EMP 2018
Electronics Manufacturing & Production Handbook

The digital manufacturing challenge for Africa
Localisation and the importance of brand
Smart manufacturing is about more than just robots
Selection Guides for equipment, consumables, tools & accessories

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Innovation + education + incubation = a winning formula?

There’s never been a better time for someone with an innovative idea to see it realised with a working design, but successfully launching a product in a crowded market has arguably never been harder. What’s more, while there will always be a place for the traditional electronic engineering fraternity and the established manufacturing sector, a perfect storm of factors is fuelling the rise of the everyman as a real force for innovation.

First of all, the ‘makers’ community of hobbyists and tinkerers is flourishing thanks mainly to simple-to-use, highly capable prototyping platforms such as Arduino and Raspberry Pi (to mention just two). Not only has their hardware power advanced to the point where they can legitimately be described as credit card-sized computers, they are also supported by massive open-source communities who are more than happy to share their ideas and software with others. Such is the popularity of Raspberry Pi in particular that Premier Farnell recently sold its ten millionth unit after less than six years, and now sells over 50 000 per week globally. So-called ‘Raspberry Jam’ events have also sprung up in dozens of countries (including South Africa) as get-togethers for members of this community to show off their designs.

Secondly, knowledge is now freely accessible by anyone willing to search for it, apply their minds to understanding it, and experiment. Gone are the days when university hallways and dusty old libraries were the exclusive entry points into the arcane engineering arts; access to the Internet gives anyone and everyone an opportunity to learn. Tertiary institutions still have their place, of course, as they provide an unmatched method of planning, structuring, imparting and testing advanced, relevant knowledge.

A decisive factor, though, and one that people of a technical bent tend to struggle with, is commercialisation – even the greatest idea in the world is worthless if it can’t be developed into an actual product, or if nobody wants to buy it. This is where incubators can play a part, providing a means of filtering out the marketable ideas from the otherwise, and advising and consulting on product industrialisation.

Just one example of this is Savant, a hardware technology incubator, which has partnered with the Small Enterprise Development Agency (SEDA) as an enterprise development partner. In October, Savant announced that, since its first incubation client in 2007, it had secured R106 million in investments from private investors and government agencies such as the IDC, TIA and DTI, and the startups on its books had earned revenues in excess of R2.51 billion.

That is not to say it’s easy being a startup. In November, Ventureburn released the results of its latest survey of 260 tech startup founders. The survey produced a host of facts and figures – here are just a handful that stand out: 72% of founders were male, 44% were white, 31% were black, and 65% were aged between 25 and 35. Gauteng has gained ground on the Western Cape as a hotbed of innovation, being home to 44% and 47% of startups surveyed, respectively. Most identified their biggest challenge as raising enough funds, with 40% being self-funded and 51% expecting to run out of funds within just 3 months. Only 10% of respondents said they were turning a profit, which is down from the 17% reported in a similar 2015 survey. So, opportunities aside, money talks and there is clearly not much to go around, despite the private and public incubation efforts.

So where does this leave electronics design and manufacturing as an industry? Some might argue that the sector loses out when the tools for innovation are put in the hands of the man in the street, but in the long run I believe it can only be stronger for it. A culture of science, technology and innovation is not easy to create – just ask the South African government – but it is a slowly rising tide that is hard to stop once it gains momentum.
Digital manufacturing is seen as one of the next major leaps within the manufacturing value chains. This digital revolution promises to align product and production processes from concept to the end consumer. Potential is huge and could hold opportunities in the reduction of costs, time to market and improvement of production processes.

According to Siemens (2017) the digital manufacturing environment may be defined as “the use of an integrated, computer-based system comprised of simulation, three-dimensional (3D) visualisation, analytics and various collaboration tools to create product and manufacturing process definitions simultaneously”. It is indeed a complex topic and is being studied and published widely worldwide. Various countries launched initiatives and are contributing to the body of knowledge, from Industry 4.0 originating in Germany, the Made in China 2025 initiative from China, and even South Africa’s own government and private sectors seeking solutions to implement it locally. There are, however, many burning questions that the business environment within South Africa would have to answer when it comes to taking the leap into the digital manufacturing world.

Do we have sufficient infrastructure on which to implement the digitisation process or are we still stuck in manual manufacturing processes that haven’t been automated properly? Is this the playground of large multinational companies or can the technologies and processes be applied to smaller businesses? How do we develop the future workforce to be prepared for the changes that the digital manufacturing environment will bring? Which enablers, technological or not, are required to implement digital manufacturing in the business?

To supply some of the answers to these questions, Accenture Strategy (2016) identified 11 enablers that companies must consider if they wish to implement digital manufacturing within their environment. These are: digital foundation, intelligent automation and control, operational analytics and process monitoring, digital safety and energy management, mobility, advanced technologies, engineering collaboration, digital production system, talent development and learning, manufacturing control tower, and industrial security.

What really drew my attention was the potential that digital manufacturing holds for the development of staff in new ‘high-tech’ skill sets. The workforce will have to be upskilled in how to deal with smart technologies (Deloitte, 2016). This would include skills in information technology, digital technologies, as well as IoT technologies. Africa also faces major challenges in manufacturing infrastructure and connectedness as an enabler for digitisation. Challenges are further made clear by the diagram below from the International Federation of Robotics showing the number of industrial robots being imported to various countries. The fact is that Africa is lagging behind the rest of the industrialised countries.

Examples of successful digital manufacturing implementation are far and few between, with many still in a trial phase showing the potential a fully automated system holds. Industry 4.0 also heightens fears that the digitisation of manufacturing will reduce the workforce required in factories to the point where they are completely run by machines. If this statement is taken seriously without further research it could offer significant barriers to the implementation of these platforms in countries where manufacturing employs a large number of the workforce. In my view it would be more correct to state that (in the immediate future) Industry 4.0 offers improvements in the existing processes, but human beings would still run processes required to implement and evolve the system.

In conclusion, Jeff Immelt probably explained it best by saying that if companies like it or not, more and more of them would have to change their technologies, people and business models to operate in the information space. Countries in Africa are thus at a crossroads; be the first to trial the technologies and strategies being offered by digital manufacturing, or wait and see what happens to their competitors and risk seeing them improve to the point where they dominate existing and new manufacturing processes.

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**Estimated Yearly Shipments of Multipurpose Industrial Robots**

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Localisation and the importance of brand

Information from Leratadima Tellumat Manufacturing (formerly Grand Tellumat Manufacturing).

Localisation is the (prescribed) use of local content (skills and components) in manufacturing. As a requirement, it’s almost impossible to avoid as governments globally impose policies that require firms to use domestically manufactured goods or supplied services in order to operate in an economy. Local content requirements serve as either a precondition to receive government support or an eligibility requirement for government procurement.

But localisation is not just an exercise in compliance. It promotes skills development, innovation in local manufacturing as well as job creation, and is usually coupled with other policy measures to encourage economic growth.

A high-profile local example can be found in digital terrestrial television (DTT) set top boxes: These highly publicised digital TV signal receivers for use with old analog TV sets have created jobs and training for hundreds of thousands of installers, households and their local economies.

How can localisation be assured of attaining these excellent objectives?

Location, location, location

A local partner can be an important success factor for an original equipment manufacturer (OEM) entering a new market. But to woo international brands, manufacturers should offer easy access to local markets. Choose your setup location carefully!

Expect a full audit

Candidates should expect searching questions about their ability to match the historic output, manufacturing standards and quality of the outsourcing OEM. Anticipate compliance with IPC and ISO quality standards, traceability of components, and health and safety to come up as preconditions to contracts.

It’s a partnership

As with any business relationship, a manufacturing deal is about trust, commitment, transparency and communication. If anything, the degree of trust involved in sharing intellectual property with another company raises the relationship requirement to the level of a trusted partnership.

Overcoming issues

Don’t expect everything to run smoothly from day one. Potential trouble areas include sourcing – if the OEM prescribes specific sources, the manufacturer is obligated to disclose known issues with quality or availability, as this will affect its (and the customer’s) ability to deliver.

Diligence – a two-sided coin

Partnership obligations also extend to the OEM. There must be a real commitment to providing the manufacturer with a full set of manufacturing processes and procedures, including changes to these over time.

Sensitivity to change

At a high level, liaison between OEM and manufacturer ‘merely’ involves a meeting of minds; at operational level, far more frequent liaison is necessary to iron out everyday issues. OEM staff may feel aggrieved at losing manufacturing to an outsider firm, requiring sensitivity on the part of the latter.

The long haul

Typically, six months are needed to identity the ideal manufacturing/OEM partner, perform audits, hand over processes, obtain the necessary equipment and components, produce and test ‘first-offs’, and then go into mass production. On the upside, diligent preparation can form the basis of a sustainable long-term relationship.

It’s just business

In the end though, it is just business. A cost-benefit analysis at the outset will reveal if localising manufacturing is profitable. No end user will pay more for a product just because it is locally made, so any extra costs must be offset against quantifiable benefits.

The importance of brand

Over and above having an effective localisation strategy, to truly stand out from the crowd a contract manufacturer needs to build the sort of brand customers want to identify and associate with. And that involves going back to their roots and rediscovering why they’re in business.

What a manufacturer does

A contract manufacturer is essentially a service business. Its value is in offering its services to business customers that buy into its consistent delivery of products on time, within budget and to the appropriate level of quality.

But does this offer much differentiation? Many manufacturers satisfy all these conditions, essentially rendering manufacturing a commodity. As a result, manufacturers engage in price-based competition, placing immense pressure on a sector already operating on very tight margins. This tends to play into the hands of a few large competitors with deep pockets and healthy volumes.

What makes some companies, and their products or services, more desirable than others is not simply what they make or how they make their products, as in most cases there is just so much similarity out there. Instead, what makes customers buy from a brand is that brand’s reason for doing (or making) what it does. In short, according to business success guru Simon Sinek, the

Continued on page 6
Why they do it
A good manufacturer goes out of its way to deliver consistently high-quality product on time and within budget, seeking innovative solutions to ensure it meets agreed service levels, while also communicating regularly with its customers on progress and timeously alerting customers of any problems standing in the way of delivering their service.

A great manufacturer knows why they are in business. It is so that their customers can focus on meeting their business objectives without worrying about the product build, logistics and manufacturing. A great manufacturing partnership allows customers to put all their efforts and focus on understanding and servicing their markets, enhancing their products, developing new ones, and most importantly, on selling their products so that a ‘river’ of demand continues to flow through the manufacturing service business to its customer and on to the end customer, nourishing all the hands it passes through.

Rediscovering your purpose
For many, their purpose may have been lost or forgotten, and as a result needs to be re-activated or reviewed to achieve sustainability and growth. To get started on this journey of rediscovery, manufacturers need to go back to their roots.

There was an initial need which they believed they could satisfy, and that is WHY the business was started. Once that reason became clear and was agreed, all other actions, services and products were aligned to get the business going and keep it going. Perhaps your reason for being in business was no more than loosely connected with your products or services. Don’t let it stop you – it can nevertheless sit very well with customers.

In a country where unemployment is rife, manufacturing that makes a difference to citizens’ lives and our national competitiveness can drive significant brand value. Through skills upliftment and job creation programmes it can uplift a largely unskilled labour force and play an anchoring role in the community and greater society.

On a purely economic level, a manufacturing sector that discovers its social ‘why’, and operates effectively, can strengthen the country’s manufacturing value proposition, justifying government support for the industry and ultimately encouraging people to think twice before they import.

Do your customers see your vision?
Successful companies share their vision with the world, and back it up with delivery, to attract customers. The ability to share and continually reinforce the reason why you and your staff do what you do through action, rather than what or how you do it, engages customers, gains their buy-in and in so doing, over time, fuels their desire to be a part of that vision.

Whether your vision is to bring good design to business, like Invision, or to turn customers into high-performance businesses like Accenture, your customers want to see evidence of it, so corporate communications must reinforce it, performance must demonstrate it, and staff must live it.

Ultimately, manufacturers must engage and create visibility for themselves, share their ‘why’, and prove their commitment to it, in order to be successful. Say it loud, say it proud and walk the talk! Customers will follow, because they want to!

For more information contact Leratadima Tellumat Manufacturing (formerly Grand Tellumat Manufacturing), +27 (0)21 710 2400.
Automation in factories isn’t new. Today, though, the disruptive force of digital transformation is taking manufacturing far beyond automation. Industry 4.0, mass customisation, and advances in tech like 3D printing and nanomaterials have placed humanity at the cusp of several game changers when it comes to this $11.6 trillion industry.

**I, Robot**

Automation began back in the 1800s with mechanised cotton spinners, steam power, and the arrival of the first industrial revolution. By the 1930s, the automotive industry was leading the second industrial revolution of mass production, paving the way for the digital control systems of the ’70s. In the 1980s, car makers became intensive adopters of industrial robots, at which point computers and automation were embodying the third industrial revolution.

Jump forward to more recent milestones, and Foxconn in China was running up to 10 automated production lines in some of its factories by the end of 2016, in the second phase of its three-phase full automation plan. Also in 2016, Adidas unveiled its first fully robot-built sneaker, one of 500 planned prototypes for its new factory in Germany. Though we’re not quite there yet, the arrival of lights-out manufacturing is a case of when, not if.

**Why the slow start?**

One major issue is outdated legacy infrastructure. The complexity of virtualising the production environment is exacerbated by IT systems that were deployed before cloud, inexpensive storage, and ubiquitous connectivity came along. Going fully digital is also risky; Shutting down an assembly line to fix a software or network failure could be cripplingly expensive for a manufacturer.

Connectivity requirements in smart manufacturing are very high, often to the tune of sub-millisecond latency and data rates of 10 Gbps, as in the case of machine vision and cooperative robots. Fortunately, that’s what the latest wireless network solutions deliver: high bandwidth, low latency, and reliable connections that can cut costs by up to 50% and energy consumption by 10%.

Equally significant, though, is the skills gap that exists in data analytics, a central facet of manufacturing and the source of insight into processes, faults, consumer habits, and much more. Many companies aren’t all that clear on how and where to deploy analytics solutions or how to use the huge volumes of data generated by sensors. And McKinsey estimates that there will soon be a shortage of around 1.5 million analytics experts in the US alone. While Forbes writer Meta S. Brown questions the McKinsey stats and analysis, she also identifies that the human factor is an issue, “Managers who have trouble finding analytics talent have usually not given enough thought to their business goals.”

Moreover, in a survey by Tata Consulting about big data analytics in manufacturing, the top problem identified by enterprises was building trust between data scientists and functional managers, which in turn creates a gap between data insights and how and which business strategies are executed. Of the 17 categories surveyed, the second biggest problem was determining what data to use for which business decisions, and the third was the inability to handle the volume and velocity of data generated by sensors. Simply put, manufacturers can’t and aren’t making the most out of the data they have access to.

The complexity of the manufacturing industry means that no coherent industry-wide digital transformation strategy exists, with individual enterprises digitising at different rates and in different directions. Moreover, many companies lack the agility to quickly shift from traditional goals like lean manufacturing. Indeed, the Tata Consulting survey found...
that the top three benefits of data analytics for manufacturers are still in line with the old-
School aim of optimising processes: tracking product defects and quality, supply planning,
And identifying manufacturing process defects.
Reflecting the industry’s commitment to lean processes, manufacturers have been relatively fast movers in analytics, smart sen-
sors, and Industrial IoT (IIoT). That’s all well and
good, but the productivity gains from 6 Sigma and lean manufacturing have petered out over
the last five or so years, because processes have become as optimised as they can be.

A change in mindset
Not all enterprises are benefiting from the new service-oriented business models that can arise from abundant sensors and data insights.
In contrast, Denzil Samuels, global head of channels and alliances for GE Digital, given an example of how his company benefits airline customers with the data, IoT and service mix,
“We can give the airline digital information in real time. That can help them with flight opera-
tions like scheduling crew and handling cargo.
We can also provide data in a whole bunch of other areas by just selling them a jet engine.”
Thus, GE is acting as a manufacturer and also as a service provider based on hardware embedded with smart sensors.

New business models aren’t just prompted by technology. Consumer expectations are lean-
ing towards personalisation and faster delivery, both of which require a shift towards mass customisation, strong digital infrastructure and, more recently, drone delivery. However, many traditional manufacturers are slow to embrace the mindset of markets of one.

Mass customisation in action: unmade.com
Fashion startup Unmade enables customers to customise garments before they’re made, so customised designs can be produced at the same unit cost as mass-produced goods.
Designed to avoid over-production and waste, the three elements of Unmade’s business model are personalisation, e-commerce and on-demand manufacturing. An online person-
alisation editor allows customers to change colours, patterns and logos on garments; the e-commerce model allows existing stock and customised pieces to be sold together; and on-demand manufacturing sends orders to partnering knitwear factories to be made.
A press evaluation describes this model as,
“Making the tools of factory production available at the click of a mouse, with no penalty for short production runs.”

Smart robotics and machine learning will help achieve advances in mass customisation. ABB, a leader in digital tech and robotics, is working with Huawei to combine wireless tech, smart sensors, and smart components to solve manufacturing challenges. According to Joni Rautavuori, president of ABB Robotics and Applications, “The development that is happening on smart components and sensors makes it possible to use machine learning to develop new ways of programming robots.”
This increases the potential for adaptive programming, which in turn helps enable mass customisation.

Despite the flexibility and agility of companies like Unmade, mass customisation isn’t high on most manufacturers’ agendas. In fact, it comes in last in the Tata Consulting survey.
However, given shifting consumer expecta-
tions, it is quite probable that this will change for many products.

The security issue
In March 2017, the tech mag Manufacturing Business Technology reported that manufac-
turing is the second most hacked industry after healthcare, in large part because of inadequate investment in security. Although cyber attacks cost businesses $400 billion in 2015, which is set to rise to $2.1 trillion per year by 2019, cybersecurity – like data analytics – lacks experts. Forbes cites the non-profit inform-
ation security advocacy group, ISACA, which “predicts there will be a global shortage of two million cybersecurity professionals by 2019.”

The transition to industry 4.0 is creating larger attack surfaces due to more complex net-
works, a vast number of connected IloIT devices, and big data processed in the cloud. Many companies lack a robust E2E information secu-
ritv solution that protects against attacks from a hacker’s armoury, including server, client, web, software and DDoS. Equally, on the R&D link of the chain, IPR and sensitive data requires a net-
work solution that separates the R&D intranet from the office extranet, provides secure con-
nections, and encourages collaboration.

Transitioning into the future
Germany’s Industry 4.0 might still draw a blank-face response from some business leaders, but it represents the next phase in manufacturing in Europe. Equivalents are the Industrial Internet in the US and Made in China 2025. All involve the convergence of a range of technological enablers and accelerators, the result of which will be connected, smart factories and smart manufacturing.

Smart manufacturing goes beyond comput-
ing and automation. It creates a cyber-physical system, or digital twin, as a virtual model of a process, product or service. Underpinned by ubiquitous, low-latency connectivity in the shape of 5G, smart sensors transmit data to the cloud where it’s processed and analysed to give contextual and predictive data.

Pairing a physical and virtual world has several advantages. GE Digital’s Denzil Samuels explains one advantage using the example of a jet engine on which smart sensors constantly transmit enough data to build a cyber copy.
“The engine that’s now being simulated can take over the pain of major aircraft engine maintenance by replacing a single blade that’s worn as soon as we know about it. Or better still, predicting when it’ll get worn to the point when it needs replacing, so we can minimise the amount of time that the engine is actually out of commission.”

Moreover, the connectivity afforded by smart manufacturing links all processes from R&D, sourcing materials and production, to QA, sales, distribution and logistics.

Manufacturing 2025
Over the next decade, smart manufacturing will extend past individual factories to connect groups of factories and the manufacturing industry with other verticals.

The convergence of manufacturing and ser-
ices will continue with the XaaS model based on IoT and data insights. Thus, the services that manufacturers will require and deliver based on the products they make will increase, many of which will be driven by data insights and consumer demand. In the B2C space, consum-
ers in emerging economies will become a dominant market presence, while demand in developed countries will fragment. However, customisation in products and after-sales services are likely to increase.

3D printing will evolve from prototyping to a viable means of mass production in the 2020s. Advances in raw materials will enhance parts’ design, manufacturing processes and printing technology. At the same time, the use of nano-
materials, which we’re seeing today in products like clothing, sports goods and electronics, will expand into an industry worth $170 billion a year. Coupled with improvements in robotics and AI, new areas of demand will emerge.
Back to 2017, and C-suite executives need to consider how maturing technologies like AI, virtualisation and 3D printing will shape the future, alongside the connected manufactur-
ing ecosystem of Industry 4.0 plus changing market dynamics. Despite advances in tech-
nology, we live in uncertain times. Strategic investment in digital infrastructure, skilled staff, and partnerships are the tools to make things happen in the next decade of smart disruption.

For more information visit www.huawei.com

www.dataweek.co.za EMP Handbook 2018 9
Electronic Touch Systems (ETS) has supplied membrane keypad solutions and ancillary products to the South African electronics industry for more than a quarter of a century. The company was founded by Tony Ellis in February 1990 to fill the niche market of South African-manufactured membrane switches and instrument panels printed on polycarbonates.

Ellis passed away in 2007 but his wife Carol still helms the company together with Denzil Hagemann and Patrick Thomas.

From humble beginnings in Albertville, Johannesburg, the company grew steadily until the premises simply were not large enough to contain its burgeoning production facilities. After a short-lived move to temporary premises in Albertskroon, in 1992 the company made its home in a 650 square metre facility in a prime Northcliff location. Having undergone extensive renovations required to optimise it for a streamlined operation, the building now houses printing, assembly and die-cutting operations on three separate floors and an administration department on the top floor.

ETS is well regarded for the high quality of its membrane switches and overlays, and indeed its core product is the membrane switch in all its contemporary formats like tactile feel, various options of backlighting, and most recently digital printing of the graphic component of the products. Quality is something to which ETS certainly does not simply pay lip service. Each and every button on each and every keypad the company manufactures is manually tested before being dispatched. It is thanks to this attention to detail, as well as its highly trained and experienced staff members, that the company has received numerous SASPA and CBI awards for quality and zero defects.

The company strives to be at the forefront of global development in the manufacturing of membrane switches and is constantly improving on its standards of excellence and service. It prides itself on being South African manufacturers of a niche product in a difficult economic environment and strives to uphold its integrity as such by ensuring its products are equal to – if not better – than what may be obtained off-shore.

Although it faces stiff price competition from Eastern competitors and has experienced cases where companies who have come to it for prototypes have then taken their high-volume production requirements to China, ETS has also seen customers come back to it, once they experience quality problems with cheap Asian products. The company steadfastly believes that its strong focus on quality, as well as its eager and immediate service capabilities will continue to hold it in good stead as they always have.

Going forward, ETS will continue to focus on delivering to the South African market to the best of its ability, in addition to exporting its products to Europe and the Americas, by driving manufacturing excellence and service to its highest standards, while remaining competitive as far as pricing is concerned.

For more information contact Electronic Touch Systems, +27 (0)11 782 3346, touch@global.co.za, www.electouch.co.za

The company strives to be at the forefront of global development in the manufacturing of membrane switches and is constantly improving on its standards of excellence and service.
New ownership – Business as usual

Many positive things happened in 2015: NASA confirmed the presence of water on Mars, 195 countries signed the world’s first accord on climate change, the US and Cuba restored diplomatic relations and global poverty fell to its lowest level in history according to the World Bank, to name but a few.

Closer to home, 2015 was a significant year in Omnigo’s history. After a period of negotiations Omnigo joined the Reutech group as one of its latest acquisitions. Being a key business partner to Reutech in previous years, Omnigo was identified as a key ingredient in the Reutech success story.

Omnigo has since evolved to become a critical link in the Reutech supply chain and is its preferred electronic contract manufacturer (ECM).

Capital injection

During the period 2015 to 2017 Reutech made a significant investment into the business, in the form of capital expenditure. This was done by following a balanced approach to improve throughput through the whole facility and subsequently very specific items were procured.

In the surface mount technology (SMT) department, existing equipment was upgraded and an additional line was added. This has resulted in an increase of up to 40% in SMT production capacity. The conventional or through hole production (THP) department added a selective soldering machine, increasing production capabilities by up to 50%.

LabVIEW equipment was added to the already substantial testing capabilities, resulting in an increased range of functionality as well as expanding the capabilities to develop test equipment. Additional environmental stress screening equipment was procured which has significantly increased capacity as well as the range of capabilities.

To further augment Omnigo’s reputation for quality it enhanced its inspection capabilities with the addition of new equipment including an X-ray machine. This has improved the quality control on each product manufactured as well as the verification of its processes.

Range of capabilities

From humble beginnings until where it is today Omnigo’s range of services has grown considerably to include the following:

- Sourcing and procurement of all materials.
- Automated surface mount and automated conventional (through hole) electronic assembly of printed circuit boards as well as hand assembly of both SMT and THP processes.
- Testing of PCB assemblies up to testing of final assemblies depending on client requirements.
- BGA re-ball and rework facilities.
- Conformal coating.
- Sub assembly and final assembly if needed (building components into enclosures, etc.)
- X-ray and automated optical inspection.
- Advanced rework and repair.
- Manufacturing of cables, looms and harnesses (IPC 620 certified).
- Testing of PBAs (PCB assemblies).
- ESS (environmental stress screening) where necessary.
- Vibration screening where necessary.
- Delivery with a certificate of conformance where required.
- Industrialisation.
- Project management.
- Quality assurance.
- Development of test equipment.

Quality and superior service

One of Omnigo’s core values is excellence, where it strives to manufacture “1st time right, everytime right”.

This has been the driving force behind the excellent reputation Omnigo has in the market. In addition this is also the reason it is the preferred PCB manufacturer for the majority of its clients. Omnigo is about more than just manufacturing, it builds long-term trust relationships and works together with its business partners to create value.

For more information contact Omnigo, +27 (0)12 803 8218, sales@omnigo.co.za, www.omnigo.co.za

Omnigo makes your design a reality.
Headquartered in Milpark, Johannesburg, and owned by the University of Johannesburg, it operates as an independent commercial company that receives no subsidies for operational expenses. By instead verifying that all activities are economically sustainable, the organisation believes that this ensures closer alignment with industry and guarantees efficiency as a result.

Resolution Circle offers both workshop-based training skills and experiential work skills. “We chose technology commercialisation as the vehicle to support experiential work skills,” explains CEO, Prof. Willem Clarke. “Overall, I would say the primary goal is to increase employment through the vehicles of both experiential training and startups (mostly developing new technology). A key goal is also to act as a third stream revenue generator for our shareholder, the University of Johannesburg.”

The organisation is divided into two main areas in accordance with its mission: experiential training and technology commercialisation. As a commercialisation company, it has developed a process called ‘Idea-to-Barcode’ which provides a standard mechanism to take a product from a concept to its launch into the market. This includes everything from business development, fund raising, prototyping, engineering and industrial design, to design for manufacturing, mould and toolmaking, small-scale manufacturing and marketing support.

“In addition to this process, we have a well-developed support system, infrastructure and skills to support a startup in its journey to the market. From an investor perspective, we offer a fixed price quote of the costs associated with commercialisation, and reduced risk,” Clarke says.

To date, Resolution Circle has graduated over 1800 students, and supported over 50 product development projects in 2017 alone. “We are proud to have been selected as one of FastCompany’s top 25 most innovative companies in South Africa,” Clarke continues. “A great source of pride is also that we have been selected as executing on several commercialisation/innovation programmes launched by various large companies.”

Smooth sailing is never guaranteed when launching an innovative, ambitious organisation like this, and Clarke admits there have been challenges: “The first few years have been difficult as we had to establish our infrastructure (roughly R200 million worth), develop a business model and operate as a commercial company responsible for our own expenses, all at the same time. Many lessons were learned during this process, sometimes at great cost. However, as we progressed, we were able to refine the business model, develop our Idea-to-Barcode process and understand the intricacies of running a complex business like this.

“I believe we have reached our goals. We reached breakeven in five years with a very complex and innovative business model, and managed to establish a brand in the market with regards to both commercialisation and workshop-based training programmes. Going forward, our aim is to achieve profitability and growth, but also to improve our impact on the South African economy and job statistics. This will be achieved by focusing on our core skills, refining our model and processes, and working on achieving economies of scale.”

For more information contact Resolution Circle, +27 (0)10 020 3300, mariusv@resolutioncircle.co.za, www.resolutioncircle.co.za

Resolution Circle was established in 2012 as a support mechanism for engineering diploma students requiring work integrated learning.
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To tent or not to tent vias

By Pam Landman, IJ-CCAL.

To provide some context to the reason behind me writing this article, allow me to first relate part of a conversation I had with one of my clients.

Client: “All vias to have no tenting please.”

Pam: “Excuse me [surprised, as this was my first such request]. Please explain?”

Client: “We have found this the most effective way to capture solder balls.”

Pam: “But surely the PCBA (printed circuit board assembly) companies you are using have this under control?”

Client: 😊

Now, I realised this would depend on assembly class and the PCBA company in question, and who am I to argue with my client about what company they utilise? After pondering the issue I decided that, although it would no doubt prove to be subjective, this article might nonetheless serve to clarify some of the considerations surrounding this topic.

For the sake of thoroughness, let me define some of the terms I will use throughout the rest of this article:

- A through-hole via is generally a small plated hole with a copper annular ring (AR), with a hole size and pad (AR) size determined by the end user and PCB supplier. It can be found on a printed circuit board (PCB) to route a track from one side of the PCB to the other side, or to an internal layer on a multilayer PCB.
- A blind via is one that is only visible from one side of the PCB.
- A buried via is not visible and is only used on a PCB with four layers or more (depending on layerstacking).
- Tenting is when solder mask covers the entire via, AR and hole. Conversely, an exposed or non-tented via is one that does not have solder mask covering it.

In this article I will consider vias of the through-hole variety only.

Full tenting

Full tenting occurs when the solder mask covers the annular ring and the hole, on both the top and bottom sides of the board.

Advantages of this approach include the fact that via placement can be at the minimum clearance (pad to pad) without interfering with another via or component pad. Placement can be under surface mount components, without fear of the component lifting during the soldering process. Because the minimum sized hole is drilled to ensure the hole remains closed, the holes are typically small enough to allow fluid movement but block solder flow, leaving the tent functional. Full tenting also prevents excess solder in via holes, prevents processing chemical exposure and reduces accidental shorting. The primary disadvantage of this technique is that, when both ends of a via are covered, there is the danger of trapped liquid evaporating and bursting the via open during any heating process.

Partial tenting

This is where the solder mask covers the annular ring while the hole is left exposed on both top and bottom sides.

As with full tenting, partial tenting benefits from the fact that via placement can be at the minimum pad-to-pad clearance without interfering with another via or component pad, and the minimal hole size is typically small enough to allow fluid movement but block solder flow. In particular, partial tenting is good for high-current traces, and for its heat dissipative properties.

I do not believe there to be any particular disadvantages to this technique.

Single sided tenting

Tenting can also be performed on only the component side of the PCB, with solder mask covering the annular ring and the hole. This allows placement to be under surface mount components, without fear of the component lifting, and also serves to reduce the likelihood of accidental shorting. Once again, the minimum sized hole is drilled to ensure the hole remains closed, and the holes are typically small enough to allow fluid movement but block solder flow, leaving the partial tenting functional.

One disadvantage of single sided tenting is that it opens the door for ‘blow out’ to occur. It may also allow small amounts of fluids (from surface finish processes or PCB cleaning solutions) to remain in the barrel of the hole. These residues may be corrosive to the copper plating over time.

Exposed via

Finally, it is possible to have neither the annular ring nor the hole covered in solder mask. This technique is good for high-current traces and offers good heat dissipative properties, as well as sealing the via barrel during wave soldering.

There are several disadvantages to leaving vias exposed. Firstly, they will tarnish and eventually corrode, depending upon the environment. They also run the risk of being shorted together by contact with other surfaces. Wave soldering can cause molten solder to blow out of the holes, leading to damaged vias, solder splashes, solder balls etc. on the board, as well as later corrosion.

Using an exposed via for testing can lead to a damaged via and a break in the net. Additionally, finish processes or PCB cleaning solutions can remain in the barrel of the hole, and some of these residues may be corrosive to the copper plating over time.

Conclusion

In conclusion, then, it is advisable to have selected vias tented and strategically placed throughout the board, and to tent the annular ring but not the hole. It may prove beneficial to have vias exposed for prototypes and then tented for production. A combination of approaches can also be considered, namely to tent the via on the component side, while only tenting the annular ring on the opposite side.

Of course, your decision should also be based on your PCB supplier and whether you are using a dry film solder mask versus a liquid photo-imageable (LPI) solder mask.

_Happy tenting…or not!_

For more information contact Pam Landman,

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_Happy tenting…or not!_

For more information contact Pam Landman,
Robert Bosch South Africa, a subsidiary of the Bosch Group, leads development, innovation and quality. We offer more than 100 years of existence in South Africa and a diversity in products and services. Bosch offers a world-class manufacturing facility, based in Brits, North-West Province, specialising in electronic PC board assembly for both automotive and non-automotive use where quality is key.

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- SMT placement rate of 143,000 cph (IPC 9850 - 1608).
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- Multi zone conveyors-free reflow oven.
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TECHNICAL ARTICLES

Printing using micro stencils for LGA/QFN rework

By Bob Willis.

If you are repairing land grid array (LGA) or area array devices, should you print the circuit board or the device terminations?

Either method can work, with your own skills determining which is easier and more repeatable.

Recent hands-on rework workshops proved very successful for the author and delegates reworking these fairly new packages. Special thanks go to TECAN in the UK for making the handheld manual rework foils specifically designed for QFN (quad flat no-lead) and LGA packages. Let us now step through the process in this step-by-step guide.

Firstly, make sure that the solder paste being used in rework is the same as in production. Often a dispense grade with larger ball size or lower metal content is used in repair areas but may not be suitable for stencil printing these fine pitch parts.

Select a micro stencil for the component footprint for a land grid array; this would normally be 0.004” (100 µm) foil (Figure 1). The stencil apertures for the outer pads are produced as one to one apertures. The centre aperture can be single or multiple apertures to cover between 50% and 60% of the surface area. It is recommended to have the paste printed to the centre of the device, not to the edge of the centre pad.

The stencil, being very thin, has a backing foil of between 0.010” and 0.012” thick and allows the stencil to be used for manual hand printing. The thicker support foil (Figure 2), prevents the image foil being flexed during printing, which can lead to inconsistent deposits. The support foil also allows the component to be positioned accurately to the terminations (Figure 3).

Place the LGA/QFN component into the stencil guide and check the right stencil is being used and the apertures are perfectly aligned with the terminations. One finger can be used to hold the component in position while the stencil is turned over for printing (Figure 4). Alternatively a small piece of Kapton tape can be used to hold the part in position.

The component can now be printed with solder paste using a small metal rework squeegee blade. It is important to use the blade in the same way as a printer; make sure the paste is rolling and the surface of the stencil is clean after the print stroke. Inspect to confirm that the paste is completely filling the apertures.

Before printing solder paste onto components, try printing paste images onto a flat surface like copper clad laminate, glass or thick...
white card. This will allow an opportunity to perfect the repair printing process. When the correct technique has been mastered, check the cleanliness of the stencil apertures and base to prevent contaminating the component surface with paste.

Turn the stencil over so the part can be lifted prior to placement (Figure 5). If the component is lifted manually it can be inspected visually prior to placement on the board. If the stencil is going to be located on a rework system the component can be placed automatically, and inspection of the paste deposits can be conducted on the rework system when the component is aligned with the pads prior to placement.

Make sure you check the stencil after use and clean or check for paste remaining in apertures if you intend to print a second device. Paste release from the stencil is just as important as printing in normal manufacture to achieve the best yields.

Another option is to jet print the solder paste directly to the board or on the surface of the component, just like manual printing. There are two or three jetting systems on the market today, one of which is a benchtop system which is perfect to use for rework or bumping packages. Bumping QFN/LGA packages can improve reliability and decrease voiding during reflow.

For more information visit www.bobwillis.co.uk

Figure 4. Stencil is turned over while still holding the LGA in place and manually printing with solder paste.

Figure 5. The LGA is lifted from the cavity and placed on the printed board for reflow. Alternatively the stencil is located on a rework system so the machine can lift the printed component directly and place the part on the surface of the board.

Figure 6. Close up of dummy LGA package used in training and printed with paste.
Current carrying capacity of a through-hole via

By Lee Ritchey, Speeding Edge.

Editor’s note
This article contains several references to the books ‘Right The First Time, A Practical Handbook on High Speed PCB And System Design, Volumes 1 and 2,’ written by Lee Ritchey and published by Speeding Edge. These books (or digital versions of them) can be purchased online from the website www.speedingedge.com.

The question “What is the current carrying capacity of a through-hole via when used to move power into and out of power planes?” comes up when it is time to design the entry of power or current from a DC-to-DC converter into the planes of a PCB or from the power blades of a connector into the planes of a PCB. The question is usually: “How many vias will be needed to ensure there is a good path into the planes?” A further question might be: “How well do these vias perform when used to conduct current into the power pins of a component, such as a BGA, from the power planes?” This article will examine both of these issues.

Vias are cylinders of plated copper that connect from one side of a PCB to the other. When used to conduct power into or out of the planes of a PCB, only the portion of the plated through-hole between the plane in question and the surface is of interest. Figure 1 is a cross section view of a via piercing a PCB.

The part of the via that is of interest in this discussion is the plating on the walls of the drilled hole. The current carrying capacity question has two parts. One is the DC resistance and potential heating and voltage drop. The other is the AC resistance or reactance and the potential voltage drop with a changing current.

Since the question usually refers to the DC voltage drop issue, let’s examine this first.

DC voltage drop and heating in a via
In order to answer the question of current carrying capacity of a via, it is necessary to determine its DC resistance. One way to do this is to look at the plating in the hole as a sheet of copper that has been bent into a cylinder. Using this approach, a 12-mil outer diameter (0,33 mm) plated cylinder when unfolded into a flat sheet of copper would be approximately 37 mils (0,94 mm) wide by the length of the via.

Figure 2 is a plot of the resistivity of traces versus length in the three common weights of copper foil.

Good PCB fabrication practice calls for a minimum plating thickness of 1 mil (25,4 microns) in a plated through-hole or via. One ounce copper is 1.4 mils (36 microns) thick. Half ounce copper is 0.7 mils (18 microns) thick. Therefore, the plating in the hole is roughly 0.75 ounce copper or midway between one ounce and one half ounce. From Figure 2 it can be seen that a 12’ long trace, 18 mils (0.46 mm) wide, has roughly 0.33 Ω of resistance. A trace twice as wide, or 36 mils (0,91 mm), has a resistance of half that or approximately 0.165 Ω.

There are 12 000 mils in 12” (30,5 cm), so the resistivity of our 37 mil (0,94 mm) wide trace is approximately 13.7 µΩ per mil of length. Suppose the length of the via were 100 mils (2,54 mm). Its resistance along its length would be approximately 1.3 mΩ. From this, voltage drop calculations as well as heating calculations can be made.

Suppose the current flow were 3 A. The voltage drop would be

\[ \text{Voltage Drop} = IR = 3 \times 1.3 \times 10^{-3} \approx 3.9 \times 10^{-3} \text{V} \]

3.9 mV and the power would be 11.7 mW. Clearly, there would be no heating problem at this current level. With a 3.9 mV voltage drop, it is unlikely that this would ever be an issue either. This example presumes that the current must travel along the entire 100 mil length of the via. In reality, the planes are normally midway into the PCB, so only a part of the via is involved resulting in an even smaller voltage drop.

The current flowing in the via must pass into the plane where the plating in the hole meets the copper in the plane. How robust this connection is depends on how thoroughly the copper edge of the plane has been cleaned after drilling and before plating the copper.
into the hole. Being a pessimist, I expect that some, perhaps not many, of these holes are imperfectly cleaned. To allow for this reduction in contact area, I have rated my vias at a maximum of 3 A. This is the usual rating for the connector pins in many of the connectors that are used to deliver power into a PCB so it all works out.

A more likely source of significant voltage drop might be in the plane itself. On page 127 of the book ‘Right The First Time, A Practical Handbook on High Speed PCB and System Design, Volume 1’, the method for calculating voltage drops in a power plane is discussed.

**Via inductance and AC voltage drop**

Current flowing into a PCB from a DC-DC converter is primarily DC or very low in frequency. As a result, the inductance of the via has little effect on this part of the power delivery process. However, current flow out of the planes through the vias into the ICs that consume the energy may have frequency components well into the hundreds of megahertz.

Figure 3 (page 20) is a plot of via inductance as a function of via length for the most common drill size used with 1 mm pitch BGA, 12 mils or 0,3 mm. The formula for calculating via inductance is listed on Page 143 of Volume 1. The approximate inductance for a 12 mil drilled and plated via is 35,5 pH per mil of length. This may vary slightly depending on the presence of surface pads and nonfunctional pads but, for this purpose, this value is close enough to illustrate the effect of via inductance on power delivery to a BGA. The inductance is little affected by the thickness of plating which is normally at least 1 mil thick.

As can be seen from the graph, the inductance gets quite large as the reach down into the PCB to connect with planes grows. This has two adverse effects on power delivery systems.

The first is this inductance adds to the parasitic inductance of the bypass capacitors that are part of the power delivery system (PDS). Even at 15 mils in length, this added inductance is often larger than the parasitic inductance of the capacitors themselves. It is for this reason that choosing ultra-low inductance capacitors, such as IDCs, is not of much help when these capacitors must be connected to planes with vias.

The effect this added inductance has on the performance of a bypass capacitor is to drive its useful frequency lower than might be expected based on the manufacturer’s data sheet. It also raises the Q or quality factor of the capacitor as installed, which increases the height of the anti-resonance peak when it forms a parallel tuned circuit with the plane capacitance of the PCB. These effects are covered in detail in Chapter 34 of Volume 1.

The second effect is that this via inductance is directly in the path of current drawn from the PDS to charge transmission lines, such as a parallel data or address bus to a DDR memory bank or a PCI bus. Figure 4 (page 20) illustrates the current flow path for transitions from a logic 0 to a logic 1. As can be seen, the current must flow through the inductance in the total current path which includes the inductance of the bypass capacitors, the inductance of the vias connecting the IC to the VDD plane, the inductance of the ball, the inductance of the IC package, the inductance of the connection between the package and the IC, and the inductance in the power path on the IC itself. Notice that the VSS or ground connection is not involved in this transition.

As charge is withdrawn from the capacitance of the PDS, its terminal voltage drops, resulting in what is commonly called ripple or rail collapse. Remedies for excessive ripple are covered in the power delivery sections of Volumes 1 and 2. This rapidly changing current also develops a voltage drop across the inductance between the VDD and the VDD terminal of the IC, known as VDD or VDD bounce. This voltage drop or spike drives the VDD rail on the IC negative and, in most cases, drives the entire die and all of the outputs negative as well. This VDD bounce appears as a noise spike on all of the outputs whether they be at a logic 0 or a logic 1. Those at a logic 1 experience a noise spike that can induce a logic failure if the spike is large enough.

The charge drawn from the PDS charges up the parasitic capacitance of the transmission line and the input capacitance of any loads attached to the line from a low voltage to a high voltage. Figure 5 (page 20) is an example of VCC or VDD bounce on a quiet output of an FPGA driving a 64-bit data bus. This is a 2,5 V system. The magnitude of the VDD bounce is 276 mV or more than 10% of the signal swing — enough to cause logic failures.

Figure 6 (page 20) illustrates the current flow path for transitions from a logic 1 to a logic 0. Notice that the PDS is not involved in this transition. The charge put on the transmission line is being removed at this time. The current flow that results develops a voltage drop or spike across the inductances in this path which include the via inductance, the ball inductance, the package inductance and the inductance on the IC.

This voltage spike drives the VSS terminal positive with respect to the VCC rail on the PCB. As with the VDD bounce, this voltage spike appears on all of the outputs. Those outputs that

*Continued on page 20*
are at a logic 0 will experience a noise spike that will erode the logic level and, if large enough, will cause a logic failure.

These VDD and ground bounce spikes are essentially the same amplitude in most CMOS components due to the fact that the power and ground paths into the IC are symmetrical. Either can cause a logic failure. Notice that VDD bounce is accompanied by rail collapse or a negative going voltage spike on the VDD rail. These two noise transients add together to create one large drop in the output voltage of all outputs set at a logic 1.

It is common for systems to fail from this type of noise spike. What makes failures from this mechanism so elusive is that they occur only when all or most of the lines in a wide, parallel bus simultaneously switch from one logic state to another. For a 64-bit wide bus, this is once in 264 times or once in 131,072 times. Systems failing from this source are often described as ‘flaky’.

The equation $V = L(di/dt)$ is used to calculate the voltage drop across an inductance. What can readily be seen is that the magnitude of the voltage rises with increased inductance or increased current and with decreasing time. As IC technologies have migrated down the feature size
Table 1. \( V_{cc} \) or ground bounce vs. package inductance and bus width.

<table>
<thead>
<tr>
<th>Inductance</th>
<th>16 bits</th>
<th>32 bits</th>
<th>64 bits</th>
<th>128 bits</th>
<th>256 bits</th>
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<tr>
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<td>160</td>
<td>320</td>
<td>640</td>
<td>1280</td>
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<td>320</td>
<td>640</td>
<td>1280</td>
<td>2560</td>
<td>5120</td>
</tr>
<tr>
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<td>400</td>
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<td>1600</td>
<td>3200</td>
<td>6400</td>
</tr>
<tr>
<td>Peak 1 (A)</td>
<td>0.4</td>
<td>0.8</td>
<td>1.6</td>
<td>3.2</td>
<td>6.4</td>
</tr>
</tbody>
</table>

\( V_{cc} \) or ground bounce in mV. Inductance in nH.

Rise time = 0.5 nsec, 2.5 V logic.

curve from 250 nm to 130 nm to 90 nm and, as of the publishing of this article, 65 nm, the \( dt \) value or switching time of CMOS ICs has dropped dramatically to as little as 200 picoseconds for DDR2 memory outputs.

Table 1 illustrates the size of the voltage spike for parallel, single-ended buses with widths from 16 bits to 256 bits wide. This example is typical of DDR buses that commonly operate at 2.5 V. The rise time in this example is 0.5 nanoseconds and was a common rise time for ICs made with the 130 nm process. The total magnitude of the voltage spike is calculated for total inductance in the current path varying from 0.1 nH to 0.5 nH. What can be seen is that the total inductance in the current path must be kept very small as bus widths grow wide and as rise times grow small.

A PCB design engineer has little or no control over the inductance in the IC package other than to exercise care when choosing new components to ensure that the package has been properly designed. The one place where a PCB design engineer can influence the inductance in the current path is the choice of the location of the power layers in the PCB stackup. Clearly, the closer these two layers (power and ground) are to the component side of the PCB, the lower the added parasitic inductance of the power vias will be.

There are many designs that are based on four-layer stackups, with one plane close to the component side of the PCB and the other 40 to 50 mils away at the bottom of the PCB. In such cases, it is not possible to keep both planes close to the IC drawing power from them. Looking at Figure 3, one or the other of the vias will have an inductance of approximately 2 nH. This would suggest that wide parallel memory buses won’t work on four-layer boards.

The PC industry has built hundreds of millions of PC motherboards that are four layers and all of them have large, fast DDR and DDR2 memory systems on them. A fair question might be, “How do they work in view of the forgoing discussions?” The methodology for solving this problem is discussed in another article.

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The importance of paying attention to component specifications

By Vitor Barros, KIC.

The theory is simple: process electronics assemblies in spec every time and you will end up with a quality product.

In practice, this is more difficult for numerous reasons, including normal and abnormal process variation, human error and more. But first, let’s be clear on what our process specifications really are.

Critical components such as LEDs, crystals, bottom-terminated components (BTC) including micro BGAs, and others have very specific process limits that can be challenging to achieve and devastating when missed. Electronics assemblers must fully understand the nomenclature and process window definitions before setting up their assembly machines. Maximum rising and falling slope limits when reflowing PCBs represent a common source of misunderstanding and failures.

Take an LED component as an example. Figure 1 shows a typical reflow process window or process limits for such a component (the terms slope and gradient are used interchangeably in this article).

Figure 1 appears easy and straightforward, right? Wrong. The devil is in the details, and the downside of getting it wrong is significant.

First, a definition of a temperature slope: ‘the rate of temperature change with distance or time.’ In a thermal profile, this will be measured in °C or K (Kelvin) per second.

A common mistake is to calculate maximum rising and falling temperature gradients as a linear measurement from the start of the profile to peak temperature, and from the peak temperature to the end of the profile (Figure 2). These calculations are misleading and very different from the maximum slope because they average the various slope calculations along the profile. It reminds me of the old joke about the statistician, with his head in the oven and his feet in the refrigerator, who stated that the average temperature was comfortable.

To find the correct measurement of the slope, we need one more specification: the distance or time over which the slope will be measured. Reading the fine print in the LED component spec limits, we could find the following (as an example): maximum rising slope to be measured over 10 second intervals.

To calculate the maximum rising slope for the LED example above, we need to measure each 10 second slope along the profile from the beginning to peak temperature. To do that we select the profile temperature at 10 seconds, subtract the temperature at 0 seconds, and divide by 10 seconds. Next, we calculate the profile temperature at 11 seconds, subtract the temperature at 1 second and divide by 10 seconds and so forth. The calculations will continue in 1 second increments until the peak.

Finally, the highest number of all these calculations represents maximum rising slope. You will note that the 10 second maximum gradient measurement is significantly higher than the average gradient. Similar calculations
will be made on the falling slope, but the component supplier will likely specify a different acceptable limit along with new calculation guidelines. The cooling section of the profile has a shorter duration and may be susceptible to more volatile temperature variations. The component specification may call for maximum falling slope measurements over a 5 second interval instead.

The use of average instead of maximum slope calculations will be misleading, and it risks component damage. What makes this particularly worrisome is that stressing LEDs or other optoelectronic and electronic components may introduce latent defects that enable the PCB to pass the factory’s quality inspection, but may fail prematurely when in use.

This may seem very complicated, but with modern profiling software it is straightforward. The calculations are made in a fraction of a second. You just need to study the specs and set the profiling software to perform slope calculations at the component and solder paste suppliers’ specifications for time interval. The 10 and 5 second specification used in this article are only examples. Make sure that the profiling software is capable of measuring the maximum slope over any duration limit. If there are several temperature-sensitive components with different specs, two options are available:

1. Use the most stringent specification for all components.
2. If the profiler supports different specs for each thermocouple (TC), you can attach the TCs to the critical components, making sure all of them are within their individual specs. This will be easier to achieve than the ‘lowest common denominator’ approach in the first method.

The larger challenge will be to set up the reflow oven to achieve a profile that accommodates the more demanding slope specs when using the correct calculations. Again, modern profiling software with prediction algorithms will do a good job of automatically selecting the appropriate oven recipe.

If, however, the slope specifications are defined for you by your client, and your reflow oven is not capable of achieving them even with powerful prediction software, then you may need to investigate further. Ensure that everybody involved is clear on the full definition of your thermal process window and the correct methods to calculate it. This is not a discussion on semantics but whether you are running your production in or out of spec, with all the risk that it entails.

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Whilst often overlooked, the flux chosen for the selective soldering process has a great impact on solder joint quality, long-term reliability and overall selective soldering performance. This article outlines the critical factors of commonly available selective soldering fluxes and how they impact the soldering quality, reliability and equipment performance.

Fluxes essentially fall into three basic categories or flux types:
• Low-solids/no-clean fluxes
• Rosin fluxes (full/high-solids rosins)
• Water soluble fluxes

When discussing fluxes for the selective soldering process, we are generally referring to low-solids/no-clean fluxes, and it is the most commonly used flux type in selective soldering.

If a company is using a full rosin or water soluble flux in their selective soldering process, they are usually mandated to use them by their customer, or industry, and are usually producing a legacy product with a legacy reliability standard. From a flux performance standpoint both of these flux types solder very well, and there is little to evaluate. But most companies using selective soldering avoid them because of the need to install expensive cleaning processes as well. After all, one of the benefits of selective soldering is the ability to selectively flux so that cleaning can be eliminated.

How to choose the correct type of flux for your process

Information from Pillarhouse International.

If you are required to use a rosin or water soluble flux in your selective soldering process then you should consult with your equipment manufacturer to make certain you have the appropriate options or materials for handling these types of fluxes.

Low-solids/no-clean fluxes break down into a few other categories:
• Alcohol-based, rosin or resin containing
• Alcohol-based, rosin or resin free
• Water-based, rosin or resin free (VOC-free) - on rare occasions will contain rosin or resin

In this category there are a variety of manufacturers and many more flux choices. So how do you decide? Even if your customers, corporate management, or your available manufacturing processes dictate the flux you use, it is important to understand if the flux you are using is a help or hindrance to your selective soldering process.

Low-solids/no-clean fluxes, in general, have less active chemistry and are more challenging to solder with than rosin or water soluble varieties. Some fluxes are made to overcome particular issues – issues you may not have – while others may be weak in an area that is an issue for you. Frequently the type of products you manufacture can impact the flux that is best for your process. Or, simply the variety of products you manufacture can influence your choice of flux – and it may even require using different fluxes for different products.

One issue is that many of the available fluxes being used in selective soldering, were originally intended for wave soldering. Regardless of the product or application, the wave soldering process was relatively the same across the industry and easier to adapt for these different fluxes. Only recently have flux manufacturers started producing fluxes specifically for selective soldering, recognising that it is a distinctly different process than wave soldering.

However, among these various flux options, the rosin/resin containing, alcohol-based low-solids/no-clean fluxes are usually the best option for the selective soldering process. They work well across various surface finishes, have a relatively wide process window, handle a wider range of time at high temperature, work with leaded and lead-free solders, and burn-off well, generally leaving safer residues.

Understanding the flux types

There are three key attributes for a flux that determine the flux categories. These attributes also govern whether you need to clean your boards after soldering. However, the level of acceptability is not necessarily universal and depends on the requirements of the product. These three attributes are: activity, solids content and material type. With that in mind the
three basic flux types can be simply distinguished in this way:

Low-solids/no-clean fluxes typically have 2% to 8% solids content and can either be solvent based (with or without rosin/resin), or water based (VOC-free) containing no rosin or resin apart from rare exceptions. They exhibit low to medium activity, a short life (in process), and may or may not require cleaning.

Rosin fluxes are full/high-solids rosins with 15% to 45% solids content, and are solvent based. Their activity may be low but is normally medium to high, they have a long in-process life, and they are typically always cleaned.

Water soluble fluxes generally have high solids content in the range of 11% to 35%, are usually solvent based, have a very long in-process life, and are always highly active and always cleaned.

Activity and solids content are usually the two key attributes that determine whether the product will require cleaning of the flux residues after soldering. And from a material type and solids content perspective the fluxes break-down further, as shown in Figure 1.

The four-character designator beginning with RO, RE, OR or IN is a system instituted by IPC to more clearly classify, or identify, the activity of fluxes as low, medium or high, based on tests outlined in IPC-J-STD-004. All flux manufacturers perform these tests and identify each flux with the appropriate designator. How the designator applies is illustrated in the table.

Flux manufacturers include this designator on the technical datasheet for every (recent) flux. However, fluxes are rarely referred to by these designators alone. Most fluxes are still referred to as low-solids/no-clean, rosin and water soluble fluxes. The designators alone do not tell you exactly what type of flux you are dealing with. For example, ROL1 could either

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**Table 1. IPC flux designators.**

<table>
<thead>
<tr>
<th>Flux composition</th>
<th>Partial designator</th>
<th>Flux/residue activity</th>
<th>Partial designator</th>
<th>Complete designator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosin</td>
<td>RO</td>
<td>Low</td>
<td>ROL1</td>
<td>ROL0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>ROM1</td>
<td>ROM0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>ROH1</td>
<td>ROH0</td>
</tr>
<tr>
<td>Resin</td>
<td>RE</td>
<td>Low</td>
<td>REL1</td>
<td>REL0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>REM1</td>
<td>REM0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>REH1</td>
<td>REH0</td>
</tr>
<tr>
<td>Organic</td>
<td>OR</td>
<td>Low</td>
<td>ORL1</td>
<td>ORLO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>ORM1</td>
<td>ORMO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>ORH1</td>
<td>ORHO</td>
</tr>
<tr>
<td>Inorganic</td>
<td>IN</td>
<td>Low</td>
<td>INL1</td>
<td>INLO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td>INM1</td>
<td>INMO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>INH1</td>
<td>INHO</td>
</tr>
</tbody>
</table>

---

**Table 2. Correlations between flux types and IPC designators.**

<table>
<thead>
<tr>
<th>Flux type</th>
<th>Flux composition</th>
<th>Partial designator</th>
<th>Solvents</th>
<th>Solids content (most commonly)</th>
<th>Designator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-solids/no-clean</td>
<td>Rosin</td>
<td>RO</td>
<td>Alcohol</td>
<td>2% - 8%</td>
<td>ROL1/0</td>
</tr>
<tr>
<td></td>
<td>Resin</td>
<td>RE</td>
<td>Alcohol</td>
<td>2% - 8%</td>
<td>REL1/0</td>
</tr>
<tr>
<td>VOC-free low-solids/NC</td>
<td>Organic</td>
<td>OR</td>
<td>Alcohol (non-VOC-free water)</td>
<td>1.5% - 6%</td>
<td>ORL1/0</td>
</tr>
</tbody>
</table>

- ROL1/0: Most common
- REL1/0: Most common
- ORL1/0: Most common
- ROL1/0: Rare
- REL1/0: Rare
- ORL1/0: Occasional
- ORL1/0: Uncommon
Full-solids rosin, and particularly water soluble fluxes, are well known for excellent soldering performance, largely due to their activity and abundance of chemistry that give it great endurance throughout the soldering process.

Low-solids no-clean fluxes do not remove oxides as well, or as completely as water soluble and full rosin fluxes, and their chemistry does not permit them to last as long throughout the soldering process. As such, they generally have a dramatically smaller process window.

Water soluble fluxes are excellent for soldering, and provide the best soldering possible. They have a great amount of activity that readily cleans the metals to be soldered, and virtually never burn off during the soldering process. However, these chemistries are generally very aggressive, corrosive, persistent and will continue to react after soldering. They are virtually always classified as ORH or INH, and must be cleaned from soldered circuit boards thoroughly by a machine wash process, and one that has to be monitored very closely. Any remaining ionic contamination could easily result in a disastrous field failure, so the cleaning process has to be extremely thorough.

Normally, boards coming out of the wash are periodically tested for ionic contamination, usually using some type of ionograph or omegameter.

The detrimental effects of corrosion can even happen in the manufacturing facility if residues are not cleaned off in a timely manner. Figure 2 is a photo of water soluble flux corrosion after sitting for only two hours. Another potential failure mode of water soluble residue contamination is dendritic growth, which is metallic, hair-like growths that can develop between and short adjacent conductor paths.

To be clear, the washing systems for water soluble fluxes have proven to be completely effective for decades, but are expensive to operate and take up valuable floor space. However, the aggressive chemistry of water soluble fluxes requires corrosive resistant fluxers, and attacks the equipment which is more difficult to keep clean (Figure 3). For these reasons many do not use, and we do not recommend using, water soluble flux whenever possible.

Full rosin fluxes also provide excellent soldering, with an equivalent ability to clean the metals to be soldered and to last throughout the process, but they do not have the same propensity as water soluble fluxes to corrode and damage the product. In fact, instead, the rosin has the benefit of acting as a protective barrier during soldering, and after soldering can entrap ionic residues, preventing them from being mobile and reacting in a destructive manner.

However, rosin leaves a residue on the board and can contaminate manufacturing equipment, which serves as the main motivator to cleaning this kind of flux from circuit boards, more so than the reliability issues of water soluble fluxes. Although, with the high demands of today’s electronics, rosin residues can also lead to failures as well in harsh environments.

The cleaning process for rosin can also be an expensive process to operate, but also usually requires a solvent that brings its own complications. However, the benefits of rosin were enough to carry it over into low-solids/no-clean fluxes.

As most realise, low-solids/no-clean fluxes were employed so that cleaning could be eliminated. As the name implies, these fluxes have less chemistry and activity, and make soldering with the same results more challenging.

**Alcohol-based, rosin low-solids/no-clean fluxes**

Initially, low-solids/no-clean fluxes were essentially rosin-like fluxes, just less of it. Today, these fluxes are much more sophisticated, but the principle is that with less chemistry, there will be little to no active

**Pros and cons**

One of most important aspects of flux is its activity and ability to form a good solder joint – wetting the lead, the hole and the land quickly, completely and leaving a strong solder joint. Usually the more activity, the better the soldering and the bigger/better the process window.
chemistry left on the board after the soldering process, thus eliminating the need to clean the board. So rather than the 35% solids in a full rosin flux, the low-solids fluxes range from 1.5% to 8%. With less chemistry the issue now becomes having enough active chemistry to be an effective flux.

It is important to note that low-solids fluxes are not necessarily no-clean for everyone, or for every application. The same flux and residues in one application may be perfectly safe, while in another application they may be harmful. It is up to the customer, the product designers, etc. – anyone who understands the demands of the end-use environment for that product – to dictate whether a low-solids flux is actually a no-clean flux for them.

Even in small amounts, resin in effect is used as a way to avoid simply adding active chemistry to improve performance. It is a key ingredient in many of these low-solids fluxes, as it helps protect the cleaned metal and the little chemistry in these fluxes during the soldering process. It allows the flux to withstand a longer, hotter exposure to heat than without it. With resin in the flux, you may see slightly more residue, but the idea is again that any remaining chemistry will be contained by the resin. Even so, some customers find any residue visibly undesirable or potentially more unsafe to leave on the board. In these cases, many end up cleaning, or are asked by their customer to clean, the low-solids flux residues from the boards.

Not only are these fluxes good in long heat/preheat exposures or higher heat processes, they work well in low heat applications, or short processes, as the alcohol evaporates very quickly, allowing the soldering to begin almost immediately.

**Alcohol-based, non-rosin, low-solids/no-clean fluxes**

To partially address this issue, most flux manufacturers offer low-solids fluxes with no resin at all, which tends to allow the active flux to volatilise more completely during soldering and leave the least amount of residue. However, as a result, these fluxes tend to not last as long because they are not shrouded by resin. For selective soldering this can be a problem, as time exposure to elevated or high heat can be relatively long in some cases. These fluxes can potentially be depleted by the time they are soldered in the selective soldering process. Leaving a little resin in the flux helps combat the heat issue as well as encapsulate remaining ionic residues. For this reason, most low-solids fluxes have some small amount of rosin, or a synthetic equivalent.

<table>
<thead>
<tr>
<th>Table 3. Pros and cons of different flux types.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water soluble flux</strong></td>
</tr>
</tbody>
</table>
| Pros:  Excellent soldering – wide process window  
Excellent to very good for high reliability applications – depends on cleaning process and product demands  
Good for high heat applications |
| Cons:  Requires more preheat  
Residues must absolutely be cleaned – process and floor space expensive  
Cleaning process must be closely monitored with ionic testing  
Cleaning must occur within time recommended by flux manufacturer  
Increased machine maintenance – chemically attacks equipment  
Contaminates carriers, totes and other work surfaces  
Requires optional fluxer upgrade, and/or material upgrade  
Slight residues can cause field failures |
| **Rosin flux**                                 |
| Pros:  Very good to excellent soldering – wide process window  
Very good to excellent for high reliability applications  
Very good to excellent for high heat applications  
Long process life |
| Cons:  Requires more preheat  
Residues must be cleaned – process and floor space expensive  
Requires more machine maintenance and can pose difficulty for downstream processes, ICT, AOI, etc.  
Often requires optional fluxer upgrade  
In some scenarios/applications residues can be a reliability concern |
| **Low solids/no clean**                        |
| Pros:  Good to very good soldering  
Less post-soldering residue – may allow for no cleaning  
Can allow for lower preheat processes (vs. wave and non-water-based)  
Variety of flux choices and can work well on variety of applications  
Easy on equipment |
| Non-rosin, alcohol  
VOC-free  |
| Cons:  Less activity and smaller process window vs. rosin or water-soluble fluxes  
Can pose difficulty and have a reduced process window with high heat applications  
Residues still may need to be cleaned by edict, or flux amount required leaves undesirable or unsafe amount of residues  
Water-based (VOC-free) can require more preheat |
| Non-rosin, alcohol  
VOC-free  |
| **VOC-free, low-solids/no-clean fluxes**       |

These fluxes work best if you have a fairly homogeneous product type and typically run short programmes, or don’t require a lot of preheat and require minimal residues. You can dial the process in to get very good results.

**VOC-free, low-solids/no-clean fluxes**

VOC-free low-solids fluxes are similar in that they do not have rosin, but because they are water based they do handle more exposure to heat and can tend to be a little more active. However, the issue with fluxes can be that they are water based – they require more heat to evaporate the water, and can force you into a longer preheat cycle than you would otherwise need, increasing your overall cycle time.

If you primarily run heavy boards and high-heat programmes/processes, VOC-free fluxes may work best, as the water takes longer to evaporate and they can be a little more active.

For these reasons, low-solids/no-clean fluxes with some small amount of rosin, or synthetic equivalent, are usually the better choice for selective soldering. They have a wider process window and offer better success when you have a variety of products and programmes that require a range of heat or time at elevated temperatures. Table 3 summarises the pros and cons of the various flux types.

For more information contact MyKay Tronics, +27 (0)11 869 0049, mykay@iafrica.com.
EQUIPMENT SELECTION GUIDE

SMT screen printer with automatic dispense unit

The SP710 SMT screen printer from Speedprint is equipped with an optional automatic dispense unit (ADu), which can be fitted with any combination of paste and glue module. The machine utilises advanced drive control technology with 1 micron resolution linear encoders on all axes, together with a suite of intuitive software that enables total control of the printing process.

The printer is fully equipped, as standard, with many features such as automatic rail width adjust, auto stencil loading and eject, and an under-stencil cleaner.

The vision system utilises a unique twin roving camera 'look down, look down' method of automatic vision alignment. This gives users the capability of checking for solder paste presence on the stencil before printing.

Selective auto-paste inspection comes as standard and is fully programmable. The top camera is used to check that adequate solder paste is present on the stencil, and will alert the operator or instruct the automatic paste dispenser to deposit paste, if fitted as an option.

For more information contact Truth Electronic Manufacturing, +27 (0)31 822 8555, terence@truthelectronics.co.za

Long-board SMT screen printer

ESE’s US-X range of SMT screen printers includes the US-LX1, US-LX3 and US-LX5 models for long boards up to 1000 mm, 1300 mm and 1500 mm, respectively, and widths of 100 mm. The machine is especially capable when it comes to LED lighting products, while also being flexible enough to handle smaller printed circuit boards.

A unique printing table features four ball screws along with three LM guides for form support, and allowing for even squeegee pressure across the entire width of the print table with 12.5 micron repeatability. 2D inspection functionality is included, and closed loop SPI control is optional to ensure printing quality stability.

Software features include squeegee Z-axis auto calibration, camera auto calibration, Gerber file programming, printing X-Y offset data, X-Y auto offset by 2D inspection data, protection against incorrect substrate direction input, machine statistics (loss time, error time, MTTR, MTBF for production) and barcode scanning (optional).

For more information contact Quamba Technologies, +27 (0)83 417 4294, lgmar@quamba.co.za

Semi-automatic screen printer

The new affordable, semi-automatic entry-level Miniko printer from Reprint International provides the user with the functionality and features normally only found in more expensive semi-automatic machines.

An easy-to-use and intuitive graphical user interface with touch screen control, combined with the printer’s state of the art servo motor control system, provide precise, repeatable printing every time, all of the time. Low maintenance, low running costs and high reliability, all packaged in an efficient benchtop design, makes the Miniko an ideal choice for a wide range of production environments.

Features include a 584 mm standard screen frame format (with optional adaptor for smaller frames); closed loop servo motor control throughout the whole print cycle; availability in benchtop configuration or with an optional standalone base; and an optional twin camera vision system which is also available with optional laser guidance.

For more information contact MyKay Tronics, +27 (0)11 869 0049, mykay@iafrica.com

Pick-and-place machine for high-mix applications unit

A new edition to Yamaha Motor’s Z-LEX series, the YSM20W, provides flexibility and efficiency in various forms of production without the need for replacing the head thanks to the ‘1 head solution’ concept. This new model is a wide-body version of the ZLEX YSM20 universal modular, and is capable of handling extra large PCBs for automotive, industrial, medical, power devices, and LED lighting etc. with its significantly increased adaptability to PCB sizes and weight.

Ideal for high-mix applications, the YSM20’s versatility comes thanks to the HM high-speed multi-purpose head using 10 nozzles in-line, supporting from ultra-tiny chips of 03015 (mm) to large components of 45 x 100 mm and height of 15 mm. The FM flexible multi-purpose head with 5 nozzles in-line supports force control and handles a broad spectrum of components from ultra-tiny chips of 03015 (mm) to ultra-large components of 55 x 100 mm and tall components with heights up to 28 mm.

For more information contact Truth Electronic Manufacturing, +27 (0)31 822 8555, terence@truthelectronics.co.za
Panasonic Factory Solutions improved on its NPM-W pick-and-place platform to produce the NPM-W2, with 10% higher throughput and 25% better accuracy. It also integrates a multi recognition camera that accommodates components from size 03015 (metric) up to 120 x 90 mm components with heights as much as 40 mm, as well as connectors approaching 150 mm in length.

Board handling has also been improved. Available in either single-lane or dual-lane options, the machine provides the ability to handle printed circuit boards (PCB) up to 1490 x 550 mm - ideal for long LED panels or large industrial boards.

Quick-change feeder carts, auto board support setup and expanded nozzle capacity, along with 120 feeder inputs and ‘intelligent feeder anywhere’ technology position the NPM-W2 as an ideal solution for virtually any mix and volume. Additionally, numerous placement and process head options, plus multiple component supply methods, are available.

For more information contact Techmet, +27 (0)11 824 1427, info@techmet.co.za

Fuji Machine Mfg’s AIMEX IIIc is a compact component mounter for high-mix production, with a width of 1280 mm and a length of 2346 mm. The machine boasts a very high number of loadable parts with up to 130 part supply positions. It also allows for the user to increase the loadable number approximately 1.5 times more by using HexaFeeders.

Furthermore, using a DynaHead (DX) makes it possible for a single machine to support a wide range of part sizes from 0402 (01005") to 74 x 74 mm parts.

This machine can be set with a coplanarity check function which detects defects on parts before placement, as well as the LCR check function. This enables users to build quality in the production process even for variable-mix, variable-volume production. Flexibility appears also in its wide production panel size range from 48 x 48 mm to 506 x 400 mm, and in its support of various panel types.

For more information contact Testerion, +27 (0)11 704 3020, info@testerion.co.za

Yamaha Motor IM Europe announced the release of the new Z:TA-R YSM40R surface mounter, which boasts a placement speed of 200 000 components per hour, and is said to be the fastest in the industry on a 1 metre wide footprint.

While providing the functionality of a rotary head, the newly developed RS (Revolutionary Speed) head is also capable of simultaneous pickup. Placement accuracy and mounting reliability are improved due to the adoption of a new high-rigidity base frame, new lightweight X beam, and a high-speed side view camera that checks the status of components in real time immediately after pickup, and before and after mounting. All of these improvements enable the Z:TA-R YSM40R to be compatible with extremely small components down to 0201 (0,25 x 0,125 mm).

Machine stoppages are minimised thanks to a system that performs nozzle self-diagnosis and self-restoration without interrupting production.

For more information contact Truth Electronic Manufacturing, +27 (0)31 822 8555, terence@truthelectronics.co.za


Essemtec’s Puma is a high-speed pick-and-place solution that can also be used in the ultra-flexible prototyping development sector. With an IPC assembly performance of 18 100 components per hour, the machine pushes forward into the mid-range field.

To further increase flexibility it boasts up to 280 feeder positions; this means Puma offers the highest number of feeders in relation to the machine’s footprint. It processes PCB sizes up to 1800 mm x 610 mm.

Aside from handling the assembly processes, Puma also dispenses and jets in parallel up to 150 000 dots per hour. When all three axes are used exclusively for dispensing fluids, the platform is called Tarantula. There are five valve technologies to choose from and with the plug-and-play method all heads can be retrofitted or changed over on site.

For more information contact Test & Rework Solutions, +27 (0)11 704 6677, sales@testandrework.co.za
**Compact pick-and-place machines**

Mycronic launched a series of new compact, high-capacity MY300 pick-and-place machines at this year’s SMT Hybrid Packaging exhibition in Nuremberg, Germany.

The SMT machine is the second member of the next-generation MYPro series, and offers 40% higher space-productivity than previous models, making it possible to handle a wider range of components within a smaller machine footprint. In addition, it achieves higher speeds due to automatic job selection, rolling changeovers, as well as faster board transfer and tool changes.

Throughput is increased significantly thanks to simultaneous assembly of multiple boards. Additionally, the improved linescan vision system ensures a future-proof solution for the most advanced components. The MY300 will be available in three different models – MY300DX, MY300SX and MY300LX – offering a wide range of highly automated line configurations.

For more information contact MyKay Tronics, +27 (0)11 869 0049, mykay@iafrica.com

**Selective soldering machine**

Kurtz Ersa’s VERSAFLOW 4 XL enables flexible production for printed circuit board formats of up to 610 x 1200 mm. Two all-new solder modules are available for the 4 XL to provide application flexibility.

The flux module VERSAFLUX allows up to four spraying heads to be installed on two completely independent axis systems. Application of the flux to the PCB is monitored by laser, resulting in a safe, automated process. In addition to the bottom heating with infrared emitters, a top convection heater can also be configured for the preheating module. There is an optional preheat module available upstream of the flux module for the VERSAFLOW 4 XL. This option allows the gentle heating of heat-intensive assemblies to preheated final temperature after fluxing, protecting the flux from thermal decomposition.

With the VERSAFLEX module, two independent axis systems allow both pots to solder in synchronous or asynchronous operation. Up to two solder modules can be integrated in the VERSAFLOW 4 XL.

For more information contact Techmet, +27 (0)11 824 1427, info@techmet.co.za

**Entry-level selective soldering system**

SEHO Systems recently launched a new entry-level selective soldering system featuring an electrodynamic soldering unit and a complete range of automated process control features.

The GoSelective-LS selective soldering system is designed for standalone production of small and medium sized volumes with a very compact footprint. To ensure an ergonomic work flow and the shortest cycle times, the system is equipped with a loading and unloading station for carriers up to 20” x 20”. Here, boards can be assembled in one carrier while a second carrier is being processed in the machine.

With the GoSelective-LS, all process steps are completely automated. The machine features a precise axis system that reliably positions the drop jet fluxer, preheat unit and soldering unit during the process. Depending on requirements, the electromagnetic soldering unit may be used for flexible mini-wave soldering processes, or can be equipped with a multi-nozzle tool for dip soldering with short cycle times.

For more information contact Quamba Technologies, +27 (0)83 417 4294, igmar@quamba.co.za

**Vacuum reflow oven**

BTU International introduced its new Pyramax vacuum reflow oven at productronica 2017, designed around the requirements of large EMS and high-volume automotive customers. The unit is configured with 10 zones of closed-loop convection heating and a maximum production width of 18 inches. Nitrogen atmosphere capable, the oven offers a maximum process temperature of 350°C.

The unit features integrated controls with BTU’s proprietary Wincon Windows-based control system and full integration with factory MES/Industry 4.0 including vacuum parameters. Additional features include automatic sequencing, programmable control of vacuum level and hold time, and pass-through mode for non-vacuum operation.

Existing Pyramax customers can easily transfer their process to this new vacuum reflow oven.

For more information contact MyKay Tronics, +27 (0)11 869 0049, mykay@iafrica.com
Benchtop soldering and desoldering stations

Weller’s HT-Line of benchtop soldering and desoldering equipment includes the WTHA 1 hot air station, WT 1 and WT 1H soldering stations, and WTP 90 soldering pencil.

The WTHA 1 is a 1-channel, 900 W hot air power unit featuring a multi-function LC display with a detailed overview of all functions and adjustable background illumination. The 1-channel WT 1 (90 W) and WT 1H (150 W) soldering power units feature a similar, detailed LC display that allows quick and easy operation of all functions thanks to a new user-friendly menu button. The quick change process of the heating element during operation allows efficient working with several different tip types in quick succession.

The WT 90 soldering iron, rated at 90 W, features a quick-change passive tip system with exchangeable heating elements. Exchange of the tips is possible while the iron is hot, with tip replacement independent of the heating element.

For more information contact Allan McKinnon & Associates, +27 (0)11 704 3020, info@testerion.co.za

Rework machine for big boards

Providing a heatable area of 625 x 625 mm and the capability to handle board thicknesses of up to 10 mm, the HR 600 XL from Kurtz Ersa offers professional repair of high-channel components on big boards, as they occur in telecommunications, networks and infrastructure. The lower infrared matrix heater consists of 25 heating elements that can be controlled individually and has a total power of 15 kW. In this way it is possible to obtain an ideal heat distribution on every application during the preheating process.

The highly efficient 800 W hybrid heating head manages the desoldering and soldering of the smallest components up to large ball grid arrays measuring 60 x 60 mm. Just like its smaller brother, the HR 600/2, the HR 600 XL incorporates automatic and precise component alignment (± 0,025 mm). The system can be used in fully automatic or half-automatic mode to ensure maximum flexibility.

For more information contact Techmet, +27 (0)11 824 1427, info@techmet.co.za

Hybrid rework system

Kurtz Ersa’s HR 550 hybrid rework system addresses the highest requirements in terms of precision and process safety in electronic assembly rework applications. The system features a 1500 W high-performance hybrid heating element to desolder and solder SMT components up to 70 x 70 mm. A 2400 W infrared bottom heater in three heating zones guarantees homogeneous bottom-side preheating of the complete assembly.

The process controls of the HR 550 ensure reliability and repeatability of the solder process by continuously monitoring the temperatures of the components and of the preheaters of the system. The system features a high-resolution 5 megapixel camera with a special optic that offers high-contrast images, and has two zoom levels for easy inspection of different sized components.

The HR 550 features a newly-developed software platform HRSoft 2, which impresses with its clarity and functional arrangement. All process steps of the rework procedure are logically displayed, and they can easily be configured and executed.

For more information contact Techmet, +27 (0)11 824 1427, info@techmet.co.za

Solder recovery system

The EVS 500LF solder recovery system has been designed to be the same size as a printer and is aimed at multiple markets, such as the customer with one lead wave and one lead-free wave, or those who use nitrogen and want to reduce their nitrogen usage.

The machine is also relevant for the customer with selective solder pots who only removes small amounts of dross every hour, or with multiple waves where one EVS 500LF is connected to each wave to ensure that the maximum recovery is maintained throughout the life of the wave solder system. Users can quickly recover up to 80% of pure solder with a higher return on investment from the waste dross.

The EVS 500LF is available in lead and lead-free models.

For more information contact Truth Electronic Manufacturing, +27 (0)31 822 8555, terence@trueelectronics.co.za
EQUIPMENT SELECTION GUIDE

GPD Global is offering a new cost-effective, automated conformal coating system with excellent repeatability. SimpleCoat is a low-cost, inline, simple conformal coating system with full featured programming, making conformal coating processes quick and easy to set up. It is ideal for selective conformal coating and dispensing applications that require a high level of accuracy and repeatability.

This coating machine is equipped with a robust 3-axis motion platform that, in the base configuration, includes a spray valve and a needle valve. An optional volumetric pump may be used in place of the needle valve. SimpleCoat works with a customer-supplied laptop computer. Programming of the system is easy and can be done either by manually teaching a program or by using a JPG image. All dispense and motion parameters can be easily altered with the easy-to-use interface. Various shapes, patterns and areas can also be programmed.

For more information contact Zetech, +27 (0)11 609 1244, zorilanski@zetech.co.za

The Sawa 5000GUS from Seika applies ultrasonic vibration directly to the stencil, providing powerful cleaning capability. The system boasts the ability to clean apertures as effectively as fully automatic stencil cleaners that can cost three times as much; stencils can be cleaned in just a few minutes.

The machine removes solder balls from stencil apertures after normal wipe cleaning. A powerful handheld ultrasonic cleaning head is manually applied over apertures with IPA, water or a non-VOC solvent. During application of the cleaning head, the stencil is laid on a foam pad soaked with solvent contained within a large tray (81.3 x 81.3 cm). The foam is utilised to capture solder balls dislodged by the cleaning head.

For more information contact Laser Stencil Technology, +27 (0)11 793 1311, don@lstec.co.za

BPM Microsystems’ 4900 memory programming system, with its advanced chip-scale part (CSP) device handling, on-the-fly vision alignment and HS400 programming speeds, satisfies a vast range of programming needs in one automated system. Featuring high-performance laser marking and 3D inspection, it provides advanced serialisation and quality control, meeting the highest programming and cybersecurity standards for automotive, aerospace, medical, industrial and mobile device industries.

The 4900 is powered by the newest BPM 9th generation technology, which programs eMMC in HS400 mode, the highest speed mode available, as well as HS200, DDR and SDR. It supports a high mix of devices on the same site, including microcontrollers, FPGA, eMMC, NAND, NOR and Serial Flash, delivering speed and versatility on one system.

Innovations for advanced CSP device handling include BPM patent-pending WhisperTeach technology, which fully automates teaching the smallest CSP devices. A new camera delivers vision alignment across the x, y and z axes, to accurately align small devices while in motion.

For more information contact MyKay Tronics, +27 (0)11 869 0049, mykay@iafrica.com

The SQ3000 is an innovative 3D automated optical inspection (AOI) system from Cyber Optics that earned three awards during 2015, the year of its introduction, including a Global Technology Award presented at productronica.

The system maximises return on investment and line utilisation with multi-view 3D sensors that capture and transmit data simultaneously and in parallel, accelerating 3D inspection speed versus competing technology. The proprietary Multi-Reflection Suppression (MRS) technology combined with the highly sophisticated 3D fusing algorithms offers microscopic image quality at production speeds. An easy-to-use, intuitive interface with touch control facilitates minimal training and operator interaction.

SQ3000 supports board sizes up to 510 x 510 mm, achieves sub-10 micron resolution and inspection speed of 40 cm²/sec.

For more information contact Truth Electronic Manufacturing, +27 (0)31 822 8555, terence@truthelectronics.co.za
Automated SPI system

Mek’s (Marantz Electronics) latest automated solder paste inspection (SPI) system, the ISO-Spector S2, features patented third generation sensor technology that enables unique, simultaneous 2D and 3D inspection.

The machine utilises the latest in 12 megapixel camera technology, and a fibre-optic link allows for a 32 gigabit per second image data transfer speed. It delivers the highest-quality 2D colour imaging using Episcopic and low-angle diffuse RGB lighting systems that remove all specular reflections from solder fluxes and solder mask. Shadow free violet/blue dual lasers provide precise and repeatable 3D images.

The system is available with standard 18/9 µm lens resolution for inspection down to 01005 pad geometries or optionally with 12/6 µm for pad geometries down to 008004. On-the-fly resolution switching allows the efficient inspection of mixed technology PCBs. Synthetic colour imaging allows the simplification of colour extraction of solder mask, silk screen and solder, and isolates the solder to be measured, even below zero reference.

For more information contact Zetech, +27 (0)11 609 1244, zorlianski@zetech.co.za

3D solder paste inspection machine

Yamaha Motor has launched the YSi-SP, a high-speed 3D solder paste inspection machine that enables high-speed, high-accuracy inspections based on the company’s ‘1-head solution’ concept for using a single type of head to handle various inspections. The YSi-SP is Yamaha Motor’s first solder paste inspection (SPI) machine, and employs a proprietary algorithm combining 2D- and 3D-based measurements, and image resolution switch-over utilising super-high resolution technology.

Tapping into the company’s expertise as a comprehensive manufacturer of a full lineup of surface mounting machinery, the YSi-SP can swiftly coordinate with other Yamaha machines, such as performing automatic setup changes, automatically adjusting solder misalignment, and automatically converting adhesive inspection data from the dispenser.

While offering Statistical Process Control (SPC) to perform a wide range of statistical processing, the YSi-SP can also be equipped with various optional features, including bonding inspection and foreign matter inspection.

For more information contact Truth Electronic Manufacturing, +27 (0)31 822 8555, terence@truthelectronics.co.za

X-ray system for larger assemblies

At productronica 2017, Viscom unveiled a new design for versatile in-line X-ray inspection. The development of the X8068 SL was based on the requirements of electronics manufacturers that produce in-line larger printed circuit boards, various power electronics and massive components, especially for the growing mobility market.

Conceived for seamless integration into in-line production, the inspection objects are automatically fed in and out of the X-ray inspection system from the side within the shortest cycle times. This involves transfer via an external conveyor system. A multitude of ways to handle samples results from five axes, enabling serial inspection of highly assembled, larger and massive parts without any problems.

In order to cover the largest possible inspection area, the detector axis can be swiveled in the system. Standard features on the system include an open Viscom microfocus X-ray tube and a flat screen image detector, to deliver the highest resolution and detail recognition in first-class image quality.

For more information contact Techmet, +27 (0)11 824 1427, info@techmet.co.za

Bed-of-nails PCB test fixture

This mechanical bed-of-nails test fixture, according to its maker Test Fixture Technologies, is the most widely used solution for printed circuit board (PCB) testing in South Africa. It is built with a sturdy aluminium enclosure whose 350 x 300 mm footprint makes it especially suitable for benchtop use.

The fixture uses a sophisticated lifting mechanism to precisely raise a platen containing the spring-loaded test probes from below the unit under test (UUT). Unique tapered tooling pins precisely position the UUT and, together with linear guide pins and bushes, ensure highly accurate, repeatable and reliable contacting of test points down to 50 mil (1,27 mm) pitch and probe counts up to 300.

Experienced engineers carefully customise the design of each and every fixture specifically for the board that is being tested. Parts are CNC machined to perfectly support the board from both sides, thus ensuring that it does not experience any mechanical stresses during testing. Interfacing of power and data is usually done through panel-mount connectors on the rear face of the enclosure.

For more information contact Test Fixtures Technologies, +27 (0)11 791 5879, info@testfixtures.co.za
M8 no-clean solder paste from AIM is designed for the most demanding high-density electronic assemblies. An evolution of the highly successful NC258 platform and developed in combination with T4 and finer mesh leaded and lead-free alloy powders, M8 provides stable transfer efficiencies required for today’s challenging applications.

A novel activator system provides powerful, durable wetting action accommodating a wide range of profiling processes and techniques. M8 eliminates head-in-pillow defects on BGA and reduced voiding on QFN/BTC components while producing bright shiny solder joints. The paste leaves minimal, high-purity residue, engineered to be safely left in place. Developed with the input of coating and cleaning industry partners, residues can be directly coated or easily removed.

AIM solder pastes are produced from the highest quality, oxide-free powder manufactured to the Electropure specification. Solder pastes are manufactured in no-clean, water soluble and rosin based chemistries, and are available in all industry standard packaging.

For more information contact Truth Electronic Manufacturing, +27 (0)31 822 8555, terence@truthelectronics.co.za.

KOKI announced a newly developed, general application solder paste with highly balanced SMT performance, in the form of S3X58-G801.

In today’s manufacturing environment, a totally balanced, high-performance solder paste with features like high wetting, ultra-low solder balling and low voiding, is required. At the same time, more emphasis is placed on achieving a stable printing process, so a stable viscosity is vital.

S3X58-G801 is engineered with a highly heat-resistant flux that stays inactive at ambient temperature, thereby ensuring stable viscosity of the solder paste on the shelf and during continuous printing. This heat resistance effectively prevents heat-slump and eliminates the occurrence of solder balls. Furthermore, the solder paste achieves low voiding thanks to the newly engineered and improved fluidity of the flux which reduces the generation of gas during the reduction reaction.

S3X58-G801 is a process-friendly, drop-in replacement solder paste that reduces the hassle of changing the material and ensures high-quality solder joints.

For more information contact Zetech, +27 (0)11 609 1244, zorlianski@zetech.co.za

Direct imaging technology has become state-of-the-art in the PCB sector, even in small and medium-sized companies. The inconvenience of long process times that are still needed by some machine technologies can be compensated by choosing a solder resist with a high photo-reactivity. Applied by screen printing, curtain coating or spray coating, the products of the series Elpemer 2467 are alkaline-developable solder resists which combine excellent direct imaging properties with high temperature resistance.

In direct imaging, these products require no more than 60 mJ/cm², or even less, of exposure energy; they are already used for series production on common direct imaging units. Despite their reactivity, they offer a wide processing window.

The solder resists fulfil the requirement of a temperature cycling resistance of 1000 cycles at -40°C/+160°C and a continuous temperature resistance of 1000 hours at 160°C. For even higher temperature resistance, Elpemer solder resists are available that can withstand 175°C.

For more information contact Techmet, +27 (0)11 824 1427, info@techmet.co.za

Kester 959T is a no-clean, non-corrosive, liquid flux that is designed for the wave soldering of conventional and surface-mount circuit board assemblies. It was developed to minimise the formation of micro-solderballs during wave soldering operations. The flux contains a small percentage of rosin (0.5%), which improves solderability, heat stability and surface insulation resistance.

959T offers the best wetting and the shiniest solder joints of any no-clean, solvent-based chemistry, and leaves evenly distributed residues for the best cosmetic appearance. It leaves no streaky, white residues and is classified as ORL0 per J-STD-004.

This flux can be applied to circuit boards by a spray, foam or dip process. Flux deposition should be 120-240 μg of solids/cm². An air knife after the flux tank is recommended in a foam and wave application to remove excess flux from the circuit board and prevent dripping on the preheated surface.

For more information contact Allan McKinnon & Associates, +27 (0)11 704 3020, info@testerion.co.za
Heraeus Electronics is expanding its range of no-clean soldering pastes with a low melting point. The new F498 product series allows significant cost savings in the soldering process.

The new series of soldering pastes is characterised by a low void rate and outstanding wetting properties on a wide range of different surfaces. This reduces the formation of solder balls (mid-chip balling). The lower temperature in the reflow process reduces energy consumption, and longer cleaning intervals due to the lower temperatures reduce maintenance costs.

Soldering pastes with a low melting point from Heraeus Electronics allow the soldering temperature of a lead-free process to be reduced by around 70°C to 80°C. Components and circuit boards are subjected to less temperature stress, allowing lower-cost components to be used. In addition, these soldering pastes can be used to mount components with lower temperature specifications such as those from optoelectronics or the LED industry.

For more information contact Electronic Industry Supplies, +27 (0)11 726 6758, hreispty@iafrica.com

Vigon PE 180, developed by Zestron, is a water-based, pH-neutral cleaning agent developed especially for defluxing lead frames, discrete devices, power modules, power LEDs and PCBs in spray-in-air equipment.

In these application fields, the cleaning agent exhibits excellent performance in terms of deoxidation of copper surfaces when it comes to clean power electronics e.g. power modules. It provides residue-free, activated copper surfaces and thus ensures optimum preconditions for subsequent processes such as wire bonding, moulding or adhesive bonding. It also offers very good cleaning performance on PCBs, especially at low-standoff components.

Vigon PE 180 is based on MPC technology and has excellent material compatibility because of its pH-neutral formulation. The cleaning agent has no flash point, does not foam and thus can be applied in all common spray-in-air equipment without explosion proofing.

For more information contact Electronic Industry Supplies, +27 (0)11 726 6758, hreispty@iafrica.com

UV92 from HumiSeal is a one part, thixotropic, UV-curable masking gel for temporary protection of components during the coating process. It is user-friendly during application, curing and removal processes, and comes in various cartridge sizes and bulk packaging.

Application of HumiSeal UV92 is simple due to its high shear thinning property, which allows the gel to reduce viscosity during dispensing. Ease of dispensing and accuracy of placement by properly wetting the surface makes it ideal for protection of critical components. The material will return to its gel state when not sheared.

The UV92 masking gel cures with industry standard UV LED lighting at 365 nm or 405 nm, and has excellent solvent resistance once cured. In its cured state, it will have a cloudy white appearance for easy identification without the need of a black light, and is easily distinguishable from conformal coating. The UV92 can withstand short temperature excursions up to 150°C for various conformal coating cure methods.

For more information contact Zetech, +27 (0)11 609 1244, zorlianski@zetech.co.za

ACL has introduced the 8695 silicone conformal coating to its existing selection of rework and repair aerosols. This transparent coating provides insulative protection for both flexible and rigid printed circuit boards against soldering heat, corrosive vapours, moisture and fungus. The silicone based resin helps protect against corrosion on electronic components and printed circuit boards in high-humidity environments and when intermittent salt water is present.

ACL silicone conformal coating will not stress delicate circuit components in high-temperature applications. The coating does not fade, crack, yellow or discolour over time under normal use conditions. It is RoHS compliant and contains a UV indicator for quality control inspections, and does not contain CFCs or HCFCs, nor does it use SvHC. The silicone conformal coating resin meets MIL-I-46058C, Type SR.

For more information contact Altico Static Control Solutions, +27 (0)11 608 3001, sales@actum.co.za
Conformal coating metal inks

Henkel Adhesive Technologies’ electronics business introduced two novel, conformal coating metal inks for semiconductor package-level electromagnetic interference (EMI) shielding. LOCTITE ABLESTIK EMI 8660S and LOCTITE ABLESTIK EMI 8880S offer superior flexibility in deployment and design, as they may be used with cost-effective spray coating equipment, while providing EMI shielding performance comparable to or better than capital-intensive, thin film metal deposition techniques. With excellent adhesion to a variety of epoxy molding compounds, both materials enhance long-term reliability performance.

LOCTITE ABLESTIK EMI 8660S provides shielding at a frequency range of 500 MHz to 10 GHz, while LOCTITE ABLESTIK EMI 8880S offers effective shielding for a wider range of 10 MHz to 10 GHz. The thermally-cured coatings may be deposited as thin as 3 to 5 µm to accommodate slim, next-generation package profiles, and are compatible with Henkel compartment shielding materials used to isolate components within System-in-Package (SiP) devices.

For more information contact MyKay Tronics, +27 (0)11 869 0049, mykay@iafrica.com

UV-cure conformal coating

Following the successful launch of its two-part 2K conformal coating materials, Electrolube has launched an addition to the range, 2K850. This new UV-cure coating enables an immediate tack-free coating. Once the two components are mixed, the system guarantees complete cure at room temperature within 24 hours by a predictable chemical reaction, thereby enabling board calibration or further processing.

The 2K850 system features a wide operating temperature range of -65°C to +130°C with excellent thermal shock performance. It is a tough, flexible, high-performance coating which also provides the protection of a resin with the ease of application of a conformal coating. The UL94V-0 compliant coating is characterised by greater coating thickness, enhanced edge coverage and improved adhesion, hardness and scratch resistance. Ultimately, this coating provides a consistent and completely reliable chemical cure.

For more information contact Vepac Electronics, +27 (0)11 454 8053, sales@vepac.co.za

Flame-retardant resin for LED luminaires

Electrolube has launched a new encapsulation resin, believed to be a market-first solution. The optically clear polyurethane resin, UR5641, has been developed to meet the increasing demands from LED lighting manufacturers for an optically clear, flame-retardant resin.

The new two-part, semi-rigid resin cures to provide a flexible, protective and aesthetically pleasing covering over the luminaire elements, and the aliphatic chemical nature of the cured resin is naturally resistant to the yellowing effects of UV light, making it useful for a range of outdoor as well as indoor applications.

UR5641 is also scratch resistant and offers high resistance to weather, acids and alkalis, water and mould growth. Due to a carefully selected blend of components, an extremely durable, low viscosity system is achieved which can be used for a wide variety of applications. UR5641 has a wide operating temperature of -40°C to +120°C and thermal conductivity of 0.20 W/m.K.

For more information contact Vepac Electronics, +27 (0)11 454 8053, sales@vepac.co.za

Stencil system with advanced tensioning

DEK’s VectorGuard stencil technology employs a unique, patented tension system offering significant advantages over traditional, mesh-mounted systems. VectorGuard is not air pressure dependent, meaning that tensioning is simple and automatic, independent of traditional pneumatic assistance processes.

Mounting the foil in the VectorGuard frame system takes only a matter of seconds - requiring little training or physical effort. Easy to set up and compatible with virtually any modern platform, VectorGuard eliminates the need for complex alignment procedures. Foil tensioning is both accurate and automatic, and the system is compatible with a wide range of VectorGuard foil technologies, from lead-free to adhesive printing.

As a lightweight and compact frameless stencil technology, VectorGuard offers manufacturers enhanced storage convenience. In fact, by storing foils in their designated protective cassettes, storage space can be reduced by up to 75% compared to conventional stencils. DEK also supplies a range of storage cabinets providing instant access to the required foil.

For more information contact Laser Stencil Technology, +27 (0)11 793 1311, don@lstec.co.za
Available from thermal profiling specialist, ECD, is a range of PCB carriers for securely holding small to medium sized circuit boards of almost any shape and up to six Temprobes for thermal profiling.

All board carriers feature four adjustable arms, two of which can be pivoted and locked to position the board in the middle of the frame. The two opposing arms are spring loaded to grip the board firmly and to permit quick board replacement. Large board carriers have two additional long arms to support the leading and trailing board edges.

All carrier arms can be repositioned along the side rails to adapt to the length of the circuit board. Standard and large size carriers are available for reflow and wave solder applications. For wave solder machines, board carriers are manufactured of clear, hard anodised aluminium for resistance to flux.

For more information contact Electronic Industry Supplies, +27 (0)11 726 6758, hreispty@iafrica.com

The ZelFlex patented stretching system using compressed air enables perfect tensioning all across the working area. The air source is disconnected after placing the stencil onto the frame. Easy, fast and repetitive changing of stencils is provided by innovative perforation.

One of the greatest advantages of ZelFlex pneumatic frames is constant tensioning, and therefore consistent and reliable print quality over time. Using different pressure levels, various thicknesses of stencil can be used. ZelFlex frames also ensure lower production costs as only one frame is required per line and can be used for multiple projects. No special docking station is required to change the stencil.

The frame can be placed into a printer and used for at least 24 hours without the need for air reconnection. Production quality can thus be improved by excluding the risk of long-term tension level decay which is presented by glued frames.

For more information contact Laser Stencil Technology, +27 (0)11 793 1311, don@lstec.co.za

Metcal has added the HCT2-200 digital hot air pencil to its line of convection rework tools. This digital handheld convection tool is designed for use in light rework applications that use smaller components and integrated circuits.

As component miniaturisation continues (e.g. 01005 components), the ergonomics of a pencil become more important to allow a user freedom to access and rework components on the board without affecting adjacent parts. Larger handheld convection systems commonly reflow and dislodge adjacent components due to a higher minimum airflow.

The HCT2-200 was developed for very small surface mount component and package sizes (1206s and smaller) and low board densities.

The pencil’s enhanced thermal performance allows the user to target a larger variety of components, and working under a microscope is made easier with the optional bent nozzles. New features include a 200 W ceramic heater, dual stage air pump and replaceable handpiece.

For more information contact Test & Rework Solutions, +27 (0)11 704 6677, sales@testandrework.co.za

Deprag’s range of powered screwdrivers are available in a variety of configurations and with modern drive technologies providing a wide torque range for industrial assembly. The company’s proven Micromat and Minimat ranges feature ergonomic design, slim construction and low weight, making them suitable for everyday use in a mass production environment.

Depending on the application, the user can choose between a straight design for vertical screw insertions, pistol grip design for horizontal assembly, and angled head design for confined spaces and high torque requirements. In addition to the air-screwdrivers with which Deprag made its name, the portfolio includes a series of electric and pneumatic screwdrivers.

For more information contact Altico Static Control Solutions, +27 (0)11 608 3001, sales@actum.co.za
CONSUMABLES, TOOLS & ACCESSORIES SELECTION GUIDE

Megohmmeter kit

The AE-800 Megohmmeter is a dependable and easy to use audit kit for conductive and dissipative surfaces. It is designed to be used in all facets of material production including engineering, maintenance, quality control, incoming inspection, manufacturing, research or sales departments for testing of anti-static mats, floor finishes, paints, wrist straps, smocks, footwear, bags and containers.

When using the built-in electrodes, the meter's test values for surface resistivity are in ohms per square. When using the external electrodes, the meter's test values for resistance are in ohms (although they are displayed in ohms/sq).

The AE-800 Megohmmeter kit measures surface resistivity, resistance, temperature and humidity. It is designed to test conductive, anti-static, and static dissipative surfaces for electrical resistivity/resistance according to EOS/ESD, CECC, ANSI, ASTM and UL test procedures.

For more information contact Hot Tools, 0861 667 665, sales@hottools.co.za

Handheld digital magnifier

Camβ (CamBeta) from Vision Engineering is a new digital inspection magnifier for portable inspection and documentation. This handheld inspection device is suitable for a wide range of applications. It provides magnification up to 20x, stores up to 20 000 images and uses grids and cursors for X and Y dimensioning.

With a high-resolution colour display, easy button operation and image capture/download capability, Camβ is ideal for roaming inspection tasks, documenting faults and inspecting large or immobile subjects. It has been equipped with dual LED illumination, with four settings; high contrast imaging and 30 frames video capture capabilities. A live-view video output via micro HDMI allows for the display of images on a larger screen, suitable for training purposes.

The magnifier is well suited in production environments where company policy disallows the use of mobile phones, and is easier to handle than a smartphone.

For more information contact Zetech, +27 (0)11 609 1244, zorlianski@zetech.co.za

Wireless label printer

The Dymo LabelWriter Wireless label printer comes with built-in Wi-Fi to enable cable-free printing. It is capable of printing on a wide selection of label tapes used by the existing LabelWriter printer series. Importantly for industrial applications, the printer can use long-lasting Dymo LW Durable labels, which use an industrial-strength adhesive that is able to stick securely to challenging surfaces such as metal tread plate, textured PVC, wood and glass.

The labels have a rugged protective coating that prevents peeling and abrasion caused by moisture and solvents, as well as industrial oils and cleaners. In addition to tolerating UV light, the moisture-resistant design can handle damp conditions and up to 85% humidity, as well as withstanding temperatures from -18°C up to +50°C.

The LabelWriter Wireless is available in black or white, and can print labels directly from Apple Macs, PCs, smartphones and tablets via its built-in Wi-Fi and can easily be added to a network for sharing.

For more information contact RS Components, +27 (0)11 691 9300, sales.za@rs-components.com

ESD flooring

The Polyflor ESD range of flooring has been specially engineered to facilitate a uniform flow of static electricity directly to a ground point. The range includes static dissipative (SD), electrostatic conductive (EC) and conductive ROF floorings.

EC flooring is a hard wearing, homogenous, commercial flooring product that is designed for areas which require static dissipative qualities. It is typically used for electronic assembly/repair areas, highly sensitive medical and computer equipment, electronics etc. Resistance to earth is in the range of 5 x 10⁴ to 1 x 10⁶ Ω.

SD flooring is a hard wearing, homogenous contact sheet or tile floor covering engineered for ESD protection. It is typically used for computer operator installations, hospital theatre / CAT scan equipment, MRI units and telephone exchanges. Resistance to earth is in the range of 5 x 10⁵ to 1 x 10⁶ Ω range.

Conductive flooring is generally used in explosive areas or manufacture of any explosive material, ammunition or highly sensitive chemicals, etc. Resistance to earth is in the range of 0 to 104 Ω, i.e., fully conductive.

For more information contact Altico Static Control Solutions, +27 (0)11 608 3001, sales@actum.co.za
ESD-safe chair

The ESD-safe chair, model number 204HF-01-CC0101-E3, from Altico Static Control Solutions, is upholstered in a black, three-layered static dissipative vinyl. It features an adjustable footing and a fixed mechanism with seat height adjustment, and provides adequate lumbar support through specially contoured, cold-cure polyurethane foam cushions.

Grounding is ensured thanks to a conductive caster wheel and a drag chain. Surface resistivity of the vinyl ranges from 106 to 109 Ω/square. The resistance between any seat component (except the base and footrest) to ESD-STM 12.1-1997 ESD DS12.1-1995 groundable points should be 1 x 104 to 1 x 109 Ω. The resistance between the footrest or base to a groundable point may be less than the recommended 1 x 104 Ω. Groundable points’ (casters, glides and drag chain) measured resistance should be equal to or less than 1 x 104 Ω.

For more information contact Altico Static Control Solutions,
+27 (0)11 608 3001, sales@actum.co.za

Static dissipative mat

Static dissipative work surfaces are essential for any workbench where static control is desired. Commonly found in sensitive device manufacturing ESD-protected areas, ESD-safe materials come in a variety of types for various applications.

SpecMat-H is a unique ESD-safe, thermoplastic vinyl mat that is made in the USA. Unlike some brands that are manufactured overseas, the mat’s homogeneous material won’t lose its anti-static properties because it is inherently dissipative through volume.

It is available in two thicknesses. The thicker material provides cushioning for those seeking gentle support for static sensitive items. The thinner material offers the most economical price point for those needing an inexpensive tray or shelf liner. The material is soft enough to be cut with a sharp blade and scraps can be recycled.

As with all ACL Staticide static dissipative matting material, the SpecMat-H can be ordered in custom sizes and the electricals are warranted for the lifetime of the mat.

For more information contact Altico Static Control Solutions,
+27 (0)11 608 3001, sales@actum.co.za

Packaging for ESD-sensitive parts

Corrugated cardboard is one of the best packaging materials ever developed. By applying various coatings and using its specialist know-how, Hans Kolb has turned corrugated cardboard into an innovative high-tech product. Whether it is ESD packaging for the production of electronic components, or packaging solutions with corrosion protection, the company’s Corronic coating solutions offer an ideal solution for any packaging requirement.

Corronic is an ideally suited packaging for electrostatic sensitive devices and because of its static dissipative skin and buried conductive core, it is an ESD shielding material suitable for use in ESD protected areas. Products made of Corronic include component boxes, PCB transit boxes, IC tube boxes, in-plant handlers for printed circuit boards, as well as other custom applications.

For more information contact Altico Static Control Solutions,
+27 (0)11 608 3001, sales@actum.co.za

ESD clothing

While working in an ESD protected area, ESD clothing is necessary to make sure that people do not charge the products that they are working with. To meet this need, Altico Static Control Products offers the Cleantex range of quality ESD safe clothing.

Cleantex is a leading manufacturer of specialty clothing and accessories for manufacturing ESD and cleanroom environments. Products include antistatic cleanroom clothes; ESD antistatic clothing for spaces; antistatic clothing for hazardous areas; and antistatic shoes, gloves and other accessories. Cleantex garments help protect electrostatically sensitive components from electrostatic discharge and fields by diverting static electricity from the body of the worker.

ESD coats are 3/4 length, blue in colour and are available ex stock for male and female workers. The material is suitable for South African weather conditions.

For more information contact Altico Static Control Solutions,
+27 (0)11 608 3001, sales@actum.co.za
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AAW Electronic Enterprises
Tool, equipment and consumables supplier
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aaw@intekom.co.za
www.aawelectronics.co.za
Contact name: Bradley Baillache

AAW Electronic Enterprises is an importer and distributor of ESD equipment, solder wire, bar and paste, soldering and rework equipment, precision and general tools, bench top and field test equipment to the electronics manufacturing and electrical industries.


Advanced Electronic Production & Integration
Service provider/contract manufacturer
510 Jasmy Street, Silverton, Pretoria, Gauteng
+27 0(12) 804 0019
leovos@absamail.co.za
www.electronicproduction.co.za

Afrisol
Solder supplier
402 Murray Road, Wadeville, Germiston, Gauteng
+27 0(11) 865 4141
karen@afrisol.co.za
www.afrisol.co.za

Allan McKinnon
Tool, equipment and consumables supplier
467 Felstead Road, North Riding, Randburg, Gauteng
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info@testerion.co.za
www.ama-sa.co.za
Contact name: Vangeli Glyptis

Allan McKinnon & Associates has been serving the electronics industry for over 40 years through the sale and rental of high-technology SMT production equipment and the distribution of European-made production consumables. Its mission is to remain a major supplier of production equipment, related consumables and technical information for the companies operating within the industry.

Brands: Heller Reflow, ITW/Cramolin, JUKI SMD Placement, Kester, Kolb PCB Cleaning Technology, Weller Tools

Altico Static Control Solutions
Static control supplier
Unit A8, The Stables Business Park, 13 3rd Road, Linbro Park, Johannesburg, Gauteng
Branches: Johannesburg, Cape Town, Durban, Port Elizabeth
+27 (0)11 608 3001
sales@actum.co.za
www.actum.co.za
Contact name: Kevin Klaff

Altico is the exclusive SA representative for many of the world’s leading suppliers of ESD products. Its offering includes complete ESD audit and recommendation, ESD packaging, test and measurement equipment, ESD consumables and cleaning materials, and the complete supply and installation of various types of ESD flooring.

Brands: ACL Staticide, Cleantex, Georg UTZ, Hans Kolb, IDI, Laja, Polyflor, Simco

Ansys
OEM
85 Regency Drive, Route 21 Corporate Park, Irene, Gauteng
+27 (0)12 749 1800
malizole@ansys.co.za
www.ansys.co.za
Contact name: Malizole Hole

Ansys is an original design manufacturer (ODM) that specialises in the design, electronic manufacturing, integration and support of advanced electronic subsystems and products for clients in the defence and aerospace, mining and industrial, information security, rail and telecommunications sectors.

Brands: SOLID WebKey

AREI
Electronic component distributors and manufacturers association
+27 (0)11 462 3256
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Contact name: Jenny Gooding

Association of Representatives for the Electronics Industry.
ASIC Design Services
Productivity & manufacturability solutions/software, training & certification
Thandanani Office Park, Invicta Road, Midrand, Gauteng
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info@asic.co.za
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Barracuda Holdings
Service provider/contract manufacturer
Unit 1, Bataleur Park, Olive Grove Industrial Estate, Somerset West, Western Cape
+27 (0)21 851 3357
ryan@ivorygroup.co.za
www.barracudaholdings.co.za
Contact name: Ryan Webb
Barracuda Holdings is a privately owned and dedicated high-technology contract electronics manufacturer (CEM), offering a complete service from materials procurement to final product assembly and packaging. The company is ISO9001:2008 certified, and boasts a passionate and highly experienced team spanning all disciplines.

Battery Guys
Battery design and manufacture
130 Seventh Avenue, Edenvale, Gauteng
+27 (0)11 452 3914
info@batteryguyz.co.za
www.batteryguyz.co.za

Bosco Printed Circuits
PCB supplier/manufacturer
1 Terrace Road, Eastleigh, Edenvale, Johannesburg, Gauteng
+27 (0)11 452 1413
sales@bosco.co.za
www.bosco.co.za

Cadshop
Laser de-panelling
211A Valyland Office Suites, Upper Recreation Road, Fish Hoek, Cape Town
+27 (0)82 377 0052
cadshop@vodamail.co.za
www.cadshop.co.za

C-Boards
PCB supplier/manufacturer
Shop 5B, Moulton Centre, Cnr Moulton & Codonia St, Waverley, Pretoria, Gauteng
+27 (0)12 332 4062
info@cboards.co.za
www.cboards.co.za
C-Boards specialises in delivering a same-day circuit board service.

Centurion Systems
Security/access control OEM
Unit 13 Northlands Production Park, Cnr Epsom Avenue & Newmarket Road, North Riding, Gauteng
+27 (0)11 699 2400
charl.mijnhardt@centurionsystems.co.za
www.centsys.com

CET Manufacturing
PCB supplier/manufacturer
19 Pieter Street, Highveld Technopark, Centurion, Gauteng
+27 (0)12 665 4860
circuits@ccza.com
www.ccza.com
Contact name: Rudi Koekemoer
CET is a manufacturer and importer of printed circuit boards – single sided, double sided and multilayer, and 100% netlist tested. It supplies defence and aerospace spec multilayers, flex and flex-rigid, aluminium and heatsink/thermal PCBs. Any PCB requirements can be met, including blind and buried vias, copper and resin filled vias, HDI and quick-turn prototypes.

ChipOnBoard
Service provider/contract manufacturer
10 Kinsman Road, Unit 9 Kinsman Industrial Park, New Germany, KwaZulu-Natal
+27 (0)31 811 4626
info@chiponboard.co.za

Christensen Tools
Tool, equipment and consumables supplier
11 Jules Street, Jeppes Town, Johannesburg, Gauteng
+27 (0)11 618 3200
steve@christensen.co.za
www.christensen.co.za

Clearline Protection Systems
Lightning & surge protection manufacturer
Corporate Park North, Clearline House, Roan Crescent, Midrand, Gauteng
+27 (0)11 848 1100
vernon@clearline.co.za
www.clearline.co.za

Conical Technologies
Tool, equipment and consumables supplier
646 Kango Street, Erasmus Kloof Ext. 3, Pretoria, Gauteng
+27 (0)12 347 5035
daniel.haywood@conical.co.za
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CORDS
Cable assembly
Hyde Park A, Unit 6, Old Ottery Road, Ottery, Western Cape
+27 (0)21 703 5836
sales@CORDS.co.za
www.CORDS.co.za
Contact name: Alistair Longman

CORDS manufactures custom cable assemblies, retractile cable (coil cords), loom assemblies and wire harnesses for all applications. Its offering currently services aeronautical, signalling, power, product manufacture, coil cords of all sizes and ranges, automotive, telecommunications, mining, seismology, information technology, retail point-of-sale and more.

CZ Electronics Manufacturing
Service provider/contract manufacturer
Unit 81, Cnr van Dyk & Brakpan Roads, Van Dyk Secure Business Park, Boksburg Industrial East, Gauteng
+27 (0)11 914 5240
info@czelectronics.co.za
www.czelectronics.co.za

DBA Technology
Laser & PCB labels
211A Valyland Office Suites, Upper Recreation Road, Fish Hoek, Cape Town
+27 (0)82 710 9797
billm@dbaTechnology.co.za
www.dbaTechnology.co.za

DDZ Technologies
Cable assembly, service provider/contract manufacturer
93 Adriana Crescent, Gateway Industrial Park, Centurion, Gauteng
+27 (0)12 661 0728
info@ddztech.co.za
www.ddztech.co.za
Contact name: Dirk du Preez

DDZ Technologies can handle everything from prototyping to high-volume production runs. Its fully automated production facility has a variety of production lines ensuring complete flexibility in volume and complexity of board assemblies. Component procurement services are offered for all customer related needs and optical inspection, testing and coating facilities are available.

Deman Manufacturing
Service provider/contract manufacturer
10 Steenbok Street, Koedoespoort, Pretoria, Gauteng
+27 (0)12 403 8000
sales@deman.co.za
www.deman-mfg.co.za

Designer Cables
Cable assembly
Unit 88 Allandale Industrial Park, Cnr Le Roux & Morkels Close, Midrand, Gauteng
+27 (0)11 805 1136
meshack@designercables.co.za
www.designercables.co.za
Contact name: Meshack Seapela

Designer Cables specialises in cable harnessing and loom manufacturing, in addition to manufacturing and PIM testing of coaxial and RF cables.

Designium
Productivity & manufacturability solutions/software
34 High Street, Deneysville, Free State
+27 (0)16 371 2238
info@designium.co.za
www.designium.co.za

Eagle Micro Systems
OEM, service provider/contract manufacturer
Shop 29, Kilburn Shopping Centre, 117 Kilburn Street, Discovery, Roodepoort, Gauteng
086 111 1660
info@eaglemicro.co.za
www.eaglemicro.co.za

EDA Technologies
Service provider/contract manufacturer, training & certification
15 Berkely Office Park, Cnr Witch-Hazel & Bauhinia St, Highveld Techno Park, Centurion, Gauteng
+27 (0)12 665 0375
sales@edaTech.co.za
www.edatech.co.za
Contact name: Nechan Naicker

EDA Technologies offers a broad array of services living up to its motto of ‘Concept-to-Complete Electronics Solutions’.

Brands: Altium, NCAB, Nexus

Edge Assembly
Enclosure manufacturer, service provider/contract manufacturer
Box 402, Hilton, KwaZulu-Natal
+27 (0)82 806 4069
alan@edgeassembly.co.za
www.edgeassembly.co.za
Contact name: Alan Robertson

Edge Assembly is an electronic subcontracting manufacturing company that was conceptualised by an electronic manufacturing process engineer for the discerning customer in mind; where quality, delivery, price competitiveness and personal service is paramount.
Electronic Industry Supplies
Tool, equipment and consumables supplier
25 Loch Avenue, Parktown, Johannesburg, Gauteng
+27 (0)11 726 6758
hr@eispty@iafrica.com
www.eispty.co.za
Contact name: Helmut Reussenzehn

Electronic Industry Supplies has been in existence since 12 July 1988 and in that time has moved from strength to strength. The main thrust of the business is the supplying of imported electronic and electrical components and related materials.


Electronic Touch Systems
Touch systems manufacturer
165 Beyers Naude Drive, Northcliff, Johannesburg, Gauteng
+27 (0)11 782 3346
touch@global.co.za
www.electouch.co.za
Contact name: Patrick Thomas

Local design and manufacture of high-quality membrane switches, fibre-optic backlit membrane switches and overlays, tactile key embossing, electroluminescent backlit membrane switches, panels and labels.

Hiconnex
Cable assembly
20 Adriana Crescent, Gateway Industrial Park, Centurion, Gauteng
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www.hiconnex.co.za

IDS
Security/access control OEM, service provider/contract manufacturer
91 Escom Road, New Germany, Durban, KwaZulu-Natal
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Impro Technologies
Security/access control OEM
478 Gillitts Road, Pinetown, KwaZulu-Natal
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info@impro.net
www.impro.net

Jemstech
Service provider/contract manufacturer
66 Regency Drive, Route 21 Corporate Park, Irene X31, Centurion, Gauteng
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info@jemstech.co.za
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K Measure
Tool, equipment and consumables supplier
302 29th Avenue, Villieria, Pretoria, Gauteng
+27 (0)87 230 0134
info@kmeasure.co.za
www.kmeasure.co.za

K PRODUCT DESIGN
Enclosure manufacturer, 3D product design and manufacturer
1050 Liner Street, Cnr Zeiss Road, Laser Park, Honeydew, Gauteng
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tommy@kmdesign.co.za
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رد: Laser Stencil Technology
Stencil and precision metal parts manufacturer
2 Naaf Street, Strijdompark, Randburg, Gauteng
+27 (0)11 793 1318
stencils@lstec.co.za
www.lstec.co.za
Contact name: Donovan Jeffery

Laser Stencil Technology is a manufacturer and supplier of solder paste stencils and precision metal parts to the local electronics manufacturing industry.

Brands: DEK Pneumatic Frames, SAWA Ultrasonic Cleaners, Zelflex Pneumatic Frames
Lauren Manufacturing
Tool, equipment and consumables supplier
1 Caroline Street, Eastgate Gardens Commercial Park, Marlboro, Sandton, Gauteng
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MANTECH
Tool, equipment and consumables supplier
32 Laub Street, New Centre, Johannesburg, Gauteng
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sales@mantech.co.za
www.mantech.co.za

Contact name: Manny Moutinho

MANTECH is a distributor of electrical and electronic parts, components, tools, equipment and consumables. Through its various outlets in South Africa, the company offers a comprehensive range of off-the-shelf products, enabling it to deliver to most of its customers within 24 hours, using its own delivery fleet as well as couriers.

Martin Electronics
Security/access control OEM
26 Kindon Road, Robertsham, Gauteng
+27 (0)11 433 4084
orders@martin-electronics.co.za
www.martin-electronics.co.za

Membrane Switch Technologies
Membrane switch manufacturer
Block H, Georgian Place, 18 Southway Road, Kelvin, Sandton, Gauteng
+27 (0)11 887 1227
info@membraneswitch.co.za
www.membraneswitch.co.za

Contact name: Colin Jennings

Manufacturer and supplier of membrane switches, polycarbonate facias, vinyl labels, flexible copper circuitry and laser cutting of plastics.

Metalgrapho
Metal and print solutions
Cnr Alexandra & Ndabeni Roads, Oude Molen, Pinelands, Western Cape
+27 (0)21 510 5960
bi@metalgrapho.co.za
www.metalgrapho.co.za

Microtronix Manufacturing
Service provider/contract manufacturer
67 CR Swart Drive, Strijdompark, Randburg, Johannesburg, Gauteng
+27 (0)11 792 5322
info@microtronix.co.za
www.microtronix.co.za

Contact name: Rebecca Elsey

Microtronix specialises in PC board assembly for the mining, military, automotive, security and various other commercial industries. It is able to provide turnkey manufacturing services including, but not limited to, SMD placements, conventional placement, testing and programming, full product assembly, conformal coating, PCB washing and component procurement.

Brands: Inseele Solar Chargers, Kivah Audible

Montar Manufacturing
Service provider/contract manufacturer
7 Gert Kotze Street, Brakenfell, Western Cape
+27 (0)21 981 5682
montar@montar.co.za
www.montar.co.za

MyKay Tronics
Tool, equipment and consumables supplier
27 Newquay Road, New Redruth, Alberton, Gauteng
+27 (0)11 869 0049
mykay@africa.com
www.mykaytronics.com

Contact name: Dean Rodger

MyKay Tronics is the sole agency for a number of market leaders in SA for electronic production equipment and consumables. The company is the local distributor for pick-and-place machines, reflow ovens, selective wave soldering, rework stations, solder wire/paste, solder bar, flux, PCB washing machines, component counters, tools, cutters and more.


Newelec Pretoria
Enclosure manufacturer, motor protection relay OEM
298 Soutter Street, Pretoria West, Pretoria, Gauteng
+27 (0)12 327 1729
info@newelec.co.za
www.newelec.co.za

Nordson EFD
Fluid dispensing solutions
Unit 40 Northgate Business Park, Block A, Gold Street, Northgate Estate, Brooklyn, Cape
+27 (0)79 693 5572
preston.bowman@nordson.com
www.nordsonefd.com

Contact name: Preston Bowman
Nordson EFD precision dispensing systems deliver consistent and reliable deposits that improve yields and reduce costs in the electronics assembly process. From benchtop dispensers to multiple robots and valve systems, the company provides the best solutions for the dispensing of solder paste, flux, UV adhesives, silicone, cyanoacrylates, epoxies and more.

**North Bridge Technologies**  
Service provider/contract manufacturer  
84 Jean Avenue, Doringkloof, Centurion, Gauteng  
+27 (0)12 667 4655  
wynand@northbridge.co.za  
www.northbridge.co.za

**Phahama Systems Development**  
Service provider/contract manufacturer  
19 Pieter Street, Highveld Technopark, Centurion, Gauteng  
+27 (0)12 665 4750  
hosiam@phahama.com  
www.phahama.com

**Priben Distribution**  
Tool, equipment and consumables supplier  
Unit 2, Motor City, 26 Main Reef Road, Langlaagte, Johannesburg, Gauteng  
+27 (0)11 473 2149  
info@priben.co.za  
www.priben.co.za

**Proactive Manufacturing Solutions**  
Service provider/contract manufacturer  
S3 Pinelands Office Park, Ardeer Road, Modderfontein, Gauteng  
+27 (0)84 840 1197  
lesley@247pms.co.za  
www.247pms.co.za

**Omnigo**  
Service provider/contract manufacturer  
320 Kuit Street, Waltloo, Pretoria, Gauteng  
+27 (0)12 803 8218  
sales@omnigo.co.za  
www.omnigo.co.za  
**Contact name:** Pieter de Nysschen

Omnigo prides itself on its quality and superior service, which is the reason it is the preferred electronics contract manufacturer for its clients. The company prefers to build long term relationships and offers a wide range of flexible services to grow a sustainable partnership with all its clients.

**Otto Wireless Solutions**  
Cable assembly  
58 Wakis Avenue, Strijdompark, Randburg, Gauteng  
Branches: Johannesburg, Cape Town  
+27 (0)11 791 1033  
wireless@otto.co.za  
www.otto.co.za  
**Contact name:** Chris Viveiros

Otto Wireless Solutions offers a custom RF cable assembly service for applications using GSM, LTE, HSPA and Wi-Fi antennas  
**Brands:** Chang Hong

**P. Beulich Sheet Metal Manufacturers**  
Sheet metal product manufacturer  
46 Lower Germiston Road, Heriotdale, Gauteng  
086 163 2116  
garth@pbeulich.co.za  
www.pbeulich.co.za

**Quamba Technologies**  
Tool, equipment and consumables supplier  
32A Kloof Road, Bedfordview, Gauteng  
+27 (0)83 417 4294  
igmar@quamba.co.za  
www.quamba.co.za  
**Contact name:** Igmar Grewar

Quamba Technologies is a supplier of production equipment from leading global manufacturers, providing excellent local technical and after-sales support.

**Pam Landman (t/a IJ-CCAL)**  
Service provider/contract manufacturer, PCB layout designer  
64 Zandspruit Road, Farmall, Chartwell, Johannesburg, Gauteng  
+27 (0)82 894 4145  
pam@ij-ccal.co.za  
www.i j-ccal.co.za

**Contact name:** Pam Landman

**Production Logix**  
Cable assembly, service provider/contract manufacturer  
5 Moss Road, Westmead, KwaZulu-Natal  
+27 (0)31 700 4718  
enquiries@prologix.co.za  
www.prologix.co.za

**Projects Concern Manufacturing**  
Service provider/contract manufacturer  
2 Friesland Drive, Longmeadow South, Longmeadow Business Estate, Edenvale, Gauteng  
+27 (0)11 608 5210  
sean@projectsconcern.co.za  
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**Quamba Technologies**  
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32A Kloof Road, Bedfordview, Gauteng  
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www.quamba.co.za  
**Contact name:** Igmar Grewar

Quamba Technologies is a supplier of production equipment from leading global manufacturers, providing excellent local technical and after-sales support.

**Brands:** MBTech, Hanwha Precision Machinery (Samsung), SEC Co Ltd, Seho, TTNs Inc., TWS Automation, Carton Optical Industries, Fonton, Gen 3, Mechatronic Systems, Surclean, Taiwan Drytech
RDC
Security communications OEM
157 Van Rebeeck Avenue, Edenvale, Gauteng
+27 (0)11 452 1471
brent.a@radiodata.co.za
www.radiodata.co.za

Resolution Circle
Service provider/contract manufacturer
Cnr Barry Hertzog Avenue & Napier Road,
Richmond, Gauteng
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marius@resolutioncircle.co.za
www.resolutioncircle.co.za

Robert Bosch South Africa
OEM, service provider/contract manufacturer
33 Riet Rautenbach Street, Brits Industrial, Brits,
North-West Province
+27 (0)12 381 3446
maritz.botha@za.bosch.com
www.bosch.co.za
Contact name: Maritz Botha
Bosch offers a world class manufacturing facility, based in Brits,
North-West Province, specialising in electronic PC board assembly for
both automotive and non-automotive use where quality is key.
Brands: Bosch, SEG Automotive, Chassis Brakes International, other
non-automotive brands

RS Components SA
Tool, equipment and consumables supplier
20 Indianapolis Street, Kyalami Business Park,
Midrand, Gauteng
+27 (0)11 691 9300
website.za@rs-components.com
www.rscomponents.co.za
RS Components is a global e-commerce distributor of industrial
products and electronic components. It offers over 500 000 products
across more than 2500 leading brands which include the following
categories: automation and control, electronics, mechanical,
electrical, test and measurement, health and safety, tools and
consumables.
Brands: RS Pro, Electronic Assembly, Weller, Stannol, Multicore, Ersa,
3M, Ansell

Scanditron SA
Tool, equipment and consumables supplier
Unit 1, Motor City, 26 Main Reef Road, Langlaagte,
Johannesburg, Gauteng
+27 (0)11 473 2149
stencildata@priben.co.za
www.priben.co.za

Specialised Manufacturing Technologies (SM Tech)
Service provider/contract manufacturer
Unit 18, Miracle Retail Park, Cnr Lenchen & Old
Johannesburg Road, Centurion, Gauteng
+27 (0)12 653 2330
info@smtech.co.za
www.smtech.co.za
Contact name: James Barclay Loggie
SM Tech caters to requirements from single PCB prototyping
up to medium volume production runs, for everything
from basic SMD only, through to complete turnkey offerings
grouped according to customer requirements, to AOI, X-ray and
automatic washing facilities.

Tech Craft Systems Cape
Tool, equipment and consumables supplier
16 Knokke Avenue, Cape Town
+27 (0)21 557 4441
tcsc@telkomsa.net
www.techcraftsystems.co.za

Techmet
Tool, equipment and consumables supplier
402 Murray Road, Wadeville, Germiston, Gauteng
+27 (0)11 824 1427
smt@techmet.co.za
www.techmet.co.za
Contact name: Grant Langley
Techmet Equipment is an integral part of the Techmet
group of companies, dedicated to providing sales and
service to the electronics manufacturing industry. The
company is proud of its qualified and experienced engi-
ergying staff, providing professional technical support to
the industry which includes installation, maintenance and
process optimisation.
Brands: AAT, Bakon, Dektec, EKRA SMT printers, ERSA, Eunil
PCB handling systems, GKG, Grohmann, Indium, Inventec, JT
Universal, KHJ Dekwin Ltd, KIC, Kiheung, Mirae Corp, Mirtek,
MOA, Nordson-Asymtek, Panasonic Factory Solutions,
Panasonic Pick and Place, Pemtron, Permali, Peters
Conformal Coatings, QA Technologies, Ren Thang Crop &
Form, S.A. Day, Viscom Vision Technology, X&Y International
Technology Station in Electronics  
Service provider/contract manufacturer, training & certification  
CSIR, Building 14D, Meiring Naudé Road, Brummeria, Pretoria, Gauteng  
+27 (0)12 382 5039  
vanderpoela@tut.ac.za  
www.tselectronics.co.za

Test & Rework Solutions  
Tool, equipment and consumables supplier  
100 Pritchard Street, Johannesburg North, Randburg, Gauteng  
+27 (0)11 704 6677  
sales@testandrewrwork.co.za  
www.testandrewwork.co.za

Test Fixture Technologies  
Automated test equipment manufacturer  
32 Liner Avenue, Laser Park, Honeydew, Gauteng  
+27 (0)11 791 5879  
info@testfixtures.co.za  
www.testfixtures.co.za  
Contact name: Adrian Storie

TFT is a specialist manufacturer of automated test equipment. Its team of highly skilled and experienced engineers and technicians cover a variety of specialities, including mechanical design, electronics, software and robotics. The company works to consistently produce top quality test and automation solutions for the local electronics manufacturing industry.

Brands: TFT, Everett Charles Technologies, ST Robotics

Testerion  
Tool, equipment and consumables supplier  
467 Felstead Avenue, North Riding, Randburg, Gauteng  
+27 (0)11 704 3020  
info@testerion.co.za  
www.testerion.co.za  
Contact name: Vangeli Glyptis

Established in October 2000, Testerion specialises in the sale of high-technology SMT production equipment and the distribution of European and USA made production consumables. Its mission is to continue growing as a profitable company, with a focus on providing its customers with the very best service and highest quality equipment.

Brands: Fuji Pick-and-Place, Nutek, Plato, Speedline, Techspray, TRI

TOA Electronics Southern Africa  
Audio equipment OEM  
Modder Crest Office Park, Izinyonini Building SC72, High Street, Modderfontein, Gauteng  
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Contact name: Terence Ruthnam

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**ZA Electronics**  
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riaan@zae.co.za  
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ZA Electronics is a Cape Town-based electronic contract manufacturer that boasts quality levels to IPC Class 2, UL inspection and lead-free solder process standards. With three Mydata SMT lines, Seho wave solder and reflow ovens, Gopel visual inspection and IMO board cleaning system, the company can place components with pitch as small as 0,35 mm and up to 50 mm² in size, and resistors down to 01005 format.

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