



**WACKER** **SILICONES**

SILICONE PASTES  
VERSATILE APPLICATIONS AND  
EXCEPTIONAL PROPERTIES

CREATING TOMORROW'S SOLUTIONS

## Contents

Silicone Pastes	3
Specific Applications	4
Table of Applications	6
Products	7
Properties	8
Wacker Chemie AG	14



OUR SILICONE PASTES ENSURE  
THAT THINGS RUN SMOOTHLY

**Reliability and the ability to cope under pressure are vital to the global market success of high-tech specialists and subcontractors. To secure an impact on tomorrow's markets, modern-day companies must offer stable production processes and low reject rates.**

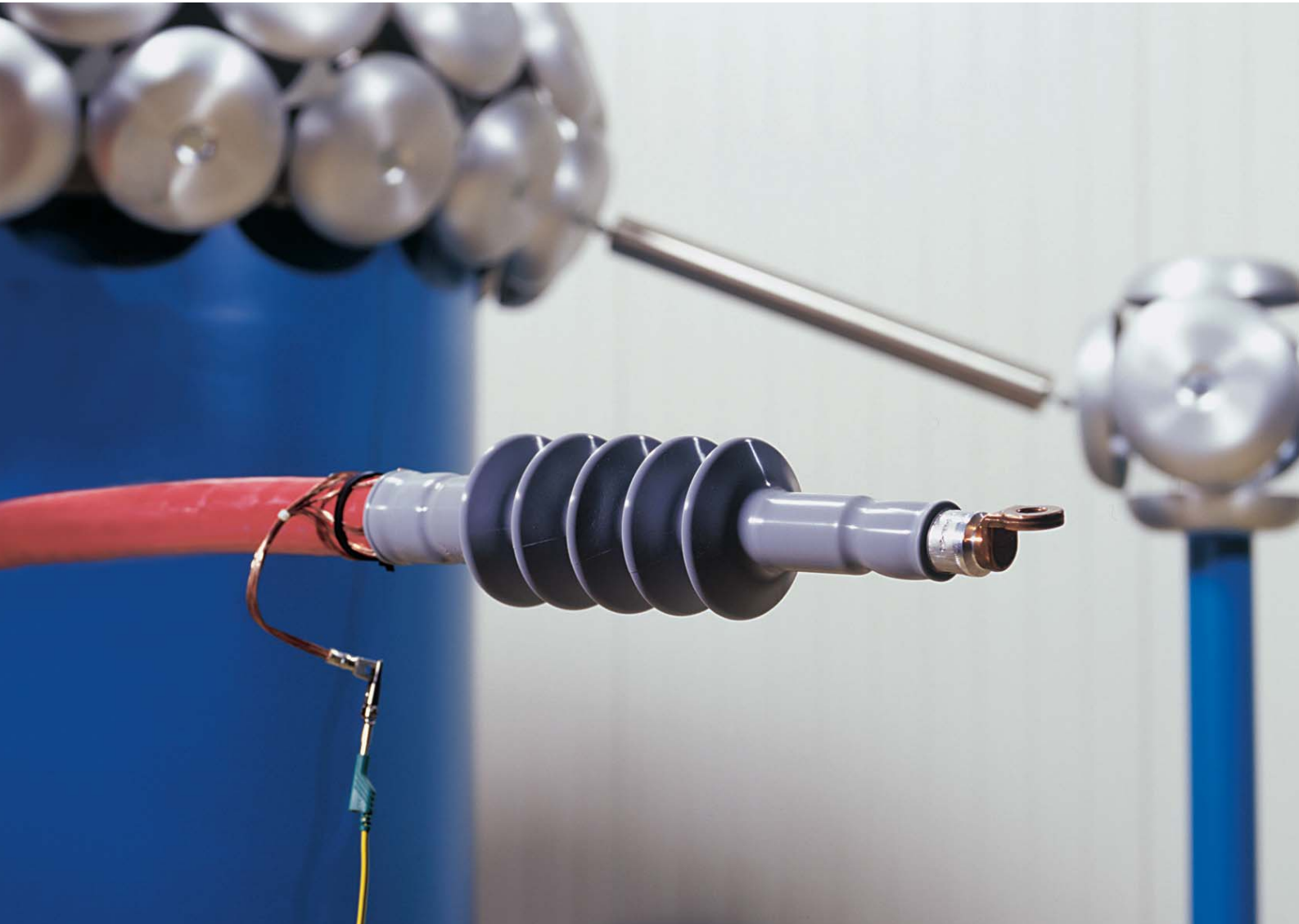
#### **Versatile Applications**

WACKER's silicone pastes are all about reliability. Their wide range of applications includes the mechanical engineering, metalworking, electronics, instrumentation and food-processing sectors. As reliable functional and process auxiliaries, our products have been used all over the world by major specialist firms and industrial subcontractors for many decades. The WACKER® Silicone Paste and POWERSIL® Paste AP product grades are used in nearly every sector: as industrial lubricants and assembly aids, as lubricants in plastic bearings, as electrical insulation pastes to protect insulators, as a heat-sink paste in electronics, or as sealing aids to reliably seal dismountable components.

#### **Impressive Properties**

A broad portfolio hinges on impressive product properties. WACKER's silicone pastes offer you key benefits thanks to a range of impressive basic properties. Our pastes comprise thermostable and highly chemical-resistant siloxanes, whose consistency is largely unaffected by temperature changes. These pastes also offer excellent electrical insulation, good release action as well as time-tested adhesive and lubricating properties – all have helped make our silicone pastes so successful in a variety of applications.

# SPECIALTY APPLICATIONS



Whether your products are for antifriction, lubricating, sealing, release, insulating, damping or conductive purposes, our silicone pastes are effective, reliable and durable in a wide range of industrial sectors. It does not matter whether you use the pastes as standard antifriction agents and lubricants or for complex, heat-resistant structural parts.

Over recent decades, WACKER's silicone pastes have made an excellent name for themselves as multifunctional process auxiliaries.

#### **Lubricating and Assembly Pastes**

Silicone pastes from WACKER are suitable lubricating and assembly aids in both technical and, to an extent, food-processing sectors. The greasing of O-rings and elastomeric parts before their installation prevents damage and ensures ease of movement. Silicone pastes make it easier to push cable lugs onto cable terminations. Our products cause only minimal swelling of organic rubber and elastomers. Only with silicone rubber can serious swelling occur as a result of the chemical similarity. In this case, we recommend pastes with higher-viscosity base fluids, such as WACKER® Silicone Paste P 8, POWERSIL® Paste AP or fluorosilicone greases.

#### **Sealing Aids**

WACKER's silicone pastes permit reliable sealing of detachable construction parts and joints because the elastomer seal tightness can be adapted to the construction elements to be connected, such as glass apparatus, seals on liquid-filled machinery, gears and similar parts.

#### **Release Agents**

Their chemical stability makes silicone pastes suitable, for example, for heat-resistant applications in which plastic parts are deformed by pressure and heat or are processed on extruders.

#### **Lubricants**

Offering good viscosity/temperature characteristics and chemically stable properties, WACKER lubricants can be used in a very broad range of applications. They not only ensure extremely low coefficients of friction in plastic/metal pairings, but also greatly reduce wear in plastic bearings and peristaltic pumps.

#### **Insulators**

If used in transformers exposed to high levels of electrolyte and dust – as is the case in coastal regions, coal mines and cement factories – silicone paste films readily siliconize the contaminating foreign particles. Silicone pastes render the dirt particles hydrophobic and incorporate them into the paste film. In rainy, foggy or very damp conditions, WACKER products prevent the formation of coherent, conductive films of liquid on high-voltage insulators. This helps prevent corona discharges and sparkovers.

#### **Damping Media**

Where components require dampened movement (e.g. sound pickups, dampened hinges and comparable parts), silicone pastes are ideal as damping media.

#### **Heat-Sink Media**

WACKER products are suitable as specialty heat-sink pastes in electronics and instrumentation. In electronic power components, our silicone pastes' thermal conductivity ensures enhanced heat dissipation to cooling rails. In metrology, they also ensure optimized heat transfer from the measurement point to sensors.

# VERSATILE APPLICATIONS

WACKER® Silicone Paste	P	P soft	P 4	P 4 soft	PNP	P 8	Heat-Sink Paste P 12	P 14	POWERSIL® Paste AP
<b>Lubricating and Assembly Pastes</b>									
Installation of O-rings	•	•	•	•					
Cable terminations									•
Cable sleeves									•
Cable connectors									•
Greasing of rubber profiles		•	•	•				•	
Sealing and lubricating aid for stuffing boxes			•	•	•	•		•	
Plastic lubricant for metals				•	•			•	
<b>Sealing Aids</b>									
Ground-glass joints, manufacture of chemical equipment (devices)						•			
Greasing of valves/stopcocks	•					•			
Greasing of seal rings			•	•		•			
<b>Release Agents</b>									
Extruder dies and rings	•		•					•	
Compression molding		•	•						
Plastic demolding		•							
Release agent on the jaws of heat-sealing equipment		•		•					
<b>Lubricants</b>									
Plastic parts, gears and bearings				•	•			•	
Shutoff valves, control devices			•	•		•			
Plastic and metal guides				•				•	
Pivot joints			•			•			
<b>Insulation</b>									
High-voltage insulators			•					•	
Ignition systems (automotive electrics)			•					•	
Encapsulation of electronic components			•					•	
Moisture protection			•					•	
<b>Damping Medium</b>									
			•		•	•			
<b>Heat-Sink Medium</b>									
							•		

# EFFECTIVE PRODUCTS

## **WACKER® Silicone Paste P/P Soft**

Translucent, Vaseline®-like, relatively stiff and water-repellent paste; it becomes soft under the force of gravity or mechanical loading (e.g. kneading). This permits greater ease of processing in many cases; the paste's actual consistency is less dependent on temperature. The paste is compliant with German BfR Recommendation XV (silicones).

## **WACKER® Silicone Paste P 4/P 4 Soft**

Opaquely translucent when applied as a thin film; average consistency, relatively shear-stable, slightly thixotropic; good electrical characteristics as regards insulating properties, permittivity and dielectric strength, and good anchorage to metals and ceramics. Parts coated with WACKER® Silicone Paste P 4 are particularly water repellent; this provides a certain amount of corrosion protection.

## **WACKER® Silicone Paste PNP**

White, particularly heat-resistant paste with good shear stability. This paste's white color makes it possible to control coating, e.g. as an elastomer lubricant, encapsulating material, release agent or dielectric. The paste is also suitable as a damping medium.

## **WACKER® Silicone Paste P 8**

Very strong, tough, slightly tacky opaque paste with relatively good shear stability. It facilitates pushing on cable terminations and is used as a sealing aid in glass apparatus. The bleed values are very low and the electrical characteristics correspond to those of WACKER® Silicone Paste P 4.

## **WACKER® Silicone Heat-Sink Paste P 12**

Pure white, soft paste with excellent thermal conductivity. Electrically insulating. This paste is used as an assembly aid in electronics and I&C, and dissipates the heat emitted by electronic components such as power transistors. It is also suitable as a heat-sensor contact medium.

## **WACKER® Silicone Paste P 14**

Opaque, slightly glossy, slightly translucent medium-consistency paste; similar to WACKER® Silicone Paste P 4, but with a much lower solidifying point and high shear stability even after exposure to high temperatures.

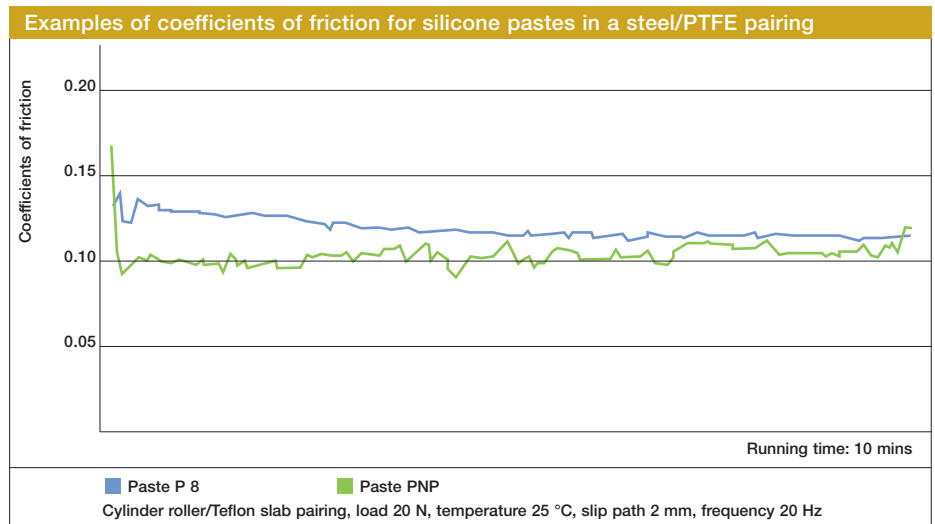
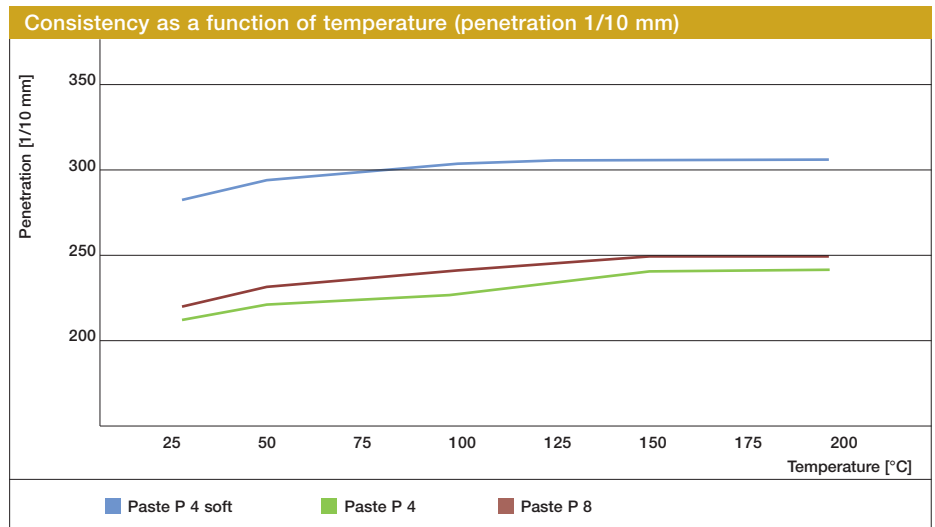
## **POWERSIL® Paste AP**

Opaque to white, medium-consistency paste; POWERSIL® Paste AP was developed specifically as an assembly aid for cable terminations, cable shoes and cable connectors for pushing on the associated cable accessories. The paste enjoys the excellent dielectric properties of silicone; at the same time, it causes very little (if any) swelling of silicone elastomers in contact with the paste.

# EXCEPTIONAL PROPERTIES

Thanks to their versatile and impressive basic properties, silicone pastes are ideal functional aids in a wide range of applications:

- Non-curing, pasty consistency largely unaffected by temperature, permitting use over a broad temperature range
- Water resistant, water repellent, oxidation resistant, hence offering long-term resistance to atmospheric influences; forms a protective layer
- Odorless, of a low order of toxicity, radiation resistant up to approx. 106 rad, inert with respect to a great many chemicals, resistant to microorganisms
- Ready adhesion to numerous surfaces, good lubricating properties in plastic/plastic or plastic/metal pairings, good lubricity
- Good release properties with respect to numerous elastomers and plastics
- Good electrical insulation, high dielectric strength and permittivity, low loss factor
- Excellent shelf life, guaranteed functionality of specific properties for up to 12 months and of general properties for several years
- Simple and direct processing (ready-to-use products) possible, supplied in tubes or drums





### Product Selection

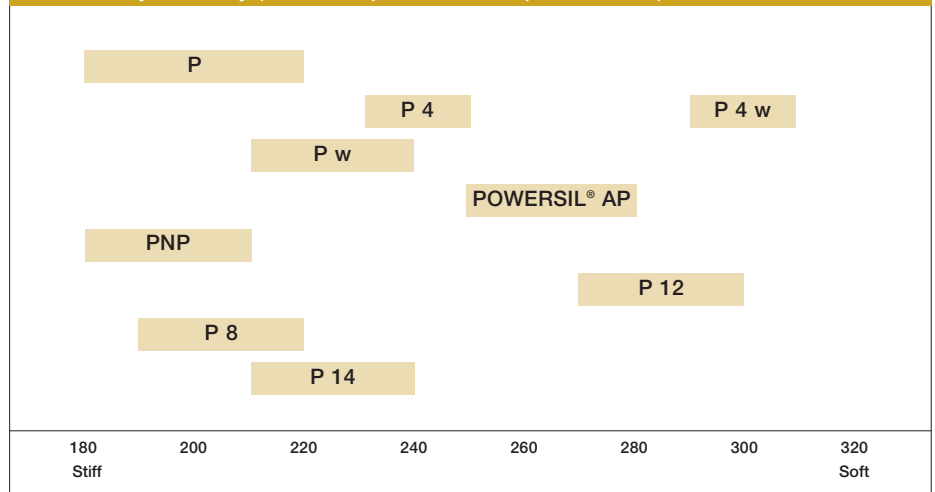
Silicone pastes are based on heat-resistant siloxanes and contain inorganically based thermostable thickeners as a substantial second phase. The individual WACKER® silicone pastes and POWERSIL® Paste AP each exhibit different properties. Specific products can therefore be recommended for individual application fields. As a solutions-oriented partner to its customers, WACKER does all it can to provide you with just the right product grade. Whatever your application requirements, we will be happy to offer you further assistance.

### Viscosity

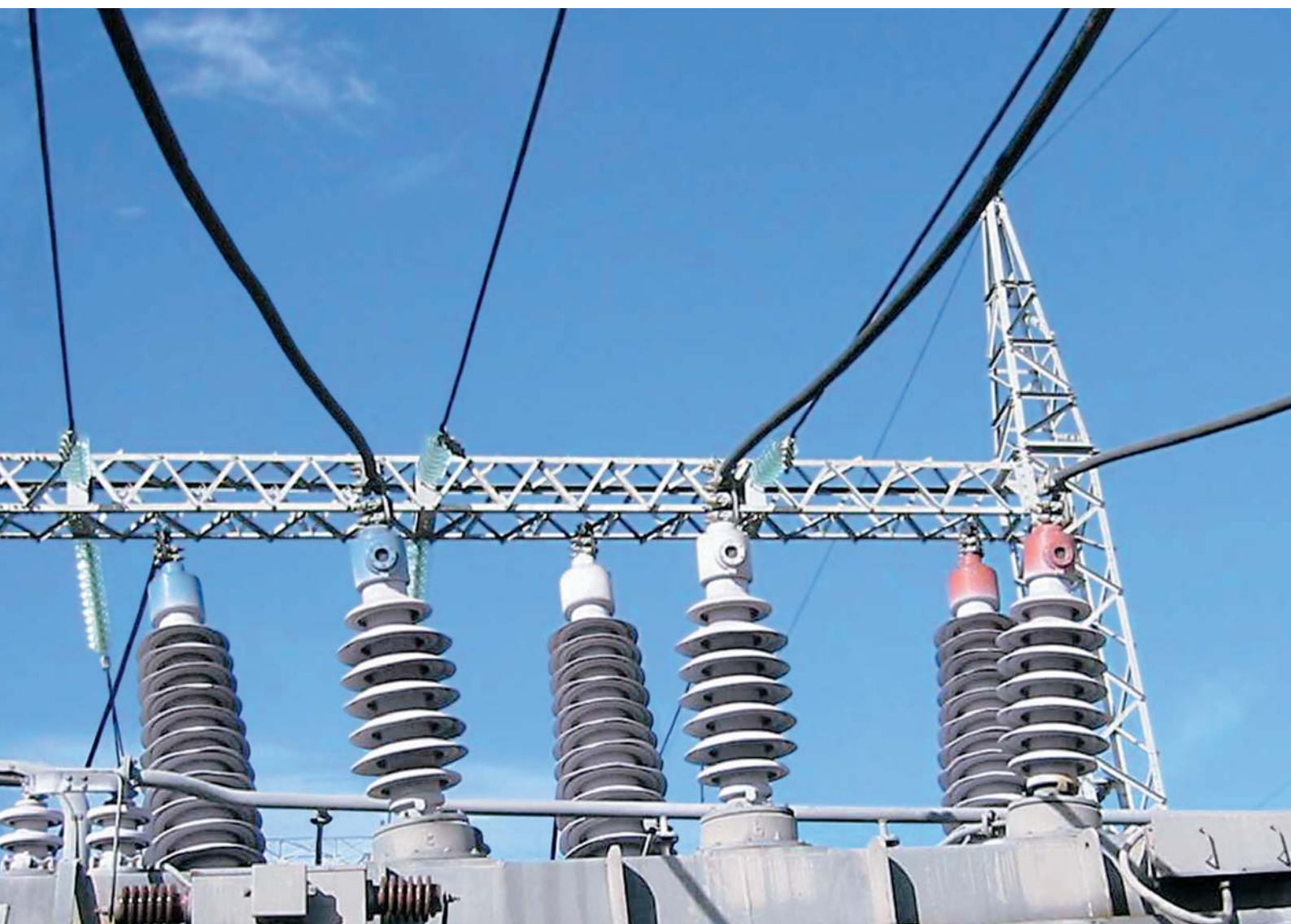
Our silicone pastes usually exhibit a yield point and are slightly thixotropic in behavior.

With low shear load, higher viscosity values are obtained.

Consistency summary (unworked penetration as per ISO 2137)



Due to varying base-fluid viscosities and the thixotropic properties, there may be obtained different viscosities when measured as consistency on ISO 2137. For more details, please contact our technicians.



### Contact with Elastomers

Because silicone pastes have little effect on elastomers, they are suitable as lubricants on organic elastomers. The table briefly summarizes the behavior of elastomers after they have been embedded in the silicone paste and have undergone thermal conditioning.

Elastomer	Blank value	P	P 4	PE soft	P 8	P 1
<b>75 EPDM</b>						
G (%)	-0.9	-1.9	-1.8	-1.8	-1.6	-1.5
V (%)	-0.9	-2.1	-2.0	-1.9	-1.8	-1.9
Shore	+1.9	+2.9	+3.0	+3.4	+3.9	+3.2
<b>50 CR Neoprene</b>						
G (%)	-0.6	-10.8	-10.8	-10.8	-10.3	-11.5
V (%)	-1.1	-15.8	-15.8	-16.1	-15.1	-16.7
Shore	+11.0	+24.0	+24.0	+23.7	+23.9	+23.3
<b>65 SBR</b>						
G (%)	-1.4	-2.9	-2.8	-2.9	-2.6	-2.5
V (%)	-1.2	-2.8	-2.8	-2.8	-2.6	-2.4
Shore	+2.7	+3.0	+3.1	+2.5	+3.8	+3.0
<b>DIN 53 538</b>						
<b>- SRE-NBR-28-BAM</b>						
G (%)	-1.5	-1.7	-1.8	-1.7	-1.6	-1.6
V (%)	-1.7	-1.9	-2.0	-2.0	-1.8	-1.8
Shore	+3.4	+3.4	+3.8	+3.2	+3.5	+3.9

Swelling data of elastomers as per DIN 53 521 after 168 hours' contact with silicone pastes at 100 °C. (test specimens: 36 mm/thickness 2 mm); G = weight change after swelling; V = volume change after swelling

# PHYSICOCHEMICAL PROPERTIES

WACKER® Silicone Paste	P	P soft	P 4	P 4 soft
Appearance	Colorless, opaque	Colorless, opaque	Colorless, opaque	Colorless, opaque
Specific weight ca. g/cm <sup>3</sup>	1.02	1.02	1.02	1.02
Consistency: ISO 2137 1/10 mm				
a) Unworked penetration	200	225	225	300
b) Worked penetration (60 strokes)	> 250	> 270	250	310
Solidifying point ca. °C	-45	-45	-45	-45
Dropping point ca. °C	None	None	None	None
Application range °C	-40 bis +200	-40 bis +200	-40 bis +200	-40 bis +200
Volatiles content FED-STD 791 M 321 (30 h/200 °C) %	1.0	1.0	2.0	2.0
Bleeding FED-STD 791 M 321 (30 h/200 °C) %	2.0	2.0	0.1	3.0
Thermal conductivity as per DIN 52 612 W/m · K (ca.)	0.15	0.15	0.15	0.15
Electrical loss factor tanδ; 1 kHz – 10 MHz	<0.003 – max. 0.0025	<0.003 – max. 0.0025	<0.003 – max. 0.0025	<0.003 – max. 0.0025
Electrical resistivity at 25 °C (ca.)	10 <sup>13</sup> Ω cm	10 <sup>13</sup> Ω cm	10 <sup>13</sup> Ω cm	10 <sup>13</sup> Ω cm
Dielectric strength DIN 53 481: 0.05 inch gap between electrodes	ca. 20 KV/mm ~25 kV/0.05 inch	ca. 20 KV/mm ~25 kV/0.05 inch	ca. 20 KV/mm ~25 kV/0.05 inch	ca. 20 KV/mm ~25 kV/0.05 inch
Dielectric constant ε; 1 kHz – 10 MHz	2.8 – 3.1	2.8 – 3.1	2.8 – 3.1	2.8 – 3.1
Arc resistance (minimum) s	60	60	60	60
Insolubility	Water, methanol, etha- nol, glycerol, glycol and mineral oils	Water, methanol, etha- nol, glycerol, glycol and mineral oils	Water, methanol, etha- nol, glycerol, glycol and mineral oils	Water, methanol, etha- nol, glycerol, glycol and mineral oils
Soluble/dispersible in:	Methylene chloride, white spirit, gasoline, petroleum ether, toluene, kerosene, ethyl acetate, etc.	Methylene chloride, white spirit, gasoline, petroleum ether, toluene, kerosene, ethyl acetate, etc.	Methylene chloride, white spirit, gasoline, petroleum ether, toluene, kerosene, ethyl acetate, etc.	Methylene chloride, white spirit, gasoline, petroleum ether, toluene, kerosene, ethyl acetate, etc.

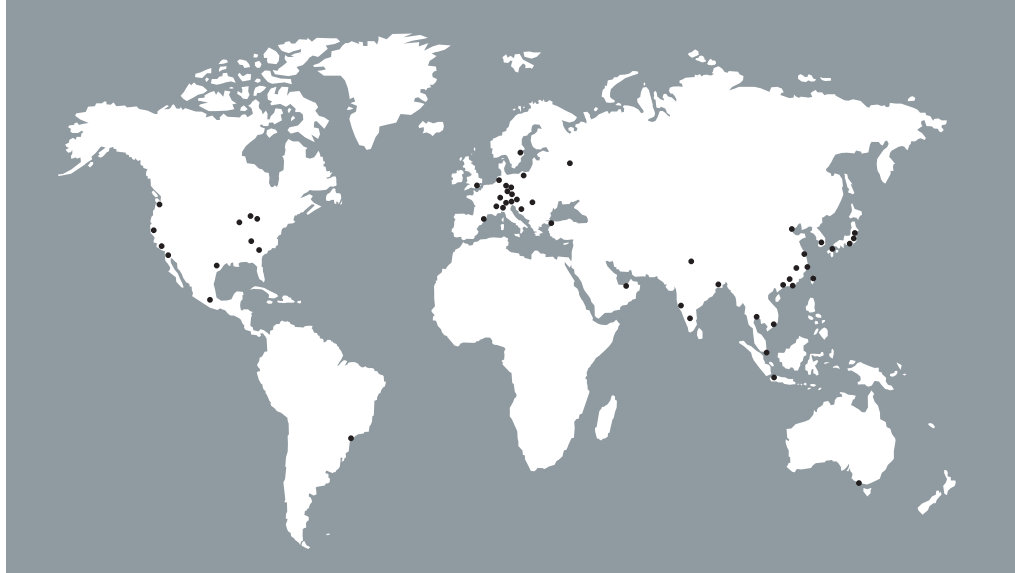
These figures are intended as a guide and should not be used in preparing specifications.

PNP	P 8	P 12	P 14	POWERSIL® AP
White	Colorless	White	Colorless, opaque	Opaque, white
1.05	1.01	2.25	1.03	1.02
195	205	280	220	260
205	230	300	250	280
-45	-35	-35	-53	-45
None	None	None	None	None
-40 bis +230	-30 bis +200	-30 bis +200	-50 bis +200	-40 bis +200
1.5	1.0	0.6	2.0	2.5
3.5	0.1	0.1	1.0	2.5
0.15	0.15	0.81	0.15	0.15
<0.003 – max. 0.0025	<0.003 – max. 0.0025	<0.003 – max. 0.0025	<0.003 – max. 0.0025	<0.003 – max. 0.0025
10 <sup>13</sup> Ω cm	10 <sup>13</sup> Ω cm	10 <sup>13</sup> Ω cm	10 <sup>13</sup> Ω cm	10 <sup>13</sup> Ω cm
ca. 20 KV/mm ~25 kV/0.05 inch	ca. 20 KV/mm ~25 kV/0.05 inch	< 15 KV/mm ~25 kV/0.05 inch	ca. 20 KV/mm ~20 kV/0.05 inch	ca. 20 KV/mm ~25 kV/0.05 inch
2.8 – 3.1	2.8 – 3.1	2.8 – 3.1	2.8 – 3.1	2.8 – 3.1
60	60	–	60	60
Water, methanol, ethanol, glycerol, glycol and mineral oils	Water, methanol, ethanol, glycerol, glycol and mineral oils	Water, methanol, ethanol, glycerol, glycol and mineral oils	Water, methanol, ethanol, glycerol, glycol and mineral oils	Water, methanol, ethanol, glycerol, glycol and mineral oils
Methylene chloride, white spirit, gasoline, petroleum ether, toluene, kerosene, ethyl acetate, etc.	Methylene chloride, white spirit, gasoline, petroleum ether, toluene, kerosene, ethyl acetate, etc.	Methylene chloride, white spirit, gasoline, petroleum ether, toluene, kerosene, ethyl acetate, etc.	Methylene chloride, white spirit, gasoline, petroleum ether, toluene, kerosene, ethyl acetate, etc.	Methylene chloride, white spirit, gasoline, petroleum ether, toluene, kerosene, ethyl acetate, etc.

# NOTES



# WACKER AT A GLANCE



## **WACKER**

is a technology leader in the chemical and semiconductor industries and a worldwide innovation partner to customers in many key global sectors.

With around 14,700 employees, WACKER generated sales of €3.34 billion in 2006. Germany accounted for 20% of sales, Europe (excluding Germany) for 28%, the Americas for 20% and Asia-Pacific, including the rest of the world, for 32%.

Headquartered in Munich, Germany, WACKER has some 20 production sites worldwide and a global network of over 100 sales offices.

With R&D spending at 5% of sales in 2006, WACKER is among the world's most research-intensive chemical companies.

## **WACKER SILICONES**

is a leading supplier of complete silicone-based solutions that comprise products, services and conceptual approaches. As a provider of solutions, the business division helps customers press ahead with innovations, exploit global markets fully, and optimize business processes to reduce overall costs and boost productivity. Silicones are the basis for products offering highly diverse properties for virtually unlimited fields of application, ranging from the automotive, construction, chemical, electrical engineering and electronics industries, through pulp and paper, cosmetics, consumer care and textiles, to mechanical engineering and metal processing.

## **WACKER POLYMERS**

is the global leader for high-quality binders and polymer additives. This business division's activities encompass construction chemicals and functional polymers for lacquers, surface coatings and other industrial applications, as well as basic chemicals, i. e. acetyls. Products such as dispersible polymer powders, dispersions, solid resins, powder binders and surface coating resins from WACKER POLYMERS are used in the construction, automotive, paper and adhesives industries, as well as by manufacturers of printing inks and industrial coatings.

## **WACKER FINE CHEMICALS**

As an expert in organic synthesis, silanes and biotechnology, WACKER FINE CHEMICALS supplies innovative biotech products and catalog chemicals for life-science and consumer-care customers worldwide. Its product portfolio includes cyclodextrins and cysteine, organic intermediates and acetyl acetone. A key

specialty is the contract manufacturing of pharmaceutical proteins via microbial systems.

## **WACKER POLYSILICON**

has been producing hyperpure silicon for the semiconductor and photovoltaics industries for over 50 years. As one of the largest global manufacturers of polycrystalline silicon, WACKER POLYSILICON supplies leading wafer and solar-cell manufacturers.

## **Siltronic**

is one of the world's leading producers of hyperpure silicon wafers, supplying many major chip manufacturers. Siltronic develops and produces wafers up to 300 mm in diameter at facilities in Europe, the USA, Asia and Japan. Silicon wafers form the basis of state-of-the-art micro and nanoelectronics used, for example, in computers, telecommunications, motor vehicles, medical technology, consumer electronics and control systems.

**WACKER**

The data presented in this brochure are in accordance with the present state of our knowledge, but do not absolve the user from carefully checking all supplies immediately upon receipt. We reserve the right to alter product constants within the scope of technical progress or new developments. The information given in this brochure should be checked by preliminary trials because of conditions during processing over which we have no control, especially where other companies' raw materials are also being used. The information provided by us does not absolve the user from the obligation of investigating the possibility of infringement of third parties' rights and, if necessary, clarifying the position. Recommendations for use do not constitute a warranty, either express or implied, of the fitness or suitability of the product for a particular purpose.

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**SILICONES**

Wacker Chemie AG  
Hanns-Seidel-Platz 4  
81737 München, Germany  
info.silicones@wacker.com

[www.wacker.com](http://www.wacker.com)