



KAZAN  
SYNTHETIC  
RUBBER PLANT



# PRODUCT CATALOGUE



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# ABOUT THE ENTERPRISE

Kazan Synthetic Rubber Plant is one of the leading enterprises of the petrochemical industry in Russia. The main products are polysulfide polymers and sealants based on them, sodium butadiene rubber, silicone rubbers and rubber mixes (aircraft rubbers), silicone sealants and compounds, polyesters, urethane rubbers, latexes, silicone self-fusing materials, automotive gasket makers, materials for construction purposes. The plant is committed to implement the best processes at all production stages.

**KSRP production complex consists of the following main divisions:**

- **Polybutadiene production**

SKB sodium butadiene rubber has been produced at the enterprise since 1936 and is one of the first KSRP products. Vinylidene chloride latex production has been implemented.

- **Polysulfide production**

Commissioned in 1965, KSRP is the only manufacturer in Russia and one of the three manufacturers of polysulfide oligomers and products based on them in the world. These are special sealants for aircraft, ship-building, automotive and electrical industries. Joint sealants are widely used in civil and industrial construction.

- **Silicone production**

Kazan synthetic rubber plant is the first and only enterprise in Russia producing silicone rubbers. Materials based on it are used for the needs of power engineering, automotive industry, aviation equipment and instrument production. It is a promising and dynamically developing division. It produces rubber compounds, automotive sealants, special and general-purpose sealants, self-fusing materials, in the production of which radiation curing was used for the first time in Russia.

- **Polyurethane production**

This is a production complex of polyesters and urethane rubbers based on them. Due to their unique properties (high oil and petrol resistance, vibration resistance, and exceptional wear resistance) they are widely used in radio electronics, automotive industry, construction and rubber industry. Close relations with the institutes of Tatarstan and Russia, large reserve of production capacities, high capital/labor ratio of production and relatively low prices for the products compared with foreign equivalents drive the prospect of development of new directions.

- **Self-extinguishing fabric-film materials**

Kazan Synthetic Rubber Plant produces self-extinguishing fabric-film materials for application in aviation, shipbuilding, machinery, metallurgical industries. This material is used to manufacture: life-saving equipment and evacuation slides, life jackets, flotation devices, fire-resistant covers, etc.

- **Competence center for manufacture of rubber products**

Kazan Synthetic Rubber Plant performs the full cycle of development and production of rubber products.

STAGE I Creation of the base rubber.

STAGE II Creation of rubber mixes.

STAGE III Development of product design.

STAGE IV Industry-specific qualification of products.

STAGE V Industrial scale production of raw materials and finished rubber products.

STAGE VI After-sales service.





# KSRP production complex

## ▶ Polysulfide production

Sealants and mastics based on polysulfide oligomers

Aircraft industry  
Ship-building industry  
Automotive industry  
Machinery industry  
Electrical industry  
Rocket and Aerospace technology  
Consumer goods industry  
Civil, industrial and road construction

## ▶ Polybutadiene production

SKB sodium-butadiene rubber  
DVHB M vinylidene chloride latex  
DVHB vinylidene chloride latex

Asbestos industry  
Electrical industry  
Footwear industry  
Food industry  
Abrasives production  
Shoe board production  
Ship-building industry

## ▶ Silicone production

Silicone rubbers

Silicone rubber mixes  
Silicone sealants and compounds  
Self-fusing materials (LETSAR)

Electrical Industry  
Fuel industry  
Construction  
Consumer goods industry  
Machinery industry  
Food industry  
Instrument production  
Art and decoration  
Ship-building  
Automotive industry

## ▶ Urethane production

Polyesters  
Urethane rubbers  
Urethane fluoropolymers

Machinery industry  
Consumer goods industry  
Production of rubber goods  
Abrasives production  
Construction  
Paint and varnish industry

## ▶ Self-extinguishing fabric-film materials

## ▶ Development of rubber products

Competence center for manufacture of rubber products  
Mold design  
Serial production of rubber products

# 1. POLYSULFIDE PRODUCTION

## 1.1 Liquid polysulfide polymers (Specification 38.50309-93)

## Liquid thiokols (Specification 38.003151-80, GOST 12812-80)

## Liquid polysulfide polymers (Specification 20.17.10-005-19346675-2021)

### Description

Liquid polysulfide polymers are sulfur-containing reactive oligomers with active end groups, curable in compositions with various fillers. Polysulfide polymers are resistant to oils, petroleum fuels, acids, alkalis, ozone, sunlight, radiation, have high gas impermeability, non-explosive, low-combustible, non-toxic.

### Application

Intended for manufacture of sealing pastes that are used in the aviation industry, shipbuilding, electrical industry, radio electronics and civil engineering

### Characteristics

| Parameters  | NVB-2    | NVB-2M    | Grade I   | Grade II  | Grade 32  | II-NT     |
|---|----------|-----------|-----------|-----------|-----------|-----------|
| Viscosity at 25 °C, Pa·s                                      | 7.5-11.0 | 10.0-15.0 | 15.0-30.0 | 30.1-50.0 | 35.0-46.0 | 30.1-50.0 |
| Total sulfur content by weight, %, maximum                    | 40       | 40        | 40        | 40        | 40        | 40        |
| Water content by weight, %, maximum                           | 0.2      | 0.3       | 0.2       | 0.2       | 0.2       | 0.2       |
| SH groups content by weight, %, within the range of           | 3.0-4.0  | 2.8-4.0   | 2.2-3.3   | 1.7-2.6   | 1.7-2.6   | 1.8-2.5   |
| Content of toluene-insoluble impurities by weight, %, maximum | 0.60     | 0.60      | 0.60      | 0.60      |           | 0.60      |
| Cured properties  |          |           |           |           |           |           |
| Pot life, h.  | -        | -         | 2-8       | 2-8       | -         | 2-5       |
| Shore A hardness, units, minimum                              | -        | -         | 20        | 40        | -         | 30        |
| Nominal tensile strength, MPa, minimum                        | 1.47     | -         | 1.57      | 2.65      | -         | -         |
| Elongation at break, %, minimum                               | 250      | -         | 250       | 180       | -         | 270       |
| Relative residual deformation after breaking, %, maximum      | 12       | -         | 10        | 6         | -         | 8         |

**Packing:** metal container

**Guaranteed shelf life:** 3 years



# 1. POLYSULFIDE PRODUCTION

## 1.2 Liquid polysulfide polymers-based sealants

**U-30MES-5, UT-32** (Specification 38.1051386-80),

**U-30MES-5NT** (Specification 38.605462-91),(Specification 1-595-28-696-2003)

**UT-32NT** (Specification 38.605462-91),

**UT-34** (GOST 24285-80),

**U-30M** (GOST 13489-79)

**U-30MES-5M** (Specification 1-595-28-697-2020),

**VITEF-1NT** (Specification 38.1051291-84), (1-595-28-708-2003)

### Description

Liquid polysulfide polymers-based sealants are three-component compositions consisting of the base (sealing) paste, hardening (curing) paste and a curing accelerator. The sealants can cure at a temperature not lower than 18 °C; UT-34, U-30MES-5M, U-30M - not lower than 15 °C.

The sealants feature good deformability, high oil and petrol resistance, good resistance to UV irradiation, oxygen, moisture, and air impermeability.

### Application

U-30MES-5, U-30MES-5NT, UT-32NT, U-30MES-5M, VITEF-1NT are designed for: surface and seam sealing of riveted, welded and bolted joints, aircraft structures, instruments and other products, repair of aircraft equipment;

UT-32, UT-34 are designed for sealing riveted, bolted and other mechanical joints; feedthroughs, plug connectors, fuel compartments.

U-30M is a general-purpose sealant, it is used for sealing of fixed metal (except brass, copper, silver and their alloys) and other joints operating in air, dilute acids, alkalis and fuels.

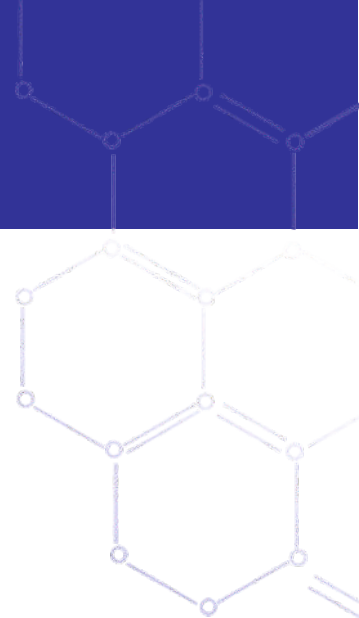
**Package:** Base paste – metal container, curing paste – plastic can, curing accelerator – plastic bag.  
U-30MES-5NT sealant can be packed in disposable cartridges.

### Guaranteed shelf life:

- U-30MES-5, U-30MES-5NT, UT-32NT, UT-34, UT-32: base paste – 3 months, curing paste – 12 months, curing accelerator – 12 months;
- VITEF-1NT: base paste – 6 months, curing paste – 3 months;
- U-30MES-5M: base paste – 4 months, curing paste – 12 months, curing accelerator – 12 months;
- U-30M: base paste – 18 months, curing paste – 12 months;
- U-30MES-5NT in cartridge – 4 months.



# 1. POLYSULFIDE PRODUCTION



## Characteristics:

| Parameters  | U-30MES-5                           | U-30MES-5NT                         |      |       | UT-32NT | U-30M                               | U-30MES-5M                          | VITEF-INT   | UT-34       | UT-32                               |
|---|-------------------------------------|-------------------------------------|------|-------|---------|-------------------------------------|-------------------------------------|-------------|-------------|-------------------------------------|
|   |                                     | A                                   | B    | C     |         |                                     |                                     |             |             |                                     |
| Pot life, h, within the range of                                    | 2-10                                | 2-4                                 | 6-10 | 10-15 | 2-8     | 2-9                                 | 2-5                                 | 1-10        | 3-20        | 2-8                                 |
| Nominal tensile strength, MPa, minimum                              | 1.76                                | 1.47                                |      |       |         | 2.6                                 | 1.76                                |             | 0.59        | 1.47                                |
| Elongation at break, %, minimum                                     |                                     | 200                                 |      |       |         | 160                                 | 200                                 | 160         | 170         | 200                                 |
| Relative residual deformation after breaking, %, maximum            | -                                   | -                                   | 8    | 8     | -       | -                                   | 8                                   | 8           | 12          | -                                   |
| Shore A hardness, units, minimum                                    | -                                   | 35                                  | 30   |       | 25      | 40                                  | 35                                  | 30          | -           | -                                   |
| Bond strength when peeled from D-16AT anodized alloy, kN/m, minimum | 1.96                                | 1.96                                |      |       | 1.47    | -                                   | 1.96                                | 1.96        | 1.66        | 1.47                                |
| Brittleness temperature limit, °C, not higher than                  | -36                                 | -36                                 | -36  | -     | -36     | -35                                 | -                                   | -           | -33         | -36                                 |
| Working temperature range, °C<br>- in air environment               | -60 to +130<br>(short-term at +150) | -60 to +130<br>(short-term at +150) |      |       |         | -60 to +130<br>(short-term at +150) | -60 to +130<br>(short-term at +150) | -60 to +150 | -60 to +130 | -60 to +130<br>(short-term at +150) |
| - in TS-1 type fuel environment                                     | -                                   | -60 to +130<br>(short-term at +150) |      |       |         | -60 to +130<br>(short-term at +150) | -60 to +130                         | -60 to +130 | -           | -                                   |

# 2. POLYBUTADIENE PRODUCTION

## 2.1 SKB sodium-butadiene rubber (Specification 38.303-04-08-93)

### Description

A product of polymerization of butadiene and butylene-isobutylene fractions in the presence of metallic sodium. Non-toxic, non-explosive, non-spontaneously combustible.

### Application

Rubber materials and products made from SKB rubber feature resistance to thermal aging and repeated deformations. They have good compounding properties, are easily mixed with other ingredients in mixtures, and have high processing performance.

SKB rubber is produced with and without the addition of antioxidant.

Depending on the type of antioxidant, SKB-R rubber for general technical applications and food grade SKB-RShch intended for manufacture of rubber products that come into contact with food are produced.

Depending on plasticity, rubber is subdivided into SKB-R (30, 40, 50), SKB-RShch (30, 40) grades. SKB-R is used in various industry sectors:

- In the rubber industry - for production of conveyor belts, rubber seals, gaskets, etc.;
- In the asbestos industry - for production of brake pads;
- For manufacture of acid and alkali resistant porous rubbers;
- In the electrical industry - for manufacture of electrical insulating gaskets (if heat resistance is not required), ebonite products;
- In the cable industry - for insulation of sheaths of high-voltage and low-voltage cables;
- In the footwear industry - for manufacture of rubber parts of shoes, as well as for varnish coating of rubber shoes;
- In production of abrasive materials - as a binder.
- For manufacture of rubber products for home applications.
- SKB-RShch rubber is used for manufacture of:
  - Jar sealing rings used in the canned food industry;
  - Food grade rubber goods.

### Characteristics:

| Parameters   | Standard requirement for grades |           |           |
|--|---------------------------------|-----------|-----------|
|  | 30                              | 40        | 50        |
| Plasticity, within the range of                            | 0.26-0.35                       | 0.36-0.45 | 0.46-0.55 |
| Nominal tensile strength, MPa, minimum                     | 9.8                             | 9.8       | 9.8       |
| Elongation at break, %, minimum                            | 400                             | 400       | 400       |
| Relative residual deformation after breaking, %, maximum   | 50                              | 50        | 50        |
| Mass fraction of ash, %, max.                              | 3.5                             | 4.5       | 5.0       |
| Weight loss after drying at 105 °C for 3 hours, %, maximum | 1.0                             | 1.0       | 1.0       |

**Package:** in the form of (30 ± 0.5) kg blocks packed in synthetic fabric bags

**Guaranteed shelf life:** with antioxidant: SKB-R - 12 months, SKB-RShch - 6 months, without antioxidant: 2 months.



# 2. POLYBUTADIENE PRODUCTION

## 2.2 Latex DVHB-70 (Specification 38.303-04-03-90)

### Description

An aqueous dispersion of a vinylidene chloride and butadiene copolymer. Forms an elastic film with high adhesion to fabrics, cellulose, leather and other materials.

### Application

Used in production of leather substitutes, for production of asbestos-cement mixtures, production of carpet products, production of shoe board and in other industries.

### Characteristics:

| Parameters  | Values   |
|---|--|
| Appearance  | Turbid liquid without coagulum and mechanical impurities. Surface film is not considered a defect (the film must be filtered out before using the latex) |
| Dry solids content by weight, %, minimum  | 26.0   |
| Volatile unsaturated compounds content by weight, %, maximum<br>- including C <sub>2</sub> ~C <sub>4</sub> hydrocarbons content by weight, %, maximum | 0.50<br>0.02   |
| Coagulum content in latex by weight after dilution with water at a ratio of 1:200, % to weight of dry matter, maximum                                 | 0.30   |
| Characteristics of latex-based films:<br>- nominal tensile strength of uncured film, MPa, minimum<br>- fabric/latex bonding strength, MPa, minimum    | 1.52<br>0.27   |
| Chlorine content in rubber by weight, %, within the range of  | 35.0-37.0  |

**Package:** rail tank cars, steel barrels and tank trucks

**Guaranteed shelf life:** 6 months



# 2. POLYBUTADIENE PRODUCTION

## 2.2.1 Synthetic vinylidene chloride latex DVHB M

(Specification 20.17.10-002-19346675-2020)

### Description

Latex is an aqueous dispersion of a vinylidene chloride and butadiene copolymer. Latex DVHB M is produced both in non-frost-resistant and frost-resistant versions

### Application

Used in construction industry for production of asbestos-cement mixtures, protective coatings, as a component in a mixture for enhancement of strength properties and in other industries.

### Characteristics:

| Parameters   | Values  |
|--|---|
| Appearance   | Turbid liquid without coagulum and mechanical impurities. Surface film is not considered a defect |
| Dry solids content by weight, %, minimum   | 26.0  |
| Volatile unsaturated compounds content by weight, %, maximum<br>- including C <sub>2</sub> ~C <sub>4</sub> hydrocarbons content by weight, %, maximum  | 0.50<br>0.02  |
| Coagulum content in latex by weight after dilution with water at a ratio of 1:200, % to weight of dry matter, maximum  | 0.30  |
| Characteristics of latex-based films:<br>- Nominal tensile strength of uncured film, MPa (kgf/cm <sup>2</sup> ), minimum<br>- fabric/latex bonding strength, MPa (kgf/cm <sup>2</sup> ), minimum | 1.52 (15.5)<br>0.27 (2.7)   |
| Chlorine content in rubber by weight, %, minimum   | 35.0  |

**Package:** rail tank cars, steel barrels and tank trucks

**Guaranteed shelf life:** 6 months



# 3. SILICONE PRODUCTION

## 3.1 Low molecular weight silicone rubbers and products based on them

### 3.1.1 SKTN low molecular weight silicone rubber (Specification 2294-002-00152000-96)

#### Description

SKTN low molecular weight silicone rubber, cured by cold cure catalyst

#### Application

Production of monolithic molding and encapsulating compounds, sealants, foam sealants, impregnating compositions, and coatings produced by cold curing. Working temperature range from  $-60^{\circ}\text{C}$  to  $+250^{\circ}\text{C}$ .

#### Characteristics:

| Parameters                    | SKTN   |         |         |          |
|-------------------------------|--------|---------|---------|----------|
|                               | A      | B       | C       | D        |
| Relative viscosity, sec.      | 90-150 | 151-240 | 241-600 | 601-1080 |
| Weight loss, %, maximum       | 2.0    | 2.0     | 2.0     | 6.0      |
| Thermal stability, %, maximum | 2.0    | 2.0     | 2.0     | 2.0      |

**Package:** sealed metal or polyethylene containers

**Guaranteed shelf life:** 12 months



# 3. SILICONE PRODUCTION

## 3.1.2 Organosilicon sealants

**Viksint U-1-18** (Specification 38.303-04-04-90),(1-595-28-698-2003)

**Viksint U-2-28** (Specification 38.303-04-04-90),(1-595-28-701-2003)

**Viksint U-4-21** (Specification 38.303-04-04-90),

**Viksint UF-7-21** (Specification 38.303-04-04-90)

**VGO-1** (Specification 38.303-04-04-90)

### Description

The sealants are produced on the basis of low molecular weight silicone rubbers. Depending on the purpose the sealants are produced in the following grades: two-component (paste and catalyst) **Viksint U-1-18**, **Viksint U-2-28**, **Viksint U-4-21**, **Viksint UF-7-21** and single component **VGO-1**, capable of curing at room temperature in contact with the moisture in the air. Two-component sealants are used with a sublayer that ensures adhesion of the sealant to the surface of the materials to be sealed.

### Application

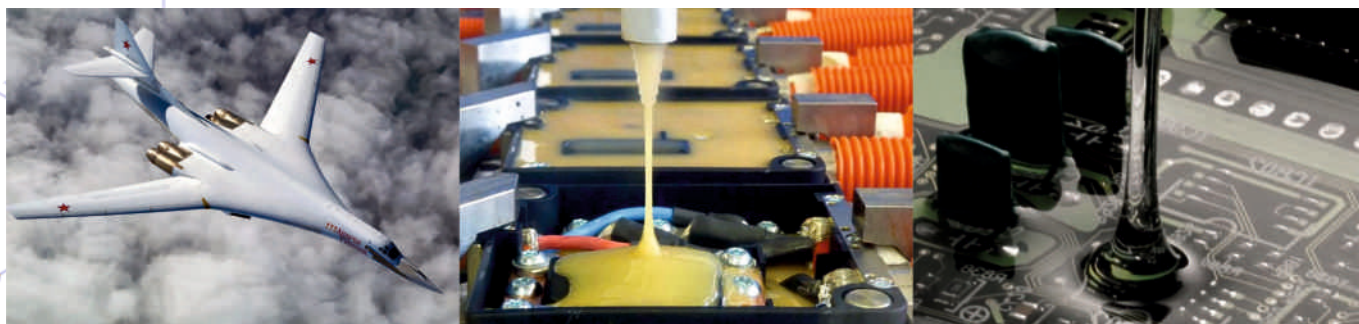
**Viksint U-1-18** sealant is designed for surface sealing of metal joints made of stainless steel, aluminum and titanium alloys and for sealing equipment operating in air environment at temperatures from  $-60^{\circ}\text{C}$  to  $+300^{\circ}\text{C}$  under conditions of vibration, shock and repetitive loads.

**Viksint U-2-28** sealant is designed for sealing riveted, bolted and welded joints of structures and devices operating in the temperature range from  $-60^{\circ}\text{C}$  to  $+250^{\circ}\text{C}$  for joint sealing, from  $-60^{\circ}\text{C}$  to  $+300^{\circ}\text{C}$  for surface sealing, and for potting plug-in connectors operating at temperatures from  $-60^{\circ}\text{C}$  to  $+250^{\circ}\text{C}$ . The sealants are also used as a material for molds in the production of art and decorative items.

**Viksint U-4-21** sealant is designed for surface sealing of riveted, bolted and welded joints of structures and devices and for protection of electrical and radio devices operating in air environment in the temperature range from  $-60^{\circ}\text{C}$  to  $+300^{\circ}\text{C}$ . It can be used at temperatures up to  $+250^{\circ}\text{C}$  in contact with aluminum alloy, stainless steel, cadmium plated and galvanized chromate passivated steel, as well as for potting plug connectors operating at temperatures from  $-60^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$ .

**Viksint UF-7-21** sealant is designed for surface sealing of metal joints, fastening of semiconductors that operate in air environment at temperatures from  $-110^{\circ}\text{C}$  to  $+300^{\circ}\text{C}$ .

**VGO-1** sealant is intended for surface sealing of structures, devices, resistors, various electronic equipment units operating in air environment at temperatures from  $-60^{\circ}\text{C}$  to  $+250^{\circ}\text{C}$ , as a sealing material for refrigeration equipment, and for repair of items sealed with VIKSINT type sealants.



# 3. SILICONE PRODUCTION

## Characteristics:

| Parameters   | U-1-18  | U-1-18<br>NT | U-2-28  | U-2-28<br>NT | U-4-21  | UF-7-21  | VGO-1   |
|--|---------|--------------|---------|--------------|---------|----------|---------|
| Density, g/cm <sup>3</sup>   | 2.2     |              |         |              | 1.35    |          | 1.9     |
| Pot life, h, within the range of or minimum  | 0.5-6.0 |              | 3.0-8.0 |              | 0.5-6.0 | 0.5-10.0 | 0.17    |
| Nominal tensile strength, MPa, minimum   | 2.1     | 2.5          | 1.9     | 2.0          | 1.5     | 1.7      | 2.0     |
| Nominal tensile strength, MPa, minimum or within the range of  | 160     | 170          | 220     | 275          | 100     | 80       | 250-600 |
| Shore A hardness, units, within the range of or minimum  | 50-60   |              | 35-50   |              | 42-55   | 40-60    | 28      |
| Bond strength when peeled from D16 aluminum alloy (material rupture or peeling in grid), kN/m, minimum               | 1.4     |              | 1.3     | 1.5          | 0.5     | 0.4      | 1.7     |
| Destructive stability (Shore A hardness after conditioning at 250 °C for 3 hours without air access), units, minimum | -       |              | 18      |              | -       |          |         |
| Frost resistance factor for elastic recovery at -70 °C, minimum  | -       |              |         |              |         | 0.7      | -       |

**Package:** single-component sealants - aluminum tubes, two-component sealants - metal or polymer containers, catalyst - glass bottles.

**Guaranteed shelf life:** VGO-1 sealant in tube - 18 months, other sealants - 12 months.



# 3. SILICONE PRODUCTION

## 3.1.3 VIKSINT organosilicon compounds (Specification 38.103508-81)

### Description

Two-component compounds based on low molecular weight siloxane rubber. The two-component compounds are a paste-like material that after mixing with a catalyst, can cure at ambient temperature transitioning into a rubber-like state.

### Application

Designed for sealing of electrical and radio devices operating in air environment, in high humidity.

### Characteristics:

| Parameters  | Viksint K-18       | Viksint K-68       | Viksint PK-68      |
|---|--------------------|--------------------|--------------------|
| Working temperature range, °C   | -60 to +250        | -70 to +250        | -60 to +200        |
| Nominal tensile strength, MPa, minimum  | 1.67               | 1.67               | 0.25               |
| Elongation at break, %, minimum   | 80                 | 80                 | 70                 |
| Compound to metal bond strength when peeled with P-11 sublayer applied, kN/m, minimum | -                  | 0.69               | 0.29               |
| pH of water extract, minimum or within the range of                                   | -                  | 6.0                | 6.0-7.0            |
| Shore A hardness, units   | 55-70              | 45-65              | -                  |
| Volume resistivity at (20±5) °C and (65±5)% relative humidity, Ohm·cm, minimum        | 1·10 <sup>13</sup> | 1·10 <sup>13</sup> | 1·10 <sup>13</sup> |
| Permittivity at 10 <sup>6</sup> Hz, maximum   | 3.5                | 4.0                | 3.0                |
| Dielectric strength at (20±5) °C and (65±5) % RH, kV/mm, minimum                      | 15                 | 15                 | 15                 |
| Surface resistivity at (20±5) °C and (65±5)% RH, Ohm, minimum                         | 1·10 <sup>13</sup> | 1·10 <sup>13</sup> | 1·10 <sup>13</sup> |

**Package:** paste is packed in metal containers, catalyst is packed in glass bottles.

**Guaranteed shelf life:** 12 months

# 3. SILICONE PRODUCTION

## 3.1.4 KL type organosilicon compounds (Specification 38.103691-89)

### Description

Organosilicon compounds are based on low molecular weight organosilicon rubbers and can cure (harden) at ambient temperature and form rubber-like materials.

### Application

**KLT-30** compound is designed for surface sealing of various equipment operating in air environment and its moisture protection, for surface sealing of devices operating in vibration conditions. It can be used for bonding of glass, plexiglass, ceramics and other silicate-based materials.

**KLT-30** compound is also used for sealing of threaded connections of pipelines, internal cold and hot water supply systems and building heating systems.

**KLSE** compound is intended for sealing of electrical and magnetic devices operating in various climatic conditions at high air humidity, as well as for manufacture of elastic molds for plastic and plaster products.

### Characteristics:

| Parameters  | KLT-30<br>(single-component) |   | KLT-30<br>(two-component) |          | KLSE  |
|---|------------------------------|---|---------------------------|----------|---|
|   | A                            | B | A                         | B        |   |
| Working temperature range, °C                                 | -60 to +300                  |   |                           |          | -55 to +250<br>(long-term),<br>-55 to +300<br>(up to 500 h) |
| Relative viscosity, sec.,<br>maximum or within the range of   | -                            |   | 900                       | 901-1500 | 600   |
| Pot life, min, minimum:<br>- K-10s hardener<br>- K-1 catalyst | 20<br>-                      |   | 15<br>40                  |          |   |
| Nominal tensile strength, MPa, minimum                        | 0.79                         |   |                           |          | 0.98  |
| Elongation at break, %, minimum                               | 120                          |   |                           |          | 80  |

**Package:** single-component compound KLT-30 is packed in aluminum tubes.

Pastes of two-component compounds KLT-30, KLSE are packed in metal or polymer containers, catalyst is packed in glass bottles.

**Guaranteed shelf life:** KLT-30, KLSE – 6 months.



# 3. SILICONE PRODUCTION

## 3.1.5 Automotive gasket maker (Specification 20.30.22-036-19346675-2023)

### Description

Based on low molecular weight siloxane rubber.

### Application

Automotive gasket maker is designed for elimination of water, antifreeze, and oil leaks in detachable joints, instead of cardboard, cork and rubber gaskets.

Sealing of flange connections.

Installation of valve covers, transfer cases, thermostats, pumps, connecting pipes.

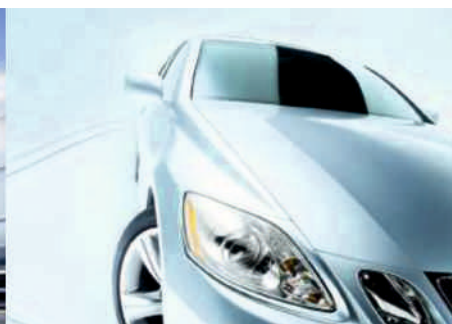
Working temperature range from  $-50^{\circ}\text{C}$  to  $+250^{\circ}\text{C}$ .

### Characteristics:

| Parameters                                      | White grade                            | Grey grade | Black grade |
|---|--|------------|-------------|
| Cure type                                       | neutral cure                           |            |             |
| Shore A hardness, units, minimum                | 35                                     |            |             |
| Pot life after squeezing from the tube, minutes | 15÷120                                 |            |             |
| Working temperature range, $^{\circ}\text{C}$   | -50 to +200<br>(shot-term up to + 250) |            |             |

**Package:** 50 to 250 g aluminum tubes or up to 480 g plastic cartridges.

**Guaranteed shelf life:** 12 months.



# 3. SILICONE PRODUCTION

## 3.1.6 KS organosilicon heat-resistant adhesive

(Specification 38.103483-80)

### Description

KS adhesive is a paste-like composition that cures at room temperature upon contact with air moisture (in a single-component version) or when mixed with K-10s hardener (in a two-component version).

### Application

Intended for bonding cured organosilicon rubbers products together, with metals, plastics, for bonding glass, ceramics and other silicate-based materials used in air in high humidity conditions in the temperature range from -60 to +250 °C.

Service life at 200°C is not less than 1000 hours.

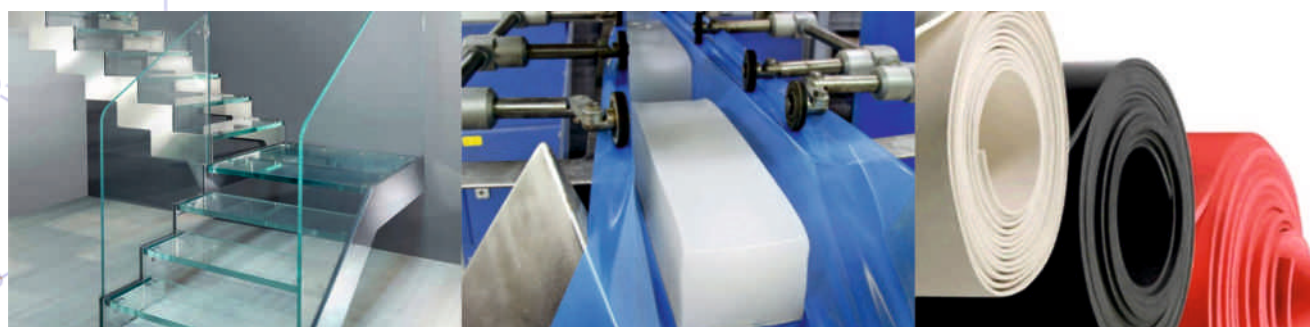
The glue is produced in two grades KS-5 and KS-5M. KS-5M glue features enhanced adhesive performance.

### Characteristics:

| Parameters  | KS-5               | KS-5M |
|---|--------------------|-------|
| Pot life after squeezing from the tube, minutes, minimum                        | 10-60              |       |
| SShR-73-2K rubber / phenolic plastic peel strength, MN/m <sup>2</sup> , minimum | 0.98               | 1.18  |
| Dielectric strength, kV/mm, minimum   | 15                 |       |
| Volume resistivity, Ohm-cm, minimum   | 1·10 <sup>13</sup> |       |

**Package:** The single-component version of the adhesive is packaged in 50 to 200 g. aluminum tubes, the two-component version is supplied in canisters, metal drums, polymer containers.

**Guaranteed shelf life:** Adhesive in a tube packing – 6 months, paste – 12 months



# 3. SILICONE PRODUCTION

## 3.2 High molecular weight silicone rubbers and products based on them

### 3.2.1 High molecular weight silicone rubbers

**SKT** (Specification 38.103694-89), **SKTV**, **SKTV-1** (Specification 38.103675-89), **SKTF** (Specification 2294-054-05766764-2003), **SKTE**, **SKTFV-803** (Specification 38.103371-77)

#### Description

Vulcanizates based on silicone rubbers have high resistance to high and low temperatures, good electrical insulating properties, weather resistance, resistance to radiation, ozone and oxygen, hydrophobicity, chemical and biological inertness.

#### Application

Intended for manufacture of rubber products that retain elastic and dielectric properties in the temperature range from -50 °C to +200 °C (SKT), from -50 °C to +250 °C (SKTV, SKTV-1), from -70 °C to +200 °C (SKTE), from -70 °C to +250 °C (SKTFV-803), from -70 °C to +200 °C (SKTF).

#### Characteristics:

| Parameters  | SKT                | SKTV               | SKTV-1             | SKTE    | SKTFV-803 | SKTF    |
|---|--------------------|--------------------|--------------------|---------|-----------|---------|
| Molecular weight, thousand, within the range of<br>Group 1<br>Group 2 | 420-570<br>571-670 | 420-570<br>571-720 | 470-570<br>571-720 | 470-670 | 430-680   | -       |
| Weight loss at 150°C for 3 hours, wt %, maximum                       | 2.5                | 3.0                | 3.0                | 4.0     | 4.0       | 10.0    |
| Penetration, units, within the range of                               | -                  | -                  | -                  | -       | -         | 150-240 |
| Cured properties  |                    |                    |                    |         |           |         |
| Nominal tensile strength, MPa, minimum                                | 4.9                | 5.9                | 5.9                | 5.9     | 6.4       | -       |
| Elongation at break, %, minimum                                       | 275                | 400                | 300                | 400     | 400       | -       |
| Shore A hardness, units   | 40-60              | 40-60              | 50-65              | 40-65   | 40-60     | -       |

**Package:** Drums, barrels with polyethylene liner

**Guaranteed shelf life:** SKT, SKTF, SKTV, SKTV-1 – 12 months, SKTE – 9 months, SKTFV-803 – 6 months





# 3. SILICONE PRODUCTION

## 3.2.2 "Silikon" basic rubber mixes (Specification 2512-046-05766764-2005)

### Description

SILIKON base mixes are based on high molecular weight SKTV and SKTV-1 siloxane rubber.

### Application

SILIKON base rubber mixes grades 100/30, 100/40, 100/50, 100/60, 100/70, 200/50, 200/60, 200/70, 300/30, 300/40, 300/50, 300/60, 300/70 are designed for production of electrical insulating tubes, heat and frost-resistant insulation and sheaths of wires, cables, as well as sealing gasket materials, profiles and various rubber products, and sealing parts.

Working temperature of products is from  $-50^{\circ}\text{C}$  to  $+200^{\circ}\text{C}$ .

Color can be according to customer's request.

**Package:** in the form of up to 10 kg pieces. The pieces are wrapped in polyethylene film and placed in a polyethylene bag. Then polyethylene bag with rubber mix is packed in synthetic fabric bags. Net weight of one bag is not more than 30 kg.

**Guaranteed shelf life:** with added curing agent - 3 months, without added curing agent - 6 months.



## Characteristics:

| Parameters  | 200/50       | 200/60        | 200/70       | After the second stage of curing |               |               |              |              | 300/30       | 300/40        | 300/50        | 300/60        | 300/70       |
|---|--------------|---------------|--------------|----------------------------------|---------------|---------------|--------------|--------------|--------------|---------------|---------------|---------------|--------------|
|   | 100/30       | 100/40        | 100/50       | 100/60                           | 100/70        | 100/80        | 100/90       | 100/100      | 100/110      | 100/120       | 100/130       | 100/140       | 100/150      |
| Density, g/cm <sup>3</sup>  | 1.1±<br>0.05 | 1.19±<br>0.05 | 1.2±<br>0.05 | 1.1±<br>0.05                     | 1.12±<br>0.05 | 1.15±<br>0.05 | 1.9±<br>0.05 | 1.2±<br>0.05 | 1.1±<br>0.05 | 1.12±<br>0.05 | 1.15±<br>0.05 | 1.19±<br>0.05 | 1.2±<br>0.05 |
| Working temperature range, °C   | - 50 to +200 |               |              |                                  |               |               |              |              |              |               |               |               |              |
| Nominal tensile strength, MPa, minimum  | 3.5          | 5.0           | 6.0          | 7.0                              | 4.5           | 5.5           | 7.0          | 4.5          | 4.5          | 5.5           | 7.5           | 7.0           | 7.0          |
| Elongation at break, %, minimum   | 250          | 200           | 150          | 450                              | 350           | 350           | 350          | 450          | 450          | 350           | 350           | 300           | 300          |
| Shore A hardness, units, minimum  | 50±5         | 60±5          | 70±5         | 30±5                             | 40±5          | 50±5          | 60±5         | 70±5         | 30±5         | 40±5          | 50±5          | 60±5          | 70±5         |
| Tear strength, kN/m, minimum  | 8.0          | 10.0          | 11.0         | 15.0                             | 12.0          | 12.0          | 12.0         | 10.0         | 10.0         | 12.0          | 12.0          | 12.0          | 12.0         |
| Relative residual deformation at 25% compression in air environment for 22 hours and at (177±5) °C, maximum | 40           | 50            | 50           | -                                | -             | -             | -            | -            | -            | -             | -             | -             | -            |
| Electrical performance after soaking in water at +20°C for 24 hours   |              |               |              |                                  |               |               |              |              |              |               |               |               |              |
| Volume resistivity, Ohm·cm·10 <sup>14</sup> , minimum   | 5            |               |              |                                  |               |               |              |              |              |               |               |               |              |
| Tan δ, maximum  | 0.03         |               |              |                                  |               |               |              |              |              |               |               |               |              |
| Dielectric strength at 50 Hz, kV/mm, minimum  | 22           |               |              |                                  |               |               |              |              |              |               |               |               |              |
| Permittivity, maximum   | 3.5          | 3.5           | 4.0          | 4.0                              | 3.5           | 3.5           | 4.0          | 4.0          | 3.5          | 3.5           | 4.0           | 4.0           | 4.0          |

# 3. SILICONE PRODUCTION

## 3.2.3 MAXSIL organosilicon rubber mixes for electrical industry

(Specification 38.103693-90)

### Description

Rubber mixes intended for the electrical industry can be produced both with and without added curing agent. Depending on the purpose, MAXSIL rubber mixes are produced in the following grades: K-69, K-69 "D", K-69T, K-69T "D", K-1520, K-1520 "D".

Working temperature range from -50 °C to +200 °C.

### Application

MAXSIL rubber mixes are designed for manufacture of heat and frost-resistant insulation and sheaths of wires, cables, electrical insulating tubes, and sealing gasket materials and profiles.

K-69T, K-69T "D" are designed for increased hardness cables.

K-1520 is designed for manufacture of heat and frost-resistant insulation and sheath of single-stage cure cables.

### Characteristics:

| Parameters  | K-69               | K-69 «D» | K-1520             | K-1520 «D» | K-69T   | K-69T «D» |
|---|--------------------|----------|--------------------|------------|---------|-----------|
| Plasticity, within the range of or minimum                          | 0.57 -0.68         |          | 0.55               |            | 0.42    |           |
| Cured properties after first stage curing                           |                    |          |                    |            |         |           |
| Nominal tensile strength, MPa, minimum                              | -                  |          | 7.2                | 6.6        | 5.9     |           |
| Elongation at break, %, minimum                                     | -                  |          | 320-550            | 320-650    | 310-600 | 310-650   |
| Shore A hardness, units, minimum                                    | -                  |          | 50                 |            |         |           |
| Cured properties after second stage curing                          |                    |          |                    |            |         |           |
| Nominal tensile strength, MPa, minimum                              | 7.5                | 6.4      | -                  |            |         |           |
| Elongation at break, %, minimum                                     | 310                |          | -                  |            |         |           |
| Shore A hardness, units, within the range of or minimum             | 53-68              |          | -                  |            | 60      |           |
| Electrical performance after soaking in water at +20°C for 24 hours |                    |          |                    |            |         |           |
| Volume resistivity, Ohm·cm, minimum                                 | 5·10 <sup>14</sup> |          | 5·10 <sup>14</sup> |            |         |           |
| Permittivity, maximum   | 3.5                |          | 3.5                |            | 4.0     |           |
| Dielectric strength at 50 Hz, kV/mm, minimum                        | 22                 |          | 22                 |            |         |           |
| Tan δ, maximum  | 0.03               |          | 0.03               |            |         |           |

**Package:** In the form of up to 10 kg pieces. The pieces are wrapped in polyethylene film and placed in a polyethylene bag. Then polyethylene bag with rubber mix is packed in synthetic fabric bags. Net weight of one bag is not more than 30 kg.

**Guaranteed shelf life:** K-69, K-69 "D", K-1520, K-1520 "D" – 6 months, K-69T, K-69T "D" – 3 months

# 3. SILICONE PRODUCTION

## 3.2.4 Silicone rubber-based rubber mixes (Specification 38.103321-76)

### Description

IRP-1265, IRP-1266, IRP-1267 rubber mixes are based on SKT, SKTV, SKTV-1, SKTE silicone rubbers.

### Application

The mixes are designed for manufacture of heat and frost resistant rubber products used in various sectors of the national economy.

Grades IRP-1265, IRP-1266, IRP-1267 are used for manufacture of molded sealing parts operating in air with high ozone content and in electric field conditions with up to 20% deformation in fixed joints.

### Characteristics:

| Parameters   | IRP-1265                               | IRP-1266 | IRP-1267    |
|--|--|----------|-------------|
| Working temperature range, °C  | -50 to +200<br>(short-term up to +250) |          | -70 to +200 |
| Nominal tensile strength, MPa, minimum   | 2.45                                   |          |             |
| Elongation at break, %, minimum  | 200                                    | 100      | 100         |
| Relative residual deformation after 20% compression in air at +200 °C for 24 hours, %, maximum | 45                                     | 35       | 65          |
| Shore A hardness, units, within the range of   | 35-55                                  | 42-62    |             |
| Frost resistance factor for elastic recovery after compression at -50°C, minimum               | 0.5                                    | 0.6      | 0.75        |

**Package:** In the form of up to 10 kg pieces. The pieces are wrapped in polyethylene film and placed in a polyethylene bag. Then polyethylene bag with rubber mix is packed in synthetic fabric bags. Net weight of one bag is not more than 30 kg.

**Guaranteed shelf life:** 6 months.



# 3. SILICONE PRODUCTION

## 3.2.5 IRP rubber mixes (Specification 38.103372-77)

### Description

Rubber mixes are based on siloxane rubbers and are produced in the following grades: IRP-1338, IRP-1354, IRP-1399, IRP-1399“B”, IRP-1400, IRP-1401.

### Application

IRP rubber mixes are used for manufacture of heat and frost resistant rubber products, that can perform in the temperature range from -50 °C to +200 °C (short-term +250 °C) For IRP-1354 rubber mix, working temperature range is from -70 °C to +200 °C.

Grades IRP-1338, IRP-1354, IRP-1399, IRP-1400, IRP-1401 are designed for fixed connections, insulating and other parts operating in an unstressed state, in air with high ozone content and in electric field conditions.

### Characteristics:

| Parameters   | IRP-1338  | IRP-1399  | IRP-1400  | IRP-1401  | IRP-1354           | IRP-1399<br>“B” |
|--|-----------|-----------|-----------|-----------|--------------------|-----------------|
| Plasticity, within the range of  | 0.35-0.60 | 0.40-0.60 |           | 0.30-0.55 | -                  | -               |
| Nominal tensile strength, MPa, minimum   | 6.4       | 4.9       | 5.1       | 6.4       | 5.4                | 5.0             |
| Elongation at break, %, minimum  | 300       | 200       | 240       | 200       | 250                | 150             |
| Relative residual deformation after breaking, %, maximum   | 10        |           | 8         |           | 10                 | -               |
| Tear strength, kN/m, minimum   | 14.7      | 9.8       |           |           |                    | -               |
| Shore A hardness, units, within the range of or minimum  | 55-70     | 60-75     |           | 65-80     | 50-65              | 65              |
| Frost resistance factor for elastic recovery after compression at -50°C, not less than at -70°C, not less than | 0.45<br>- | 0.50<br>- | 0.45<br>- |           | -<br>0.30          | -<br>-          |
| Relative residual deformation after 20% compression in air at +200 °C for 24 hours, %, maximum                 | 55        | 35        | 34        | 40        | 50                 | 40              |
| Dielectric strength at 20°C at 50 Hz, kV/mm, minimum   | -         |           |           |           | 20                 | -               |
| Volume resistivity, Ohm·cm at 20°C   | -         |           |           |           | 1·10 <sup>14</sup> | -               |

**Package:** In the form of up to 10 kg pieces. The pieces are wrapped in polyethylene film and placed in a polyethylene bag. Then polyethylene bag with rubber mix is packed in synthetic fabric bags. Net weight of one bag is not more than 30 kg.

**Guaranteed shelf life:** 2 months.



# 3. SILICONE PRODUCTION

## 3.2.6 SShR type rubber mixes (Specification 38.103484-80)

### Description

Rubber mixes are based on silicone rubbers and are produced in the following grades: SShR-73-2K, SShR-73-2KV, SShR-73-2KV-S. The rubber mix is non-toxic, non-explosive.

### Application

Designed for injection molding and compression molding production of gaskets for SNTs, SNO type plug connectors operating in air, electric field environment in the temperature range from -60 °C to +200 °C with up to 20% compression strain.

### Characteristics:

| Parameters   | SShR-73-2K         | SShR-73-2KV | SShR-73-2KV-S |
|--|--------------------|-------------|---------------|
| Nominal tensile strength, MPa, minimum   | 5.0                |             |               |
| Elongation at break, %, minimum  | 300                |             | 320           |
| Relative residual deformation after breaking, %, maximum   | 6                  |             |               |
| Tear strength, kN/m, minimum   | 7.8                |             | 8.7           |
| Shore A hardness, units, within the range of   | 45-58              |             |               |
| Relative residual deformation at a constant compression value of 20% in air at 200 °C for 24 hours, %, maximum | 33                 |             |               |
| Rebound resilience, %, minimum   | 37                 |             | 35            |
| Frost resistance factor for elastic recovery after 20 % compression at -55°C, minimum                          | 0.48               |             | 0.50          |
| Dielectric strength at 50 Hz, kV/mm, minimum   | 20                 |             |               |
| Volume resistivity, Ohm·cm, minimum  | 1·10 <sup>13</sup> |             |               |

**Package:** In the form of up to 10 kg pieces. The pieces are wrapped in polyethylene film and placed in a polyethylene bag. Then polyethylene bag with rubber mix is packed in synthetic fabric bags. Net weight of one bag is not more than 30 kg.

**Guaranteed shelf life:** 2 months.



# 3. SILICONE PRODUCTION

## 3.2.7 OKT increased fire resistance organosilicon rubber mix

(Specification 2512-078-05766764-2009)

### Description

OKT increased fire resistance organosilicon rubber mix is available both with and without added curing agent. The rubber mix is non-toxic, it has FV 0 flammability class.

Products made from OKT rubber mix have the following properties: high tracking and erosion resistance, good electrical insulating properties in wet condition, high resistance to ozone, UV rays, precipitation and pollution, weather temperature fluctuations. OKT rubber mix products working temperature conditions are from -50 °C to +200 °C.

### Application

OKT increased fire resistance rubber mix is intended for manufacture of various rubber products. It can also be used for manufacture of polymer housings of high-voltage insulators and other electrical products.

### Characteristics:

| Parameters  | Values                  |
|---|-------------------------|
| Rollability, minutes, minimum   | 5                       |
| Density, g/cm <sup>3</sup> , maximum                                    | 1.45                    |
| Cured properties:   |                         |
| Nominal tensile strength, MPa, minimum                                  | 4.0                     |
| Elongation at break, %, minimum   | 300                     |
| Shore A hardness, units, within the range of                            | 58-70                   |
| Electrical performance after soaking in water at (20±2) °C for 24 hours |                         |
| Volume resistivity, Ohm·cm, minimum                                     | 1·10 <sup>14</sup>      |
| Tan δ, maximum  | 0.04                    |
| Dielectric strength at 50 Hz, kV/mm, minimum                            | 18                      |
| Permittivity, maximum   | 5.0                     |
| Flammability rating   | Class FV 0              |
| Tracking and erosion resistance   | Class 1 A 4.5 (1 V 4.5) |

**Package:** In the form of up to 10 kg pieces. The pieces are wrapped in polyethylene film and placed in a polyethylene bag. Then polyethylene bag with rubber mix is packed in synthetic fabric bags. Net weight of one bag is not more than 30 kg.

### Guaranteed shelf life:

- Type I: with added curing agent – 3 months, without added curing agent – 6 months
- Type II: with added curing agent – 2 months, without added curing agent – 6 months

# 3. SILICONE PRODUCTION

## 3.2.8 Medical-grade silicone rubber mix 52-336/4, 52-336/4D (Specification 38.103212-76)

### Description

Both rubber mix grades can be produced with and without added curing agent.

### Application

52-336/4 is intended for manufacture of blood transfusion tubing (including tubing for extracorporeal circulation devices) and drains for various purposes.

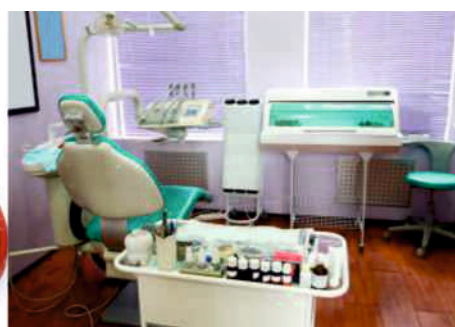
52-336/4D is designed for manufacture of sealing parts for reusable syringes.

### Characteristics:

| Parameters   | 52-336/4  | 52-336/4D |
|--|-----------|-----------|
| Plasticity, within the range of                          | 0.50-0.65 |           |
| Rollability, minutes, minimum                            | 5         |           |
| Nominal tensile strength, MPa, minimum                   | 6.5       |           |
| Elongation at break, %, minimum                          | 320       |           |
| Relative residual deformation after breaking, %, maximum | 8         |           |
| Shore A hardness, units, within the range of             | 48-63     |           |
| Tear strength, kN/m, minimum                             | 11        |           |

**Package:** In the form of up to 10 kg pieces. The pieces are wrapped in polyethylene film and placed in a polyethylene bag. Then polyethylene bag with rubber mix is packed in synthetic fabric bags. Net weight of one bag is not more than 30 kg.

**Guaranteed shelf life:** 3 months.



# 3. SILICONE PRODUCTION

## 3.2.9 NTA rubber mixes for aviation rubber components

(Specification 38 0051166-2015)

### Description

High heat and frost resistance, high performance characteristics and durability of products, chemical inertness, resistance to ozone and solar radiation, high electrical and mechanical strength, and excellent electrical insulating properties.

They perform in any climatic zones and in electric field conditions, the absence of hazardous halogen-containing compounds in the combustion products of silicone rubber products is one of the unique features.

### Application

Areas of application: aviation industry, machinery, instrumentation, defense complex manufacturers. Manufacture of rubber products, shaped sealing and electrical insulating parts operating under deformation in fixed joints, in ozone and electric field environments in the temperature range from -60 °C to +250 °C.

### Characteristics:

| Parameters  | IRP-1265<br>NTA          | IRP-1266<br>NTA | IRP-1267<br>NTA | IRP-1338<br>NTA | IRP-1354<br>NTA | IRP-1399<br>NTA | IRP-1400<br>NTA | IRP-1401<br>NTA |
|---|--------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Nominal tensile strength, MPa, minimum  | 2.9                      |                 | 2.4             | 6.4             | 5.4             | 4.9             |                 | 6.4             |
| Elongation at break, %, minimum   | 250                      | 110             | 140             | 330             | 280             | 200             |                 | 220             |
| Shore A hardness, units, within the range of  | 36-48                    | 46-58           | 44-61           | 58-70           | 45-66           | 62-73           | 64-74           | 66-76           |
| Frost resistance factor for elastic recovery after compression:                               | - at -50°C not less than | 0.50            | 0.60            | -               | 0.45            | -               | 0.50            | 0.45            |
|   | - at -60°C not less than | -               | -               | 0.75            | -               | -               | -               | -               |
|   | - at -70°C not less than | -               | -               | -               | -               | 0.30            | -               | -               |
| Relative residual deformation after 20% compression in air at +200°C for 24 hours, %, maximum | 45                       | 35              | 70              | 55              |                 | 40              | 45              | 50              |
| Change of elongation after aging in air at +250°C for 72 hours, %                             | -20 to 45                | -15 to 40       | -               | -50 to 0        | -55 to -5       |                 |                 |                 |

**Package:** In the form of up to 10 kg pieces. The pieces are wrapped in polyethylene film and placed in a polyethylene bag. Then polyethylene bag with rubber mix is packed in synthetic fabric bags. Net weight of one bag is not more than 30 kg.

**Guaranteed shelf life:** IRP-1265 NTA, IRP-1266 NTA, IRP-1267 NTA – 6 months, IRP 1338 NTA, IRP-1354 NTA, IRP-1399 NTA, IRP-1400 NTA, IRP-1401 NTA – 2 months.

# 3. SILICONE PRODUCTION

## 3.2.10 Self-fusing materials

### 3.2.10.1 LETSAR electrical insulating heat-resistant self-fusing radiation cure rubber tape

#### 3.2.10.1.1 LETSAR (Specification 38.103171-80)

##### Description

LETSAR tape is based on siloxane polymers and is radiation cured. LETSAR has a self-fusing (autohesion) ability at  $(25\pm 5)$  °C within 48 hours (type H) or with additional heating within three hours at  $(150\pm 3)$  °C (type G). In this process, a monolithic, very durable silicone rubber shell is formed, which provides hermetic protection of a joint from atmosphere and sun exposure. LETSAR tape features moisture resistance, resistance to ozone, ultraviolet rays, complete absence of toxicity, resistance to a number of oils and many chemicals, electric current.

LETSAR is produced in two grades:

- "K" - red color tape designed for use in the temperature range from  $-50^{\circ}\text{C}$  to  $+250^{\circ}\text{C}$  (short-term  $+300^{\circ}\text{C}$ );
- "B" - white color tape, designed for use in the temperature range from  $-50^{\circ}\text{C}$  to  $+200^{\circ}\text{C}$  (short-term  $+250^{\circ}\text{C}$ )

LETSAR tape is produced in two groups (I or II) differing in physical and mechanical parameters.

##### Application

Radiation cure LETSAR tape is intended for use in electrical and other industries as an electrically insulating elastic material for various parts and assemblies of electrical machines and devices.

It is used for insulation of flexible shunts and leads of AC and DC electrical machines, induction electric furnaces, high-voltage transformers, for bonding, orientation, transportation and development of semiconductor elements, insulation of electrical cables, harnesses, busbars and conductors.

Due to the self-shrinking effect, LETSAR in addition to the insulation of electrical products can also be used for mechanical waterproofing of plastic and anti-corrosion protection of metal pipeline joints that are not subjected to active movement and in other areas where PVC tapes cannot be used.

In home applications LETSAR tape can be used:

- temporary elimination of leaks in heating and water supply pipes
- electrical insulation of cables, wires and connections, including those operating in an environment of high temperatures and humidity,
- electrical insulation of tool handles,
- sealing of hoses and tubes,
- car repairs on the road.



# 3. SILICONE PRODUCTION

## Characteristics:

| Parameters   | Values             |                    |
|--|--------------------|--------------------|
|  | Group I            | Group II           |
| Tape autohesion after half-lap tape application and exposure:<br>- at (25±5) °C for 48 h for H type,<br>- at (150±3) °C for 3 h for G type | No delamination    |                    |
| Physical and mechanical properties:  |                    |                    |
| Nominal tensile strength, MPa, minimum   | 4.9                | 4.4                |
| Elongation at break, %, minimum  | 350                |                    |
| Physical and mechanical properties after thermal ageing:   |                    |                    |
| For red tape after exposure at 300 °C for 48 h:<br>- nominal tensile strength, MPa, minimum<br>- elongation at break, %, minimum           | 2.45<br>100        |                    |
| For white tape after exposure at 250 °C for 72 h:<br>- nominal tensile strength, MPa, minimum<br>- elongation at break, %, minimum         | 2.95<br>150        |                    |
| Dielectric properties:   |                    |                    |
| Volume resistivity, Ohm·cm, minimum  | 1·10 <sup>14</sup> | 1·10 <sup>13</sup> |
| Dielectric strength, kV/mm, minimum  | 20                 |                    |
| Tan δ at 50 Hz and 1 kV/mm electric stress, maximum  | 0.02               |                    |

**Package:** tape is shipped in 130–150 mm dia. rolls (spools). Net weight of the tape in the roll is 500 g. max. A polyethylene tape is laid between the rubber layers, which prevents the layers from fusing.

Tape rolls are packed in polyethylene film bags. Bags are placed in max 40 kg plywood boxes.

**Guaranteed shelf life:** 12 months for red tapes, 10 months for white tapes.



# 3. SILICONE PRODUCTION

## 3.2.10.1.2 Electrical insulating heat-resistant self-fusing tapes

**LETSAR "ChP"** (Specification 22.19.20-003-19346675-2021)

**LETSAR "5A"** (Specification 22.19.20-007-19346675-2021)

**LETSAR "Zh", LETSAR "R", LETSAR "F"** (Specification 22.19.20-006-19346675-2021)

### Description

LETSAR tape is based on siloxane polymers and is radiation cured. It features moisture resistance, resistance to ozone, ultraviolet rays, complete absence of toxicity, resistance to a number of oils and many chemicals. LETSAR 5A tape has fire-resistant properties. Tapes of "Zh", "R", "F" grades change to a lighter color at elevated temperatures (+250 °C). Working temperature range for "ChP" and 5A grades is from -50°C to +250°C (short-term up to +300°C), for "Zh", "R", "F" grades working temperature range is from -50°C to +200°C (short-term up to +250°C).

### Application

The tape is intended for use in electrical and other industries as an electrically insulating elastic material for various parts and assemblies of electrical machines and devices.

LETSAR "ChP" is used to ensure sealing of electrical insulation and moisture protection of electrical harnesses of aircraft engines. It can also be used for insulation of flexible shunts and leads of AC and DC electrical machines, induction electric furnaces, high-voltage transformers.

LETSAR 5A can be used as a protective layer for electric harnesses and tubular parts preventing from heating damage.

LETSAR "Zh", LETSAR "R", LETSAR "F" can be used in home repairs for:

- electrical insulation of cables, wires and connections, including those operating in an environment of high temperatures and humidity,
- electrical insulation of tool handles,
- temporary elimination of leaks in heating and water supply pipes,
- sealing of hoses and tubes,
- car repairs on the road.



# 3. SILICONE PRODUCTION

## Characteristics:

| Parameter   |                       | LETSAR             |                    |                    |                    |                    |
|---|-----------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Grade   |                       | 5A                 | "ChP"              | "Zh"               | "R"                | "F"                |
| Color   |                       | Gray               | Black              | Yellow             | Pink               | Violet             |
| Tape autohesion after half-lap tape application and exposure: | at 25 ± 5°C for 48 h. | No delamination    | No delamination    | No delamination    |                    |                    |
|   | at 150 ± 3°C for 3 h. |                    | -                  |                    |                    |                    |
| Nominal tensile strength, MPa, minimum                        |                       | 4.0                | 4.0                | 4.0                | 4.0                | 4.0                |
| Elongation at break, %, minimum                               |                       | 450                | 350                | 450                | 450                | 450                |
| Nominal tensile strength after 48 h. at +250°C, MPa, minimum  |                       | 2.45               | 2.45               | 2.45               | 2.45               | 2.45               |
| Elongation at break after 48 h. at +250°C, %, minimum         |                       | 100                | 150                | 100                | 100                | 100                |
| Volume resistivity, Ohm·cm                                    |                       | 1·10 <sup>13</sup> | 1·10 <sup>12</sup> | 1·10 <sup>13</sup> | 1·10 <sup>13</sup> | 1·10 <sup>13</sup> |
| Dielectric strength, kV/mm, minimum                           |                       | 20                 | 17                 | 20                 |                    |                    |

**Package:** LETSAR tape is shipped in 130–150 mm dia. rolls (spools). Net weight of the tape in the roll is 700 g. max. A polyethylene tape is laid between the rubber layers, which prevents the layers from fusing.

Tape rolls are packed in polyethylene film bags. Bags are placed in max 40 kg plywood boxes.

**Guaranteed shelf life:** 10 months.

# 3. SILICONE PRODUCTION

## 3.2.10.2 RETSAR heat-resistant electrical insulating self-fusing radiation cure rubber glass cloth (Specification 38.103172-80)

### Description

RETSAR is produced from fiberglass and organosilicon rubber using radiation curing method. RETSAR has self-fusing ability within 48 hours at  $(25\pm 5)^\circ\text{C}$  or within 3 hours with additional heating at  $(150\pm 3)^\circ\text{C}$ . It features high water resistance, resistance to ozone, ultraviolet rays, some oils (turbine, transformer oils) and some chemicals, complete absence of toxicity.

### Application

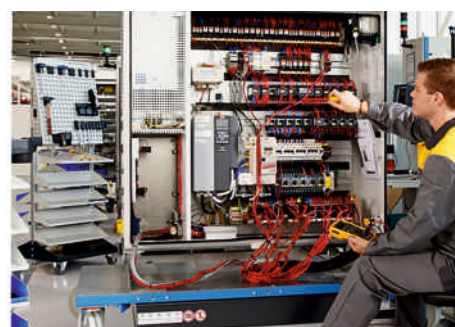
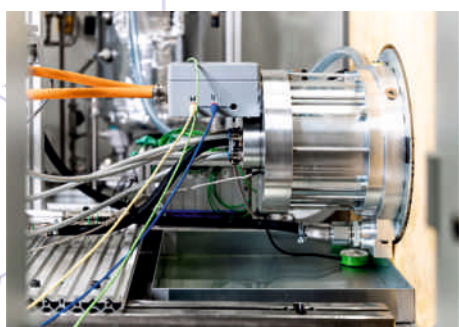
RETSAR heat-resistant electrical insulating self-fusing radiation cure rubber glass cloth is intended for use in the electrical industry as insulation for winding elements of electrical machines and devices operating in high humidity and high temperature conditions. RETSAR is used for flexible shunts and leads of AC and DC electrical machines, electrical harnesses, cables, busbars and current conductors. This material can be used both on its own and in combination with LETSAR tape.

### Characteristics:

| Parameters  | Values  |
|---|---|
| Working temperature range, $^\circ\text{C}$   | -50 to +250   |
| Rubber glass cloth autohesion after exposure at $(25\pm 5)^\circ\text{C}$ for 48 h. or at $(150\pm 3)^\circ\text{C}$ for 3 h.:<br>– end-to-end application on self-fusing tape insulation (with rubber layer of the rubber glass cloth facing towards the tape) | Monolithic self-fusion of rubber layers of rubber-glass cloth and rubber tape |
| Nominal tensile strength, MPa, minimum  | 39.2  |
| Nominal strength after thermal aging (72 hours exposure at $250^\circ\text{C}$ ), MPa, minimum  | 14.7  |
| Dielectric properties:<br>– volume resistivity, $\text{Ohm}\cdot\text{cm}$<br>– dielectric strength, $\text{kV}/\text{mm}$ , minimum  | $1\cdot 10^{13}$<br>20  |

**Package:** in the form of rolls packed in polyethylene bags (20 kg max.) with a polyethylene film between the rubber layers preventing self-fusing of the layers. Each roll is packed in a plastic bag and placed in a wooden or plywood case. Maximum weight of one package is 40 kg.

**Guaranteed shelf life:** 8 months.



# 4. URETHANE PRODUCTION

## 4.1 P-6, P6-BA, PDA-800 polyesters

**P-6, P6-BA** (Specification 38.103582-85),  
**PDA-800** (Specification 38.103287-80)

### Description

P-6 grade polyester is a solid waxy substance. P-6BA grade is a viscous salvelike substance. PDA-800 is a transparent homogeneous liquid. Polyesters do not have toxic properties and are physiologically harmless.

### Application

P-6, P6-BA grade polyesters are intended for production of urethane rubbers, wear-resistant rubber products based on them, monolithic and porous products by injection molding.

P6-BA is used for production of non-crystallizing urethane rubbers and polyurethane foam for shoe soles.

PDA-800 is intended for enamel elastification, production of light sensitive urethane polymers, and also as a component of adhesive compositions.

### Characteristics:

| Parameters   | P-6            | P-6BA          | PDA-800      |              |
|--|----------------|----------------|--------------|--------------|
|  |                |                | Grade I      | Grade II     |
| Mass fraction of hydroxyl groups, %, within the range of         | 1.60-1.90      | 1.50-1.80      | 4.10-4.40    | 2.00-2.30    |
| Viscosity, Pa·s, within the range of<br>- at 25 °C<br>- at 60 °C | -<br>0.85-1.25 | -<br>1.00-1.50 | 0.9-1.4<br>- | 4.0-5.0<br>- |
| Acid number, mg KOH/g, maximum                                   | 1.3            | 0.9            | 1.2          |              |
| Water content by weight, %, maximum                              | 0.08           |                | 0.07         |              |

**Package:** metal containers with anti-corrosion coating.

**Guaranteed shelf life:** 12 months.





# 4. URETHANE PRODUCTION

## 4.2 P-9A, P-9-14 polyesters (Specification 38.303-04-09-90)

### Description

P-9A, P-9-14 polyesters are a transparent liquid without mechanical impurities.

### Application

P-9A, P-9-14 polyesters are intended for manufacture of special-purpose products.

### Characteristics:

| Parameters   | P-9A      | P-9-14    |
|--|-----------|-----------|
| Mass fraction of hydroxyl groups, %, within the range of | 2.0-2.3   | 2.9-3.1   |
| Mass fraction of carboxyl groups, %, within the range of | 0.05-0.10 | 0.03-0.07 |
| Viscosity at 25 °C, Pa·s, within the range of            | 4.0-6.0   | 2.4-3.3   |
| Mass fraction of iron, %, maximum                        | 0.0007    |           |
| Mass fraction of water, %, maximum                       | 0.05      |           |
| Physical and mechanical properties of cured products     |           |           |
| Nominal stress at 100% elongation, MPa, maximum          | 1.57      |           |
| Nominal tensile strength, MPa, minimum                   | 3.92      | 2.16      |
| Elongation at break, %, minimum                          | 600       | 250       |
| Relative residual deformation after breaking, %, maximum | 12        | 4         |

**Package:** aluminum or stainless steel thermal-insulated railway tank cars or aluminum, galvanized, steel barrels, drums or other sealed containers

**Guaranteed shelf life:** 12 months.



# 4. URETHANE PRODUCTION

## 4.3 PEF-3A low molecular weight rubber (Specification 103466-80)

### Description

PEF-3A low molecular weight rubber is a polyether urethane with epoxy end groups.

### Application

The rubber is used for preparation of potting and impregnating compositions such as elastic epoxy resin.

### Characteristics:

| Parameters   | PEF-3A   |
|--|--|
| Appearance   | Viscous homogeneous liquid from colorless to yellow free from foreign inclusions |
| Mass fraction of epoxy groups, %, within the range of    | 6.0-7.5  |
| Viscosity at 50 °C, Pa·s, max                            | 18.0   |
| Nominal tensile strength, MPa, minimum                   | 15   |
| Elongation, %, minimum                                   | 100  |
| Relative residual deformation after breaking, %, maximum | 15   |

**Package:** Tinned cans or tightly closed canisters

**Guaranteed shelf life:** Rubber with maximum viscosity of 12 Pa·s – 1 year,  
Rubber with (12 – 18) Pa·s viscosity – 6 months



# 4. URETHANE PRODUCTION

## 4.4 Rolled and molded urethane rubbers

**SKU-PF** (Specification 38.103204-78)

**SKU-8A** (Specification 38.103209-77)

**SKU-8M** (Specification 38.103253-80)

**SKU-8TB** (Specification 38.103468-80)

**SKU-7L** (Specification 2253-059-05766764-2003)

**SKU-PFL-100** (Specification 38.103137-78)

**SKU-AA** (Specification 20.17.10-004-19346675-2021)

### Description

Urethane rubbers are the product of interaction of polyesters with isocyanates and a crosslinking agent.

### Application

SKU-PF rubber is intended for manufacture of rubber parts, frost-resistant artificial "Russia leather".

SKU-8A rubber is intended for manufacture of wear-resistant elements of shoe soles.

Rubber SKU-8M is used in production of magnetic varnishes.

SKU-8TB, SKU-AA rubber is intended for manufacture of products with high oil and petrol resistance, abrasion resistance and enhanced frost resistance.

SKU-7L rubber is intended for manufacture of various products with high tensile strength, resistance to abrasion, ozone, oxygen and swelling in gasoline and oils.

SKU-PFL-100 rubber is intended for molding of urethane elastomer products that feature increased wear resistance, high strength, oil and petrol resistance, resistance to oxygen and ozone.

### Package:

Urethane rubbers are produced in the form of rolled sheets or monolithic slabs with subsequent packaging in polyethylene bags. Polyethylene bags are packed in a synthetic fabric bag.

SKU-PFL-100 is supplied in canisters, drums, steel barrels or sealed containers.

### Guaranteed shelf life:

SKU-8TB, SKU-AA – 4 months, SKU-8A, SKU-PF – 6 months, SKU-8M – 9 months, SKU-7L – 5 years, SKU-PFL-100 – 6 months.



# 4. URETHANE PRODUCTION

## Characteristics:

| Parameters   | SKU-PF  |          | SKU-8A | SKU-8M | SKU-8TB | SKU-AA | SKU-7L | SKU-PFL-100 |
|--|---------|----------|--------|--------|---------|--------|--------|-------------|
|  | Mapka I | Mapka II |        |        |         |        |        |             |
| Mooney viscosity MB 10+4 (100 °C), within the range of   | 25-60   | 61-150   | 25-55  | -      | 40-90   | 38-92  | -      | -           |
| Viscosity at 25 °C, Pa·s, within the range of  | -       | -        | -      | -      | -       | -      | -      | 7.5-13.0    |
| Mass fraction of NCO groups, %, within the range of  | -       | -        | -      | -      | -       | -      | -      | 5.3-6.4     |
| Nominal tensile strength, MPa, minimum   | 24      | 29       | 29.4   | -      | 29.4    | 29.0   | 30.0   | 38          |
| Elongation at break, %, minimum  | 450     | 400      | 275    | -      | 450     | 440    | 300    | 380         |
| Nominal tensile strength, MPa, minimum   | -       | -        | -      | 98     | -       | -      | -      | -           |
| Shore A hardness, units, within the range of or minimum  | 60-70   |          | 92     | -      | 55-65   | 53-68  | 76-86  | -           |
| Relative residual deformation at break, %, maximum   | -       | -        | 30     | -      | -       | -      | 8      | 10          |
| Nominal stress at 100% elongation, MPa, minimum  | -       | -        | 10.8   | -      | -       | -      | -      | -           |
| Nominal stress at 300% elongation, MPa, minimum  | -       | -        | -      | -      | -       | -      | -      | 18.0        |
| Tear strength, kN/m, minimum   | -       | -        | -      | -      | -       | -      | 30     | -           |
| Mass fraction of extractable substances in polymer vulcanized with hexamethoxymethylmelamine, %, maximum | -       | -        | -      | 5.5    | -       | -      | -      | -           |

# 5. SELF-EXTINGUISHING FABRIC-FILM MATERIALS

## Description

Self-extinguishing fabric-film materials for use in the aviation, shipbuilding, machinery, metallurgy industries.

This fabric-film material is developed according to TSO-C69c international technical standard and AP-25 aviation regulations.

It can be glued, welded, has high peel and tear strength, antistatic properties, extinguishes during combustion.

## Application

Fabric-film material is used for the manufacture of: rescue equipment, life jackets, aircraft evacuation slides, flotation devices, fire-resistant covers, etc.



## Characteristics\*:

| TSO-C69c international standard requirements          | Inflatable material  | Slide path material  | Girt material        |
|---|----------------------|----------------------|----------------------|
| Area density, up to                                   | 280 g/m <sup>2</sup> | 300 g/m <sup>2</sup> | 450 g/m <sup>2</sup> |
| Tensile strength (grip test), minimum                 | 61.20 N/mm           | 73.93 N/mm           | 68.59 N/mm           |
| Tearing strength (trapezoid / tongue method), minimum | 34.60 N              | 296.2 N              | 184 N                |
| Adhesion strength (peel, std. 5970), minimum          | 3.12 N/mm            | Not required         | Not required         |
| Adhesion strength (shear, std. 5960), minimum         | 27.18 N/mm           | Not required         | Not required         |

\*material is certified to TSO-C69c



# 6. DEVELOPMENT OF RUBBER PRODUCTS

## 6.1 Competence center for manufacture of technical rubber products

"Kazan Synthetic Rubber Plant" performs the full cycle of development and production of rubber products

STAGE I "Creation of base rubber".

STAGE II "Creation of rubber mixes".

STAGE III "Development of product design".

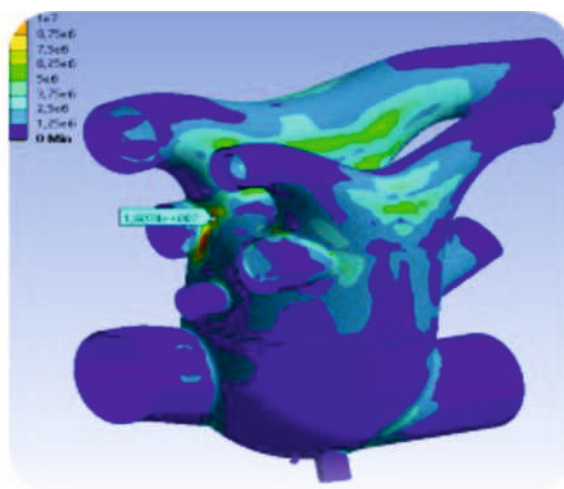
STAGE IV "Industry-related product qualification".

STAGE V "Industrial production of raw materials and finished rubber products".

STAGE VI "After-sales service".

### 6.1.1 Development from base raw materials to finished rubber products

1. Synthesis of basic raw materials and rubber mixes based on it.
2. Strength calculations of the stress-strain state of rubber goods using modern CAD/CAE systems (Siemens NX, NASTRAN, PATRAN, MARK).
3. Software product lifecycle management (Teamcenter, design documentation management, configuration management).
4. Release of a complete set of design documentation in accordance with industry design standards.
5. Development of qualification test programs and methods.
6. Qualification and certification of rubber products as part of assemblies and systems.



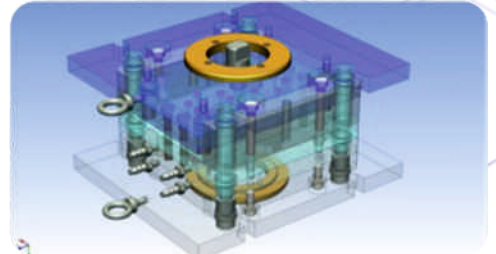
### Industry-related qualification of the finished component product

1. Basic analytical studies of polymers:  
IR spectroscopy, chromatography, DMA, TMA, etc.
2. A complex of physical and mechanical tests.
3. A complex of environmental tests:
  - vibration dynamic tests;
  - shock pulse;
  - low and high temperature tests in the range from minus 70°C to plus 180°C;
  - salt spray;
  - exposure to solar radiation;
  - static and dynamic dust climatic tests;
  - a complex of low pressure, depressurization and icing tests;
  - rain tests;
  - resistance to aggressive environments in combination with operational loads;
  - pressure, etc.
4. Endurance tests including operational loads.

# 6. DEVELOPMENT OF RUBBER PRODUCTS

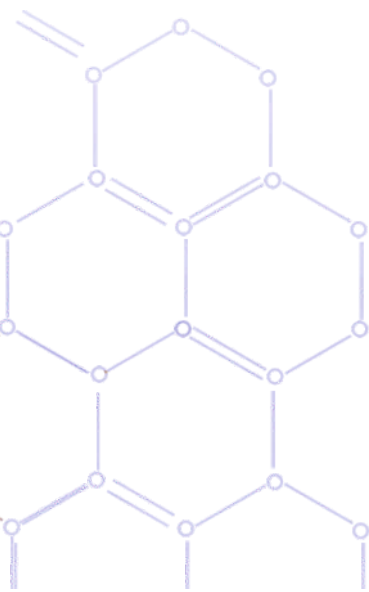
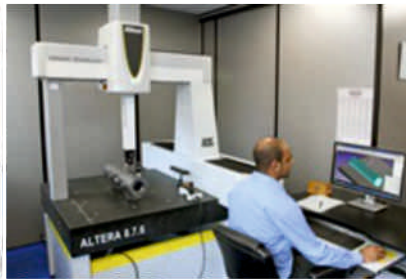
## 6.1.2 Mold design

Kazan Synthetic Rubber Plant is ready to offer mold design services for manufacture of complex rubber products based on the customer's technical specification.











## 6.2 Serial production of rubber products

1. Industrial production of basic raw materials.
2. Industrial production of rubber mixes.
3. State-of-the-art rubber production workshop meeting the international requirements (12 units of equipment).  
Product dimensions up to 600x400x4500 mm, with capability of production of complex shaped products of unlimited length.
4. State-of-the-art instruments for measuring and inspection of finished rubber products.
5. Delivery of products under the control of quality control agency of Ministry of Defense of the Russian Federation/Independent inspection.



# 6. DEVELOPMENT OF RUBBER PRODUCTS

| Parameters of the designed rubber products  | Application  | Fire resistance category per KT-160G qualification requirements | Main characteristics   |
|---|--|---|--|
|    | Seals between the engine reverser mount assembly panels                                | Category- A (1100°C, 15 minutes)                                | Working temperature range from - 60 °C to + 250 °C.<br>Resistant to high humidity, vibrations, contaminating liquids, dust and sand, fungi, salt spray and open flame.                           |
|    | Sealing of a section of the aircraft emergency door                                    | Category- C   | Working temperature range from - 60 °C to + 250 °C.<br>Resistant to high humidity, vibrations, contaminating liquids, dust and sand, fungi, salt spray, icing and open flame.                    |
|    | Seal installed on the engine air intake  | Category- A (1100°C, 15 minutes)                                | Working temperature range from - 60 °C to + 250 °C.<br>Resistant to high humidity, vibrations, contaminating liquids, dust and sand, fungi, salt spray, icing and open flame.                    |
|  | Seal between bucket and panels of the engine thrust reverser mount assembly            | Category- A (1100°C, 15 minutes)                                | Working temperature range from - 60 °C to + 250 °C.<br>Resistant to high humidity, vibrations, contaminating liquids, dust and sand, fungi, salt spray and open flame.                           |
|  | Seal installed on the housing of the engine thrust reverser mounting assembly          | Category- A (1100°C, 15 minutes)                                | Working temperature range from - 60 °C to + 250 °C.<br>Resistant to high humidity, vibrations, contaminating liquids, dust and sand, fungi, salt spray and open flame.                           |
|  | Seals installed between pylon and engine mixer   | Category- A (1100°C, 15 minutes)                                | Working temperature range from - 60 °C to + 250 °C.<br>Resistant to high humidity, vibrations, contaminating liquids, dust and sand, fungi, salt spray and open flame.                           |
|  | Engine cowl flaps seals  | Category- A (1100°C, 15 minutes)                                | Working temperature range from - 60 °C to + 250 °C.<br>Resistant to high humidity, vibrations, contaminating liquids, dust and sand, fungi, salt spray, icing and open flame.                    |
|  | Corrugated bush, used in gas turbine units, intended for pumping gas via main pipeline | Category requirement not set by the consumer                    | Working temperature range from - 60 °C to + 250 °C;<br>Resistant to high humidity;<br>Designed for operation in MS-805 type oil at high temperatures.<br>Confirmed endurance of over 3000 hours. |





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