

SILRES® 604:

Solid Silicone Resins for Excellent High-Temperature Performance

Powder coatings have a whole range of unique and ecological advantages over conventional liquid paints. Thanks to their resistance to high mechanical loads and thermal stresses, silicone resins used as binders can open up new application areas for powder coatings. Organic binders have a fairly narrow range of service temperatures, but silicone-based powder resins can be exposed to severe frost or temperatures as high as 600 °C and still remain fully functional.

What Characterizes SILRES® 604 Powder Resin?

As sole binder, SILRES® 604 can be combined with suitable fillers and pigments to produce powder coatings whose performance is not significantly affected by temperatures up to around 600 °C. Furthermore, the product can be used together with organic resins to formulate powder coatings that display considerably enhanced weatherability compared to purely organic binder systems. The combination of SILRES® 604 with organic resins – especially polyester and epoxides – results in powder coatings with long-term thermal stability up to around 250 °C, and short-term even up to 300 °C. In this temperature range, white coatings containing SILRES® 604 powder resin as binder are less likely to yellow than comparable powder coatings without silicone resin.

Typical General Characteristics	
SILRES® 604	
Supply form	Flakes
Silicone content	> 99%
Glass transition temperature [T _g]	> 55 °C
Ph/Me ratio	~ 1
OH group content	4.5 – 6.0%

Together, the enhanced properties (resistance to extreme temperatures and weathering, as well as increased thermal stability and reduced surface tension) open up a wide range of applications.

A Wide Variety of Application Possibilities

As sole binder, SILRES® 604 is ideal as raw material for highly heat-resistant powder coatings in exhaust systems and cast-iron stoves. Moreover, due to the products' compliance with FDA 17.300 and BfR XV, it is possible to combine it with organic binders for high-temperature applications with food contact, e.g. BBQ grills and coatings for pots and pans with medium temperature tolerance. The latter display excellent gloss retention and alkali resistance even with long-term use.

More Advantages with SILRES® 604

SILRES® 604 features a glass transition temperature (T_g) of over 55 °C. The product can thus be used to formulate powder coatings that have a long shelf life at normal temperatures.

Example: Silicone Powder Coating (Resistant to Corrosion and Heat, Black)	
SILRES® 604	190.0 g
Ferrous oxide, black	60.0 g
Mica filler	42.4 g
Anticorrosion pigment	52.8 g
Talc	47.6 g
Benzoin degassing agent	1.2 g
Pyrogenic silica HDK®	1.6 g
Curing time: 30 min. at 130 – 230 °C	

Coating Properties (Dry Film Thickness ~ 40 – 60 µm, Low Gloss, Smooth Structured)

Thermoplasticity at 200 °C	2H
Pencil hardness after curing at 130 – 230 °C / 30 min.	4H



Free-Flow Properties

To ensure that such fine-particle powders never lose their free-flow properties, it is advisable to admix a pyrogenic silica, such as WACKER's HDK®. This ensures simple processing and excellent fluidization every time.

During mixing, HDK® is absorbed on the surfaces of the individual powder particles, separating them from one another. The powder can therefore flow freely, ensuring better edge coverage in the melt phase. Hydrophobic HDK® is generally more effective. In hygroscopic powder formulations, there may be advantages to using hydrophilic HDK®. Its ability to absorb moisture generates a drying effect that assists powder flowability.

Economical in Use

The desired effect can be obtained with an addition of 0.1 to 0.3 wt. percent of HDK®. The advantages of HDK® are effective in each application phase:

- Easier and faster sieving
- Uncomplicated application (spraying, fluidized bed)
- Electrostatic wrap-around is retained
- Film-formation and hardening are not disadvantaged

For more information about product selection and processing, visit www.wacker.com/hdk

Example: Silicone-Polyester Powder Coating (Heat Resistant, Full Gloss, Black)

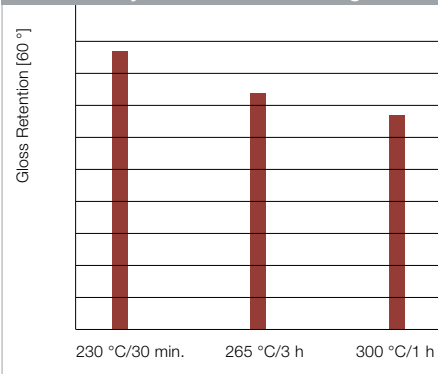
SILRES® 604	547.0 g
IPDI hardener	12.0 g
Polyester resin	100.0 g
PE hardener	5.0 g
Ferrous oxide, black	250.0 g
Filler	66.0 g
Benzoil degassing agent	5.0 g
Pyrogenic silica HDK®	15.0 g
Curing time: 30 min. at 130 – 230 °C	

Coating Properties (Dry Film Thickness ~ 40 – 60 µm, Full Gloss, Smooth)

Thermoplasticity at 100 °C	HB
Pencil hardness	4H
MEK (after curing at 130 – 230 °C / 30 min.)	> 200 DR



Gloss Retention after Heat Stress of a Silicone-Polyester Powder Coating



At a Glance: The Advantages of SILRES® 604

- Solvent-free flaked silicone resin
- Hydroxy-functional phenyl-methyl resin
- Provides powder paints with high thermal stability
- Good organic compatibility
- High glass transition temperature, T_g
- Conforms to FDA 21 CFR 175.300 and BfR XV
- Broad end-use application range

