



FLUOROPLAST PRODUCTS



 HaloPolymer



FLUOROPLAST PRODUCTS



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INTRODUCTION

One of the directions of activities of our company is the development, manufacturing and delivery of products and semi-finished items from fluoropolymers. We have our own modern hi-tech industrial facility and test laboratory. The production is carried out by a team of highly qualified technical specialists that guarantees high quality of production.

Wide range and high quality of our products allow us to cooperate with many companies from Russia, the CIS and the Baltics, as well as with foreign partners from Germany, France, Belgium, Switzerland, Hungary, Poland, the USA, Canada, Turkey, China, Korea, Brazil, Italy, Romania, Vietnam, the Netherlands, Japan and other countries.

The main fluoropolymer product still remains the PTFE (Polytetrafluoroethylene), a semicrystalline material of tetrafluoroethylene (TFE). Polytetrafluoroethylene has a unique chemical stability to the majority of excited environments, that is explained by the high strength of communication C-F which is the greatest of all known in the organic chemistry bindings of carbon with elements.

The PTFE (Polytetrafluoroethylene) products have the following properties:

- high chemical stability practically to all excited environments - to mineral and organic acids, alkalis, organic solvents, oxidizers and gases, except for melts of alkaline metals and trifluoride chlorine;
- an extremely low factor of friction, almost temperature independent;
- low value of dielectric permeability, a greater electric strength;
- dielectric properties do not change up to 200°C, while chemical – up to plus 250°C;
- mechanical strength is kept in the temperature range from –190°C up to +250°C;
- physiological and biological inertness;
- water repellency;
- are easily treated by turning, drilling, milling and grinding.

Owing to such properties, PTFE products are applied in various industries - instrument making, armature engineering, mechanical engineering, the atomic power, chemical, food, light and medical industry; in agriculture, construction and everyday life.

Application of polytetrafluoroethylene products is always effective, as their use raises reliability, extends the service life of constructions and mechanisms, facilitates repair and operation.



**POLYTETRAFLUOROETHYLENE
AND
POLYTETRAFLUOROETHYLENE-A
SHEETING**



Polytetrafluoroethylene and Polytetrafluoroethylene-A plates

TS (Technical Specifications) 6-05-810-88

Polytetrafluoroethylene and Polytetrafluoroethylene-A plates are assigned for the production of sealing, electrical insulation, antifrictional and chemically resistant elements of the constructions applied in various industries, including food industry and medicine, serving as details of the process equipment (gaskets, cuffs, shells, bushings, membranes, etc.).

Polytetrafluoroethylene and Polytetrafluoroethylene-A plates are produced mechanically.

The plates of the premium class are produced out of Polytetrafluoroethylene of “PN” and “O” series (GOST 10007-80) and Polytetrafluoroethylene-4A of 2 series, (TS 6-05-1999-85), plates of the first grade — from Polytetrafluoroethylene of “PN”, “O”, “T” series and Polytetrafluoroethylene-A of 1 and 2 series.

Warranty period of storage of plates — 20 years from the date of manufacturing.

Polytetrafluoroethylene plates

TS 95 2467-93

Polytetrafluoroethylene plates are applied as lining and gasket material in various industries.

Polytetrafluoroethylene plates are resistant to almost all hostile environment with the exception of gaseous fluorine, three-fluoric chlorine, solutions and melts of alkaline metals.

Operating temperatures: from -269°C up to $+260^{\circ}\text{C}$.

Warranty period of storage — 5 years from the date of manufacturing.

Depending on the way of manufacturing 2 series are issued:

- Series “P” — pressed sheet;
- Series “S” — sliced sheet.

Rolled Polytetrafluoroethylene plates for pads and membranes

TS 84-522-75

There are 2 series of rolled Polytetrafluoroethylene plates issued:

- CDT (cold-drawn tempered);
- CDnT (cold-drawn non-tempered).

Both are used for the manufacturing of pads and membranes resistant to hostile environment and working under pressure, as well as, for the production of electrical insulation, antifriction and chemically resistant elements, constructions and various parts.

Used at temperatures from -60°C up to $+250^{\circ}\text{C}$.

1.1 Polytetrafluoroethylene and Polytetrafluoroethylene-A plates

TS 6-05-810-88

Dimensions and mass of Polytetrafluoroethylene and Polytetrafluoroethylene-A plates

Dimensions, mm			Product calculated weight
Width	Length	Thickness	
290±10	290±10	3-10 ±1.0 10-30 ±2.0 30-60 ±3.0	180g per 1mm of the thickness of an item
300±10	300±10	2-10 ±1.0 10-30 ±2.0 30-60 ±3.0	220g per 1mm of the thickness of an item
400±15	400±15	3-10 ±1.0 10-30 ±2.0 30-60 ±3.0	370g per 1mm of the thickness of an item
500±20	500±20	3-10 ±1.0 10-30 ±2.0 30-60 ±3.0	590g per 1mm of the thickness of an item
600±20	600±20	3-10 ±1.0 10-30 ±2.0 30-60 ±3.0	800g per 1mm of the thickness of an item

Polytetrafluoroethylene and Polytetrafluoroethylene-D plates (with radial corners)

TS 6-05-810-88

Dimensions and mass of Polytetrafluoroethylene and Polytetrafluoroethylene-A plates

Dimensions, mm			Product calculated weight
Width	Length	Thickness	
200±10	200±10	3-10 ±1.0 10-30 ±2.0 30-50 ±3.0	93g per 1mm of the thickness of an item
250±10	250±10	3-10 ±1.0 10-30 ±2.0 30-50 ±3.0	150g per 1mm of the thickness of an item
300±10	300±10	2-10 ±1.0 10-30 ±2.0 30-50 ±3.0	215g per 1mm of the thickness of an item
350±10	350±10	3-10 ±1.0 10-30 ±2.0 30-50 ±3.0	300g per 1mm of the thickness of an item
400±25	400±25	3-10 ±1.0 10-30 ±2.0 30-50 ±3.0	400g per 1mm of the thickness of an item
500±30	500±30	3-10 ±1.0 10-30 ±2.0 30-50 ±3.0	600g per 1mm of the thickness of an item
560 ⁺³⁰ ₋₁₅	730 ⁺⁴⁰ ₋₂₀	7-10 ±2.0	850g per 1mm of the thickness of an item

NOTE:

A release of plates of other nominal sizes under the coordinated drawings or specifications is also permitted. Plates buckling (bending deflection) – within the limits of the TS requirements. Gage interference and unevenness of plates should be within the limits of tolerances for the sizes. At registration of the specification the customer should specify only the nominal sizes of plates (length, width, thickness) and their lump without the indication of tolerances and weights of one plate.

Plates quality index

Premium class	First grade
Plates surface appearance	
Plates surface should be:	
White	From white up to grey, a cream tint is also permitted
Without cracks or abscesses	
Various shades of coloring are also permitted	
There may be pinchers, chips, traces of burr removal on the plates surface, not exceeding maximum deviations from the nominal sizes; plates buckling not more than 1.5 % from the maximal linear length. Polytetrafluoroethylene A plates surface may have a pattern in the form of traces of the pressed granules.	
There must not be separate inclusions of dark color more than:	
6 mm ²	8 mm ²
Inclusions:	
From 1 mm ² up to 6 mm ²	From 3 mm ² up to 8 mm ²
Must not be more than 2 items per:	
30 cm ² of the plate	25 cm ² of the plate
The condition of inner layers of plates at check in passing light	
Plates should not have inner defects, cracks or interstice	
There must not be more than 2 separate inclusions of dark color of more than 10 mm ² on the surface:	
30 cm ²	25 cm ²
Various shades of coloring are also permitted in accord with the check sample	
The condition of inner layers of plates at check of radiography	
Absence of cracks and abscesses	
There must not be inclusions more than 0.5 mm ² , on the surface of up to 35 cm ² in the quantity of:	
2 it.	3 it.
On the surface from 35 cm ² up to 200 cm ² in the quantity of:	
3 it.	5 it.
On the surface more than 200 cm ² in the quantity of:	
4 it.	7 it.
NOTE:	
The release of the plates is conducted without radiography check.	

1.2 Polytetrafluoroethylene plates

TS 95 2467-93

Plates dimensions and mass

Series	Width, mm	Thickness, mm	Tolerance, mm		Length, mm	Sheet mass of 1000mm length, kg
			width	thickness		
P	500	3.0	±20	±0.3	500-1100	3.20
P	500	4.0	±20	±0.3	500-1100	4.30
P	500	5.0	±20	±0.4	500-1100	5.40
P	500	6.0	±20	±0.4	500-1100	6.50
S	500	0.5	±20	±0.075	100-220000	0.54
S	500	1.0	±20	±0.25	100-110000	1.08
S	500	2.0	±20	±0.25	100-55000	2.16
S	500	3.0	±20	±0.3	100-36500	3.24
S	500	4.0	±20	±0.3	100-27500	4.32
S	500	5.0	±20	±0.4	100-22000	5.40
S	500	6.0	±20	±0.7	100-18000	6.48
S	880	0.5	±20	±0.075	880-120000	0.95
S	880	1.0	±20	±0.25	880-60000	1.90
S	880	2.0	±20	±0.25	880-30000	3.80
S	880	3.0	±20	±0.3	880-20000	5.70
S	880	4.0	±20	±0.3	880-15000	7.60
S	880	5.0	±20	±0.4	880-12000	9.50
S	880	6.0	±20	±0.7	100-9000	11.41
S	1200	1.0	±20	±0.25	100-55000	2.59
S	1200	2.0	±20	±0.25	100-27500	5.18
S	1200	3.0	±20	±0.3	100-18000	7.78
S	1200	4.0	±20	±0.3	100-13500	10.37
S	1200	5.0	±20	±0.4	100-11000	12.96
S	1500	1.0	±30	±0.25	100-55000	3.24
S	1500	2.0	±30	±0.25	100-27500	6.48
S	1500	3.0	±30	±0.5	100-18000	9.72
S	1500	4.0	±30	±0.7	100-13500	12.96

Series	Width, mm	Thickness, mm	Tolerance, mm		Length, mm	Sheet mass of 1000mm length, kg
			width	thickness		
S	1750	2.0	+20 -50	±0.25	1750—25000	7.60
S	1750	3.0	+20 -50	±0.3	1750—17000	11.30

NOTE:

Sheets of series “S” are issued in rolls without coil. Upon the request of the customer a release of sheets of other thickness and other sizes is also possible.

Thickness and width tolerance of the sheet of other sizes is chosen in accord with the nearest greatest size in the catalogue as agreed. Sheet buckling of series “P” should not exceed 1.5 % per 1m length.

The weight of sheets is calculated by their minimal density and nominal sizes.

Plates quality index

Series “P”	Series “S”
Surface appearance	
Plates surface should be from white to light grey, plain, dead, without cracks, abrasion and through holes. Various shades of coloring, presence of separate dark inclusions, buckling, traces from a cutting tool and tier-sheets at heat treatment are also permitted.	
Lengthwise direction tensile strength, MPa (kgf/cm²)	
Not less than 17.6 (180)	Not less than 14.7 (150)
Relative elongation at lengthwise direction break, %	
Not less than 180	Not less than 180
Density, g/cm³	
Not less than 2.15	Not less than 2.16

1.3 Rolled Polytetrafluoroethylene plates for pads and membranes

TS 84-522-75

Plates dimensions of series “CDT” AND “CDnT”

Plates dimensions, mm			Product weight, g
length	width	thickness	
200÷500 ±10%	200÷500 ±10%	0.8÷1.5 ±0.1	Charge is not calculated
		1.6÷2.0 ±0.3	
		2.1÷4.9 ±0.5	
		5.0±1.0	
		6.0±1.0	

Plates quality index

Appearance

Colour from white to grey: there may be inclusions not more than 1mm² length and not more than 4 it. On the surface of 100 cm². Marks or pinchers that break the integrity of the plates surface are not permitted.

Presence of cracks, pitting and foliation in the passing light

Plates should be without cracks, pitting and foliation



**POLYTETRAFLUOROETHYLENE,
POLYTETRAFLUOROETHYLENE-A,
POLYTETRAFLUOROETHYLENE-NM,
POLYTETRAFLUOROETHYLENE-M
CORES AND DISCS**



Polytetrafluoroethylene, Polytetrafluoroethylene-A cores and discs manufactured using the compression molding method with the subsequent heat treatment

TS 6-05-810-88

Polytetrafluoroethylene and Polytetrafluoroethylene-A cores and discs are designed for the production of sealing, electrical insulation, antifriction and chemically resistant elements of the constructions applied in various industries, including food industry and medicine, serving as details of the process equipment (gaskets, cuffs, shells, bushings, membranes, etc.).

The production of parts from cores and discs is carried out mechanically.

Cores and discs of the premium class are produced out of Polytetrafluoroethylene “PN” and “O” (GOST 10007-80) and Polytetrafluoroethylene-A series 2, (TS 6-05-1999-85).

Cores and discs of the first grade are manufactured from Polytetrafluoroethylene “PN”, “O”, “T” and polytetrafluorethyne-A of series 1 and 2.

Operating temperatures: from -269°C up to $+250^{\circ}\text{C}$.

Warranty period of storage of plates — 20 years from the date of manufacturing.

Polytetrafluoroethylene, Polytetrafluoroethylene-A, Polytetrafluoroethylene-NM, Polytetrafluoroethylene-M cores produced utilizing the piston extrusion method

TS 6-05-041-535-74

The cores are manufactured using the piston extrusion method from heat-treated granulated Polytetrafluoroethylene of series “O”, “PN” (GOST 10007-80), and Polytetrafluoroethylene -NM series “RB” (TS 2213-027-07623164-2002), and Polytetrafluoroethylene -M series “MA”, “MO” and “MT” (TS 2213-054-002003521-99) and Polytetrafluoroethylene -A (TU 6-05-1999-85).

The cores are used for the mechanical production of details of electrotechnical, anticorrosive and antifriction purpose.

Warranty period of storage — 15 years from the date of manufacturing.

2.1 Polytetrafluoroethylene, Polytetrafluoroethylene-A cores and discs manufactured using the molding compression method with the subsequent heat treatment

TS 6-05-810-88

Cores and discs of vertical pressing

External diameter, mm	Height, mm	Tolerance, mm		Weight, g
		diameter	height	
45	105	+4.0 -3.0	±10.0	380
55	105	+4.0 -3.0	±10.0	600
60	50	+4.0 -3.0	±5.0	320
65	105	+4.0 -3.0	±10.0	820
70	50	+4.0 -3.0	±5.0	425
75	105	+4.0 -3.0	±10.0	1080
80	50	+4.0 -3.0	±5.0	560
85	105	+4.0 -3.0	±10.0	1380
90	50	±4.0	±5.0	700
90	105	+4.0 -3.0	±10.0	1500
95	105	+4.0 -3.0	±10.0	1760
100	50	±4.0	±5.0	910
100	105	+5.0 -4.0	±10.0	2000
105	105	+5.0 -4.0	±10.0	2100

External diameter, mm	Height, mm	Tolerance, mm		Weight, g
		diameter	height	
110	50	±4.0	±5.0	1050
110	105	+5.0 -4.0	±10.0	2300
115	105	+5.0 -4.0	±10.0	2450
117	124	±3.0	±10.0	2300
120	50	+5.0 -4.0	±5.0	1250
120	105	±4.0	±10.0	2700
125	105	+6.0 -4.0	±10.0	3100
130	50	±4.0	±5.0	1450
140	50	±4.0	±5.0	1730
150	50	±4.0	±5.0	2000
150	105	+7.0 -4.0	+10.0 -5.0	4500
150	150	+7.0 -4.0	+10.0 -5.0	6400
160	50	±6.0	±5.0	2250
160	150	+7.0 -4.0	±10.0	6300
170	50	±6.0	±5.0	2700
180	105	+7.0 -5.0	±10.0	6100
180	150	+7.0 -5.0	+10.0 -5.0	8000
200	50	±6.0	±5.0	3730
210	50	±8.0	±5.0	4150
212	105	+8.0 -5.0	±10.0	9000
212	135	+8.0 -5.0	±10.0	11 000
220	50	+8.0	±5.0	4150
250	60	+7.0 -5.0	±5.0	6400
260	50	±8.0	±5.0	5800

External diameter, mm	Height, mm	Tolerance, mm		Weight, g
		diameter	height	
290	60	+7.0 -5.0	±5.0	8700
300	50	±10.0	±5.0	8150
300	60	+10.0	±5.0	9800
330	50	±5.0	±5.0	10 400
330	60	±5.0	±5.0	12 000
350	50	±10.0	±5.0	11 900
400	50	±15.0	±5.0	15 000
410	40	±10.0	±5.0	12 500
410	50	±10.0	±5.0	15 900
410	60	±10.0	±5.0	18 750
500	40	±10.0	±5.0	18 500
500	50	±10.0	±5.0	23 100
500	60	±10.0	±5.0	27 700
600	40	±10.0	±5.0	25 000
600	50	±10.0	±5.0	31 500
760	40	±20.0	±5.0	43 000
760	60	±20.0	±5.0	63 500
760	80	±20.0	±5.0	86 000
800	80	±30.0	±5.0	47 000

NOTE:

Cone form, ellipticity, diameter height fluctuation, thickness variety are tolerated within the limits per sizes. Variation in vertical plane (pill curvature) should be in accord with the technical specifications (TS).

Vertical pressing cores

External diameter, mm	Height, mm	Tolerance, mm		Weight, g
		diameter	height	
10	400	+2.0 -1.0	+30 -10	69
13	400	+2.0 -1.0	+30 -10	115
15	400	+2.0 -1.0	+30 -10	155
20	400	±3.0	+30 -10	300
25	400	±3.0	+30 -10	450
30	400	±3.0	+30 -10	660
35	400	±3.0	+30 -10	870
40	400	±3.0	+30 -10	1150
50	400	±3.0	+30 -10	1750
60	400	±3.0	+30 -10	2500
70	400	±3.0	+30 -10	3350
80	400	±3.0	+30 -10	4600
85	500	±4.0	+30 -10	6450
85	600	±4.0	+30 -10	7800
100	400	±5.0	+30 -10	7100
160	150	±5.0	+30 -10	6800

NOTE:

Cone form, ellipticity — within the limits for the sizes. Buckling (bending deflection) — within the limits of the TS specifications. Weld size is conditioned by the setup. There may be burr, deepening in the core body within the limits of tolerance for the sizes and the connection of cores by the burr. The delivery of cores in blocks is also possible. The quantity of cores in a block is determined by the setup.

Cores and discs quality index

Premium class	First grade
Surface appearance of cores and discs	
Cores and discs surface should be:	
White	From white up to grey, a cream tint is also permitted
Without cracks or abscesses	
Various shades of coloring are also permitted	
There may be pinchers, chips, splits, traces of burr removal on the cores and discs plates surface, not exceeding maximum deviations from the nominal sizes; cores connection by burr, cores and discs buckling not more than 1.5 % from the maximal linear length. Polytetrafluoroethylene cores and discs surface may have a pattern in the form of traces of pressed granules.	
There must not be separate inclusions of dark color more than:	
6 mm ²	8 mm ²
Inclusions:	
From 1 mm ² up to 6 mm ²	From 3 mm ² up to 8 mm ²
Must not be more than 2 items per:	
30 cm ² of cores or discs	25 cm ² of cores or discs
The condition of inner layers of cores and discs at check in passing light	
Cores and discs should not have inner defects, cracks or interstice	
There must not be more than 2 separate inclusions of dark color of more than 10 mm ² on the surface:	
30 cm ²	25 cm ²
Various shades of coloring are also permitted in accord with the check sample	
The condition of inner layers of cores and discs at check of radiography	
Absence of cracks and abscesses	
There must not be inclusions more than 0.5 mm ² , on the surface of up to 35 cm ² in the quantity of:	
2 it.	3 it.
On the surface from 35 cm ² up to 200 cm ² in the quantity of:	
3 it.	5 it.
On the surface more than 200 cm ² in the quantity of:	
4 it.	7 it.
NOTE:	
Upon coordination with the customer the release of cores and discs may be conducted without radiography check.	

2.2 Polytetrafluoroethylene, Polytetrafluoroethylene-A, Polytetrafluoroethylene-NM, Polytetrafluoroethylene-M cores produced utilizing the piston extrusion method

TS 6-05-041-535-74

External diameter, mm	Length, mm	Tolerance, mm		Weight of the 100mm length, g
		Diameter	Length	
7.9	50-2000	+0.4		11.5
10	50-2000	+0.6		18
12	50-2000	+0.7		25
15	50-2000	+0.9		38.5
16	50-2000	+1.0		44
17	50-2000	+1.1		55
20	50-2000	+1.2		69
23	50-2000	+1.4		100
25	50-2000	+1.5		110
27	50-2000	+1.6		122
28	50-2000	+1.7		150
30	50-2000	+1.8	At length up to 500 mm: +10.0 mm	155
32	50-2000	+1.9		177
35	50-2000	+2.1	At length exceeding 500 mm: + 2%	205
38	50-2000	+2.3		230
40	50-2000	+2.4		290
44	50-2000	+2.6		334
45	50-2000	+2.7		360
46	50-2000	+2.9		385
50	50-2000	+3.0		420
55	50-2000	+3.3		520
60	50-2000	+3.6		615
68	50-2000	+4.0		800
70	50-2000	+4.2		880
80	50-2000	+4.8		1080
88	50-2000	+5.2		1300

External diameter, mm	Length, mm	Tolerance, mm		Weight of the 100mm length, g
		Diameter	Length	

NOTE:

Core length corresponds to the range given in the table.

The client should specify only core diameters and total weight not mentioning the tolerance.

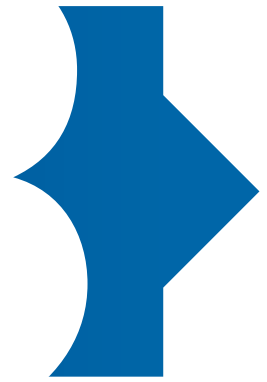
Upon coordination with the customer there may be cores with a negative diameter tolerance.

Cores quality index

Quality index	Norm
Appearance	<p>The color of cores should be from white to grey. There may be floating within one core. The surface should be plain and smooth, without cracks, bubbles or abscesses. Waviness, traces of a forming tool, surface asperities within the limits for the external diameter, separate inclusions of a darker color not more than 8 mm² in the quantity of 2 it. per any 25 cm² of core surface are admissible. The ends of the core should be cut perpendicular to the core axle.</p>
Stability to curvature of cores with diameter less than 8 mm	There must not be cracks and stratifications on the care surface at its bending manually around a metal bar 100 ±1 mm diameter at 90°.
Material density, g/cm ³	<p>Diameter up to 35 mm — not less than 2.14; diameter more than 35 mm — not less than 2.15.</p>



**POLYTETRAFLUOROETHYLENE,
POLYTETRAFLUOROETHYLENE-A,
POLYTETRAFLUOROETHYLENE-NM,
POLYTETRAFLUOROETHYLENE-M
BUSHINGS**



Polytetrafluoroethylene, Polytetrafluoroethylene-A bushings manufactured using the molding compression method with the subsequent heat treatment

TS 6-05-810-88

Polytetrafluoroethylene, Polytetrafluoroethylene-A bushings manufactured using the molding compression method with the subsequent heat treatment are designed for the production of sealing, electrical insulation, antifrictional and chemically resistant elements of the constructions applied in various industries, including food industry and medicine, serving as details of the process equipment (gaskets, shells, etc.). The production of parts from bushings is carried out mechanically.

Bushings of the premium class are produced out of Polytetrafluoroethylene “PN” and “O” (GOST 10007-80), bushings of the first grade are manufactured from Polytetrafluoroethylene “PN”, “O”, “T” and polytetrafluorethyne-A of series 1 and 2 (TS 6-05-1999-85).

Operating temperatures: from -269°C up to $+250^{\circ}\text{C}$.

Warranty period of storage of bushings — 20 years from the date of manufacturing.

Polytetrafluoroethylene, Polytetrafluoroethylene-A, Polytetrafluoroethylene-NM, Polytetrafluoroethylene-M bushings (tubes) produced utilizing the piston extrusion method

TS 6-05-1876-79

The tubes (bushings) are manufactured using the piston extrusion method from heat-treated granulated Polytetrafluoroethylene of series “O”, “T”, “PN” (GOST 10007-80), and Polytetrafluoroethylene -NM series “RB” (TS 2213-027-07623164-2002), and Polytetrafluoroethylene -M series “MT” (TS 2213-054-002003521-99) and Polytetrafluoroethylene -A (TS 6-05-1999-85).

The tubes (bushings) are designed for application in conduits and molded pieces of piping for transportation under influence of hostile environment except for melts of alkaline metals and trifluoride chlorine and fluorine.

The workspace pressure with concern of the operation temperature is calculated using the formula given in the technical specifications TS 6-05-1876-79.

The tubes (bushings) are also used for the production of various parts of electrotechnical, anticorrosive and antifriction purpose.

Operating temperatures of the tubes (bushings): from -200°C up to $+260^{\circ}\text{C}$.

Warranty period of storage — 20 years from the date of manufacturing.

3.1 Polytetrafluoroethylene, Polytetrafluoroethylene-A bushings manufactured using the molding compression method with the subsequent heat treatment

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Bushing dimensions and weight

External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g	External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g
35±2.0	11±1.0	50±5.0	90	80±3.0	40±3.0	120±5.0	1050
35±2.0	18±1.0	50±5.0	80	80±3.0	45±2.0	50±5.0	345
40±2.5	13±1.5	50±5.0	120	80±4.0	50±4.0	50±5.0	350
40±2.5	25±2.0	50±5.0	70	85±4.0	22±2.0	80±5.0	910
45±2.5	30±2.5	50±5.0	90	85±4.0	22±2.0	95 ^{+6.0} _{-2.0}	1080
50±2.5	20±1.5	50±5.0	180	85±4.0	54±2.0	55±5.0	420
50±2.5	25±2.0	50±5.0	160	86±4.0	44±3.0	120±5.0	1100
50±2.5	35±2.5	50±5.0	110	90±4.0	30±2.0	50±5.0	630
53±3.0	38 ^{+1.0} _{-2.0}	90 +5.0	230	90±4.0	30±2.0	120±5.0	1550
55±2.5	25±2.0	50±5.0	200	90±4.0	40±2.0	50±5.0	570
55±2.5	40±2.5	50±5.0	120	90±4.0	50±2.5	50±5.0	500
55±3.0	25 ^{+1.0} _{-2.0}	90 +5.0	385	90±4.0	60±2.5	50±5.0	360
55±3.0	30±2.0	90±5.0	320	92±4.0	52±3.0	120±5.0	1250
60±3.0	15±1.5	50±5.0	300	98±4.0	65-3.0	55±2.5	550
60±2.5	25±2.0	50±5.0	250	98.5±4.0	75±3.0	50±5.0	340
60±3.0	40±2.0	50±5.0	180	100±4.0	25±2.0	50±5.0	800
64±3.0	25±3.0	50±5.0	320	100±4.0	40±2.0	50±5.0	730
64±3.0	45±2.0	45±2.0	170	100±4.0	50±2.0	145 ^{+15.0} _{-5.0}	1900
65±3.0	30±2.0	50±5.0	300	100±4.0	60±2.5	50±5.0	620
66±3.0	30±2.0	120±5.0	700	105±4.0	25±2.0	97±5.0	925

External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g	External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g
66±3.0	35±2.0	50±5.0	280	105±4.0	25±3.0	97±5.0	1650
66±3.0	35±2.0	120±5.0	660	105±4.0	25±3.0	110±5.0	1870
70±3.0	30±2.0	50±5.0	360	105±4.0	85±3.0	50±5.0	340
70±3.0	40±2.5	50±5.0	285	107±3.0	42±2.0	120±5.0	2000
70±3.0	40±2.0	120±5.0	740	109±4.0	75±4.0	130±5.0	1500
70±3.0	50±2.5	50±5.0	220	110±4.0	15±1.0	50±5.0	1010
75±3.0	30±2.0	50±5.0	390	110±4.0	30±2.0	50±5.0	1000
75±3.0	35±2.0	50±5.0	370	110±4.0	30±2.0	120±5.0	2400
75±3.0	50±2.5	50±5.0	300	110±4.0	50±2.5	50±5.0	820
80±3.0	20±1.5	50±5.0	570	110±4.0	50±2.0	120±5.0	2050
80±4.0	20±2.0	120±5.0	1200	110±4.0	70±3.0	50±5.0	610
80±3.0	30±2.0	50±5.0	490	110±4.0	70±2.0	120±5.0	1550
80±4.0	30±2.0	120±5.0	1100	115±3.0	50±3.0	125±5.0	2500
80±3.0	40±2.0	50±5.0	440	120±4.0	20±2.0	120±5.0	2800
120±4.0	30±2.0	50±5.0	1200	152 ^{+4.0} _{-2.0}	128 ^{+8.0} _{-2.0}	110±5.0	1410
120±4.0	30±2.0	120±5.0	2700	154±5.0	127±2.0	40±5.0	680
120±4.0	40±3.0	120±5.0	2750	155±4.0	60±3.0	120±5.0	4350
120±5.0	70±2.0	50±5.0	820	155±4.0	94±3.0	125±5.0	3300
120±4.0	70±3.0	120±5.0	2050	155±4.0	94±3.0	150±5.0	3960
120±4.0	80±3.0	120±5.0	1700	155±4.0	94±3.0	155±5.0	4050
120 ^{+4.0} _{-7.0}	80 ^{+3.0} _{-7.0}	150 ^{+4.0} _{-10.0}	2100	155 ^{+5.0} _{-2.0}	127 ^{+2.0} _{-5.0}	50 ^{+5.0} _{-2.0}	850
120±5.0	90±4.0	50±5.0	545	158±4.0	93±3.0	80±4.0	2200
120±4.0	90±3.0	120±5.0	1350	160±6.0	50±2.5	50±5.0	2100
125±5.0	50±2.5	50±5.0	1030	160±6.0	90±4.0	50±5.0	1630
128±5.0	74±3.0	120±5.0	2200	160±6.0	100±4.0	50±5.0	1220
130±5.0	30±2.0	50±5.0	1360	160±6.0	120±5.0	50±5.0	990
130±5.0	50±2.5	50±5.0	1250	162±4.0	94±4.0	65±5.0	2000
130±4.0	60±2.5	80 ^{+5.0} _{-2.0}	1800	162±4.0	94±4.0	110±5.0	3300
130±5.0	65±4.0	125±5.0	2700	164±4.0	92±2.0	65±5.0	2150
130±5.0	65±4.0	130±5.0	2900	167±4.0	147±4.0	122±4.0	1600
130±5.0	80±3.0	50±5.0	935	169±2.0	145±2.0	47±5.0	670

External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g	External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g
130±4.0	80±3.0	120±5.0	950	170±6.0	50±2.5	50±5.0	2300
130±4.0	95±4.0	60±5.0	865	170±6.0	80±3.0	50±5.0	2000
130±5.0	100±4.0	50±5.0	600	170±6.0	100±4.0	50±5.0	1750
130±5.0	110 ^{+2.0} _{-5.0}	40±2.0	250	170±6.0	120±5.0	50±5.0	1300
135±5.0	115±5.0	50±5.0	460	170 ^{+1.0} _{-5.0}	130 ^{+5.0} _{-2.0}	70±3.0	1390
140±5.0	30±2.0	50±5.0	1590	171 ^{+5.0} _{-2.0}	144 ^{+2.0} _{-5.0}	46±5.0	860
140±5.0	50±2.5	50±5.0	1450	171 ^{+5.0} _{-2.0}	144 ^{+2.0} _{-5.0}	50±5.0	950
140±4.0	50±3.0	80±5.0	2450	172 ^{+4.0} _{-2.0}	158 ^{+2.0} _{-4.0}	105 ^{+5.0} _{-2.0}	1350
140±5.0	70±2.5	80 ^{+5.0} _{-2.0}	2000	182 ^{+4.0} _{-2.0}	158 ^{+2.0} _{-4.0}	105±5.0	1470
140±4.0	75±3.0	125±5.0	3040	190±6.0	50±2.5	50±5.0	2930
140±4.0	75±3.0	170±5.0	4150	190±6.0	90±3.0	50±5.0	2480
140±5.0	80±3.0	50±5.0	1200	190±5.0	145±5.0	40±3.0	1000
140±5.0	90±4.0	50±5.0	990	191±2.0	115±2.0	120±5.0	4850
140±5.0	100±4.0	50±5.0	860	192±4.0	94±4.0	65 ^{+5.0} _{-2.0}	5100
142±3.0	115±2.0	100±3.0	1160	192±6.0	94±4.0	110±4.0	4850
150±5.0	30±2.0	50±5.0	1870	200±6.0	90±4.0	50±5.0	2900
150±5.0	50±2.5	50±5.0	1740	200±6.0	120±5.0	50±5.0	2300
150±5.0	80±3.0	50±5.0	1420	200±6.0	140±5.0	50±5.0	1800
150±5.0	100±4.0	50±5.0	1100	200±6.0	150±5.0	50±5.0	1700
150±5.0	120±5.0	50±5.0	635	205 ^{+10.0} _{-5.0}	40±5.0	125±5.0	9050
152 ^{+4.0} _{-2.0}	128 ^{+8.0} _{-2.0}	40±5.0	515	205 ^{+10.0} _{-5.0}	40±5.0	150±5.0	11 000
205 ^{+10.0} _{-5.0}	50 ^{+5.0} _{-2.0}	150±5.0	10500	330±7.0	270±8.0	50±5.0	2700
205±6.0	175±6.0	50±5.0	970	336 ^{+6.0} _{-12.0}	291 ^{+10.0} _{-5.0}	70±3.0	2650

External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g	External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g
205 ^{+4.0} _{-2.0}	175 ^{+2.0} _{-4.0}	100±5.0	1950	350±5.0	255±5.0	110±5.0	10 300
210±5.0	132±5.0	125±5.0	5700	350±15.0	290±10.0	35±2.5	2670
210±6.0	180±6.0	50±5.0	1050	370±7.0	285±8.0	50±5.0	5400
215±8.0	125±5.0	70±5.0	3800	380±10.0	280±10.0	50±5.0	5200
220±6.0	50±5.0	145±5.0	1170	380±10.0	280±10.0	105±5.0	11 500
220±6.0	160±6.0	80±5.0	3420	380±7.0	310±8.0	50±5.0	4200
230-8.0	180±6.0	25±2.0	800	400±8.0	320±10.0	50±5.0	5000
230±5.0	185±5.0	65±5.0	2200	410±8.0	205±8.0	50±5.0	9900
232 ^{+3.0} _{-8.0}	195 ^{+3.0} _{-8.0}	70±3.0	1780	410±8.0	305±8.0	110±5.0	10 100
237 ^{+8.0} _{-2.0}	219 ^{+2.0} _{-8.0}	30±2.5	700	415±8.0	360±10.0	50±5.0	3200
243 ^{+5.0} _{-3.0}	145±7.0	56±3.0	3610	430±8.0	360±10.0	50±5.0	4350
250±6.0	160±6.0	50±5.0	3340	440±20.0	320±20.0	110±5.0	17 700
250±6.0	180±6.0	50±5.0	2600	440±20.0	360±20.0	110±5.1	12 400
251±8.0	237±8.0	50±2.5	1150	450±10.0	385±10.0	120±15.0	11 000
251 ^{+8.0} _{-3.0}	237 ^{+2.0} _{-8.0}	105 ^{+5.0} _{-2.0}	2410	458±10.0	412±10.0	65 ^{+15.0} _{-5.0}	4200
260±6.0	160±6.0	50±5.0	3590	470±8.0	410±12.0	50±5.0	4550
260±6.0	200±6.0	50±5.0	2600	490±10.0	412±3.0	50±8.0	6600
265 ^{+2.0} _{-8.0}	80 ^{+4.0} _{-2.0}	30±2.0	3350	490±20.0	415±20.0	110±5.0	13 200
270±6.0	200±6.0	50±5.0	2850	490±8.0	416±12.0	50±5.0	5100
280±7.0	170±6.0	50±5.0	4300	520±20.0	410±20.0	110±5.0	19 900
280±7.0	200±6.0	50±5.0	3600	520±9.0	450±12.0	50±5.0	5300
280±7.0	230±8.0	45±5.0	1850	520±20.0	450±20.0	60±5.0	6970
280±6.0	250±8.0	50±5.0	2200	520±20.0	450±20.0	110±5.0	13 500
285±7.0	175±6.0	50±5.0	4730	670±9.0	550±12.0	50±5.0	14 000
285±8.0	175±5.0	100±5.0	8600	820±20.0	250±20.0	100±10.0	10 700
300 ^{+15.0} _{-2.0}	190 ^{+6.0} _{-10.0}	50 ^{+4.0} _{-2.0}	4900	820±10.0	600±14.0	50±5.0	26 750
308 ^{+4.0} _{-2.0}	272 ^{+2.0} _{-4.0}	125±5.0	4600	866±20.0	730±20.0	70±10.0	26 800

External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g	External diameter. mm	Inner diameter. mm	Height. mm	Item weight. g
315±7.0	260±8.0	50±5.0	2150	870±10.0	730±16.0	50±5.0	18 600
320±7.0	250±8.0	50±5.0	3200	1000±10.0	900±16.0	50±5.0	17 000
330±10.0	258±10.0	120±5.0	9300				

NOTE:

A release of bushings of other nominal sizes with other tolerances under the coordinated drawings or specifications is also permitted.

Cone form. ellipticity. diameter height fluctuation. thickness variety are tolerated within the limits per sizes. Variation in vertical plane (pill curvature) should be not more than 3.5 mm.

Bushings quality index

Premium class	First Grade
Bushings surface appearance	
Bushings surface should be:	
White	From white up to grey, a cream tint is also permitted
Without cracks or abscesses	
Various shades of colouring are also permitted	
There may be pinchers, chips, splits, traces of burr removal on the bushings surface, not exceeding maximum deviations from the nominal sizes. Polytetrafluoroethylene bushings surface may have a pattern in the form of traces of the pressed granules.	
There must not be separate inclusions of dark colour more than:	
6 mm ²	8 mm ²
Inclusions:	
From 1 mm ² up to 6 mm ²	From 3 mm ² up to 8 mm ²
Must not be more than 2 items per:	
30 cm ² of the plate	25 cm ² of the plate
The condition of inner layers of bushings at check in passing light	
Bushings should not have inner defects, cracks or interstice	
There must not be more than 2 separate inclusions of dark colour of more than 10 mm ² on the surface:	
30 cm ²	25 cm ²
Various shades of colouring are also permitted in accord with the check sample	
The condition of inner layers of bushings at check of radiography	
Absence of cracks and abscesses	
There must not be inclusions more than 0,5 mm ² , on the surface of up to 35 cm ² in the quantity of:	
2 it.	3 it.
On the surface from 35 cm ² up to 200 cm ² in the quantity of:	
3 it.	5 it.
On the surface more than 200 cm ² in the quantity of:	
4 it.	7 it.
NOTE:	
Upon coordination with the customer the release of the bushings is conducted without radiography check	

3.2 Polytetrafluoroethylene, Polytetrafluoroethylene-A, Polytetrafluoroethylene-NM, Polytetrafluoroethylene-M tubes (bushings) produced utilizing the piston extrusion method

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Tubes (bushings) dimensions and weight

External diameter, mm	Wall thickness, mm	Inner diameter, mm	Tolerance, mm		Item weight with 100 mm height, kg
			Per external diameter	Per wall thickness	
11	2	7	±0.3	±0.5	0.013
15	3.6	7.8	±0.4	+0.4 -0.2	0.030
15	2	11	±0.4	±0.3	0.016
20	2	16	±0.2	±0.2	0.024
20	4	12	±0.2	±0.3	0.070
24	4	16	±0.3	±0.3	0.055
25	2	21	±0.3	±0.5	0.035
25	6	13	±1.0	±0.5	0.080
28	5	18	±1.0	±0.7	0.075
30	2.5	25	±0.3	±0.2	0.046
30	5	20	+1.5 -0.8	±0.5	0.083
30	10	10	±0.8	±0.8	0.120
32	10	12	±0.8	±0.8	0.180
34.5	7.5	19.5	±0.5	±0.8	0.136
35	12	11	+1.0 -0.5	±0.5	0.178
38	4	30	±0.4	±0.4	0.092
38	6.5	25	±1.0	±1.0	0.143
40	10	20	±1.0	±0.8	0.202
42	3	36	±0.5	±0.5	0.078
44	12	20	±1.0	±1.0	0.259

External diameter, mm	Wall thickness, mm	Inner diameter, mm	Tolerance, mm		Item weight with 100 mm height, kg
			Per external diameter	Per wall thickness	
46.5	5	36.5	±1.0	±0.7	0.140
46.5	7.5	31	±1.0	±0.8	0.205
47	3	41	±0.8	±0.3	0.089
50	3	44	±0.7	±0.3	0.095
50	5	40	±1.0	±0.5	0.141
50	15	20	±1.0	±1.0	0.354
54	5.0	44	±0.8	±0.5	0.156
54	6.5	41	±0.8	±0.7	0.210
56	3	50	±1.0	±0.3	0.105
60	10	40	±1.2	±1.0	0.320
60	14	32	+1.3 -1.0	+1.0 -0.5	0.480
62	4	54	±0.8	±0.3	0.140
66	4	58	±0.8	±0.3	0.167
66	5.5	55	±0.6	±0.4	0.224
66	7.5	51	±1.0	±0.5	0.310
71	8	55	±1.5	+1.0 -0.7	0.325
72	6	60	±0.8	±0.5	0.315
74	3.5	67	±1.0	±0.3	0.180
75	5	65	±0.8	±0.5	0.236
86.5	10	66.5	±2.5	±1.0	0.550
87	13.5	60	±2.0	±2.0	0.685
88	6	76	±1.5	±0.5	0.350
90	31.5	27	±2.0	±2.0	1.230
92	5	82	±2.0	±0.5	0.260
96	5	86	±2.0	±0.5	0.307
96	7	82	±2.0	±0.5	0.420
97	37	23	±2.0	±2.0	1.500
100	10	80	±3.0	±2.0	0.640
115	4.6	106	±1.0	±0.5	0.342
115	6	103	±2.0	±0.5	0.450
115	11	93	±3.0	±1.0	0.780

External diameter, mm	Wall thickness, mm	Inner diameter, mm	Tolerance, mm		Item weight with 100 mm height, kg
			Per external diameter	Per wall thickness	
123	9	105	±3.0	±1.0	0.70
139	8.5	122	±2.0	±0.5	0.720
145	5	135	±3.0	±0.5	0.472
159	4.5	150	±3.0	±0.5	0.480
190	6.5	177	±3.0	±0.7	0.805
240	7	226	±3.0	±0.7	1.100
290	7	276	±4.0	±0.7	1.400

NOTE:

The height of the tubes (bushings) supplied ranges from 500 up to 2000 mm. The client upon submitting a request for tubes (bushings) should specify only the nominal sizes (external diameter and wall thickness) and their total weight without tolerances.

Upon request we may deliver tubes (bushings) of other sizes. The setup should be delivered by the customer in accord with the drawings coordinated with the producer.

Bushings (tubes) quality index

Quality index	Norm
Appearance	<p>The surface of the tubes (bushings) should be from white to grey, without cracks or abscesses. There may be a greyish tint.</p> <p>Waviness, traces of a forming tool on the surface are also permitted within the limits of the nominal size. There must not be separate inclusions of a darker colour than that of the tube (bushing) more than 6 mm².</p> <p>There might be inclusions (not more than 2) of 1–6 mm² per any 25 cm² of the tube (bushing) surface.</p>
Material density, g/cm ³	Not less than 2.140

3.3 Polytetrafluoroethylene discs and bushings produced using isostatic pressing

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External diameter, mm	Inner diameter, mm	Height, mm	Tolerance, mm			Weight, kg
			External diameter	Inner diameter	height	
160	50	400	+20 -10	±10	±50	16
160	80	400	+20 -10	±10	±50	13
160	80	1500	±20	±20	±50	50
320	120	900	+0 -30	+10	+10 -20	121
320	120	1200	+0 -30	+10	+10 -20	162
320	120	1500	+0 -30	+10	+10 -20	202
320	120	1750	+0 -30	+10	+10 -20	236
410	125	500	+0 -30	+10	±30	96
420	380	1700	±20	±20	±100	92
450	100	500	±30	±30	±50	135
530	500	1700	±20	±20	±100	91
1000	460	80	±30	±20	±10	110
1000	550	80	±30	±20	±10	100
1000*	—	40	+50 -30	—	+15 -10	80
1000*	—	60	+50 -30	—	+15 -10	120
1000*	—	80	+50 -30	—	+15 -10	160
1200*	—	40	+50 -30	—	+20 -10	100
1200*	—	60	+50 -30	—	+20 -10	150

External diameter, mm	Inner diameter, mm	Height, mm	Tolerance, mm			Weight, kg
			External diameter	Inner diameter	height	
1200*	—	80	+50 -30	—	+20 -10	200
1400*	—	40	+50 -30	—	+20 -10	134
1400*	—	60	+50 -30	—	+20 -10	201
1400*	—	80	+50 -30	—	+20 -10	268
1670*	—	40	+50 -30	—	+20 -10	190
1670*	—	60	+50 -30	—	+20 -10	285
1670*	—	80	+50 -30	—	+20 -10	380

NOTE:

The setup is delivered by the client using the drawings coordinated with the manufacturer.

* At manufacturing of the products of other thickness the tolerance for the size is determined by the product of greater thickness present in the catalogue.

Bushings and discs quality index

Surface appearance of the bushings and discs

Colour: ranging from white to grey; traces of rust, creamy tint, surface spots of dark grey or brown colour are admissible. There may be pinchers, scratches, chips, traces of burr removal on the surface, waviness not exceeding maximum deviations from the nominal sizes; bushings and discs buckling not more than 1,5 % from the maximal linear length.

The condition of inner layers of bushings and discs at check in passing light

The bushings with the wall thickness not exceeding 30mm are subject to the check of the inner layers in passing light. At check of the inner layers in passing light there must not be any inner defects, cracks or through holes.



**POLYTETRAFLUOROETHYLENE
COMPOSITIONS PRODUCTS**



To increase hardness, heat conductivity, stability to attrition, and to decrease deformation under load and the coefficient of thermal expansion we add various fillers to Polytetrafluoroethylene.

Our company manufactures antifriction pills on the basis of Polytetrafluoroethylene with various fillers, namely: F4K20 (TS 6-05-1413-76, addition of 20 % of coke), F4K15M5 (TS 6-05-1413-76, addition of 15 % of coke and 5 % of molybdenum disulfide), F4S15 (TS 6-05-1413-76, addition of 15 % of fiber glass), F4UV15 (“Flubon-15”- TS 301-05-16-89, addition of 15 % of carbonaceous fiber), F4M5 (TS 301-05-109-91, addition of 5 % of molybdenum disulfide).

The pills are used for the production via mechanical treatment of various antifriction parts, including piston rings, journal bearings, sealing cuffs etc. working the temperature range from minus 60°C up to plus 250°C, and for a short time up to plus 300°C.

Semi-finished products of F4UV15 (“Flubon-15”) are utilized in the manufacture of sealing and supporting elements, friction units working in general-purpose compressors or other cars and mechanisms with limited greasing and without greasing.

Polytetrafluorethylen pills with a fiber glass additive are applied in conditions of frequent shock loads, especially in manufacture of various constructional units.

There are two grades of bushings, cores and disks from compositions F4K20, F4K15M5, F4S15, i.e.: the premium and the first.

Bushings, cores and disks of the premium grade are made of compositions F4K20, F4K15M5, F4S15 of the premium grade and are used in the production of antifriction and sealing details of special purpose.

Bushings, cores and disks of the first grade are made of compositions F4K20, F4K15M5, F4S15 of the first grade and are used in the production of antifriction and sealing details of general purpose.

Bushings, cores and disks from compositions F4K20, F4K15M5, F4S15 are nonhygro-scopic and noncombustible.

Warranty period of storage — 12 years from the date of manufacturing.

4.1 Polytetrafluoroethylene vertical pressing bars F4K20, F4K15M5

TS 6-05-1413-76

Vertical pressing bars dimensions and weight

Dimensions, mm		Product calculated weight at 50 mm height, g
Diameter	Length	
25±2.5	50±5.0	50
45±3.0	105+10	360
55±3.0	105+10	550
60±2.5	50±5.0	320
65±3.0	110+10	760
70±3.0	50±5.0	425
80±3.0	50±5.0	560
85±3.0	105+10	1290
90±4.0	50±5.0	700
100±4.0	50±5.0	910
100±3.0	105+10	1800
110±4.0	50±5.0	1000
110±3.0	105+10	2200
117±3.0	50±5.0	1050
120±4.0	50±5.0	1250
120±4.0	105+10	2520
130±4.0	50±5.0	1450
140±4.0	50±5.0	1730
150±4.0	50±5.0	1950
150±5.0	105+10	4000
160±6.0	50±5.0	2250
160±5.0	150+10	6500
170±6.0	50±5.0	2700
200±6.0	50±5.0	3730
210±8.0	50±5.0	4150
250±8.0	50±5.0	5800

Dimensions, mm		Product calculated weight at 50 mm height, g
Diameter	Length	
290±5.0	60±5.0	8400
300±8.0	50±5.0	8000
330±5.0	60±5.0	11 000
350±10.0	50±5.0	10 800
400±20.0	40±5.0	11 650
410±20.0	50±5.0	15 000
500±20.0	50±5.0	22 500
600±10.0	40±5.0	23 000
600±20.0	50±5.0	30 000
780±30.0	50±5.0	47 000

NOTE:

Upon coordination with the client there may be supplied bars of a greater height. up to 100mm.
The height tolerance of the bars of more than 50mm height increases per 2mm every 10mm plus accordingly.

4.2 Polytetrafluoroethylene vertical pressing bars F4S15, F4M5

TS 6-05-1413-76, TS 301-05-109-91

Vertical pressing bars dimensions and weight

Dimensions, mm		Product calculated weight at 50 mm height, g
Diameter	Length	
25±2.5	50±5.0	50
60±2.5	50±5.0	320
70±3.0	50±5.0	425
80±3.0	50±5.0	560
90±4.0	50±5.0	700
100±4.0	50±5.0	910
110±4.0	50±5.0	1000
117±3.0	50±5.0	1050
120±4.0	50±5.0	1250
130±4.0	50±5.0	1450
140±4.0	50±5.0	1730
150±4.0	50±5.0	1950
160±6.0	50±5.0	2250
170±6.0	50±5.0	2700
200±6.0	50±5.0	3730

4.3 Polytetrafluoroethylene vertical pressing bars F4UV15

TS 301-05-16-89

Vertical pressing bars dimensions and weight

Dimensions, mm		Product calculated weight at 50 mm height, g
Diameter	Length	
60±3.0	50±5.0	312
70±3.0	50±5.0	390
90±4.0	50±5.0	470
100±4.0	50±5.0	710
110±4.0	50±5.0	850
140±5.0	50±5.0	1370
150±6.0	50±5.0	1570
170±6.0	50±5.0	2500
200±7.0	50±5.0	3450

4.4 Polytetrafluoroethylene horizontal pressing bars F4K20, F4K15M5, F4S15, F4M5

TS 6-05-1413-76, TS 301-05-109-91

Horizontal pressing bars dimensions and weight

Dimensions, mm		Product calculated weight, g
Diameter	Length	
10±1.0	400±20	69
13±1.0	400±20	115
15±1.0	400±20	155
20±1.5	400±20	276
25±2.0	400±20	458
30±2.0	400±20	625
40±2.5	400±20	1100
50±2.5	400±20	1700
60±3.0	400±20	2450
70±3.0	400±20	3300
80±3.0	400±20	4400

NOTE:
Horizontal pressing bars made of Polytetrafluoroethylene compositions are issued only upon request.

4.5 Polytetrafluoroethylene bushings F4K20, F4K15M5

TS 6-05-1413-76

Dimensions and weight of bushings

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	height	
30±2.0	20±1.5	55±2.0	52
35±2.0	11±1.0	50±5.0	90
35±2.0	18±1.0	50±5.0	80
40±2.5	13±1.5	50±5.0	120
40±2.5	25±2.5	50±5.0	70
45±2.5	30±2.5	50±5.0	90
50±2.5	20±1.5	50±5.0	180
50±2.5	25±2.0	50±5.0	160
50±2.5	35±2.5	50±5.0	110
50±1.0	36±1.0	80±5.0	170
53 ^{+3.0} _{-1.0}	38 ^{+1.0} _{-2.0}	90±5.0	230
55±2.5	25±2.0	50±5.0	200
55±2.5	40±2.5	50±5.0	120
55±1.0	41±1.0	80±5.0	180
60±3.0	15±1.5	50±5.0	300
60±2.5	25±2.0	50±5.0	250
60±2.5	40±1.0	50±5.0	175
60±2.0	46±1.0	80±5.0	210
65±3.0	30±2.0	50±5.0	300
66±3.0	35±2.0	50±5.0	280
66±3.0	35±2.0	120±5.0	590
70±3.0	30±2.0	50±5.0	360
70±3.0	40±2.5	50±5.0	285
70±3.0	40±2.0	120±5.0	630
70±3.0	50±2.5	50±5.0	220
75±3.0	30±2.0	50±5.0	390

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	height	
75±3.0	50±2.5	50±5.0	300
80±3.0	20±1.5	50±5.0	570
80±3.0	20±2.0	120±5.0	1250
80±3.0	30±2.0	50±5.0	490
80±3.0	40±2.0	50±5.0	440
80±3.0	45±2.0	50±5.0	345
80±4.0	50±3.0	50±5.0	350
85±2.0	54±2.0	55±5.0	430
86±4.0	44±3.0	120±5.0	1050
90±4.0	30±2.0	50±5.0	630
90±4.0	40±2.0	50±5.0	570
90±4.0	50±2.5	50±5.0	500
90±4.0	60±2.5	50±5.0	360
100±4.0	25±2.0	50±5.0	800
100±4.0	40±2.0	50±5.0	730
100±4.0	60±2.5	50±5.0	620
105±4.0	25±2.0	50±5.0	925
105±4.0	30±2.0	50±5.0	925
105±4.0	85±3.0	50±5.0	340
107±3.0	42±2.0	120±5.0	2000
109±4.0	75±4.0	130±4.0	1500
110±4.0	15±1.0	50±5.0	1010
110±4.0	30±2.0	50±5.0	1000
110±4.0	50±2.5	50±5.0	820
110±4.0	70±3.0	50±5.0	610
120±5.0	30±2.0	50±5.0	1200
120±4.0	30±2.0	120±5.0	2500
120±4.0	40±3.0	120±5.0	2400
120±5.0	50±2.5	50±5.0	1030
120±5.0	70±2.0	50±5.0	820
120±4.0	80±3.0	120±5.0	1500
120±5.0	90±4.0	50±5.0	545

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	height	
128±5.0	74±3.0	120±5.0	2250
130±5.0	30±2.0	50±5.0	1360
130±5.0	50±2.5	50±5.0	1250
130±4.0	60±2.5	80±5.0	1700
130±4.0	65±4.0	125±5.0	2500
130±5.0	80±3.0	50±5.0	935
130±5.0	100±4.0	50±5.0	600
135±5.0	115±5.0	50±5.0	460
140±5.0	30±2.0	50±5.0	1590
140±5.0	50±2.5	50±5.0	1450
140±4.0	75±3.0	125±5.0	2750
140±5.0	80±3.0	50±5.0	1200
140±5.0	90±4.0	50±5.0	990
140±5.0	100±4.0	50±5.0	860
140±4.0	104±5.0	120±5.0	1650
142±3.0	115±2.0	100±5.0	1160
150±5.0	30±2.0	50±5.0	1870
150±5.0	50±2.5	50±5.0	1740
150±5.0	80±3.0	50±5.0	1420
150±5.0	100±4.0	50±5.0	1100
150±5.0	120±5.0	50±5.0	635
152±5.0	128±5.0	40±5.0	490
155±4.0	94±3.0	120±5.0	3250
158±4.0	93±3.0	80±4.0	2050
160±6.0	50±2.5	50±5.0	2100
160±6.0	90±4.0	50±5.0	1630
160±6.0	100±4.0	50±5.0	1220
160±6.0	120±5.0	50±5.0	990
160 ^{+3.0} _{-5.0}	130±3.0	70±3.0	920
169±2.0	145±2.0	47±5.0	660
170±6.0	50±2.5	50±5.0	2300

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	height	
170±6.0	80±3.0	50±5.0	2000
170±6.0	100±4.0	50±5.0	1750
170±6.0	120±5.0	50±5.0	1300
170 ^{+2.0} _{-5.0}	130 ^{+5.0} _{-12.0}	70±3.0	1300
190±6.0	50±2.5	50±5.0	2930
190±6.0	90±3.0	50±5.0	2480
200 ^{+15.0} _{-5.0}	40 ^{+2.0} _{-3.0}	150±5.0	9500
200±6.0	90±4.0	50±5.0	2900
200±6.0	120±5.0	50±5.0	2300
200±6.0	140±5.0	50±5.0	1800
200±6.0	150±5.0	50±5.0	1700
205±6.0	175±6.0	50±5.0	1950
210±5.0	132±5.0	125±5.0	5400
210±6.0	180±6.0	50±5.0	1050
215±4.0	125±3.0	70±5.0	3600
220±6.0	50±5.0	145±5.0	11 700
220±6.0	160±6.0	80±5.0	3420
237±8.0	219±8.0	30±2.5	620
243±10.0	141±7.0	56±2.5	3400
250±6.0	160±6.0	50±5.0	3340
250±6.0	180±6.0	50±5.0	2600
260±6.0	200±6.0	50±5.0	2600
265±3.0	80±2.0	30±2.0	3100
265 ^{+5.0} _{-2.0}	180 ^{+2.0} _{-5.0}	120±5.0	8500
270±5.0	180±5.0	110±5.0	7100
270±6.0	200±6.0	50±5.0	2850
280±7.0	50±2.5	300±5.0	39 500
280±7.0	170±6.0	50±5.0	4300
280±7.0	200±6.0	50±5.0	3600

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	height	
280±7.0	230±8.0	45±5.0	1850
280±6.0	250±8.0	50±5.0	2200
284±7.0	175±6.0	50±5.0	4730
285±8.0	175±5.0	100±5.0	8100
300±5.0	190±3.0	50±3.0	4700
315±7.0	260±8.0	50±5.0	2150
320±7.0	250±8.0	50±5.0	3200
330-10.0	258-8.0	120±5.0	8300
330±7.0	270±8.0	50±5.0	2700
336-12.0	291±10	70±3.0	2650
345±5.0	255±5.0	110±5.0	10 200
370±7.0	285±8.0	50±5.0	5400
380±7.0	280±8.0	50±5.0	5200
380±10.0	285±10.0	105±5.0	10500
380±7.0	310±8.0	50±5.0	4200
400±8.0	320±10.0	50±5.0	5000
410±8.0	205±6.0	50±5.0	9900
410±10.0	305±10.0	105±10.0	14 500
415±8.0	360±10.0	50±5.0	3200
430±8.0	360±10.0	50±5.0	4350
440±10.0	320±10.0	105±10	17 500
440±10.0	360±10.0	105±10	12 500
458±10.0	412±10.0	65±3.0	4200
470±8.0	410±12.0	50±5.0	4550
490±10.0	412±10.0	50±8.0	6600
490±8.0	415±12.0	50±5.0	5100
490±10.0	415±10.0	105±10	13 500
520±10.0	410±10.0	105±10	20 000
520±9.0	450±12.0	50±5.0	5300
520±10.0	450±10.0	105±10	14 000
670±9.0	550±12.0	50±5.0	14 000
800±20.0	250±20.0	105±10	102 000

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	height	
850 ^{+6.0} _{-10.0}	700±14.0	50±5.0	20 900
866 ^{+6.0} _{-10.0}	730±16.0	50±5.0	18 600
1000 ^{+6.0} _{-10.0}	900±16.0	50±5.0	17 000

NOTE:

Upon coordination with the client there may be supplied bushings of a greater height. up to 70–100mm.
The height tolerance of the bushings of more than 50 mm height increases per 2 mm every 10 mm plus accordingly.

4.6 Polytetrafluoroethylene bushings F4M5

TS 301-05-109-91

Dimensions and weight of bushings

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	Height	
35±2.0	11±1.0	50±5.0	90
35±2.0	18±1.0	50±5.0	80
40±2.5	13±1.5	50±5.0	120
40±2.5	25±2.0	50±5.0	70
45±2.5	30±2.5	50±5.0	90
50±2.5	20±1.5	50±5.0	180
50±2.5	25±2.0	50±5.0	160
50±2.5	35±2.5	50±5.0	110
55±2.5	25±2.0	50±5.0	200
55±2.5	40±2.5	50±5.0	120
60±3.0	15±1.5	50±5.0	300
60±2.5	25±2.0	50±5.0	250
65±3.0	30±2.0	50±5.0	300
66±3.0	35±2.0	50±5.0	280
70±3.0	30±2.0	50±5.0	360
70±3.0	40±2.5	50±5.0	285
70±3.0	50±2.5	50±5.0	220
75±3.0	30±2.0	50±5.0	390
75±3.0	50±2.5	50±5.0	300
80±3.0	20±1.5	50±5.0	570
80±3.0	30±2.0	50±5.0	490
80±3.0	40±2.0	50±5.0	440
80±3.0	45±2.0	50±5.0	345
80±4.0	50±3.0	50±5.0	350
90±4.0	30±2.0	50±5.0	630
90±4.0	40±2.0	50±5.0	570
90±4.0	50±2.5	50±5.0	500
90±4.0	60±2.5	50±5.0	360

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	Height	
100±4.0	25±2.0	50±5.0	800
100±4.0	40±2.0	50±5.0	730
100±4.0	60±2.5	50±5.0	620
105±4.0	25±2.0	50±5.0	925
105±4.0	30±2.0	50±5.0	925
105±4.0	85±3.0	50±5.0	340
110±4.0	15±1.0	50±5.0	1010
110±4.0	30±2.0	50±5.0	1000
110±4.0	50±2.5	50±5.0	820
110±4.0	70±3.0	50±5.0	610
120±4.0	30±2.0	50±5.0	1200
120±4.0	50±2.5	50±5.0	1030
120±4.0	70±2.0	50±5.0	820
120±5.0	90±4.0	50±5.0	545
130±5.0	30±2.0	50±5.0	1360
130±5.0	50±2.5	50±5.0	1250
130±5.0	80±3.0	50±5.0	935
130±5.0	100±4.0	50±5.0	600
135±5.0	115±5.0	50±5.0	460
140±5.0	30±2.0	50±5.0	1590
140±5.0	50±2.5	50±5.0	1450
140±5.0	80±3.0	50±5.0	1200
140±5.0	90±4.0	50±5.0	990
140±5.0	100±4.0	50±5.0	860
142±3.0	115±2.0	100±5.0	1160
150±5.0	30±2.0	50±5.0	1870
150±5.0	50±2.5	50±5.0	1740
150±5.0	80±3.0	50±5.0	1420
150±5.0	100±4.0	50±5.0	1100
150±5.0	120±5.0	50±5.0	635
152±5.0	128±5.0	40±5.0	490
160±6.0	50±2.5	50±5.0	2100
160±6.0	90±4.0	50±5.0	1630

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	Height	
160±6.0	100±4.0	50±5.0	1220
160±6.0	120±5.0	50±5.0	990
169±2.0	145±2.0	47±5.0	660
170±6.0	50±2.5	50±5.0	2300
170±6.0	80±3.0	50±5.0	2000
170±6.0	100±4.0	50±5.0	1750
170±6.0	120±5.0	50±5.0	1300
190±6.0	50±2.5	50±5.0	2930
190±6.0	90±3.0	50±5.0	2480
200±6.0	90±4.0	50±5.0	2900
200±6.0	120±5.0	50±5.0	2300
200±6.0	140±5.0	50±5.0	1800
200±6.0	150±5.0	50±5.0	1700

4.7 Polytetrafluoroethylene bushings F4S15

TS 6-05-1413-76

Dimensions and weight of bushings

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	Height	
35±2.0	11±1.5	50±5.0	83
35±2.0	18±1.5	50±5.0	70
40±2.5	13±1.5	50±5.0	112
40±2.5	25±2.0	50±5.0	80
45±2.5	20±2.0	50±5.0	140
45±2.5	30±2.0	50±5.0	90
50±2.5	25±2.0	50±5.0	160
50±2.5	35±2.0	50±5.0	110
55±2.5	25±2.0	50±5.0	200
70±3.0	35±2.0	50±5.0	314
70±3.0	50±2.5	50±5.0	118
90±2.0	60±1.5	50±5.0	360

4.8 Polytetrafluoroethylene bushings F4UV15.

TS 301-05-16-89

Dimensions and weight of bushings

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	Height	
35±2.0	11±1.0	50±5.0	83
40±2.5	13±1.5	50±5.0	121
45±2.5	20±2.0	50±5.0	136
50±2.5	20±2.0	50±5.0	177
50±2.5	25±2.0	50±5.0	165
50±2.5	35±2.5	50±5.0	106
55±2.5	15±1.5	50±5.0	228
55±2.5	25±2.0	50±5.0	216
55±2.5	40±2.5	50±5.0	125
60±3.0	15±1.5	50±5.0	307
60±3.0	25±2.0	50±5.0	252
65±3.0	20±2.0	50±5.0	325
70±3.0	30±2.0	50±5.0	334
70±3.0	40±2.5	50±5.0	275
70±3.0	50±2.5	50±5.0	205
80±3.0	40±2.0	50±5.0	385
80±3.0	50±2.0	50±5.0	306
90±4.0	30±2.0	50±5.0	933
90±4.0	40±2.0	50±5.0	525
90±4.0	50±2.5	50±5.0	439
100±4.0	40±2.0	50±5.0	680
100±4.0	60±2.5	50±5.0	502
110±4.0	30±2.0	50±5.0	879
110±4.0	70±3.0	50±5.0	580
120±4.0	50±2.5	50±5.0	770
120±4.0	70±2.0	50±5.0	934
130±5.0	50±2.5	50±5.0	1165
130±5.0	80±4.0	50±5.0	850

Dimensions, mm			Product calculated weight, g
External diameter	Inner diameter	Height	
130±5.0	100±2.5	50±5.0	541
140±5.0	50±4.0	50±5.0	1340
140±5.0	80±4.0	50±5.0	1065
140±5.0	90±4.0	50±5.0	920
140±5.0	100±3.0	50±5.0	730
150±5.0	80±2.0	50±5.0	1260
160±6.0	50±4.0	50±5.0	1600
160±6.0	90±4.0	50±5.0	1155
170±6.0	100±5.0	50±5.0	1750
170±6.0	120±4.0	50±5.0	1300
190±6.0	90±5.0	50±5.0	2261
200±6.0	140±4.0	50±5.0	1735
200±8.0	120±4.0	50±5.0	2009

NOTE:

Upon coordination with the client there may be supplied bushings of another height.

The height tolerance of the bushings of more than 50 mm height increases per 2 mm every 10 mm plus accordingly.

4.9 Polytetrafluoroethylene plates F4K20, F4K15M5, F4M5

TS 6-05-1413-76, TS 301-05-109-91

Plates dimensions and weight

Dimensions, mm			Product calculated weight per 1mm of thickness, g
Width	Length	Thickness	
200±10	200±10	5-10±1	93
		10-30±2	
		30-50±3	
250±10	250±10	5-10±1	150
		10-30±2	
		30-50±3	
300±10	300±10	5-10±1	215
		10-30±2	
		30-50±3	
350±10	350±10	5-10±1	300
		10-30±2	
		30-50±3	
400±25	400±25	10-30±2	400
		30-50±3	
500±30	500±30	10-30±2	600
		30-50±3	
550±20.0	730±20.0	7-10±2	850
NOTE: Upon coordination with the client there may be supplied plates of a greater thickness, up to 100 mm.			

Characteristics of materials F4K20, F4K15M5, F4S15, F4UV15, F4M5 (reference information)

Characteristics denomination	F4K20	F4K15M5	F4S15	F4UV15	F4M5
Density, g/cm ³	2.05	2.1	2.17	1.95	2.2
Rupture tensile stress, MPa	11.8–14.6	13.7–17.1	9.8–17.1	15.0–18.0	–
Failure elongation, %, not less than	65.0	150	220	60.0	300
Coefficient of elasticity, MPa ² : on compression	805	800	520	–	–
on expansion	1500	–	480	–	–
Brinell hardness, Mpa	49–53.8	49	39–43	–	–
Deformation under load 10 MPa (24h), %	2.9–3.0	3.5–4.0	3.0–4.0	–	–
Tension at 10% deformation, MPa	21.5	20.0	19.5–20.5	–	–
Heat conductivity, W/(m.K), %	0.23	0.29	0.25	–	–
Specific heat capacity, J/kg, °	0.71	–	0.9	–	–
Linear expansion coefficient x 10 ⁻⁵ °C ⁻¹ from –60°C up to +20°C	8–11	–	4.5–12.5	–	–
Vicat Heat capacity, °C	145–160	–	130–140	–	–
Water absorption after 24h, %	0.03	–	0.04	0.01	–
Extreme, PV, kPa Mc/:					
at V = 0.05 m/sec	490	588	343	–	–
at V = 0.5 m/sec	687	687	442	–	–
at V = 5 m/sec	1078	1078	542	–	–
Wear rate, g/h, not more than	2.0x10 ⁻³	0.8x10 ⁻³	3.0x10 ⁻³	1.5x10 ⁻³	5x10 ⁻³
Friction coefficient of steel	0.14–0.30	0.1–0.39	0.15–0.3	–	–
Operating temperatures rate, °C	from –60 up to +250	from –60 up to +250	from –60 up to +250	from –60 up to +250	from –60 up to +250

Technical requirements TS 6-05-1413-76

Characteristics denomination	Standards					
	F4K20		F4K15M5		F4DS15	
	Premium grade	First grade	Premium grade	First grade	Premium grade	First grade
Density, g/cm ³ , not less than	Not specified	Not specified	Not specified	Not specified	2.18	Not specified
Rupture density, Mpa (kgf/cm ²), not less than	Not specified	Not specified	Not specified	Not specified	12.7 (130)	Not specified
Relative elongation at rupture, %	Not specified	Not specified	Not specified	Not specified	220	Not specified
Wear rate, g/h, not more than	1.5x10 ⁻³	2.0x10 ⁻³	0.8x10 ⁻³	1.2x10 ⁻³	3.0x10 ⁻³	5.0x10 ⁻³
Appearance	The surface of bushings, cores and discs should be void of cracks, bulging; the colour ranging from dark grey to black. There may be small surface pinchers, inclusions, scratches, mould marks that are easily eliminated by taking off of a 0.5 mm layer from the pill surface.		The surface of bushings, cores and discs should be void of cracks, bulging; the colour ranging from dark grey to black. There may be small surface pinchers, inclusions, scratches, mould marks that are easily eliminated by taking off of a 0,5 mm layer from the pill surface.		The surface of bushings, cores and discs should be void of cracks, bulging. There may be small surface pinchers, inclusions, scratches, mould marks that are easily eliminated by taking off of a 0.5 mm layer from the pill surface.	

Technical requirements TS 301-05-16-89

Index denomination	Standard
Appearance and colour of the surface	F4UV15 The colour of the pills should range from dark grey to black. The surface of bushings, cores and discs should be void of cracks and bulging. There may be roughness, pinchers, scratches, mould and grease marks. Inclusions that are not a part of the composition are not allowed. There may be a sample appearance agreed accordingly.
Density, g/cm ³ , not less than	1.95
Rupture density, Mpa (kgf/cm ²), not less than	15.0 (153)

Technical requirements TS 301-05-109-91

Index denomination	Standard
	F4M5
Density, g/cm ³ , not less than	2.2
Rupture density, Mpa (kgf/cm ²), not less than	27.0 (265)
Relative elongation at rupture, %	300
Wear rate, g/h, not more than	5.0 x10 ⁻³



**POLYTETRAFLUOROETHYLENE-D
PRODUCTS**



Hot-press crude Polytetrafluoroethylene-D film (film SKLF-4D)

TS 301-05-49-90

Hot-press crude Polytetrafluoroethylene-D film is applied as electrical insulation material for wires, cables and other electrotechnical products in the form of a monolith-caked coat.

It is a non-sintered two-axle-oriented film made from Polytetrafluoroethylene-D series “SH” and “L” manufactured using the extrusion-calender method supplied as tapes of various width.

Hot-press crude Polytetrafluoroethylene-D film is issued in the following variants:

- colourless unfilled;
- colourless filled;
- coloured unfilled;
- coloured filled.

Inorganic pigments are used as dyes and fillers.

Upon coordination with the customer there are issued up to ten primary colours of the coloured unfilled film (white, yellow, red, orange, dark blue, green, brown, black, violet, grey), of the coloured filled — 6 colours (red, orange, yellow, dark blue, grey, green) and of the uncoloured filled — only white colour.

Hot-press crude Polytetrafluoroethylene-D film is non-explosive, incombustible, and at direct contact is not injurious to a person.

Operating temperatures of a film product are from -60°C up to $+250^{\circ}\text{C}$.

Warranty period of storage of a hot-press crude Polytetrafluoroethylene-D film is 5 years from the date of manufacturing.

Thread sealing tape FUM-1, FUM-2, FUM-3 (tape FUM)

TS 6-05-1388-86

Tape FUM is a non-sintered Polytetrafluoroethylene-D film produced by cord drawing.

Tape FUM is intended for the sealing of carving connections of technological conduits that transport corrosive liquids and gases in the temperature range from minus 60°C up to plus 200°C. It can be applied in the process equipment of pharmaceutical, food and medical industry, in pipelines of hot and cold water supply, including drinking water supply.

Tape FUM provides tightness of the carving connections working at pressure up to 64.7 MPa (660 kgf/cm²).

Depending on the application there are 3 series of tape FUM issued:

- Series FUM-1 — for sealing of systems with environments of common industrial type, as well as systems with strong hostile environments (concentrated and diluted solutions of acids and alkalis); contains greasing — medical liquid paraffin in accordance with GOST 3164-78 — from 17 up to 20 %;
- Series FUM-2 — for sealing of systems working on oxygen and other strong oxidizers; does not contain greasing;
- Series FUM-3 — for sealing of systems with environments of common industrial type, as well as systems with strong hostile environments (concentrated and diluted solutions of acids and alkalis); it is the edge part of tapes FUM-1, FUM-2 and SKLF-4D film manufactured in accordance with TS 301-05-49-90.

Moreover tape FUM is issued in individual package for retail trade.

Warranty period of storage of any FUM tape is 13 years from the date of manufacture.

Sealing material FUM

TS 6-05-1570-86

Fluoroplast sealing material (FUM) is a profile product from non-sintered Polytetrafluoroethylene-D, series “U” and “T” (GOST 14906-77), containing various greasings, or without greasing.

FUM is used as a chemically resistant self-greased packing and gasket material in stop-valve units, pumps and as various sealing of chemical equipment, pipelines, as well as in the equipment of the food and pharmaceutical industry. The range of operating temperatures is from minus 60°C up to plus 150°C (series FUM-V and FUM-F) and up to plus 200°C (series FUM-O) at pressure up to 6,3 MPa (64 kgf/cm²).

Depending on the application there are 3 series of FUM issued:

- Series FUM-V — for various hostile environment of common industrial type. It contains grease “V”.
- Series FUM-F — for special operating conditions. It contains grease “F”;
- Series FUM-O — for especially pure environments and strong oxidizers. Does not contain any greasing.

FUM — O withstands an admissible total absorbed dose of radiation up to 10³ Gy (10⁵ rad) not changing the operational characteristics.

Warranty period of storage of FUM-O — 20 years, of FUM-V and FUM-F — 14 years from the date of manufacture.

FUM is issued in three shapes: round, square and rectangular.

Upon coordination with the customer FUM we may supply a FUM of another shape or size (physico-mechanical parameters thus are not normalized) and deliver the material in blocks of shorter length.

The minimal length of any FUM is 2 m.

Polytetrafluoroethylene-D, Polytetrafluoroethylene-DM dielectric tubes

GOST 22056-76

Polytetrafluoroethylene-D, Polytetrafluoroethylene-DM dielectric tubes are used for electric isolation of wires.

The tubes have a high chemical stability to various hostile environments, and are efficient in various climatic conditions.

Operating temperatures range is from minus 196°C up to plus 250°C.

Warranty period of storage — 17 years from the date of manufacture.

5.1 Hot-press crude Polytetrafluoroethylene-D film (film SKLF-4D)

TS 301-05-49-90

HOT-PRESS CRUDE POLYTETRAFLUOROETHYLENE-D FILM DIMENSIONS

Thickness, mm	Width, mm	Width tolerance, mm	Film length, not less than, m	
0.045±0.007 0.070±0.007 0.085±0.009 0.100±0.010 0.125±0.012 0.150±0.015	3.0		40	
	4.0	±0.3	50	
	5.0			
	6.0		80	
	8.0			
	10.0	±0.5	100	
	12.0			
	14.0			
	16		110	
	18	±1		
	20			
	25			
		from 30 up to 150	—	150

NOTE:

Upon coordination with the customer there may be a delivery of a film of a smaller length on the coil.

Winding of the film on the coil can be carried out in one or several streams (rolls).

The length of a film of 0.100±0.010 mm thickness maybe 50 % less than the length specified in the table.

Upon coordination with the customer the film can be delivered in 160mm-wide rolls not-cut or wide-cut in the limits from 30 up to 150 mm. the requirements for which are agreed upon order.

Film quality index

Characteristics denomination	Standard for a mm-thick film:					
	0.045		0.070—0.100		0.125—0.200	
	Premium class	First class	Premium class	First class	Premium class	First class
COLOURLESS UNFILLED						
Appearance	The surface of a film along the whole length should be smooth, without breaks and folds. There should not be any mechanical pollution or agnail in the film. The variety of the tint of a film within the limits of the coil — in conformity with the check sample.					
Mass fraction of greasing after extraction, %, not more than:	0.08	0.09	0.09	0.10	0.09	0.10
Tensile strength, MPa (kgf/cm ²), not less: in the longitudinal direction in the traverse direction	12.7 (130) 1.5 (15)	9.8 (100) 0.9 (10)	10.8 (110) 1.0 (11)	8.8 (90) 0.8 (8)	5.8 (60) 0.9 (10)	4.9 (50) 0.8 (8)
Relative elongation at rupture, % not less: in the longitudinal direction in the traverse direction	100 600	90 400	95 550	80 400	70 500	60 400
Longitudinal shrinkage, %, not more	30	30	30	30	30	30
Dielectric dissipation at 10 ⁶ Hz rate, not more	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Dielectric conductivity at 10 ⁶ Hz rate, not more	2.1	2.2	2.2	2.2	2.2	2.2
Specific volumetric electric resistance, Ohm of m, not less	1x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁴	1x10 ¹⁴
Electric strength at DC voltage, MB/m, not less than	250	250	200	150	50	25
COLOURLESS FILLED COLOURED UNFILLED COLOURED FILLED						
Appearance	The surface of a film along the whole length should be smooth, without breaks and folds. There should not be any mechanical pollution or agnail in the film. The variety of the tint of a film within the limits of the coil — in conformity with the check sample.					
Mass fraction of greasing after extraction, %, not more than:	0.09	0.09	0.09	0.10	0.09	0.10
Tensile strength, MPa (kgf/cm ²), not less: in the longitudinal direction in the traverse direction	10.8 (110) 1.2 (13)	7.8 (80) 0.8 (8)	10.8 (110) 1.2 (13)	7.8 (80) 0.8 (8)	5.8 (60) 0.9 (10)	4.9 (50) 0.8 (8)

Characteristics denomination	Standard for a mm-thick film:					
	0.045		0.070—0.100		0.125—0.200	
	Premium class	First class	Premium class	First class	Premium class	First class
Relative elongation at rupture, % not less: in the longitudinal direction	90	80	90	80	70	60
in the traverse direction	550	400	550	400	500	400
Longitudinal shrinkage, %, not more	30	30	30	30	30	30
Dielectric dissipation at 10 ⁶ Hz rate, not more	Not specified		Not specified		Not specified	
Dielectric conductivity at 10 ⁶ Hz rate, not more	Not specified		Not specified		Not specified	
Specific volumetric electric resistance, Ohm of m, not less	1x10 ¹³	1x10 ¹³	1x10 ¹³	1x10 ¹³	1x10 ¹³	1x10 ¹³
Electric strength at DC voltage, MB/m, not less than	80	70	80	70	50	25

5.2 Thread sealing tape FUM-1, FUM-2, FUM-3 (tape FUM).

TS 6-05-1388-86

FUM dimensions

Tape FUM	Width, mm	Width tolerance, mm	Thickness, mm
Series FUM-1 premium class first class	10	±1.0	0.10±0.02 0.11±0.02 0.14±0.02
	15		
	20		
	40		
	60		
	80		
	100		
Series FUM-2	3	±1.0	0.045±0.010 0.065±0.010 0.085±0.010 0.105±0.010 0.14±0.02 0.18±0.02
	4		
	5		
	6		
	8		
	9		
	10		
	12		
	14		
	15		
	16		
	18		
	20		
Series FUM-3 First class Second class	3-10	-	0.12±0.09
	10-20	-	

NOTE:

The minimal length of a tape: Series FUM-1 – 1,0 m; Series FUM-2 – 1,0 m; Series FUM-3 – 1,0 m.

Upon coordination with the customer we can supply other sizes of the film not specified in the table. For retail trade the film is delivered of 10mm width and of not less than 15m length in an individual package in accord with TS Ko4-81.

FUM tape quality index

Series FUM-1		Series FUM-2	Series FUM-3
Premium class	First class		
Appearance			
The tape might have a various colour tint. There may be dark spots and separate inclusions. The surface of the tape should be smooth, without breaks. Waviness is also possible.			
Tensile strength, MPa (kgf/cm²), not less:			
6.86 (70)	4.9 (50)	For thickness: up to 0.105 mm inclusive – 6.86 (70); exceeding 0.105 mm – 4.90 (50)	2.94 (30)
Relative elongation at rupture, % not less:			
95	80	70	40
Mass fraction of greasing, %, not more than:			
Not determined		0.15	Not determined

NOTE:

Tape FUM is delivered reeled up on plastic coils.
Winding on the coil of several pieces of a tape is admissible.
Winding should be tight.

5.3 Sealing material FUM

TS 6-05-1570-86

Fluoroplast sealing material FUM-V (section — round)

Diameter, mm	Diameter tolerance, mm	1 m weight, g
1.0	±0.2	1.5
2.0	±0.2	5
2.5	±0.25	10
3.0	±0.3	12
4.0	±0.4	25
5.0	±0.5	35
6.0	±0.6	55
7.0	±0.7	75
8.0	±0.8	105
10.0	±1.0	160
12.0	±1.2	230
14.0	±1.4	317
16.0	±1.6	415
18.0	±1.8	524
20.0	±2.0	647
22.0	±2.2	780

Fluoroplast sealing material FUM-V (section – square, rectangular)

Dimensions, mm	Tolerance, mm		1 m weight, g
	height	width	
3X3	±0.3	±0.3	15
4X4	±0.4	±0.4	30
5X5	±0.5	±0.5	50
6X6	±0.6	±0.6	70
7X7	±0.7	±0.7	100
8X8	±0.8	±0.8	125
10X10	±1.0	±1.0	200
12X12	±1.2	±1.2	288
14X14	±1.4	±1.4	392
16X16	±1.6	±1.6	512
2X4	±0.2	±0.4	15
2X5	±0.2	±0.5	20
2X6	±0.2	±0.6	25
2X7	±0.2	±0.7	27
2X8	±0.2	±0.8	30

Fluoroplast sealing material FUM-F (section — round)

Diameter, mm	Diameter tolerance, mm	1 m weight, g
2.0	±0.2	5
3.0	±0.3	12
4.0	±0.4	25
5.0	±0.5	35
6.0	±0.6	55
7.0	±0.7	75
8.0	±0.8	105

Fluoroplast sealing material FUM-F (section — square, rectangular)

Dimensions, mm	Tolerance, mm		1 m weight, g
	height	width	
3x3	±0.3	±0.3	15
4x4	±0.4	±0.4	30
5x5	±0.5	±0.5	50
6x6	±0.6	±0.6	70
7x7	±0.7	±0.7	100
8x8	±0.8	±0.8	125
2x4	±0.2	±0.4	15
2x5	±0.2	±0.5	20
2x6	±0.2	±0.6	25
2x7	±0.2	±0.7	27
2x8	±0.2	±0.8	30

Fluoroplast sealing material FUM-O (section – round)

Diameter, mm	Diameter tolerance, mm	1 m weight, g
2.0	±0.2	5
3.0	±0.3	12
4.0	±0.4	25
5.0	±0.5	35
6.0	±0.6	55
7.0	±0.7	75
8.0	±0.8	100

Fluoroplast sealing material FUM-O (section – square, rectangular)

Dimensions, mm	Tolerance, mm		1 m weight, g
	height	width	
3x3	±0.3	±0.3	15
4x4	±0.4	±0.4	30
5x5	±0.5	±0.5	50
6x6	±0.6	±0.6	70
7x7	±0.7	±0.7	100
8x8	±0.8	±0.8	125
2x4	±0.2	±0.4	15
2x5	±0.2	±0.5	20
2x6	±0.2	±0.6	25
2x7	±0.2	±0.7	27
2x8	±0.2	±0.8	30

Sealing material quality index

Series FUM-V		Series FUM-F	Series FUM-O	
Premium class	First class		Premium class	First class
Appearance				
<p>The colour of the material varies from white to creamy. There may be small dark spots and lines. The surface of the material should be smooth, without cracks, profound pinchers, blisters and tousled parts. There may be small surface cracks but not more than 15mm length.</p>				
Tensile strength, MPa (kgf/cm²), not less:				
3.43 (35)	2.45 (25)	1.96 (20)	2.94 (30)	2.35 (24)
Relative elongation at rupture, % not less:				
100	50	60	50	40

5.4 Polytetrafluoroethylene-D, Polytetrafluoroethylene-DM dielectric tubes

GOST 22056-76

Tubes dimensions and weight

Inner diameter, mm	Wall thickness, mm	Tolerance, mm		1 m weight, g
		Inner diameter	Wall thickness	
0.3	0.2	±0.10	+0.06 -0.02	0.68
0.4	0.2	±0.10	+0.06 -0.02	0.81
0.5	0.2	±0.10	+0.06 -0.02	0.97
0.6	0.2	±0.15	+0.06 -0.02	1.10
0.7	0.2	±0.15	+0.06 -0.02	1.23
0.8	0.2	±0.15	+0.06 -0.02	1.36
0.9	0.2	±0.15	+0.06 -0.02	1.52
1.0	0.2	±0.15	+0.06 -0.02	1.65
1.0	0.3	±0.15	+0.09 -0.03	2.68
1.2	0.3	±0.15	+0.09 -0.03	3.08
1.5	0.3	±0.15	+0.09 -0.03	3.70
1.6	0.3	±0.15	+0.09 -0.03	3.9
1.8	0.3	±0.15	+0.09 -0.03	4.3
2.0	0.3	±0.15	+0.09 -0.03	4.73
2.0	0.4	±0.15	+0.12 -0.04	7.96

Inner diameter, mm	Wall thickness, mm	Tolerance, mm		1 m weight, g
		Inner diameter	Wall thickness	
2.0	1.0	±0.15	+0.15 -0.05	22.40
2.1	0.4	±0.15	+0.12 -0.04	6.86
2.2	0.4	±0.15	+0.12 -0.04	7.13
2.4	0.4	±0.15	+0.12 -0.04	7.85
2.5	0.4	±0.15	+0.12 -0.04	7.96
2.6	0.4	±0.15	+0.12 -0.04	8.30
2.8	0.4	±0.15	+0.12 -0.04	8.84
3.0	0.4	±0.15	+0.12 -0.04	9.33
3.0	1.0	±0.15	+0.15 -0.05	29.50
3.5	0.6	±0.30	+0.09 -0.03	16.90
3.8	0.6	±0.30	+0.09 -0.03	18.10
4.0	0.6	±0.30	+0.09 -0.03	18.90
4.0	1.0	±0.30	+0.15 -0.05	26.60
4.2	0.6	±0.30	+0.09 -0.03	19.70
4.5	0.6	±0.30	+0.09 -0.03	20.96
5.0	0.6	±0.30	+0.09 -0.03	23.10
5.0	1.0	±0.30	+0.15 -0.05	41.20
5.5	1.0	±0.30	+0.15 -0.05	44.40
6.0	1.0	±0.30	+0.15 -0.05	48.30

Inner diameter, mm	Wall thickness, mm	Tolerance, mm		1 m weight, g
		Inner diameter	Wall thickness	
6.0	1.5	±0.30	+0.23 -0.07	77.23
7.0	1.0	±0.30	+0.15 -0.05	54.80
8.0	1.0	±0.30	+0.15 -0.05	62.20
8.0	1.5	±0.30	+0.23 -0.07	97.50
8.0	2.0	±0.30	+0.30 -0.10	140.00
9.0	1.5	±0.30	+0.23 -0.07	108.00
10.0	1.5	±0.30	+0.23 -0.07	118.40
12.0	1.5	±0.30	+0.23 -0.07	152.0

NOTE:

Polytetrafluoroethylene-D, Polytetrafluoroethylene-DM tubes are delivered by length not less than 1.0 m — 95 %, length 0.3 — 1.0 m — 5 %. Upon certain coordinated re-quests we may produce Polytetrafluoroethylene-D, Polytetrafluoroethylene-DM dielectric tubes of other sizes (nevertheless, the inner diameter should be not more than 10.0 mm).

Tubes quality index

Quality index	Norm
Colour of uncoloured tubes	White natural
Tensile strength, MPa (kgf/cm ²), not less:	Without additional heat treatment in diameter from 0.3 up to 7.0 mm inclusive — not less than 32 (320) Exceeding 7.0 up to 10.0 mm inclusive — not less than 27 (270) With additional heat treatment — not less than 35 (350)
Relative elongation of tubes at rupture, %	Without additional heat treatment — not less than 250; With additional heat treatment — not less than 210

NOTE:

Upon coordination with the customer unpainted dielectric Polytetrafluoroethylene-D, Polytetrafluoroethylene-DM tubes of a creamy colour may be issued.

RECOMMENDATIONS

- Transportation of Fluoroplast products should be carried out in conditions excluding their falling, sharp impacts and mechanical damages.
- Polytetrafluoroethylene tubes and shaped parts of pipelines should be stored on shelves or equal platforms in one row, tube support by a flange should be eliminated, and each tube should have a support along the whole length or in several places. Storage of pipes of one diameter in cells in several rows with the arrester on the body of the tube, not on the flanges is also allowed.
- Temperature (desirable) of storage of tubes and shaped parts of pipelines should not be below minus 10 °C.
- Storage of tubes and shaped parts of pipelines should be made only with mounted blank flanges used for preservation of the form and geometrical sizes of the crimp seal; blind removal should be carried out whilst installation of the pipelines.
- If there is a temperature difference of storage and processing of Fluoroplast products, as well as, in case of gaging of parts it is mandatory to expose them to conditioning (to store them at 23±2 °C for not less than 12 h).
- To preserve the form and geometrical sizes of Fluoroplast bushings their packing is conducted vertically (in wooden boxes), their storage should be done in the same vertical position.
- We would like to draw your attention to fact that the processing of Fluoroplast products has a number of peculiarities with its physicomechanical properties, that determine technological modes of processing and geometry of the cutting tool.
- At manufacturing of precision details it is necessary to consider, that at temperature 19,6 °C there is a variation of crystal modification of polymer and a variation of volume of a detail up to 1,5 %. Therefore, processes of treatment, measurement and assembly of details should be carried out at the same temperatures 23±2 °C.
- All electrogas-welding works at the installation site of Fluoroplast pipelines should be finished prior to the beginning of installation. At installation of pipelines the possibility of mechanical damages or thermal influences on them should be excluded.
- The following is not allowed at installation:
 - Tubes overcast by their heating;
 - The lining of pipelines closer than one meter from pipelines (including temporary), transporting steam and hot products at temperature above plus 80 °C and not having thermal insulation.





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