

**Mini. Micro. Welco.**  
Assembly solutions for  
next generation LEDs





## What is the next big thing in display technology?

Since the launch of LED-backlit LCD screens, the display industry has been eagerly anticipating the next evolution. In response to the rising consumer demand for premier visualization, miniLEDs and microLEDs are increasingly being adopted in the latest display technologies.

MiniLEDs have been introduced to backlighting modules for LCD TV screens, making them comparable to OLED screens in terms of contrast but with a longer product lifespan. They are also used in video walls, producing large-size displays with far superior performances to current technology. On the other hand, the tinier microLEDs offer even greater change to consumer display products such as TVs, tablets and smartphones. Small enough to act as individual pixels, these self-emissive lights can be lit up for whatever color, adjusted for brightness, or switched off entirely – something that LCD screens cannot do.

The challenge in producing micro and miniLEDs is with the packing of components onto electronic circuit carriers such as printed circuit boards (PCBs), glass substrates or flexible substrates. With the edge length of <math><240 \mu\text{m}</math> for miniLEDs, the soldering pads need to be even smaller.

How can the solder paste deposits be applied effectively onto a circuit carrier so small? To do so consistently, solder pastes with particles smaller than  $15 \mu\text{m}$  are needed, and the best application method is stencil printing.

With its tight particle size distribution, Heraeus's Welco technology is designed for fine pitch applications such as micro and miniLEDs. Its excellent printability makes it the ideal material solution for these latest display innovations.

## Heraeus Electronics' powder making process — Welco technology

Welco technology is Heraeus Electronics's proprietary material solution for advanced packaging applications. Our patented solder powder products are used to produce the specially formulated Welco ultra-fine pitch solder paste that is superior in consistency, quality and sphericity.

With its very tight particle size distribution that exceeds IPC specifications, Welco powder allows a smaller pitch to be attained. It is also highly customisable to suit a myriad of applications, including the assembly of micro and miniLEDs.

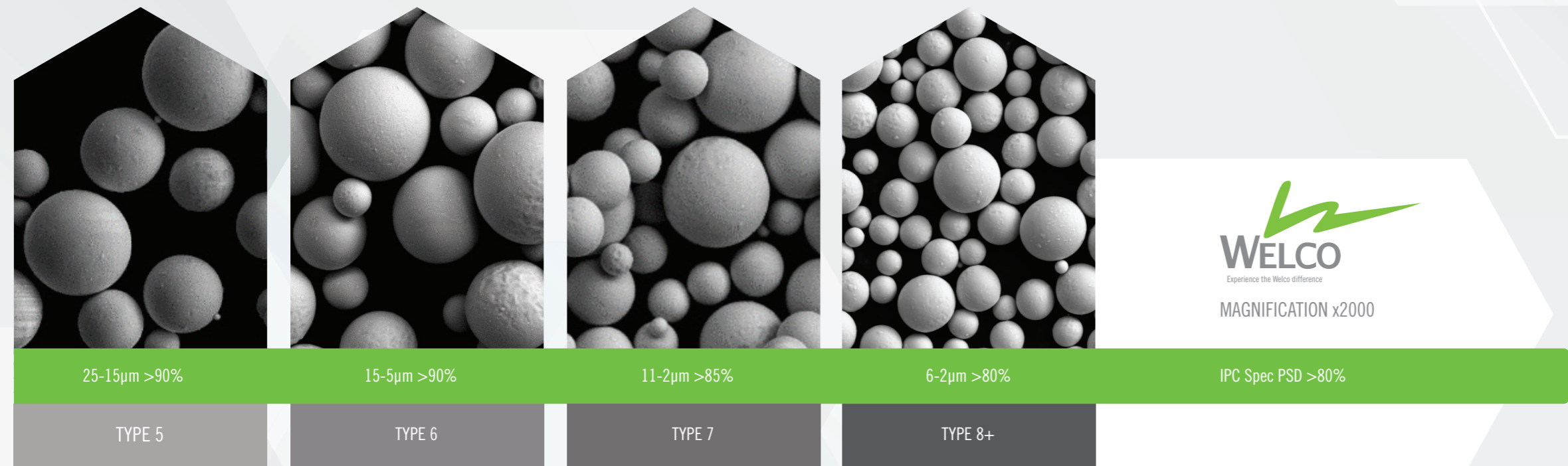
## Benefits of our Welco technology

- Narrow particle size distribution
- No sieving step required for meeting PSD specification
- High yield for fine powder (T5 and beyond)
- Perfectly spherical shape



Heraeus Electronics' proprietary material solutions are designed for advanced packaging applications.

Experience the Welco difference.





Heraeus Electronics' solder pastes are the **perfect match** to various applications.

## Welco LED120 T7 SAC305 no-clean printing paste

Welco LED120 T7 SAC305 is a state-of-the-art no-clean printing paste, engineered primarily for miniLED and microLED attach applications. Paste release performance is exceptional at 70um stencil openings and highly consistent over its stencil life.

LED120 series uses only Heraeus proprietary Welco Type 7 powders to achieve highly reliable solder joints with low voids for customers' applications.

### Benefits

- Uses high-quality Welco T7 SAC305 powders
- Halgon-free & no-clean chemistry
- Best-in-class low-void performance
- Minimal solder beading
- Consistent fine pitch paste release
- Long stencil life (≥10hr) & staging life (≥10hr)
- Proven reliability & shear strength in miniLED application

## Welco LED131 Lead-free no-clean solder paste

Welco LED131 SAC solder paste series is a lead-free no-clean solder paste that promotes outstanding wetting and minimizes soldering defects. The LED131 flux system is optimized explicitly for lead-free alloys, such as Sn/Ag/Cu. This formula provides superior performance on a variety of surface finishes and leaves behind a clear residue.

The unique superfine powder technology excels in printing and soldering performance in miniLED pads. Perfectly suited for the LED flip-chip package of miniLED display, lighting, and automotive.

### Benefits

- Wide processing window, suitable for traditional die attach & die mass transfer application
- Excellent printing performance for ultra-fine pitch & long work life
- Good shear strength for solder joint & high reliability
- Superior wetting performances on fine pitch & self-align in reflow process
- Light residue — perfect for optical application
- Low void

## Welco AP5112 Water soluble halogen free solder paste

Welco AP5112 halogen free water soluble printing solder paste series is designed for use in fine pitch applications including miniLED & microLED die attach, and other semiconductor advanced packaging applications such as flip-chip and SMD attach in System-in-Package (SiP).

### Benefits

- Halogen-free
- Good printability on fine pitch pad size
- Good wetting performance
- Good cleaning properties
- Long stencil life (≥8hr) & long staging life (≥8hr)
- No splashing
- Minimal residue
- Available in Type 4 to 7 powders
- Available in low alpha count SAC 305 alloy T5 to T7

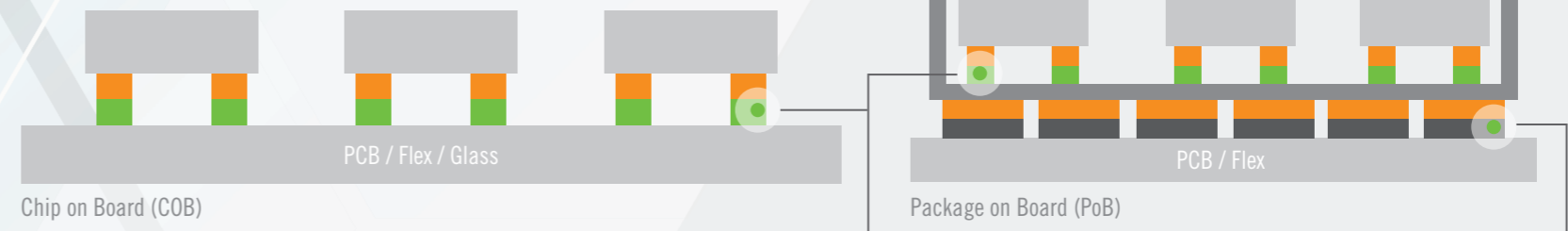
## Welco AP519 T6 low temperatrue no-clean printing paste

Welco AP519 T6 solder paste is a low-temperature, state-of-the-art no-clean, lead-free solder paste formulated with Heraeus proprietary Welco powders. It is specifically designed for processes that require a low peak reflow temperature of ≤170°C. Applications include mini & microLED attach, and BGA, SMD component or flip-chip attach in fine-pitch semiconductor packages such as System-in-Packages (SiP), Package-on-Packages (PoP), etc.

### Benefits

- Uses high-quality Welco Type 6 powders
- Narrow size distribution
- Uniform spherical shapes
- Batch-to-batch consistency
- Low peak reflow temperature at 170 °C
- Best-in-class low-void performance
- Excellent fine pitch paste release
- Long stencil life (≥8hr) & long staging life (≥8hr)
- Colorless flux residue after reflow

# Heraeus Electronics MiniLED product line-up



DIE ATTACH

SMT



	AP5112	LED131	AP519	AP9133 (UNDER DEVELOPMENT)	AP5112	LED120	UNDER DEVELOPMENT	UNDER DEVELOPMENT	AP519
POWDER SIZE	Type 6 (15-5µm)	Type 6 (15-5µm)	Type 6 (15-5µm)	Type 6 (15-5µm)	Type 7 (11-2µm)	Type 7 (11-2µm)	Type 8+ (6-2µm)	Type 9 (4-1µm)	Type 6 (15-5µm)
ALLOY	SAC305	SAC305	SnBiAg1	SnSb5	SAC305	SAC305	SAC305	SAC305	SnBiAg1
MELTING TEMPERATURE	217-219°C	217-219°C	138-142°C	232-241°C	217-219°C	217-219°C	217-219°C	217-219°C	138-142°C
STENCIL OPENING (based on Heraeus pastes)	> 90µm	> 90µm	> 90µm	> 90µm	> 70µm	> 70µm	> 35µm	> 25µm	> 90µm

Water soluble No clean

## Providing material solutions that matter

### Your reliable partner who is always there for all your needs

With an optimal infrastructure and comprehensive equipment, we shorten product development cycles through our application knowhow and expertise in matching materials, thereby lowering costs and bringing next-generation products faster to market.

Our expertise in material integration, optimization and understanding of material combinations, and the ability to test them under simulated conditions in our lab allow manufacturers to better understand material behaviors and the reliability of their products under simulated conditions. This accelerates the development process with higher first-time success rates.



## We are Heraeus Electronics

We are one of the leading manufacturers of materials for the assembly and packaging of devices in the electronics industry. We develop sophisticated material solutions for the automotive, power electronics, and semiconductor industry. Our core competencies include bonding wires, solder and sinter materials, thick film pastes, and substrates.

Headquartered in Hanau, Germany, Heraeus Electronics has a global footprint with eight production sites across six countries, ensuring a high supply chain reliability.

Additional four service centers located across Asia, USA and Europe enable us to support the needs of local markets, ensuring proximity and quick response time for our regional customers. Our customers benefit from shortened development cycles with higher first-time success rates, leading to faster time to market.



Headquartered in  
**Hanau, Germany**



Product distribution to  
**over 50 countries**



More than **50 years**  
of experience in providing  
materials for the electronics  
industry



**8 production sites**  
across 6 countries



**1200+**  
employees worldwide

## Production sites and service labs

### Strategic locations to support our customers worldwide



#### PRODUCTION SITES

Hanau, Germany  
Chisoda, Romania  
West Conshohocken, USA  
Kulajaya, Malaysia  
Changshu, China  
Zhaoyuan, China  
Singapore (2x)

#### SERVICE LABS

Hanau, Germany  
West Conshohocken, USA  
Shanghai, China  
Singapore

# HERAEUS GROUP THE GLOBAL TECHNOLOGY COMPANY

Heraeus, the technology group headquartered in Hanau, Germany, is a leading international family-owned portfolio company. The company's roots go back to a family pharmacy started in 1660. Today, the Heraeus group includes businesses in the environmental, electronics, health and industrial applications sectors. Customers benefit from innovative technologies and solutions based on broad materials expertise and technological leadership.

In the 2020 financial year, the FORTUNE Global 500 listed group generated revenues of €31.5 billion with approximately 14,800 employees in 40 countries. Heraeus is one of the top 10 family-owned companies in Germany and holds a leading position in its global markets.

The data given here is valid. We reserve the right to make technical alterations.

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The descriptions and engineering data shown here have been compiled by Heraeus using commonly-accepted procedures, in conjunction with modern testing equipment, and have been compiled as according to the latest factual knowledge in our possession. The information was up-to date on the date this document was printed (latest versions can always be supplied upon request). Although the data is considered accurate, we cannot guarantee accuracy, the results obtained from its use, or any patent infringement resulting from its use (unless this is contractually and explicitly agreed in writing, in advance). The data is supplied on the condition that the user shall conduct tests to determine materials suitability for particular application. The Heraeus logo, Heraeus, Condura®, DTS®, Die Top System® and the Condura, DTS, Die Top System figurative mark are trademarks or registered trademarks of Heraeus Holding GmbH or its affiliates. All rights reserved.

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