

LOCTITE[®]

THE GAME CHANGERS

THE FIRST-EVER TEMPERATURE STABLE SOLDER PASTES



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THE GC STORY

For years, the electronics assembly industry has requested a stable solder paste platform, one that could handle the demands of miniaturization and the rigors of modern manufacturing. Purchasing and assembly specialists also wanted to eliminate complex material transport, storage, handling and management. And, naturally, cost reduction was a priority. You asked. Henkel answered.

The LOCTITE GC solder paste platform changes everything. Uniquely stable flux chemistry delivers unprecedented performance and is the basis of all LOCTITE GC materials, including the award-winning LOCTITE GC 10 and LOCTITE GC 3W. Forget everything you thought you knew about solder technology.

LOCTITE GC: Stable. Game-Changing. Future-Proofed.
Cost-Effective. Remarkable.



BEING A GAME CHANGER

Changing the game is not about incremental improvements. Game changers take risks and push beyond the boundaries of conventional norms to deliver the extraordinary. For the developers of the LOCTITE GC solder paste platform, changing the game meant innovating without being influenced by the limits of traditional solder materials. Stability in all stages of use is the LOCTITE GC game changer. The industry's best performance is the result. Cost reduction is a given.

For you, being a game changer isn't easy. Previous process protocols are hard to alter, but if you're bold enough to challenge antiquated methods, your customers and business will reap the rewards – eliminate complicated paste management procedures and refrigerated rotations; take solder paste off the shelf, put it on the stencil and go; reduce waste by 20 percent, abolish end-of-shift scrap procedures and lower defect rates; realize unprecedented printing and reflow performance; deliver quantifiable cost savings through improved yield.

Change the game competitively for your business. Try LOCTITE GC 10 or LOCTITE GC 3W and transform manufacturing paradigms.

INDUSTRY VALIDATION

Outstanding products are not the result of luck. The unequaled award wins, third-party testing validation and, most importantly, customer satisfaction, are based on ingenious chemistry formulation. That's why Henkel's solder development program is world-class. Having won countless industry honors, three consecutive New Product Introduction (NPI) Awards for different solder materials – LOCTITE HF 212, LOCTITE GC 10 and LOCTITE GC 3W – and realizing rapid market acceptance, the significance of Henkel's solder innovation platforms is undeniable.



CUSTOMER TESTIMONIALS

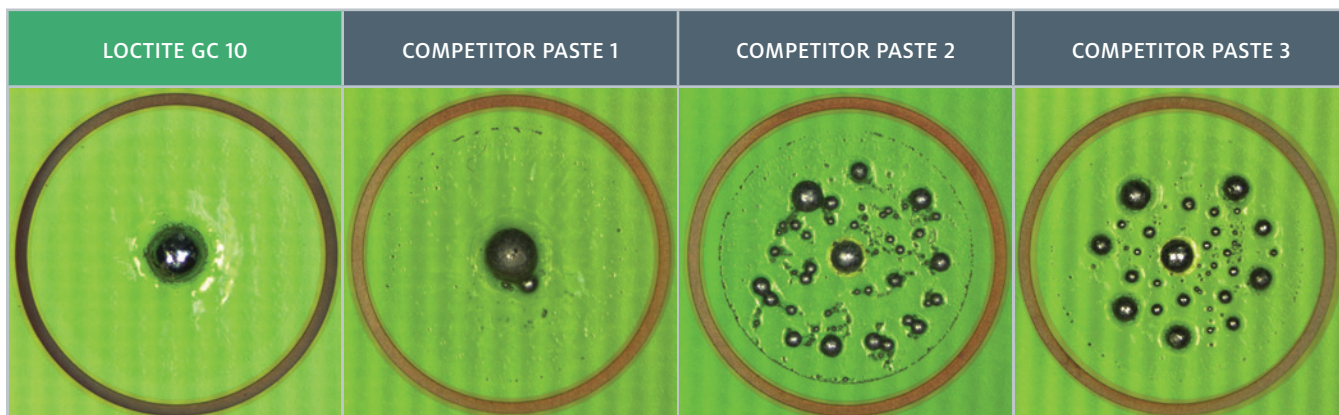
With the launch of the LOCTITE GC platform, Henkel has forever changed the game and the way the industry thinks about and uses solder paste. Our customers have an advantage, and they're enthusiastically talking about it.



"Our company has recently entered a field where high-mix, low volume production is the norm and demand is very dynamic. Thanks to LOCTITE GC 10's temperature stability, long shelf life and simplified storage capability, we don't have to worry about the performance of our solder paste being compromised, even when demand levels change."

Andrew Thiel, Product Development Engineer, Walker Products, Inc.

INDEPENDENT TESTING – OVERPRINT SOLDER BALL



This overprint solder ball test is just one example of independent testing with LOCTITE GC 10 versus three competitive solder pastes, confirming what Henkel and our customers already knew: There is no comparison!

“Outside of its excellent process performance, which is always our top priority, the sheer simplicity and cost savings realized by LOCTITE GC 10’s hassle-free material management are incredible. There is no taking it out of the refrigerator hours before a shift, no complex labeling and, best of all, start-up time is zero. We just take it off the shelf, put it on the stencil and start printing boards. We’ve left LOCTITE GC 10 on the stencil for more than eight hours and it was as creamy as when we first opened the jar – no kneading required. Plus, we can do away with expensive overnight shipping of solder paste and the worry about temperature exposure. With LOCTITE GC 10, we have a lot more latitude and that translates to a more efficient operation.”

Chris Murphy, Technical Steward,
The Morey Corporation

THE PROOF IS IN THE PERFORMANCE

LOCTITE GC 10's technologically advanced flux delivers material stability from its manufacture to transport to end-of-life production usage. Stable at room and elevated temperatures, LOCTITE GC 10 means improved quality, reduced defects, and better performance in process and in the field.

The stability of the LOCTITE GC flux platform doesn't just translate to elimination of refrigerated storage. The advantages of the material's stability are statistically proven by industry and third-party studies. LOCTITE GC 10's performance can be seen on the printer with the industry's best transfer efficiency, in air reflow with a wide process window, exceptional coalescence and shiny joints, and at the end of the line in higher yields.

IMPROVED FLUX STABILITY



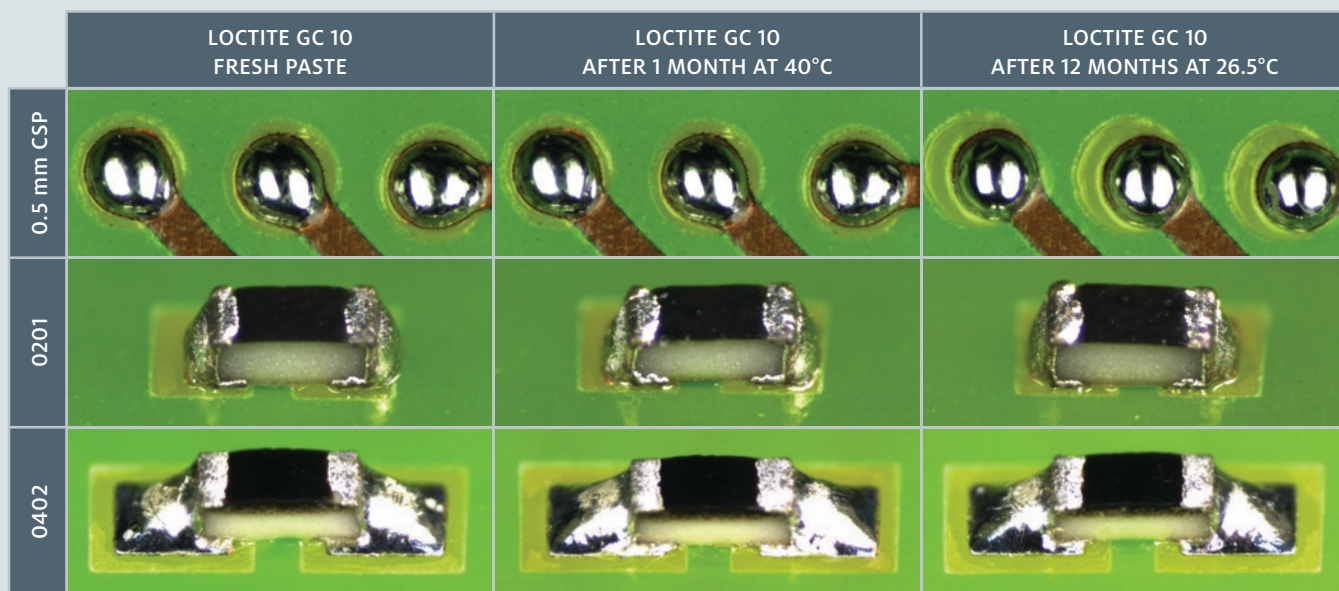
LOCTITE GC 10 offers unique stability and maintains its effective, creamy consistency over the life of the paste. Comparatively, competitive materials begin to deteriorate over time, challenging performance on the line. Lack of stability accounts for 20 percent scrap rates and higher costs.



ADVANCED MATERIAL STABILITY

- 12 times the stability at room temperature, compared to conventional pastes
- Exceptional batch-to-batch consistency
- Tested, proven best-in-class printing performance on 01005 components and larger
- Market-leading reflow results in air
- Optimized paste management with a wide range of pitches
- Simplified logistics and storage
- Lower handling and operating costs

REMARKABLE REFLOW STABILITY



Flux stability translates to exceptional coalescence and solder wetting results. LOCTITE GC 10 maintains high humidity resistance and consistent reflow performance over time and temperature for a wide range of component types, despite exposure to 40°C for extended periods of time.

BEST-IN-CLASS PRINTING

When it comes to printing performance, there is simply nothing better than LOCTITE GC 10. In impartial, third-party testing, LOCTITE GC 10 was proven to provide the absolute best paste transfer efficiency and paste-on-pad material volumes for challenging, miniaturized component types. Plus, the benefits of exceptionally long abandon times of up to 24 hours, a staggering stencil life of up to 72 hours and zero start-up time deliver ease-of-use, higher yields and improved profitability.

PERFORMANCE COMPARISON ON 0.3 mm CSP PADS

MATERIAL	LOCTITE GC 10	COMPETITOR PASTE
Cpk	1.5	1.1
Mean	95	93
Standard Deviation	10.4	13.5
Defects Per Million	31	1,039
Take Away	<ul style="list-style-type: none">• High transfer efficiency• Low variability	<ul style="list-style-type: none">• Insufficient solder• High variability• Bridging
Sample Area		

Based on 67,600 measurements

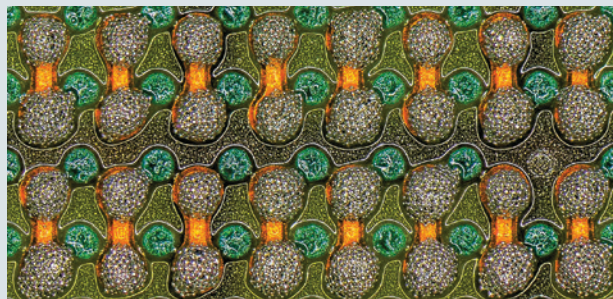
Compared to commonly used competitive solder pastes in independent testing, LOCTITE GC 10 delivered the best material transfer efficiency, highest Cpk and fewest defects per million on challenging component types.

Consider that close to 70 percent of defects originate during the printing process, and it's clear that making the proper solder paste selection is essential to reducing defects such as mid-chip balling. Now, there's a single flux formulation that can meet all assembly demands, from miniaturized components such as 01005 for handheld products to high-reliability devices for automotive applications such as engine control units. LOCTITE GC 10 does it all and simplifies qualifications to one flux platform and provides the industry's best print performance.

MEASURING SOLDER PASTE PRINTING CAPABILITIES

When calculating the printing capability of a solder paste, Cpk is used to measure how close a paste can come to its target volume, commonly referred to as nominal volume, and how much variation there is from its average performance. A higher Cpk value results in fewer defects per million.

Translating a solder paste's Cpk into defects per million can be alarming, but it doesn't have to be, with the right paste. LOCTITE GC 10 is flexible in its ability to maintain a smaller standard deviation from the target volume, eliminating defects from too little or too much paste, or incorrect stencil design.



0.3 mm CSP printing: LOCTITE GC 10's high transfer efficiency results in low solder volume variability.



0.3 mm CSP printing: Competitive paste's poor transfer efficiency results in high solder volume variability and the potential for defects.

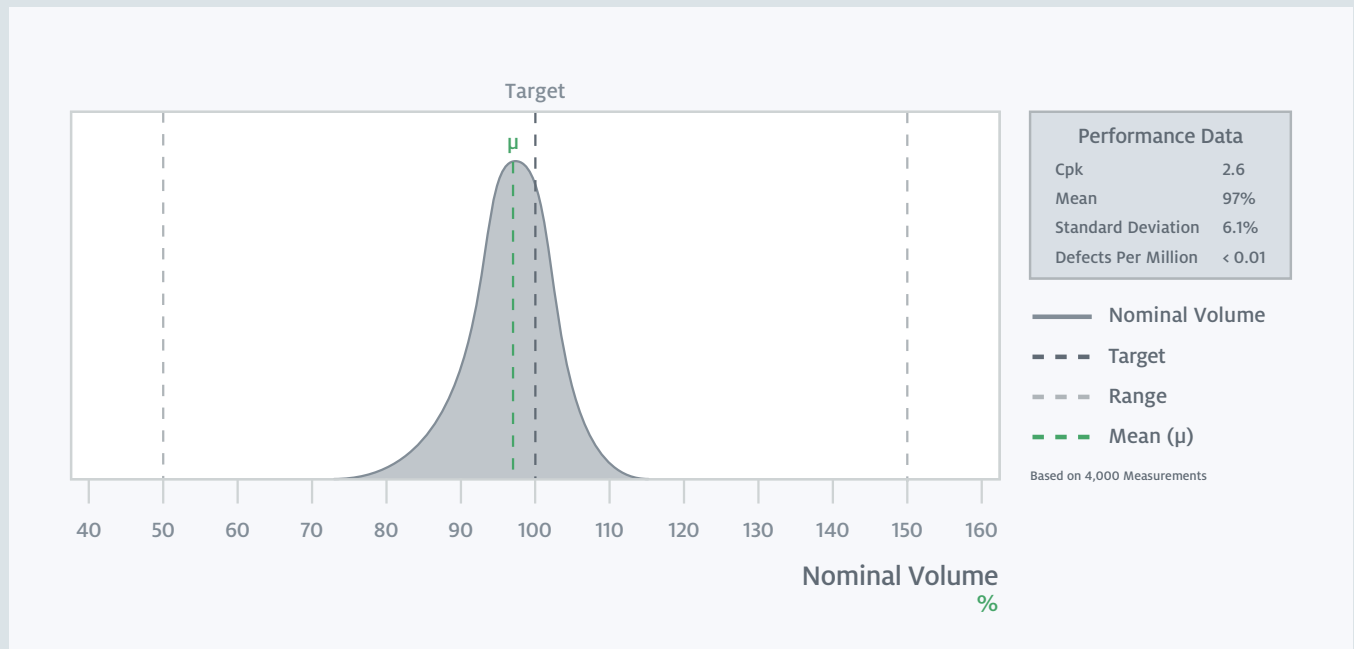


REDUCE DEFECTS AND IMPROVE PERFORMANCE

- LOCTITE GC 10 offers consistent, outstanding print performance with Type 3, Type 4, Type 4.5 (4A) and Type 5 solder powders
- Six Sigma quality paste deposition with exceptionally long abandon times
- Untouchable stencil life of up to 72 hours

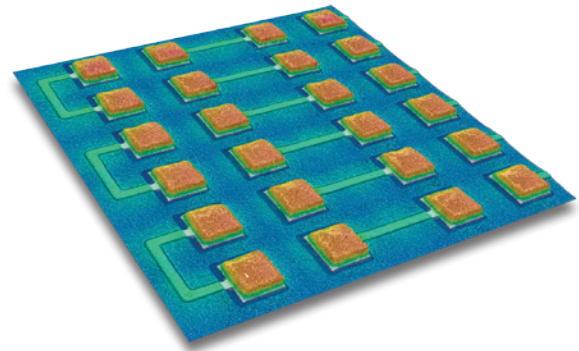
PROCESS CAPABILITY OF 01005 PAD VOLUMES

LOCTITE GC 10 – SAC305 Type 4



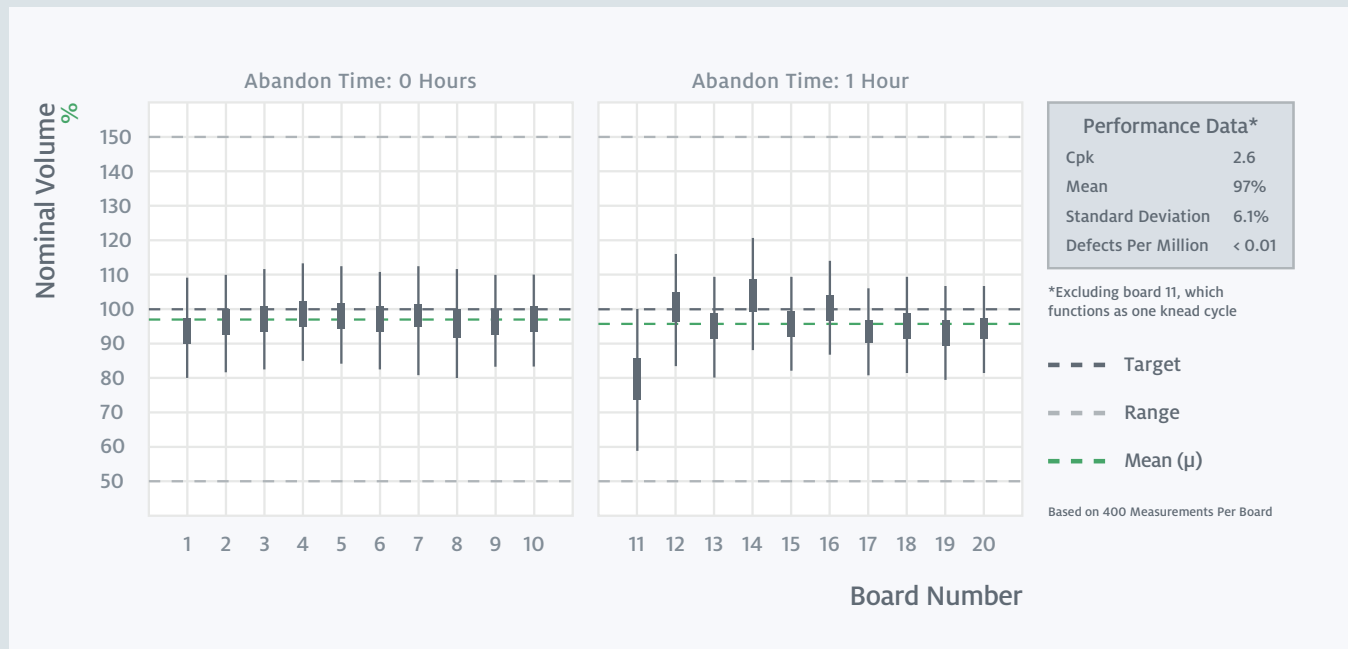
Compared to the standard Cpk of 2.0 for Six Sigma quality, LOCTITE GC 10 delivers an exceptionally high Cpk of 2.6, which equates to fewer than 0.01 defects per million on challenging 01005 pads. High transfer efficiency (97 percent) with low variability (6.1 percent) ensures excellent yield performance.

- Reduced insufficient volume-related defects
- Delivers the best Cpk and fewest defects per million
- Less material waste
- Zero start-up time



PRINTING PERFORMANCE ON 01005 PADS

LOCTITE GC 10 – SAC305 Type 4

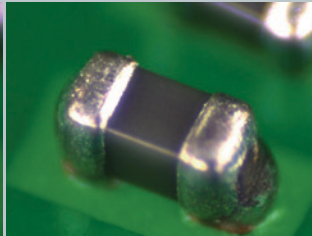
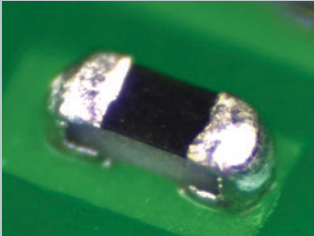


LOCTITE GC 10 has minimal degradation after one hour of abandon time, indicating a stable paste structure and the ability to return to optimal print performance with only one knead cycle.

BEST-IN-CLASS REFLOW

LOCTITE GC 10’s unsurpassed reflow results are almost too numerous to mention, but let’s try. Superb coalescence in air on 0201, 01005 and 0.3 mm CSP components eliminates the requirement for nitrogen during reflow, reduces numerous defects and promotes improved solderability for enhanced solder joint reliability. What’s more, LOCTITE GC 10 has shown zero dewetting on long, hot soak profiles, with minimal hot slump at 182°C. When evaluating against competitor solder pastes, LOCTITE GC 10 exhibits enviable reflow performance, eliminating costly NPI evaluations, satisfying new product development needs, and reducing requirements to a single material. From 01005 to 2512, from low- to high-density board designs where component “real estate” becomes more demanding, from 235°C to 260°C component temperature limits, LOCTITE GC 10 does it all.

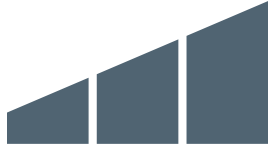
CONSISTENT PERFORMANCE ON MULTIPLE COMPONENTS AND PROFILES

	LOCTITE GC 10 REFLOW PROFILE 1	LOCTITE GC 10 REFLOW PROFILE 2	LOCTITE GC 10 REFLOW PROFILE 3	LOCTITE GC 10 REFLOW PROFILE 4
01005 CAPACITOR				
01005 RESISTOR				

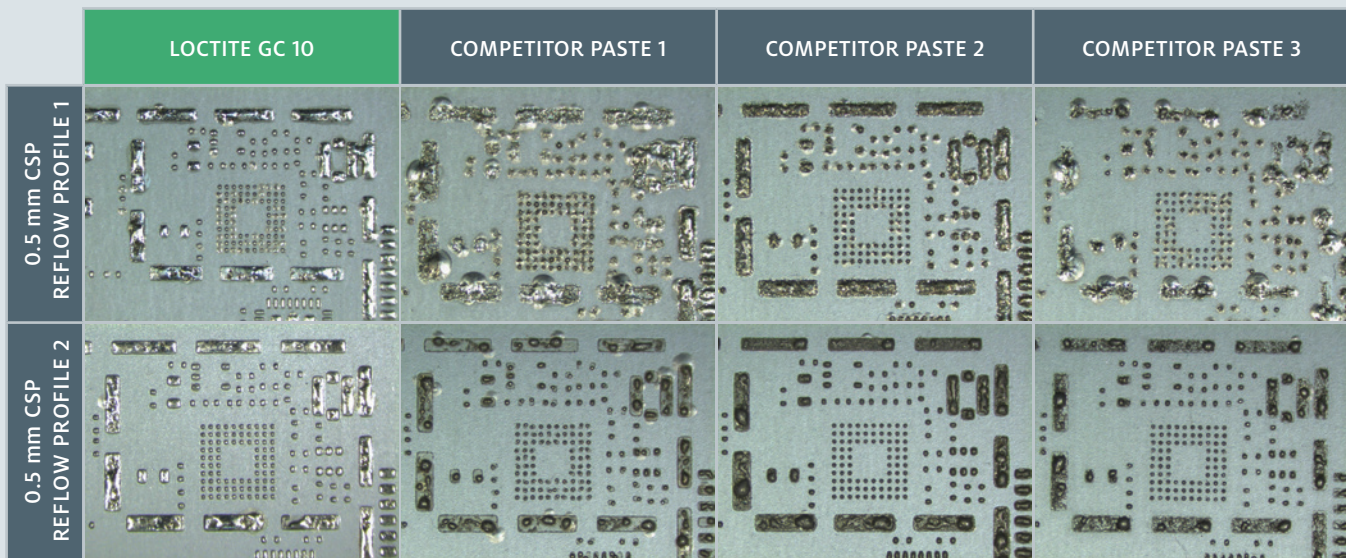
Multiple reflow profiles were evaluated on various component types. Regardless of the profile, the solderability of LOCTITE GC 10 remained consistent even with different paste types: Type 3, Type 4, Type 4.5 (4A) and Type 5. All test boards were reflowed in air and every profile yielded excellent wetting on even the smallest component type.

REFLOW MADE SIMPLE

- Excellent coalescence in air on components from 01005 to 2512, producing shiny, cohesive lead-free solder joints
- Zero dewetting after long, hot reflow profiles, even after 3 days at room temperature and 80 percent relative humidity (RH); minimal hot slump at 182°C
- Eliminate expensive nitrogen reflow with stable flux chemistry that improves total pad solderability in air
- Simplify qualifications, address future requirements and lower NPI costs
- Reduce defects like head-in-pillow (HiP), non-wet opens (NWO) and graping



EXCELLENT WETTING ON CHALLENGING SURFACES



LOCTITE GC 10 exhibits best-in-class wetting onto challenging substrates with reflow in air. These images are from an analysis that was performed without nitrogen on copper-nickel-zinc for RF shield attach. Zinc is notorious for its challenging solderability.

WATER WASHABLE, TEMPERATURE STABLE

The stability of the LOCTITE GC platform and its corresponding performance advantages also extend to a revolutionary water-soluble formulation. Developed on the heels of the award-winning LOCTITE GC 10, LOCTITE GC 3W offers similar benefits, providing cost-effective, yield-enhancing features to applications that demand post-assembly residue removal.

A breakthrough in water-soluble flux chemistry, LOCTITE GC 3W is a halide-free, halogen-free, lead-free solder paste technology that dramatically expands the post-assembly cleaning window to an unprecedented seven days. Manufacturers now have the flexibility to clean boards up to a full week following assembly. This, in addition to long stencil life and abandon times, incredible storage stability and exceptional transfer efficiency make LOCTITE GC 3W the choice for water wash applications.



IMPROVE PRINTING AND STABILITY

- Extended abandon time and stencil life
- Enhanced transfer efficiency
- Excellent humidity resistance
- Industry's first high-temperature stable water wash solder paste



UNMATCHED CLEANING FLEXIBILITY

- Ultrasonic or spray under immersion cleaning
- Low temperature, shorter cleaning times
- Easy residue removal up to seven days post-assembly
- No change in residue removal after dual reflows
- No additional saponifiers or co-solvents required

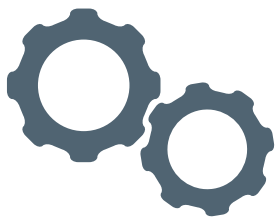
SUPERB REFLOW PERFORMANCE

- Excellent coalescence in air for 0201, 01005 and 0.3 mm CSP
- Minimal hot slump at 182°C, improving solder joint reliability
- No dewetting on long, hot reflow profiles, even after 3 days at room temperature and 80 percent RH
- Flux technology improves total pad solderability in air
- Outperforms halide-containing, industry standard formulations

OPTIMIZED PASTE MANAGEMENT

Time and materials are money. Maximizing both reduces costs and raises profits. With greater than 95 percent paste utilization, LOCTITE GC 10 minimizes scrap, saves time and simplifies material management protocols. Old methods of paste management include complicated refrigeration rotations, cumbersome usage time logs and confusing container tracking. With highly miniaturized device assemblies, some manufacturers even require scrapping of any remaining paste at the end of a shift so as not to compromise yield integrity on subsequent production runs. Say goodbye to this complexity and waste, and say hello to LOCTITE GC 10.

EFFICIENT MATERIAL MANAGEMENT



- 95 percent utilization results in less scrap compared to the industry standard of 75 percent
- Paste stability requires no refrigeration – room-temperature storage for one year and no complicated rotations or material use logs
- Zero start-up time; no kneading or bringing up to ambient temperature prior to production – put it on the stencil and print



SIMPLIFIED LOGISTICS AND STORAGE

Most solder pastes require refrigeration. Without it, particle oxidation will likely occur and compromise the performance and reliability of the solder paste. But, LOCTITE GC 10 is different. The next-generation flux formulation delivers stability at room- and elevated temperatures, allowing for the elimination of refrigerated storage, which equates to more cost-effective transport, handling and storage.



VALUE FROM SHIPPING TO THE SHOP FLOOR

- Eliminate cold pack, dry ice overnight shipments and realize flexible shipping options
- Simplify receiving procedures and do away with refrigerated storage
- Zero thaw time equals immediate productivity
- Up to one year room-temperature storage with consistent performance on day one or day 365
- Enjoy the benefits of an adaptable, flexible supply chain



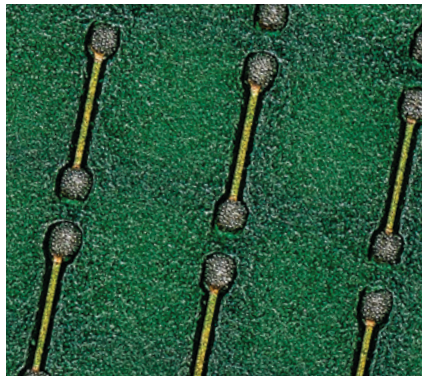
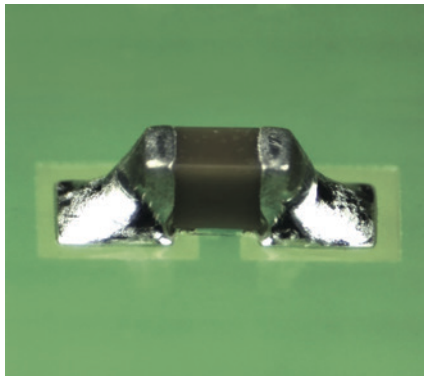
COST SAVINGS

Not only does LOCTITE GC 10 deliver proven, outstanding printing and reflow performance, it's also the industry's most cost-effective solder paste across the entire transport, production and operating life cycle. The game-changing material saves on shipping, storage, scrap, defect rates, nitrogen use and NPI qualifications.



IN-PROCESS, IN-TRANSIT AND IN-FACTORY SAVINGS

- Reduce defect-per-million rates
- Raise yields
- Qualify one material for all assembly requirements
- Reduce scrap by as much as 20 percent
- Eliminate expensive nitrogen reflow – even with Type 5 solder paste
- No more cold pack, overnight shipping
- Enjoy cost-conscious ground transportation
- Say goodbye to refrigerated storage
- No need to build in start-up time to production routines



It's already paying off for customers around the world:

"We were one of the early adopters of LOCTITE GC 10 and our initial great results have continued. We have consistently experienced fantastic performance and, in fact, have recommended the material to other companies who are equally as impressed with LOCTITE GC 10. The ability to reuse the material without scrapping remaining paste at the end of a shift has paid big dividends. By our estimates, we've saved as much as 50 percent on overall solder paste costs versus previous materials. LOCTITE GC 10 has exceeded expectations!"

Matthew Polak, Owner,
Raven Systems Design, Inc.



SUSTAINABILITY

Sustainability is embraced at the highest levels of the Henkel Corporation and is central to the company's philosophy. Creating sustainable value for our customers, employees, business and the societies in which we live is a commitment we take seriously and one that permeates throughout all of Henkel's development efforts.

Henkel's solder development program, specifically the LOCTITE GC platform, is a benchmark for sustainable materials innovation. Compliance with REACH halogen-free initiatives, RoHS and EICC conflict-free tin sourcing practices are integrated into all of our solder formulation protocols, with the LOCTITE GC program pushing even further into sustainability by eliminating nitrogen, reducing energy usage and maximizing productivity and yield. LOCTITE GC materials are the sum of tangible value and environmental responsibility.



SUSTAINABILITY FROM START TO FINISH



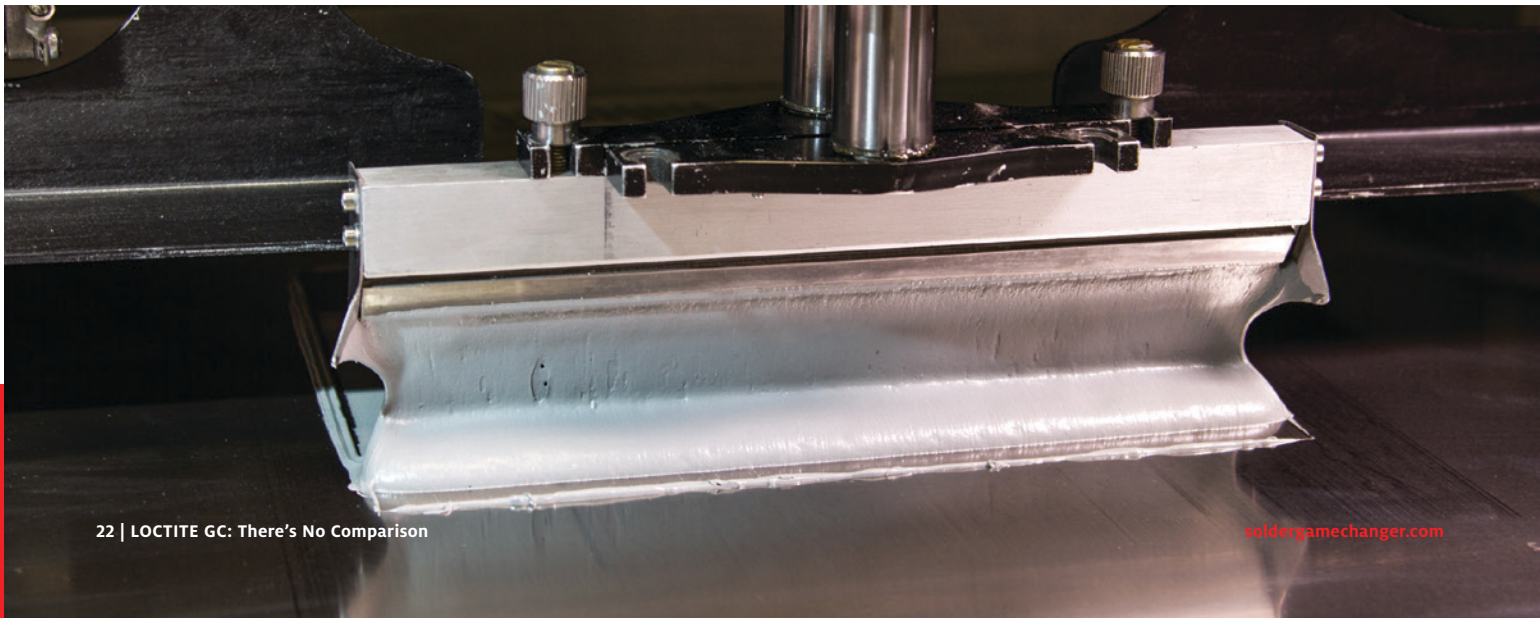
- Zero added halogens, a true halogen-free formula
- Lead-free in compliance with environmental legislative and sustainability initiatives
- Long shelf life and greater than 95 percent utilization significantly reduces waste
- Simplified supply chain logistics – a single material qualifies for all processing needs
- Energy consumption reduction – no overnight shipping or refrigerated storage

AREA OF IMPROVEMENT	LOGISTICS	INDUSTRIAL PROCESSING	SERVICE/USE	DISPOSAL
PERFORMANCE	Longer shelf life and no need for air freight	Zero start-up time and fewer end-of-line defects	Consistent performance on increasingly smaller devices for improved reliability	20% reduced scrap rate
MATERIALS AND WASTE	Less packaging – no cold packs needed	Reduced material waste, elimination of nitrogen requirement and universal qualification for all applications	Extends product life of devices	Greater than 95% paste utilization
ENERGY AND CLIMATE	Eliminates refrigerated transport	Eliminates refrigerated storage	Zero added halogens and lead-free; less wasted material	Zero added halogens and lead-free; less wasted material
WATER AND WASTEWATER	–	No post-reflow residue cleaning required for LOCTITE GC 10; shorter cleaning times for LOCTITE GC 3W	–	–

LOCTITE GC: THERE'S NO COMPARISON

NO-CLEAN SOLDER PASTE

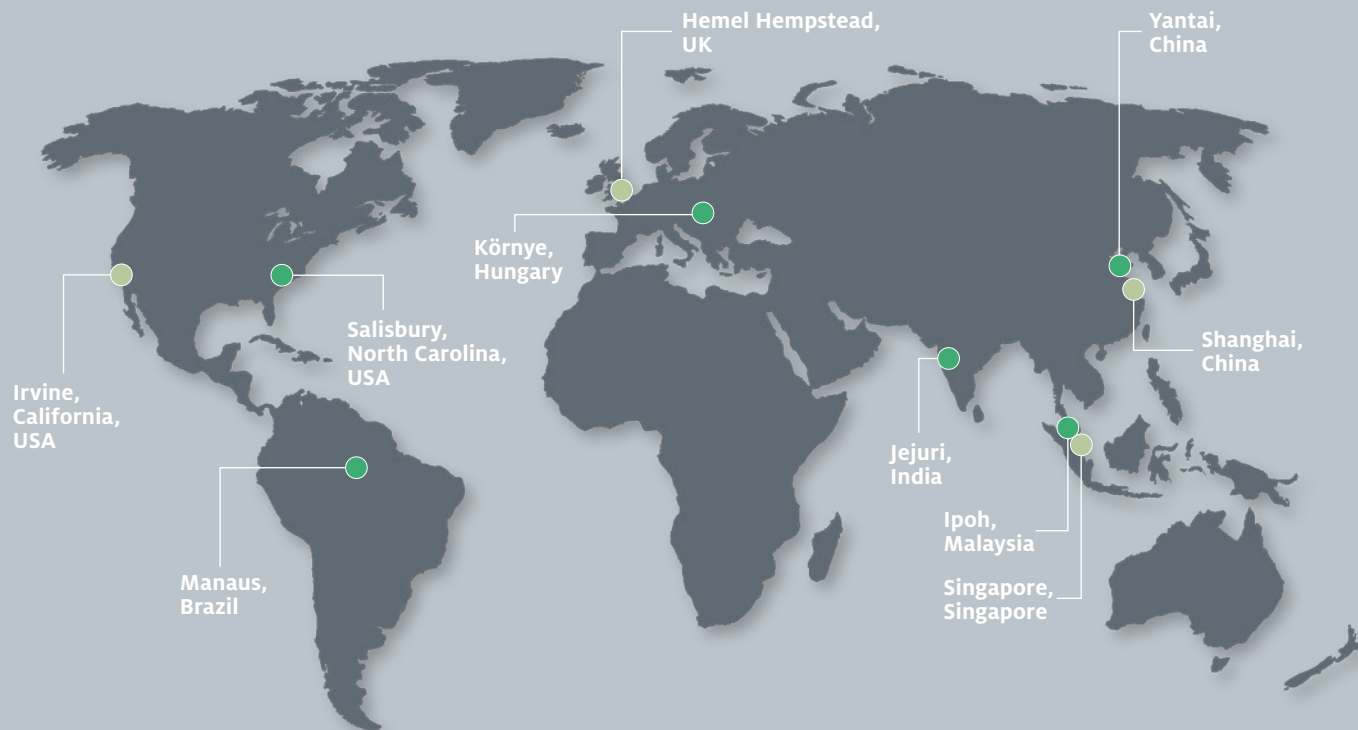
ATTRIBUTES	CURRENT TECHNOLOGY	LOCTITE GC 10
Regulatory Compliance	Halogen-free	Zero halogens added
Particle Size Distribution	Type 3, 4	Type 3, 4, 4.5 (4A), 5
Performance Stable at 26.5°C	1 month	1 year
Stencil Life	Up to 4 hours	Up to 72 hours
Abandon Time	1 – 4 hours	Up to 24 hours
Soak Temperature (Reflow)	150°C – 180°C	150°C – 200°C
On-line Paste Utilization	75%	> 95%
Start-up Time	4 – 24 hours	0 hours
Voiding Performance (IPC-7095B)	Class 3 (< 10%)	Class 3 (< 10%)
Slump Performance (IPC-TM-650 2.4.35)	0.3 mm	0.15 mm





WATER WASH SOLDER PASTE

ATTRIBUTES	CURRENT TECHNOLOGY	LOCTITE GC 3W
Regulatory Compliance	Halide/halogen-containing	Zero halogens added
Particle Size Distribution	Type 3, 4	Type 3, 4
Performance Stable at 26.5°C	1 month	6 months
Stencil Life	< 4 hours	> 24 hours
Abandon Time	< 2 hours	> 4 hours
Soak Temperature (Reflow)	150°C – 180°C	140°C – 170°C
On-line Paste Utilization	75%	> 95%
Start-up Time	4 – 24 hours	0 hours
Cleaning Time/Temperature	5 – 10 minutes at 55°C – 75°C	5 minutes at 45°C – 60°C
Residue Cleaning (IPC-TM-650 2.3.25)	Within 24 hours	Within 7 days
SIR Post-Cleaning (IPC-9201A)	Within 24 hours	Within 7 days
Voiding Performance (IPC-7095B)	Class 3 (< 10%)	Class 3 (< 10%)
Slump Performance (IPC-TM-650 2.4.35)	0.3 mm	0.2 mm



- Solder Manufacturing
- Solder Product Development and Technical Service

**Across the Board,
Around the Globe.**



henkel-adhesives.com/electronics
soldergamechanger.com