.05	0.15	±0.05	1.50– 2.00
2S AWG 16	2.35	1.45	0.40	±0.08	0.31	±0.05	0.15	±0.05	1.60– 2.20
2S AWG 15	2.80	1.60	0.40	±0.08	0.31	±0.05	0.15	±0.05	1.80– 2.60
2S AWG 14	3.05	1.82	0.40	±0.08	0.31	±0.05	0.20	±0.05	2.00– 2.90
2S AWG 13	3.55	2.03	0.40	±0.08	0.31	±0.05	0.20	±0.05	2.20– 3.35
2S AWG 12	3.81	2.26	0.40	±0.08	0.31	±0.05	0.20	±0.05	2.50– 3.60
2S AWG 11	4.32	2.50	0.40	±0.08	0.31	±0.05	0.20	±0.05	2.70– 4.10
2S AWG 10	4.85	2.80	0.40	±0.08	0.31	±0.05	0.20	±0.05	3.00– 4.60
2S AWG 9	5.20	3.10	0.50	±0.10	0.38	±0.08	0.20	±0.05	3.30– 5.00
2S AWG 8	6.10	3.55	0.50	±0.10	0.38	±0.08	0.20	±0.05	3.80– 5.90
2S AWG 7	6.85	3.90	0.50	±0.10	0.38	±0.08	0.20	±0.05	4.10– 6.60
2S AWG 6	7.67	4.40	0.50	±0.10	0.38	±0.08	0.25	±0.08	4.60– 7.40
2S AWG 5	8.10	4.90	0.50	±0.10	0.38	±0.08	0.25	±0.08	5.10– 7.90
2S AWG 4	9.40	5.45	0.50	±0.10	0.38	±0.08	0.25	±0.08	5.70– 9.20
2S AWG 3	9.90	6.12	0.50	±0.10	0.38	±0.08	0.25	±0.08	6.40– 9.70
2S AWG 2	10.90	6.90	0.50	±0.10	0.38	±0.08	0.25	±0.08	7.10–10.70
2S AWG 1	11.45	7.65	0.50	±0.10	0.38	±0.08	0.25	±0.08	7.90–11.20
2S AWG 0	11.95	8.56	0.50	±0.10	0.38	±0.08	0.25	±0.08	8.80–11.70

The expanded internal Ø (and external Ø) are not toleranced. The dimensions can be greater than the minimum values. Toleranced diameters can be manufactured on request.

Please note longitudinal shrinkage or expansion of +/-10% may occur during the manufacturing process. The shrink temperature of POLYTETRAFLON™ and Moldflon™ heat shrinkable tubing can also vary from lot to lot and should be determined in advance during a test procedure.

## POLYTETRAFLON™-PTFE heat shrinkable tubing 4:1 – Dimensions (in inches)



### Sizes (in inches)

PTFE heat shrinkable tubing 4:1 – Dimensions in mm					
Size	ID expanded minimum	ID after max. shrinkage	Wall thickness after max. shrinkage	Wall thickness tolerance	Recommended object diameter
4S 5/64"	1.98	0.64	0.23	±0.05	0.80– 1.70
4S 3/32"	2.38	0.85	0.23	±0.05	1.00– 2.10
4S 1/8"	3.18	0.94	0.25	±0.05	1.20– 2.90
4S 3/16"	4.75	1.27	0.31	±0.05	1.50– 4.50
4S 1/4"	6.35	1.60	0.31	±0.05	1.80– 6.10
4S 5/16"	7.92	2.00	0.31	±0.05	2.20– 7.70
4S 3/8"	9.52	2.44	0.31	±0.05	2.70– 9.10
4S 7/16"	11.13	2.85	0.31	±0.05	3.10–10.90
4S 1/2"	12.70	3.66	0.38	±0.10	3.90–12.50
4S 9/16"	14.27	3.94	0.38	±0.10	4.30–13.90
4S 5/8"	15.88	4.52	0.38	±0.10	4.80–15.60
4S 11/16"	17.45	5.03	0.38	±0.10	5.40–17.10
4S 3/4"	19.05	5.70	0.38	±0.10	6.00–18.70
4S 7/8"	22.23	6.20	0.38	±0.10	6.50–21.90
4S 1"	25.40	7.06	0.38	±0.10	7.40–25.00
4S 1 1/4"	31.75	8.82	0.38	±0.10	9.30–31.40
4S 1 1/2"	38.10	10.20	0.38	±0.10	10.50–37.80
4S 1 3/4"	44.45	11.43	0.38	±0.10	11.80–44.00
4S 2"	50.80	13.20	0.50	±0.13	13.60–50.40
4S 2 1/4"	57.15	14.85	0.50	±0.13	15.30–56.70
4S 2 1/2"	63.50	16.51	0.50	±0.13	17.50–62.50
4S 2 3/4"	69.85	18.03	0.50	±0.13	19.00–68.80
4S 3"	76.20	19.68	0.50	±0.13	21.00–75.00
4S 3 1/4"	82.50	21.21	0.50	±0.13	23.00–80.50
4S 3 1/2"	88.90	22.86	0.64	±0.13	25.00–86.00
4S 3 3/4"	92.95	24.38	0.64	±0.13	27.00–90.00
4S 4"	101.60	26.03	0.64	±0.13	28.00–99.00

The expanded internal Ø (and external Ø) are not tolerated. The dimensions can be greater than the minimum values. Toleranced diameters can be manufactured on request.

Please note longitudinal shrinkage or expansion of +/-10% may occur during the manufacturing process. The shrink temperature of POLYTETRAFLON™ and Moldflon™ heat shrinkable tubing can also vary from lot to lot and should be determined in advance during a test procedure.

Also available on request:

- Heat shrinkable tubing with special shrinkage rates of 5:1 or 6:1
- Overexpanded dimensions
- Antistatic heat shrinkable tubing

## Dual heat shrinkable tubing



Dual heat shrinkable tubing made from POLYTETRAFLON™-PTFE and Moldflon™-FEP or -PFA is specially used in applications in which the ends have to be closed in a media tight manner or water proof joints are necessary. Dual heat shrinkable tubing comprises inner tubing made from Moldflon™-FEP or -PFA and outer heat shrinkable tubing made from POLYTETRAFLON™-PTFE. The inner tubing acts as a kind of inner hot melt and liquefies when shrink fitted. During the shrinking process, the hollows are filled and, as the outer

tubing shrinks, it exerts a corresponding pressing force, ensuring the desired media tight connection.

### Dual heat shrinkable tubing made from POLYTETRAFLON™-PTFE and Moldflon™-FEP or -PFA, with standard walls

<i>Dual heat shrinkable tubing, with standard walls</i>				
<i>Size</i>	<i>Expansion ID in mm</i>	<i>Shrinkage ID in mm</i>	<i>Wall thickness after max. shrinkage in mm</i>	<i>Suitable object diameter in mm</i>
DTW 036	0.91	0	N.A.	0.00– 0.70
DTW 060	1.52	0	N.A.	0.00– 1.30
DTW 130	3.3	0	N.A.	0.00– 3.10
DTW 160	4.05	0	N.A.	0.00– 3.80
DTW 190	4.8	1.6	0.9	1.90– 4.50
DTW 250	6.4	3.2	0.9	3.50– 6.10
DTW 350	8.9	4.8	0.9	5.10– 8.60
DTW 450	11.4	7.9	1.4	8.30–11.00
DTW 700	17.8	11.2	1.4	11.60–17.40
DTW 950	24.1	16	1.65	16.40–23.70

### Dual heat shrinkable tubing made from POLYTETRAFLON™-PTFE and Moldflon™-FEP or Moldflon™ -PFA, with thin walls

<i>Dual heat shrinkable tubing, thin walls</i>				
<i>Size</i>	<i>Expansion ID in mm</i>	<i>Shrinkage ID in mm</i>	<i>Wall thickness after max. shrinkage in mm</i>	<i>Suitable object diameter in mm</i>
DLW 065	1.65	0.00	N.A.	0– 1.50
DLW 115	2.90	1.15	0.38	1.35– 2.70
DLW 130	3.30	1.50	0.38	1.70– 3.10
DLW 180	4.60	1.65	0.38	1.85– 4.40
DLW 190	4.80	1.80	0.38	2.00– 4.60
DLW 240	6.10	3.80	0.50	4.10– 5.80
DLW 350	8.90	5.40	0.65	5.70– 8.60
DLW 480	12.20	8.00	0.80	8.30–11.90
DLW 700	17.80	12.70	1.00	13.10–17.40
DLW 990	25.40	17.80	1.15	18.20–25.00

We manufacture a standard range of pre-shrunk lengths, which can be loose and movable if desired. We also provide suitable stoppers for sealing bigger parts. We shall be glad to advise you.

## Moldflon™-FEP heat shrinkable tubing 1.3:1

Moldflon™-FEP heat shrinkable tubing is particularly used wherever lower shrinking temperatures are necessary. They are highly transparent, UV resistant, and food-safe, and cover a broad spectrum of applications—as cable insulation, as a coating for rollers, in delicate technical equipment, or as splinter protection for fluorescent lamps.

### AWG sizes

<i>FEP heat shrinkable tubing 1.3:1 – Dimensions in mm</i>					
<i>Size</i>	<i>ID expanded minimum</i>	<i>ID after max. shrinkage</i>	<i>Wall thickness after max. shrinkage</i>	<i>Wall thickness tolerance</i>	<i>Recommended object diameter</i>
FEP-HST AWG 24	0.79	0.69	0.20	±0.05	0.70– 0.78
FEP-HST AWG 22	0.91	0.81	0.20	±0.05	0.83– 0.89
FEP-HST AWG 20	1.14	0.99	0.20	±0.05	1.00– 1.10
FEP-HST AWG 18	1.52	1.25	0.20	±0.05	1.30– 1.45
FEP-HST AWG 16	1.91	1.55	0.20	±0.05	1.60– 1.85
FEP-HST AWG 14	2.34	1.83	0.23	±0.05	1.90– 2.20
FEP-HST AWG 12	2.92	2.26	0.23	±0.05	2.30– 2.80
FEP-HST AWG 10	3.58	2.90	0.25	±0.08	3.00– 3.40
FEP-HST AWG 9	4.01	3.15	0.25	±0.08	3.20– 3.80
FEP-HST AWG 8	4.57	3.63	0.25	±0.08	3.70– 4.40
FEP-HST AWG 7	5.00	4.01	0.28	±0.10	4.10– 4.80
FEP-HST AWG 6	5.72	4.57	0.28	±0.10	4.70– 5.50
FEP-HST AWG 5	6.30	5.03	0.28	±0.10	5.10– 6.10
FEP-HST AWG 4	7.37	5.74	0.28	±0.10	5.80– 7.10
FEP-HST AWG 3	7.87	6.32	0.28	±0.10	6.40– 7.60
FEP-HST AWG 2	9.27	7.11	0.30	±0.10	7.20– 9.00
FEP-HST AWG 1	10.16	7.90	0.30	±0.10	8.00– 9.90
FEP-HST AWG 0	11.18	8.86	0.30	±0.10	9.00–10.90

### Sizes (in inches)

<i>FEP heat shrinkable tubing 1.3:1 – Dimensions in mm</i>					
<i>Size</i>	<i>ID expanded minimum</i>	<i>ID after max. shrinkage</i>	<i>Wall thickness after max. shrinkage</i>	<i>Wall thickness tolerance</i>	<i>Recommended object diameter</i>
FEP-HST 3/8"	12.70	9.73	0.38	±0.10	9.80–12.50
FEP-HST 7/16"	14.73	11.38	0.51	±0.10	11.50–14.50
FEP-HST 1/2"	16.92	12.95	0.51	±0.10	13.10–16.60
FEP-HST 5/8"	21.08	16.18	0.64	±0.10	16.30–20.80
FEP-HST 3/4"	25.40	19.41	0.76	±0.10	19.50–25.20
FEP-HST 7/8"	29.72	22.63	0.89	±0.10	22.80–29.40
FEP-HST 1"	33.78	25.91	0.89	±0.10	26.10–33.50
FEP-HST 1 1/8"	38.10	29.08	0.89	±0.10	29.30–37.80
FEP-HST 1 1/4"	42.32	32.26	0.89	±0.10	32.50–42.00
FEP-HST 1 3/8"	46.56	35.31	0.89	±0.10	35.50–46.20
FEP-HST 1 1/2"	50.80	39.88	0.89	±0.10	40.20–50.50

*The expanded internal Ø (and external Ø) are not tolerated. The dimensions can be greater than the minimum values. Toleranced diameters can be manufactured on request.*

*Please note longitudinal shrinkage or expansion of +/-10% may occur during the manufacturing process. The shrink temperature of POLYTETRAFLON™ and Moldflon™ heat shrinkable tubing can also vary from lot to lot and should be determined in advance during a test procedure.*



## Moldflon™-FEP heat shrinkable tubing 1.6:1

### Sizes (in inches)

<i>FEP heat shrinkable tubing 1.6:1 — Dimensions in mm</i>					
<i>Size</i>	<i>ID expanded minimum</i>	<i>ID after max. shrinkage</i>	<i>Wall thickness after max. shrinkage</i>	<i>Wall thickness tolerance</i>	<i>Recommended object diameter</i>
FEP-HST 3/32"	2.36	1.42	0.20	±0.05	1.50– 2.20
FEP-HST 1/8"	3.18	1.91	0.25	±0.05	2.00– 3.00
FEP-HST 3/16"	4.78	2.92	0.25	±0.05	3.00– 4.60
FEP-HST 1/4"	6.35	3.81	0.25	±0.05	4.00– 6.20
FEP-HST 3/8"	9.53	5.72	0.31	±0.05	5.90– 9.40
FEP-HST 1/2"	12.70	7.62	0.38	±0.05	7.80–12.50
FEP-HST 3/4"	19.05	11.43	0.51	±0.05	11.70–18.80
FEP-HST 1"	25.40	15.24	0.64	±0.08	15.50–25.10
FEP-HST 1 1/2"	38.10	22.86	0.76	±0.08	23.10–37.80
FEP-HST 2"	50.80	30.48	0.76	±0.08	30.70–50.50

## Moldflon™-PVDF heat shrinkable tubing 2:1

Heat shrinkable tubing made from Moldflon™-PVDF is resistant to almost all chemicals and solvents and has a higher dielectric strength. Moldflon™-PVDF heat shrinkable tubing is transparent and self extinguishing, and also offers good sliding characteristics and high abrasion resistance.

### Sizes (in inches)

<i>PVDF heat shrinkable tubing 2:1 — Dimensions in mm</i>					
<i>Size</i>	<i>ID expanded minimum</i>	<i>ID after max. shrinkage</i>	<i>Wall thickness after max. shrinkage</i>	<i>Wall thickness tolerance</i>	<i>Recommended object diameter</i>
PVDF-HST 3/64"	1.20	0.60	0.25	±0.05	0.70– 1.10
PVDF-HST 1/16"	1.60	0.80	0.25	±0.05	0.90– 1.50
PVDF-HST 3/32"	2.40	1.20	0.27	±0.05	1.30– 2.30
PVDF-HST 1/8"	3.20	1.60	0.27	±0.05	1.70– 3.10
PVDF-HST 3/16"	4.80	2.40	0.27	±0.05	2.50– 4.70
PVDF-HST 1/4"	6.40	3.20	0.33	±0.05	3.30– 6.30
PVDF-HST 3/8"	9.50	4.80	0.33	±0.05	4.90– 9.40
PVDF-HST 1/2"	12.70	6.40	0.33	±0.05	6.60–12.50
PVDF-HST 3/4"	19.10	9.50	0.45	±0.08	9.70–18.80
PVDF-HST 1"	25.40	12.70	0.50	±0.08	12.90–25.10
PVDF-HST 1 1/2"	38.10	19.10	0.50	±0.08	19.30–37.80

## Moldflon™-PFA heat shrinkable tubing 1.3:1

Heat shrinkable tubing made from Moldflon™-PFA has a very high purity and greater temperature resistance than heat shrinkable tubing made from Moldflon™-FEP. It is chemically resistant and flame retardant, allows longer production lengths, and has a particularly smooth surface.

### AWG sizes

PFA heat shrinkable tubing 1.3:1 – Dimensions in mm					
Size	ID expanded minimum	ID after max. shrinkage	Wall thickness after max. shrinkage	Wall thickness tolerance	Recommended object diameter
PFA-HST AWG 24	0.79	0.69	0.20	±0.05	0.70– 0.78
PFA-HST AWG 22	0.91	0.81	0.20	±0.05	0.83– 0.89
PFA-HST AWG 20	1.14	0.99	0.20	±0.05	1.00– 1.10
PFA-HST AWG 18	1.52	1.25	0.20	±0.05	1.30– 1.45
PFA-HST AWG 16	1.91	1.55	0.20	±0.05	1.60– 1.85
PFA-HST AWG 14	2.34	1.83	0.23	±0.05	1.90– 2.20
PFA-HST AWG 12	2.92	2.26	0.23	±0.05	2.30– 2.80
PFA-HST AWG 10	3.58	2.90	0.25	±0.08	3.00– 3.40
PFA-HST AWG 9	4.01	3.15	0.25	±0.08	3.20– 3.80
PFA-HST AWG 8	4.57	3.63	0.25	±0.08	3.70– 4.40
PFA-HST AWG 7	5.00	4.01	0.28	±0.10	4.10– 4.80
PFA-HST AWG 6	5.72	4.57	0.28	±0.10	4.70– 5.50
PFA-HST AWG 5	6.30	5.03	0.28	±0.10	5.10– 6.10
PFA-HST AWG 4	7.37	5.74	0.28	±0.10	5.80– 7.10
PFA-HST AWG 3	7.87	6.32	0.28	±0.10	6.40– 7.60
PFA-HST AWG 2	9.27	7.11	0.30	±0.10	7.20– 9.00
PFA-HST AWG 1	10.16	7.90	0.30	±0.10	8.00– 9.90
PFA-HST AWG 0	11.18	8.86	0.30	±0.10	9.00–10.90

### Sizes (in inches)

PFA heat shrinkable tubing 1.3:1 – Dimensions in mm					
Size	ID expanded minimum	ID after max. shrinkage	Wall thickness after max. shrinkage	Wall thickness tolerance	Recommended object diameter
PFA-HST 3/8"	12.70	9.73	0.38	±0.10	9.80–12.50
PFA-HST 7/16"	14.73	11.38	0.51	±0.10	11.50–14.50
PFA-HST 1/2"	16.92	12.95	0.51	±0.10	13.10–16.60
PFA-HST 5/8"	21.08	16.18	0.64	±0.10	16.30–20.80
PFA-HST 3/4"	25.40	19.41	0.76	±0.10	19.50–25.20
PFA-HST 7/8"	29.72	22.63	0.89	±0.10	22.80–29.40
PFA-HST 1"	33.78	25.91	0.89	±0.10	26.10–33.50
PFA-HST 1 1/8"	38.10	29.08	0.89	±0.10	29.30–37.80
PFA-HST 1 1/4"	42.32	32.26	0.89	±0.10	32.50–42.00
PFA-HST 1 3/8"	46.56	35.31	0.89	±0.10	35.50–46.20
PFA-HST 1 1/2"	50.80	39.88	0.89	±0.10	40.20–50.50

Our manufacturing range also includes Moldflon™ PFA heat shrinkable tubing with a shrinkage rate of 1.6:1. Contact us for more information.

The expanded internal Ø (and external Ø) are not toleranced. The dimensions can be greater than the minimum values. Toleranced diameters can be manufactured on request.

Please note longitudinal shrinkage or expansion of +/-10% may occur during the manufacturing process. The shrink temperature of POLYTETRAFLON™ and Moldflon™ heat shrinkable tubing can also vary from lot to lot and should be determined in advance during a test procedure.

## *Moldflon™-FEP heat shrinkable tubing as splinter protection for fluorescent lamps*



Safety heat shrinkable tubing made from Moldflon™-FEP is specially designed to offer splinter protection for fluorescent lamps used in the food and pharmaceutical industries.

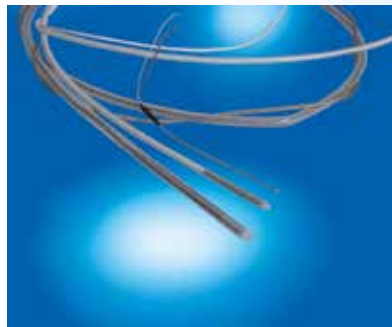
The following standard sizes are available:

- Poly F 5 Ø 15 mm
- Poly F 8 Ø 26 mm
- Poly F 10 Ø 30 mm
- Poly F 12 Ø 38 mm

Wall thickness 0.25 mm

## *Special types of heat shrinkable tubing*

### **Custom covering of parts**



One of our core competences lies in encasing delicate technical parts with heat shrinkable tubing. We know how to professionally cover thermal sensors, springs, stirring shafts, cable antennae, heaters, probes, or immersion pipes, right up to complete system components, to protect them reliably against extreme temperatures, corrosion, or chemically aggressive media. You can have your parts covered at our premises or we can do this for you on site—it is your choice.

### **Coatings**



In many cases, fluoropolymer coatings offer significant advantages because of the substantial reduction in cleaning times for production equipment in sectors of industry that involve working with sticky and adhesive goods. Our coatings are used in the packaging, food, textile, and plastic processing industries. They offer anti-adhesiveness, high thermal stability, low friction coefficients, and an almost universal chemical resistance.



## Technical details: Rollcovers



Compared with conventional coatings, rollcovers made from Moldflon™-FEP or -PFA have the decisive advantage of a very smooth surface (no microporosity). During the production process, the user benefits from the anti-adhesiveness of the roller. Conventional coatings can achieve layer thicknesses of up to 100 µm, while the use of rollcovers made from Moldflon™-FEP or -PFA allows wall thicknesses ranging from 0.50 mm to 1.50 mm. This compensates for any unevenness of the rollers. The rollcovers are also physiologically harmless, and therefore ideally suited for use in the food industry. The excellent chemical resistance allows easy cleaning even with aggressive chemicals.

- Wall thicknesses that can be manufactured, depending on the material:  
0.50 mm, 0.60 mm, and 1.50 mm
- Please contact us for special wall thicknesses.

### ***Custom covering of parts***

We can cover customer supplied rollers weighing up to 1.4 t at our premises. If the application requires it, the rollcover can also be bonded. In the case of heavy rollers, we mount the bonded at the customer premises.

Important parameters such as roller type, roller length (barrel length measured without journal), roller diameter, surface of the roller (shore hardness and temperature resistance in case of rubber-coated rollers), working temperature, chemical load, linear pressure, and rotation speed are to be clarified before order placement.

The length of the rollcover should be at least 10% greater than the shell length of your roller in view of the manufacturing process and the longitudinal shrinkage that occurs.



## Moldflon™-FEP rollcovers — Standard wall thickness 0.50 mm



Rollcovers made from Moldflon™-FEP with a wall thickness of 0.50 mm are produced absolutely seamlessly up to a nominal width of 16½ inches, larger sizes with a weld seam. The wall thickness data is nominal; effective wall thicknesses vary slightly, depending on the shrinkage. Please contact us for other nominal widths. Please also get in touch with us if your rollers are at the limit range for diameter and shrinking range. Special manufacturing processes allow us to produce intermediate sizes. Depending on the application, we recommend a rollcover etched on the inside and bonded.

Please note that the length of the rollcover should be approx. 10% greater than the shell length of your rollers on account of the manufacturing process and the longitudinal shrinkage that occurs.

### Dimensions

<i>Rollcover, FEP, wall 0.50 mm etched or nonetched, produced without seams</i>	
<i>Size</i>	<i>Suitable for rollers Ø in mm</i>
1"	22– 26
1 1/4"	27– 32
1 1/2"	33– 43
2"	44– 53
2 1/2"	54– 67
3"	68– 74
3 1/2"	75– 92
4"	93–108
5"	109–130
6"	131–150
7"	151–176
8"	177–203
9"	204–241
10 1/2"	242–266
12"	267–302
13"	303–343
14"	344–416
16 1/2"	417–466
<i>Welded variant (with seam)</i>	
20"	418–550

We supply this product in piece lengths of 100 mm to 6,100 mm. Other lengths available on request. Need special wall thicknesses? Contact us for more information. We shall be glad to advise you.

### *Moldflon™-FEP rollcovers — Special wall thickness 1.50 mm*

Rollcovers made from Moldflon™-FEP with a special wall thickness of 1.50 mm are available in sizes of up to 17", and produced without seams. We will be happy to assist you if you require other special sizes. The wall thickness data is nominal; effective wall thicknesses vary slightly, depending on the shrinkage. Please also get in touch with us if your rollers are at the limit range for diameter and shrinking range. Special manufacturing processes allow us to produce intermediate sizes.

The working temperature, rotation speed, and linear pressure must always be considered interdependently. Our technical sales team will be happy to advise you.

### *Dimensions*

<i>Rollcover, FEP, wall 1.50 mm etched or nonetched, produced without seams</i>	
<i>Size</i>	<i>Suitable for rollers Ø in mm</i>
4"	105–117
5"	118–142
6"	143–164
7"	165–195
8 1/2"	196–233
9"	234–253
10"	254–298
11"	299–341
12"	342–382
15"	383–413
17"	414–464

We supply this product in piece lengths of 100 mm to 6,100 mm. Other lengths available on request.



*Moldflon™-PFA rollcovers – Standard wall thicknesses 0.60 mm and 1.50 mm*



The use of rollcovers made from Moldflon™-PFA is recommended with “banana rollers” in which spot loads occur, for example. This is because PFA (visually almost indistinguishable from FEP) has a significantly higher reverse bending strength. Moreover, the temperature resistance is noticeably higher than that of Moldflon™-FEP. We therefore particularly recommend the use of rollcovers made from Moldflon™-PFA for rubber-coated rollers that are operated in the higher temperature range.

*Rollcovers made from Moldflon™-PFA – Wall thickness 0.60 mm*

<i>Rollcover, PFA, wall 0.60 mm etched or nonetched, produced without seams</i>	
<i>Size</i>	<i>Suitable for rollers Ø in mm</i>
1 1/2"	36– 42
2"	47– 52
2 1/2"	58– 65
2 3/4"	66– 70
3"	71– 80
3 1/2"	81– 90
4"	91–103
4 1/2"	104–121
5"	122–143
6"	144–165
7"	166–190
8"	191–222
9"	223–249
10 1/2"	250–282
12"	283–318
13"	319–371
15"	372–390

Please note that the length of the rollcover should be approx. 10% more than the shell length of your rollers on account of the manufacturing process and the longitudinal shrinkage that occurs. Depending on the application, we recommend a rollcover etched on the inside and pasted.

We supply this product in piece lengths of 100 mm to 6,100 mm. Other lengths available on request.

**Rollcovers made from Moldflon™-PFA — Wall thickness 1.50 mm**

<b>Rollcover, PFA, wall 1.50 mm etched or nonetched, produced without seams</b>	
<b>Size</b>	<b>Suitable for rollers Ø in mm</b>
6"	165–187
7"	188–219
8"	220–245
10"	246–279
11"	280–312
12"	313–380
14"	381–390

We supply this product in piece lengths of 100 mm to 6,100 mm. Other lengths available on request.

**Anti-static, black rollcovers**



Our anti-static rollcovers are used whenever the electrical conductivity of rollcovers is crucial—e.g., for applications in the paper industry.

We shall be glad to advise you on these products.

<b>PTFE rollcover, anti-static</b>	
<b>Size</b>	<b>Wall thickness in mm</b>
5"–100"	1.52

All lengths can be manufactured. Seamless up to 1,200 mm, larger sizes with weld seam.





# Thermoplastic tubes: create the perfect shape with Moldflon™

## *Thermoplastic extrusion*

In contrast to paste extrusion, thermoplastic extrusion involves the use of granulate, which is continuously melted. The dimensions and shape are created during the subsequent calibration and cooling in a water basin. This allows us to manufacture tubes with varying dimensions. The wrapping and guillotine device at the end of the process allows the tubes to be supplied in units or by the meter. This offers the following economic advantages:

- Customized shape
- Large scale production
- Short turnaround times
- More economical use of resources
- Low supervision costs
- High process reliability/stability
- Continuous production

## *Combination of outstanding properties*

Moldflon™-PTFE is characterized by its balanced array of properties. In the fully fluorinated PTFE and thermoplastic products segment, it is positioned between modified PTFE and PFA. With a melting point between 315°C and 320°C, it has very similar properties to modified PTFE.

## *Application examples*

- Automotive
- Medical and laboratory technology
- Analytics
- Electrical engineering
- Chemistry
- Food technology
- Pharmaceuticals
- Biotechnology

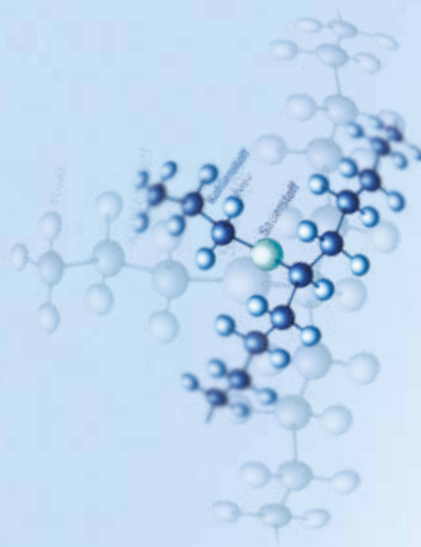
## *Approvals for Moldflon™-PTFE*

Moldflon™-PTFE has been given numerous approvals for a wide range of applications. The following certificates are available for natural types, and in special cases also for compounds:

- FDA, EU, BgVV: application in contact with foodstuffs
- In vitro cytotoxicity: no extractable cytotoxic fractions
- USP Class VI: pharmaceuticals and biotechnology
- W270: protection of drinking water from microorganisms

Approvals have also been granted for the other Moldflon™ materials.

With these available approvals, users can immediately start development, reduce their own testing costs during product development, and gain time in the development process. We will be happy to assist you in choosing the right material so that you will receive the most functional and economical solution for your specific area of application.



### **Need more information?**

Give us a call:

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or e-mail:

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## Advantages of different tube materials

### **POLYTETRAFLON™-PTFE**

- Lowest friction coefficient of any polymer
- Very good sliding characteristics—self-lubricating effect
- No water absorption, water repellent
- Anti-adhesive
- Exceptionally large operating temperature range: –200°C to +260°C
- Almost universal chemical resistance
- Good electrical and dielectric properties
- Resistant to superheated steam
- Light, weather and radiation resistant
- Self extinguishing in acc. with UL 94 V-0
- Physiologically harmless
- Suitable for contact with foodstuffs and medical applications
- UV resistant
- Sterilizable with ethylene oxide and autoclave

### **POLYTETRAFLON™-modified PTFE (mod. PTFE)**

- Comparable properties to PTFE with additional advantages
- Lower permeation and denser, less porous polymer structure
- Reduced pore formation when stretched (stretch void index)
- Higher elongation at break
- Significantly decreased deformation under load
- Smoother surface structure
- Improved weldability
- Higher transparency than standard PTFE

### **Moldflon™-PTFE**

- In contrast to conventional PTFE, can be processed thermoplastically by means of injection molding and extrusion (particularly attractive for large-scale production)
- Continuous operating temperature of up to 260°C
- Significantly better wear behavior than PTFE and mod. PTFE, particularly as an unfilled material
- Optimal sliding and frictional behavior in dynamic applications
- Suitable for contact with foodstuffs

- Biocompatible in accordance with USP Class VI and in terms of cytotoxicity
- Excellent chemical resistance
- Resistant to weather and ageing
- Self extinguishing in acc. with UL 94 V-0

### **Moldflon™-PFA**

- Outstanding purity properties
- Good stress cracking resistance
- Good weldability
- Outstanding thermal resilience
- Very high chemical resistance
- High electrical resistance
- Very high oxygen index
- Self extinguishing in acc. with UL 94 V-0
- Physiologically harmless
- Combines the attributes of PTFE and FEP
- Low gas permeability
- Smoother surface structure than FEP and PTFE
- Can be sterilized with gamma radiation, ethylene oxide, e-beam radiation, and autoclave

### **Moldflon™-FEP**

- Lower gas and vapor permeability than most plastics
- Good stress cracking resistance
- Good weldability
- High purity
- Outstanding thermal resilience
- Very high chemical resistance
- High electrical resistance
- Very high oxygen index
- Self extinguishing in acc. with UL 94 V-0
- Physiologically harmless
- Greater flexibility than PTFE
- Better optical clarity than PTFE
- Better sliding characteristics than PFA
- Excellent UV transmission rates
- Outstanding dielectric strength



**Moldflon™-ETFE**

- Continuous operating temperature of up to 150°C
- Improved mechanical strength and stiffness
- High chemical resistance to acids/bases and organic solvents
- Resistant to ageing and weather
- Self extinguishing in acc. with UL 94 V-0
- Suitable for contact with foodstuffs
- Can be joined by electron beam welding

**Moldflon™ PCTFE**

- Continuous operating temperature of up to 160°C
- Outstanding mechanical properties and good machinability
- Suitable for cryogenic applications with temperatures as low as -250°C
- High chemical resistance
- Self extinguishing in acc. with UL 94 V-0
- Physiologically harmless

**Moldflon™-PVDF**

- Has the best mechanical properties of any unfilled fluoropolymer
- Very good machinability
- Good weldability
- Fulfills the highest purity standards
- Highly resistant to chemicals
- Very good electrical insulation properties
- Resistant to hot water
- Self extinguishing in acc. with UL 94 V-0
- Very high radiation resistance
- Approved in accordance with FM 4910
- Physiologically harmless

**Moldflon™-ECTFE**

- Continuous operating temperature of up to 150°C
- Optimal permeation resistance
- High chemical resistance
- Outstanding surface quality
- High wear resistance
- Self extinguishing in acc. with UL 94 V-0
- High resistance to UV and gamma radiation
- Good weldability
- Physiologically harmless

**Moldflon™-PEEK**

- Continuous operating temperature of up to 260°C
- Outstanding mechanical strength and viscosity
- Very good dimensional stability
- High wear resistance and good frictional properties
- Excellent chemical resistance
- Self extinguishing in acc. with UL 94 V-0
- Suitable for contact with foodstuffs and drinking water

**Moldflon™-PEI**

- Continuous operating temperature of up to 170°C
- High mechanical strength and stiffness
- Creep resistance and dimensional stability over a large temperature range
- Excellent electrical insulator
- Resistant to high energy radiation
- High hydrolysis resistance
- Self extinguishing in acc. with UL 94 V-0
- Low smoke emission in the event of a fire

## Overview of technical characteristics of different tube materials

			POLYTETRAFLON™		Moldflon™
General property	Standard	Unit	PTFE	mod. PTFE	PTFE
Density	ISO 1183	g/cm <sup>3</sup>	2.14–2.19	2.14–2.19	2.13–2.18
Upper operating temperature, no load		°C	250–260	250–260	250–260
Flammability	UL94	–	V-0	V-0	V-0
Water absorption at 23°C saturation		%	< 0.05	< 0.05	< 0.05
<b>Thermal</b>					
Thermal	Standard	Unit	PTFE	mod. PTFE	PTFE
Melting temperature	ISO 11357	°C	327	327	310–320
Coefficient of linear thermal expansion	DIN 52612	10 <sup>-5</sup> *K <sup>-1</sup>	10–16	10–16	10–16
Thermal conductivity at 23°C	ISO	W/(m*K)	0.23	0.23	0.22
Specific heat at 23°C		kJ/(kg*K)	1.01	1.01	1.09
Oxygen index		%	> 95	> 95	> 95
<b>Mechanical</b>					
Mechanical	Standard	Unit	PTFE	mod. PTFE	PTFE
Tensile strength at 23°C	ISO 527	MPa	29–39	30–42	20–25
Tensile strength at 150°C			14–20	15–24	
Yield stress at 23°C	ISO 527	MPa	10	12	
Tensile strength at 23°C	ISO 527	%	200–500	400–600	330–380
Young's modulus at 23°C	ISO 527	MPa	400–800	500–900	650
Limiting bending stress at 23°C	ISO 178	MPa	18–20	19–22	
Flexural modulus of elasticity	ISO 527	MPa	600–800	650–900	
Ball indentation hardness 23°C	ISO 2039		25–30	26–31	25–30
Rockwell hardness R	ISO 2039		20–30	22–32	25–35
Shore hardness D	ISO 868		55–72	56–75	60–65
Friction coefficient			0.05–0.2	0.05–0.2	0.15–0.25
<b>Electrical</b>					
Electrical	Standard	Unit	PTFE	mod. PTFE	PTFE
Dielectric constant at 100 Hz	IEC 60250		< 2.1	< 2.1	< 2.1
Dielectric constant at 10 <sup>6</sup> Hz			< 2.1	< 2.1	< 2.1
Dielectric loss factor at 100 Hz		*10 <sup>-4</sup>	0.5–0.7	0.5–0.7	0.5–0.7
Specific contact resistance	IEC 60093	Ω*cm	> 10 <sup>18</sup>	> 10 <sup>18</sup>	> 10 <sup>18</sup>
Surface resistance	DIN 53482	Ω	> 10 <sup>16</sup>	> 10 <sup>16</sup>	> 10 <sup>16</sup>
Tracking resistance	IEC 60112	CTI	600	600	600
Dielectric strength	IEC 60243-2	kV/mm	> 40	> 40	> 50

<b>PFA</b>	<b>FEP</b>	<b>ETFE</b>	<b>PCTFE</b>	<b>PVDF</b>	<b>ECTFE</b>	<b>PEEK</b>	<b>PEI</b>
2.12–2.17	2.12–2.17	1.71–1.78	2.10–2.16	1.75–1.78	1.67–1.70	1.3	1.27
250–260	200–205	150–180	150–180	150–170	150–180	260	170
V-0	V-0	V-0	V-0	V-0	V-0	V-0	V-0
< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.45	1.25
<b>PFA</b>	<b>FEP</b>	<b>ETFE</b>	<b>PCTFE</b>	<b>PVDF</b>	<b>ECTFE</b>	<b>PEEK</b>	<b>PEI</b>
300–310	253–282	265–275	185–210	165–178	240–247	340–350	217
10–16	10–14	8–12	4–8	8–18	4–8	4.7	5
0.22	0.20	0.23	0.19	0.17	0.15	0.29	0.24
1.09	1.17	1.95	0.92	1.38		1.4	2.0
> 95	> 95	30	> 95	43	60	24	47
<b>PFA</b>	<b>FEP</b>	<b>ETFE</b>	<b>PCTFE</b>	<b>PVDF</b>	<b>ECTFE</b>	<b>PEEK</b>	<b>PEI</b>
27–32	19–25	36–48	31–42	38–50	41–54	98	129
15–21	4–6	8–12	1–2	7.5–10.5	3.5–4.5		
14	12	24	40	46	34	98	130
300	250–350	200–500	80–250	20–250	200–300	34	60
650	350–700	500–1,200	1,000–1,200	1,800–1,800	1,200–1,800	3,500	3,200
15		25–30	52–63	55	50	130	140
650–700	660–680	1,000–1,500	1,200–1,500	1,200–1,400	1,700	3,800	3,400
25–30	23–29	34–40	55–70	62–68	55–65	220	165
25–35	20–30	45–55	103–118	100–115	85–95		M 115
60–65	55–60	63–75	70–90	73–85	70–80	85	
0.2–0.3	0.3–0.35	0.3–0.5	0.3–0.4	0.2–0.4	0.65	N/A	0.3–0.4
<b>PFA</b>	<b>FEP</b>	<b>ETFE</b>	<b>PCTFE</b>	<b>PVDF</b>	<b>ECTFE</b>	<b>PEEK</b>	<b>PEI</b>
< 2.1	< 2.1	2.6	2.3–2.8		2.3–2.6	3.2	3
< 2.1	< 2.1	2.6	2.3–2.4			3.1	3
0.5–0.7	0.5–0.7	0.5–0.6				30	0.002
> 10 <sup>18</sup>	> 10 <sup>18</sup>	> 10 <sup>16</sup>	> 10 <sup>18</sup>	> 10 <sup>15</sup>	> 10 <sup>15</sup>	> 10 <sup>14</sup>	
> 10 <sup>16</sup>	> 10 <sup>16</sup>	> 10 <sup>14</sup>	> 10 <sup>16</sup>	> 10 <sup>13</sup>	> 10 <sup>12</sup>	> 10 <sup>16</sup>	> 10 <sup>13</sup>
600	600	600	600	600	600	150	175
> 50	> 50	> 40	> 40	> 40	> 40	19	> 20

*This table, intended for guidance only, shows typical values obtained with standard samples. The material properties expressly do not constitute any legal basis for specification or design purposes and may deviate substantially depending on the material, components, and processing and operating conditions.*

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