Thermostatic Elements ››

-Turning Heat into Motion

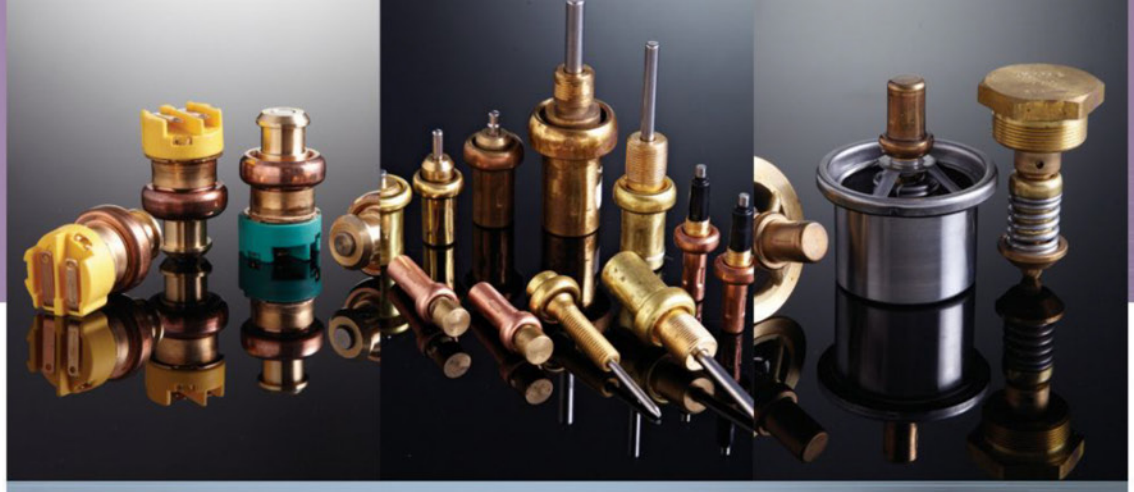
Why Choose Shanghai TU-POLY

As a professional manufacturer which is specially in producing thermostatic elements, Shanghai TU-Poly has the top technical experts, high-quality staff team with rich experience in the field of wax thermostatic elements as well as advanced automated equipments adopted from USA. We ensure that:

- **Wide Range of Production Applications**
  Used in the motorized fields like automobile, train, ship, helicopter, armored vehicle, air compressor, electric generator and so on. Rich design experience in the field of sanitary, heating and ventilation as well as chemistry.
- **Largest product range**
  in order to meet customers' special requirements
- **Strong Capability of New Product Research and development.**
  efficient design and development of new products in accordance with customers' demand
- **Rich Experience of Thermostatic Wax Production:**
  Providing with precise control in a practical application, wax preparation for ODM service.
- **Advanced Productive Technologies and Equipments**
  products with outstanding quality in accordance with customers' demand
- **Reliability of First-class Production**
  to ensure customers' satisfaction

Rich experience of being equipped with automobile engine manufactures to offer excellent service with high credibility
Location in Shanghai, China with well-established supporting system as well as logistics distribution system.
to provide our customers with the most cost efficient products in time.

>> The endless endeavor to meet customers' requirements
The pursuit of excellent quality, strives for perfection



Definitions

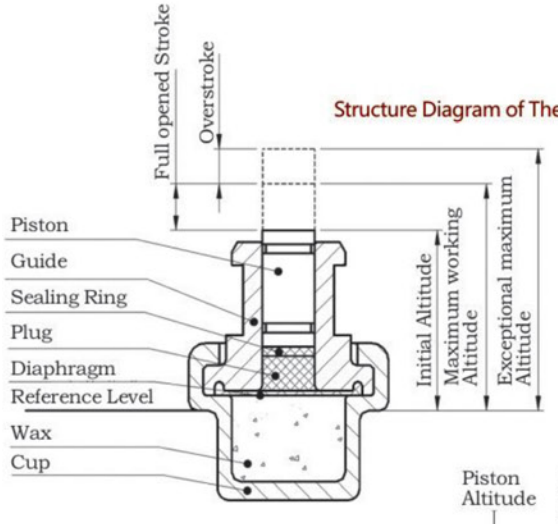
Initial Altitude: the initial altitude of the piston measured from a reference level when it is static

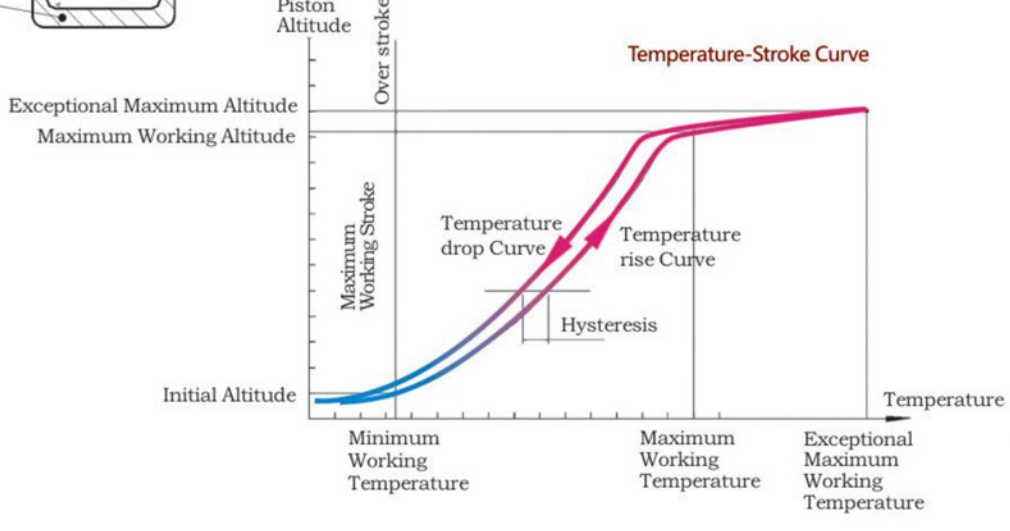
Full opened Stroke: the displacement of piston from initial altitude under the full opened temperature

Overstroke: the displacement of piston from initial altitude under utmost working temperature

Hysteresis: the disparity between the temperature rise curve and temperature drop cooling curve of thermostatic elements, which is decided by the composition of wax.

Sensitivity: the time when the top of piston up to the full opened stroke under certain temperature





Application Rules

In the course of designing thermo actuator application, some principles must be followed:

Reference Level

- A stable reference level is essential. Each element should be calibrated to a reference face respectively so as to achieve the best accuracy for the product
- When installed, the spring load must have a mechanical stop rather than be used in piston directly in case of early failure of elastomeric bag and diaphragm
- The design of element application should be set sufficient space for over stroke under exceptional maximum working temperature
- Spring load should be in the range of the allowable value of the element drawing

Design input

Parameter required in elements design

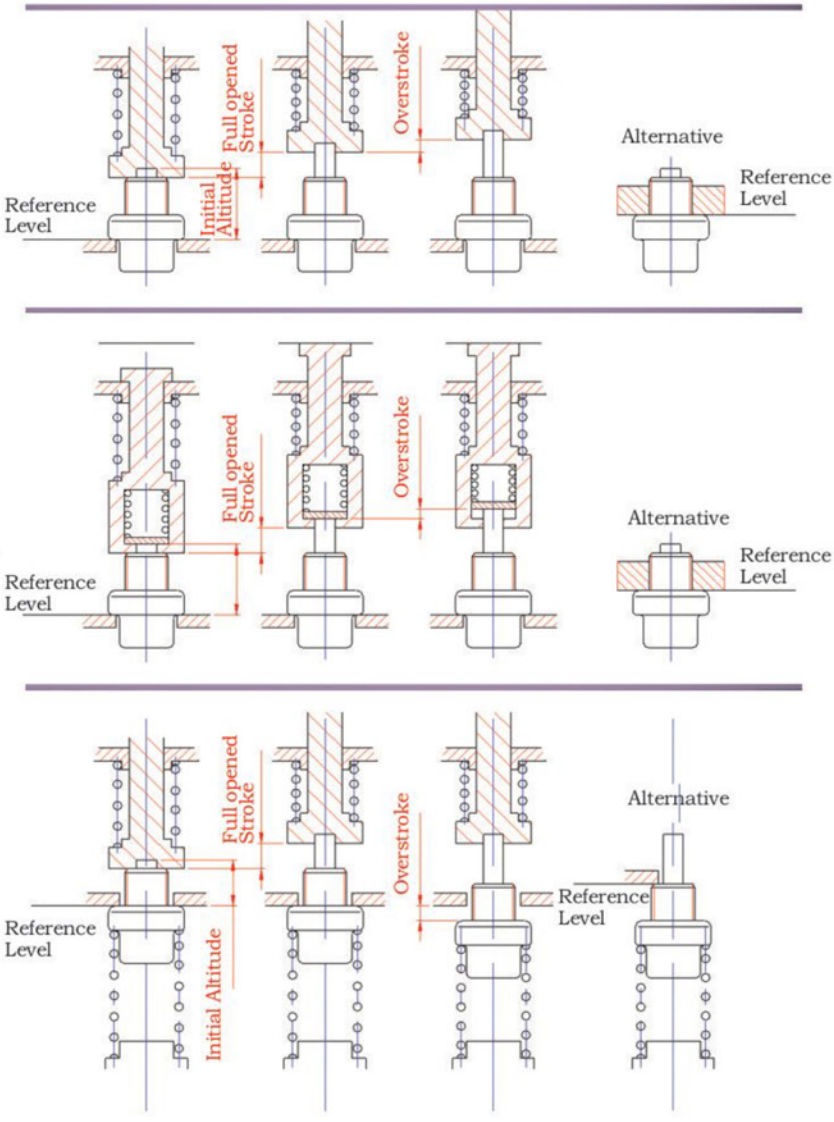
- Reference Level
- Initial Altitude
- Spring Initial Load, Spring stiffness
- Minimum Working Temperature
- Maximum Working Temperature and Working Stroke
- Over Stroke

The Working Life Expectancy of Element Depends on:

- Load
- Temperature
- Working Stroke
- Number of Cycles
- Operating Time under Load
- Duration under Over stroke

Sensitivity Depends on:

- Types of Medium touch with Element
- Flow Velocity of Medium
- Environment around Element
- Element Surface which touching with Medium
- Composition of Wax



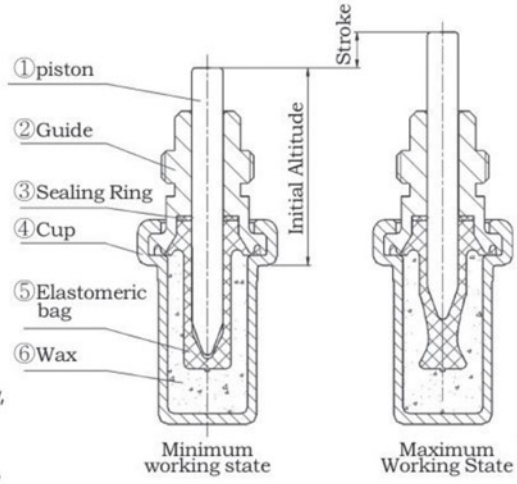
Product Structure

In line with internal sealing methods of thermostatic element, it can be divided into squeeze-push type, diaphragm type and piston type.

Squeeze-push Type

Operating Principles

A sealed capsule is composed of guide②, cup④, elastomeric bag⑤. Wax⑥is sealed in the cup④, while piston① is surrounded in the elastomeric bag⑤. When the temperature of medium outside cup④ rises and over the minimum working temperature of thermostatic element, wax⑥ expands and the pressure applies, via the bag, both a radial force (squeeze) and an axial force (push) on the piston① to makes movement. Again, an external spring ensures the return of piston when the temperature decreases.



Structural Features

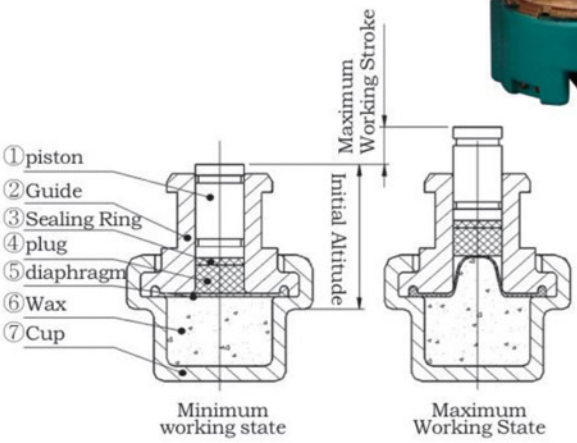
Advantages: larger stroke distance, higher reliability, the preferred choice for engine thermal management system

Weakness: worse than diaphragm type in sensitivity and hysteresis

Diaphragm Type

Operating Principles

A sealed capsule is composed of guide②, cup⑦, diaphragm⑤. wax⑥ is sealed in the cup⑦. When the temperature of medium outside cup⑦ rises and over the minimum working temperature of thermostatic element , wax⑥ expands and pushes against the diaphragm⑤ the movement is transmitted via the plug④ to the piston①. The guide② maintains the diaphragm, and allows the plug and piston to slide freely. An external spring ensure the return of the piston when cooling down.



Structural Features

Advantages: precise movement path, high sensitivity, the preferred choice for sanitary applications and heating system

Weakness: worse than squeeze-push type in reliability, not suitable for the large-stroke product (over 10mm)

Product Structure

Plunger Piston Type

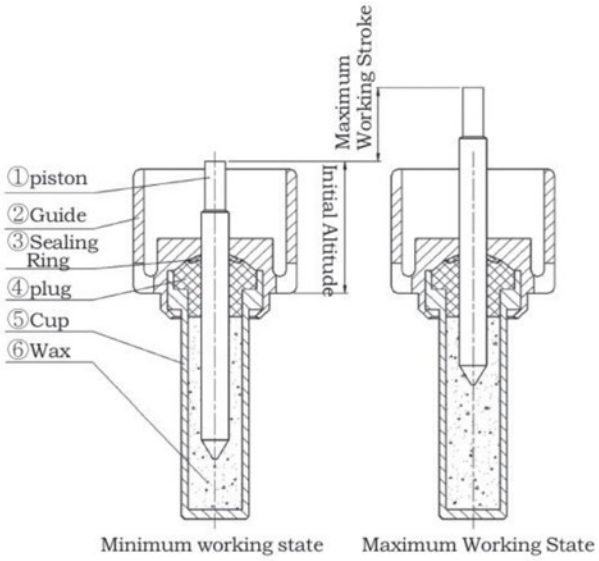
Operating Principles

A sealed capsule is composed of guide②, cup⑤, rubber plug④. Wax⑥ is sealed in the cup⑤. When the temperature of medium outside cup⑤ rises and over the minimum working temperature of thermostatic element, wax⑥expands and pushes against the piston①movement. Again, an external ensure the return of the piston when the temperature decreases.

Structural Features

Advantages: large stroke, big absorbing load, small volume, generally used in engine cooling system or some other special application.

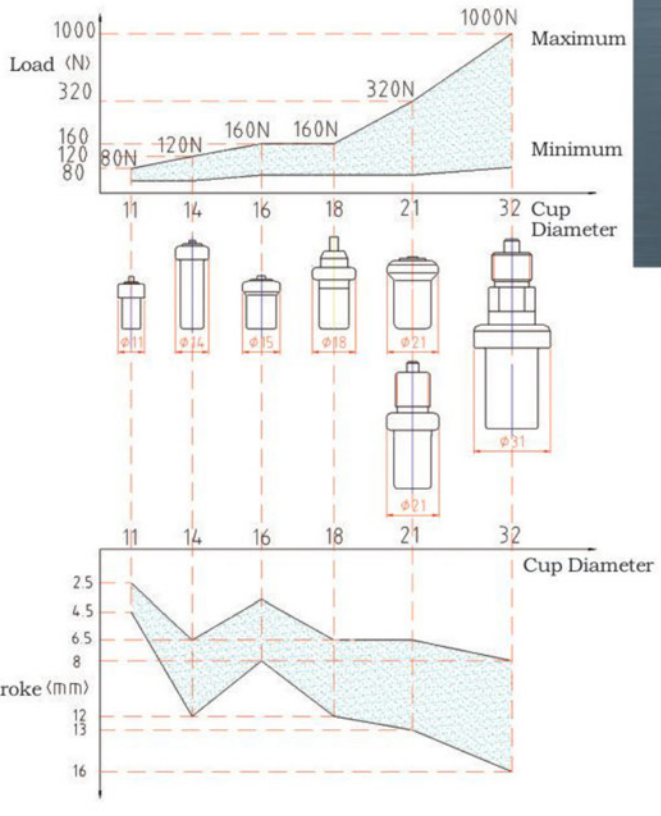
Weakness: worse than squeeze-push type in reliability, poor hysteresis



Being equipped with domestic and foreign automobile engine manufactures for a long time, Shanghai TU-Poly owns well-established quality assurance system, accumulates rich experience as well as sustainable research and development capability. Technical team members have more than 30 years of experience in the field of thermostatic elements ensuring that our company product keeps the world leading position in this field. Our aim is to be an international first-class enterprise with perseverant efforts and achieve customers' dream finally.

Product Specifications

Squeeze-push Type



Structural Features

Advantages: larger stroke distance, higher reliability, the preferred choice for engine thermal management system

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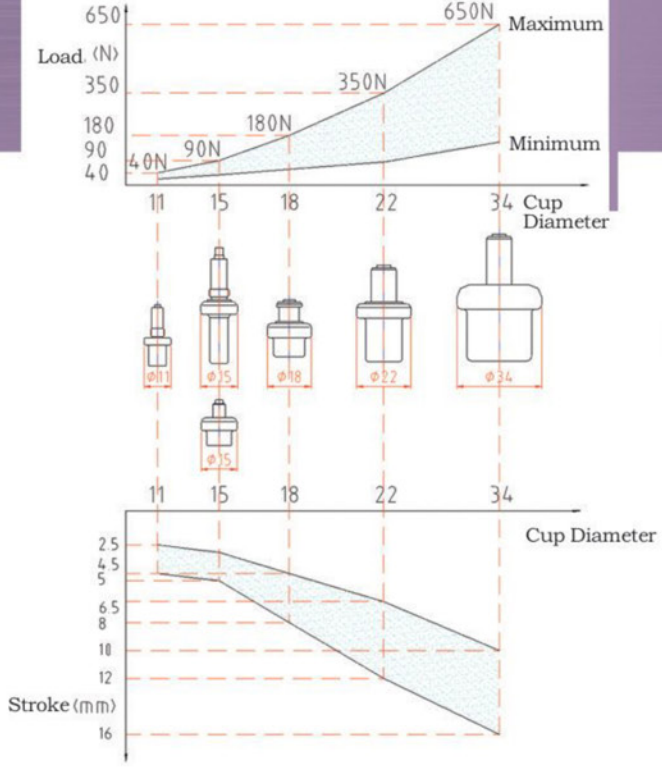
Diaphragm Type



Structural Features

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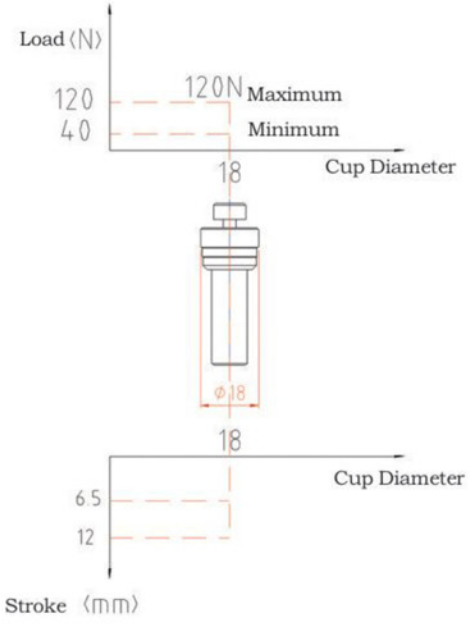
Plunger Piston Type



Structural Features

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Weakness: worse than squeeze-push type in reliability, poor hysteresis

Main Applications

- **Engine Thermal Management**

  Thermostats
  Temperature Control of Engine Oil
  Recycling of Waste Gas
  Temperature Control of Air Admission
  Temperature Control of Automatic Transmission, etc

- **Heating**

  hermostatic Radiator Valves（TRV）
  Underfloor Heating
  Zone Valve Actuators
  Return Temperature Limiters（RTL）
  Heating System Regulator
  Ventilation Shutter Control, etc
  Temperature control for solar heating and geothermal systems, etc

- **Sanitary**

  Thermostatic Shower Mixers, Basin Mixers, Bidet Mixers
  Anti-legionnella Recirculation Valves
  Thermostatic Mixing Valves（TMV）
  Temperature Limiting Valves, etc

- **Industry**

  Motorized Valves
  Thermal Sensors
  Temperature Compensating Devices
  Frost Detectors, etc

- **Indoor Products**

  Door Lock Controller (washing machine)
  High-pressure Cleaners
  Frost Detection, etc

Thermostatic Wax Series

The characteristic of Thermostatic Wax consists of its volume expansion amount can reach up to 13 ~ 15 % when it is heated from solid to liquid. We use this characteristic, when it is heated to a solid-liquid transformation, its' heat energy can translate into mechanical energy. Thermostatic Wax has been widely applied to temperature auto regulation of thermal-driving and various thermal-starting devices.
For example, automobile thermostat has been most widely well known, it has cylindrical seal part that loads some Thermostatic Waxes inside. To realize automatic temperature control, it was designed by a special technical specification for the solid-liquid transformation of Thermostatic Wax..

Within temperature control range of –20 ~ 180℃ of Thermostatic Wax may compound with different temperature range and different efficient distance according to client's technical demand. Our company may offer the relative technical service.

Model Number	Appearance (Normal Temperature)	Quality Standard			
		Range of Temperature Control	Effective Distance Travel	Water–Solubility Acid and Alkali	Mechanical Impurity
TUB-10	Liquid	-20/-10	⩾10	Non.	Non.
TUB-5	Liquid	-15/-5	⩾10	Non.	Non.
TUB0	Liquid	-10/0	⩾10	Non.	Non.
TUB5	Liquid	-5/5	⩾10	Non.	Non.
TUB10	Liquid	0/10	⩾10	Non.	Non.
TUB15	Liquid	5/15	⩾10	Non.	Non.
TUB20	Semisolid	10/20	⩾10	Non.	Non.

Thermostatic Wax Series

TUB25	Semisolid	15/25	⩾10	Non.	Non.
TUB30	Semisolid	20/30	⩾10	Non.	Non.
TUB35	Semisolid	25/35	⩾10	Non.	Non.
TUB40	Powder, Slice , Column	30/40	⩾10	Non.	Non.
TUB45	Powder, Slice , Column	35/45	⩾10	Non.	Non.
TUB50	Powder, Slice , Column	40/50	⩾10	Non.	Non.
TUB55	Powder, Slice , Column	45/55	⩾10	Non.	Non.
TUB60	Powder, Slice , Column	50/60	⩾10	Non.	Non.
TUB65	Powder, Slice , Column	55/65	⩾10	Non.	Non.
TUB70	Powder, Slice , Column	60/70	⩾10	Non.	Non.
TUB75	Powder, Slice , Column	65/75	⩾10	Non.	Non.
TUB80	Powder, Slice , Column	70/80	⩾10	Non.	Non.
TUB85	Powder, Slice , Column	75/85	⩾10	Non.	Non.
TUB90	Powder, Slice , Column	80/90	⩾10	Non.	Non.
TUB95	Powder, Slice , Column	85/95	⩾10	Non.	Non.
TUB100	Powder, Slice , Column	90/100	⩾10	Non.	Non.
TUB105	Powder, Slice , Column	95/105	⩾10	Non.	Non.
TUB110	Powder, Slice , Column	100/110	⩾10	Non.	Non.
TUB115	Powder, Slice , Column	105/115	⩾10	Non.	Non.
TUB120	Powder, Slice , Column	110/120	⩾10	Non.	Non.
TUB125	Powder, Slice , Column	115/125	⩾10	Non.	Non.
TUB130	Powder, Slice , Column	120/130	⩾10	Non.	Non.
TUB135	Powder, Slice , Column	125/135	⩾10	Non.	Non.
TUB140	Powder, Slice , Column	130/140	⩾10	Non.	Non.
TUB145	Powder, Slice , Column	135/145	⩾10	Non.	Non.
TUB150	Powder, Slice , Column	140/150	⩾10	Non.	Non.
TUB155	Powder, Slice , Column	145/155	⩾10	Non.	Non.
TUB160	Powder, Slice , Column	150/160	⩾10	Non.	Non.
TUB165	Powder, Slice , Column	155/165	⩾10	Non.	Non.
TUB170	Powder, Slice , Column	160/170	⩾10	Non.	Non.
TUB175	Powder, Slice , Column	165/175	⩾10	Non.	Non.
TUB180	Powder, Slice , Column	170/180	⩾10	Non.	Non.

Thermostatic Wax Linearity Series

Model Number	Appearance (Normal Temperature)	Quality Standard			
		Range of Temperature Control	Effective Distance Travel	Water-Solubility sAcid and Alkali	Mechanical Impurity
TUB-5-1	Liquid	-20/-5	≥7	Non.	Non.
TUB0-1	Liquid	-15/0	≥7	Non.	Non.
TUB5-1	Liquid	-10/5	≥7	Non.	Non.
TUB10-1	Liquid	-5/10	≥7	Non.	Non.
TUB15-1	Liquid	0/15	≥7	Non.	Non.
TUB20-1	Semisolid	5/20	≥7	Non.	Non.
TUB25-1	Semisolid	10/25	≥7	Non.	Non.
TUB30-1	Semisolid	15/30	≥7	Non.	Non.
TUB35-1	Semisolid	20/35	≥7	Non.	Non.
TUB40-1	Powder, Slice , Column	25/40	≥7	Non.	Non.
TUB45-1	Powder, Slice , Column	30/45	≥7	Non.	Non.
TUB50-1	Powder, Slice , Column	35/50	≥7	Non.	Non.
TUB55-1	Powder, Slice , Column	40/55	≥7	Non.	Non.
TUB60-1	Powder, Slice , Column	45/60	≥7	Non.	Non.
TUB65-1	Powder, Slice , Column	50/65	≥7	Non.	Non.
TUB70-1	Powder, Slice , Column	55/70	≥7	Non.	Non.
TUB75-1	Powder, Slice , Column	60/75	≥7	Non.	Non.
TUB80-1	Powder, Slice , Column	65/80	≥7	Non.	Non.
TUB85-1	Powder, Slice , Column	70/85	≥7	Non.	Non.
TUB90-1	Powder, Slice , Column	75/90	≥7	Non.	Non.
TUB95-1	Powder, Slice , Column	80/95	≥7	Non.	Non.
TUB100-1	Powder, Slice , Column	85/100	≥7	Non.	Non.
TUB105-1	Powder, Slice , Column	90/105	≥7	Non.	Non.
TUB110-1	Powder, Slice , Column	95/110	≥7	Non.	Non.
TUB115-1	Powder, Slice , Column	100/115	≥7	Non.	Non.
TUB120-1	Powder, Slice , Column	105/133	≥7	Non.	Non.
TUB125-1	Powder, Slice , Column	110/125	≥7	Non.	Non.
TUB130-1	Powder, Slice , Column	115/130	≥7	Non.	Non.
TUB135-1	Powder, Slice , Column	120/135	≥7	Non.	Non.
TUB140-1	Powder, Slice , Column	125/140	≥7	Non.	Non.
TUB145-1	Powder, Slice , Column	130/145	≥7	Non.	Non.

Thermostatic Wax Linearity Series

Model Number	Appearance (Normal Temperature)	Quality Standard			
		Range of Temperature Control	Effective Distance Travel	Water-Solubility sAcid and Alkali	Mechanical Impurity
TUB150-1	Powder, Slice , Column	135/150	⩾7	Non.	Non.
TUB155-1	Powder, Slice , Column	140/155	⩾7	Non.	Non.
TUB160-1	Powder, Slice , Column	45/160	⩾7	Non.	Non.
TUB165-1	Powder, Slice , Column	150/165	⩾7	Non.	Non.
TUB170-1	Powder, Slice , Column	155/170	⩾7	Non.	Non.
TUB175-1	Powder, Slice , Column	160/175	⩾7	Non.	Non.
TUB180-1	Powder, Slice , Column	165/180	⩾7	Non.	Non.

Special Wax in special purpose

Energy Storage Wax

We take the wax's advantage characteristic which can absorb and release thermal energy in the solid-liquid transformation process to store the transferred energy to achieve making use of the most of rich energy resource. Recently years, the new technique has been researched and developed in many fields all over the world, such as new building material, textile industry, electric power, medical device, aviation and space. Some of projects have already stepped into a practical and commercial stage.

To conform to market requirement, we have a very good cooperation with some Chinese famous Universities, Scientific Institutions & enterprises to develop and research in energy storage wax.. Some projects have already stepped into a practical stage.

Name	Model	Melt Point (℃)	Mechanical Impurities(%)	Water-Solubility Acid and Alkali	Appearance
Energy Storage Wax	TUE20	20	Non	Non	White-Yellowy Liquid
Energy Storage Wax	TUE21	25	Non	Non	White-Yellowy Liquid
Energy Storage Wax	TUE22	30	Non	Non	White-Yellowy Liquid
Energy Storage Wax	TUE23	35	Non	Non	White-Yellowy Liquid
Energy Storage Wax	TUE24	40	Non	Non	White-Yellowy Liquid
Energy Storage Wax	TUE25	45	Non	Non	White-Yellowy Liquid
Energy Storage Wax	TUE26	50	Non	Non	White-Yellowy Liquid
Energy Storage Wax	TUE27	80	Non	Non	White-Yellowy Liquid

Special Wax in special purpose

Powdery Special Wax

	YNE17
Drop point, ℃	76
Penetration, 25℃, 1/10mm	31
Oil Content, %	
Viscosity, 125℃	8.7
Water-Solute Acid and Alkali	Non

Precision Casting Wax

Precision Casting Wax mainly is used for precision mechanical process with zero allowance or very limited allowance. We can not adopt general casting technique, but can only adopt zero allowance casting or precision casting. Because of the product's structure is very delicate and complex especially in bejeweled with golden and silver, such as diamond ring, brooch, earring etc.

The characteristics of precision casting wax are: good coating property, no denaturalization to be heated, good flow ability, good thermal stability, and well surface finish.

	YNE-1	YNE-2	YNE-3
Drop Point, ℃	55-65	65-75	75-85
Linear Shrinkage	0.3-1.5	0.3-1.5	0.3-1.5
Bending Strength	>5	>5	>5
Penetration, 1/10mm	8-15	8-15	8-15
Viscosity,100℃,cSt	10-30	10-30	10-30
Soft Point, ℃	54-62	64-72	74-82
Ash Content, 700℃, m/mm	<0.1	<0.1	<0.1

Special Wax in special purpose

Electric Wax Series

(1) Special Seal Wax for Electronic Elements

This series of products have very good moisture proof capability and good capability for enduring temperature changed. Its' hardness and viscosity are temperate, and it's pliability and plasticity are well. They have excellent electrical property parameters. Their high frequency loss is few. They have no any corrosion. Their various processing property are stable.

This series of products are mainly applicable for dipping electrical coil such as electronic tuner coil, various oscillator coils, adjustable inductance electronic component, electronic transformer and color TV luminance delay, thermal seal to some materials.

Items		Model Number					
		YNE6	YNE7	YNE8	YNE9	YNE10	YNE11
Drop Point, ℃		76-80	—	84±6	84±6	70-80	94-106
Kinematical Viscosity, 130℃							
Penetration, 25℃, 1/10mm		24-32	<25	16-25	>30	>34	15-28
Soft Point, ℃		—	64-67	—	—	—	≮32
Acid Value, mm KOH/g		0.1	—	—	—	—	—
Volume Resistively ≮		1×10^{16}	1×10^{14}	1×10^{15}	1×10^{16}	1×10^{12}	1×10^{15}
Medium Loss, ≯		9×10^{-4}	5×10^{-4}	9×10^{-4}	9×10^{-4}	5×10^{-4}	9×10^{-4}
Temperature Resistance	+70℃	4h no flow	—	—	—	—	—
	-40℃	2h no crack	—	—	—	—	—
Shrinkage Percentage, %			100℃<9			16℃<9.5	
Corrosion Test		—	—	—	—	Cooper sheet 150℃, 3h non	—

Special Wax in special purpose

(2) Dipping Seal wax for Various Capacitors

This series of products have eight grades, which their common characteristic are excellent insulating property, well moisture proof capability, low loss, well compatibility and oxidation resistance. The drop melting point from 65℃ to 145℃, can be adapt to the demands for insulating envelopments with different ranges.

This series of products are mainly applicable for dipping envelopment of the electronic elements such as line-motivating transformer, color TV delay coil, various film and paper capacitor, porcelain capacitor, etc.

Model Number	Item					
	Drop Point,℃	Kinematical Viscosity, 130℃, cSt.	Penetration, 25℃, 1/10mm	Acid Value, Mm KOH/g	Medium Loss, ≯	Volume Resistance,≮
TUE60	60-70	10±2	10±3	0.05	9×10^{-4}	1×10^{16}
TUE61	65-75	10±2	10±3	0.05	9×10^{-4}	1×10^{16}
TUE62	70-80	10±2	10±3	0.05	9×10^{-4}	1×10^{16}
TUE63	75-85	12±2	9±2	0.05	9×10^{-4}	1×10^{16}
TUE64	80-90	12±2	9±2	0.05	9×10^{-4}	1×10^{16}
TUE65	85-95	12±2	9±2	0.05	9×10^{-4}	1×10^{16}
TUE66	90-100	14±2	8±2	0.05	9×10^{-4}	1×10^{16}
TUE67	95-105	14±2	8±2	0.05	9×10^{-4}	1×10^{16}
TUE68	120-130	150℃10±2	7±2	0.05	9×10^{-4}	1×10^{16}
TUE69	135-145	160℃ 20±2	7±2	0.05	9×10^{-4}	1×10^{16}

(3) Sealing wax for Power Capacitor

This series of products have outstanding insulation impedance and low loss. They have a suitable air-absorption capacity and appearance surface. Their performance is stable. They have a suitable hardness and viscosity, non-poisonous, tasteless and low acid value.

This series of products are mainly applicable for dipping & seal of the metallic capacitor such as the low-voltage power capacitor, alternating current capacitor, household appliances capacitor, etc.

Special Wax in special purpose

Special Wax in Agriculture and Forestry

(1)YNE4 Series Special Molding Moisturized Wax for Fruit Trees

In order to protect fruit trees and shrubs from desiccation during winter dormancy or transportation or to keep moisture in summer drought, Special Molding Moisturized Wax is spayed on the surface of trees, forming the protecting film in surface of trees. The film has some adequate micro pore that could efficiently reduce the losses of moisture in the surface of the trees, and it simultaneously ensures physiological respiration of the trees.

Appearance		Emulsification Tranquilization
Stability Test	Thermal Resistance Test 40℃ 10h	Emulsification Tranquilization
	Thermal Resistance Test-30℃ 10h	Emulsification Tranquilization
PH Value		7-8
Max. Dilute Multiple		<30

(2)YNE5 Series Special Preventing Frostbite Wax for Trees

In large northern areas of our country, the winter season is severe cold and the spring seasons more heavy windy. The early winter and the late spring's frost are quite disadvantage to young plant, the weather is particularly abnormal coldness after spring comes, and frequently injures these trees. As a result young plant is cold death. YNE5 Series Special Preventing Frostbite Wax for Trees not only has anti-freezing effect on trees but also well effect on anti-sprouting etc. Spraying on branches and leaves of trees can make exuberant growth of foliage.

Items	Quality Standard
Appearance	White
PH Value	7-8
Density, 20℃g/cm3	0.98-0.99
Refrigerating Test, -50℃, 60 minutes	No any change, same as room situation
Impurities	Non
Storage Test, 6-12 months	Good
Odor	Non

TU-POLY

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