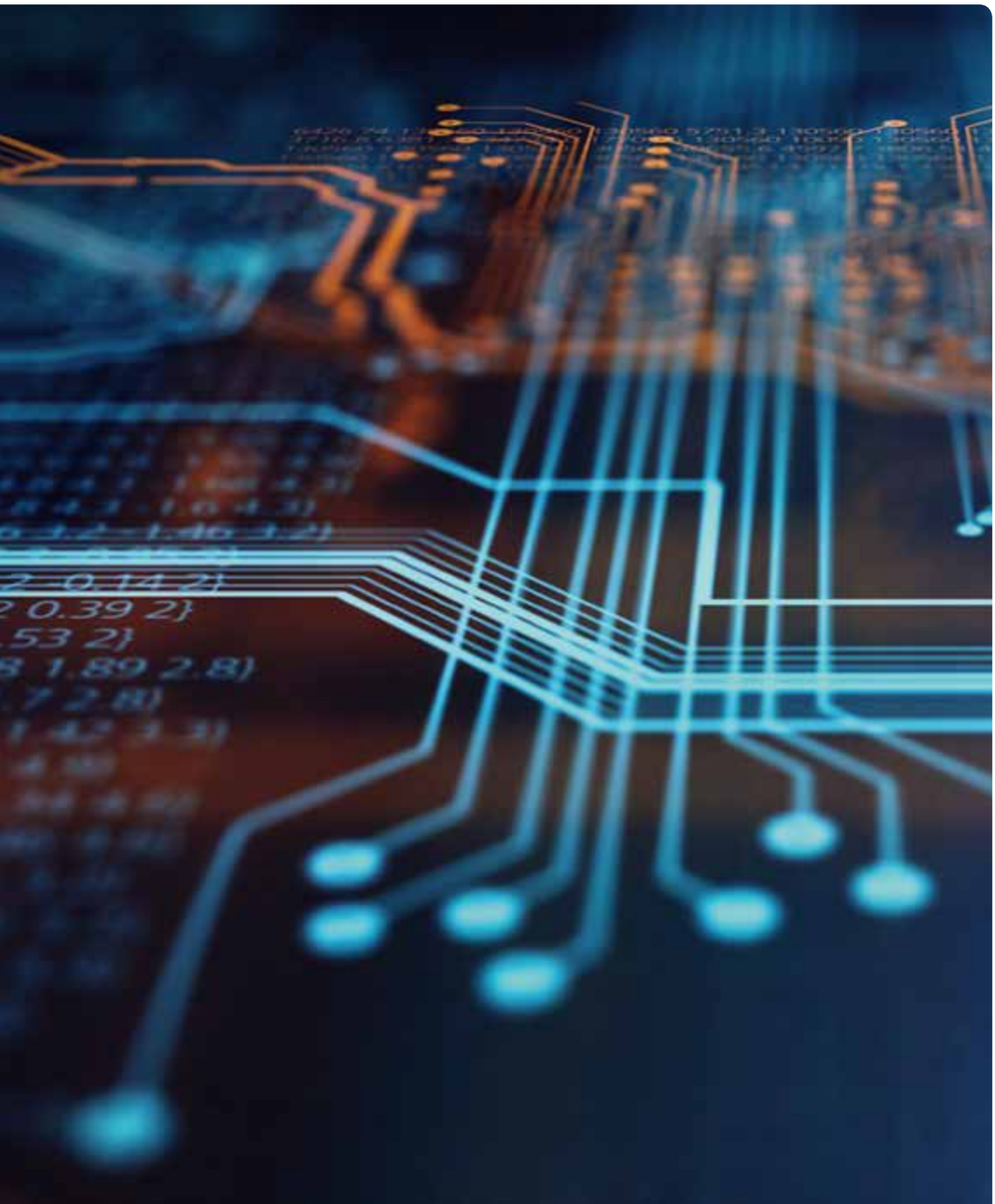
JUKI

smart.fast.modular.

SOFTWARE SOLUTION



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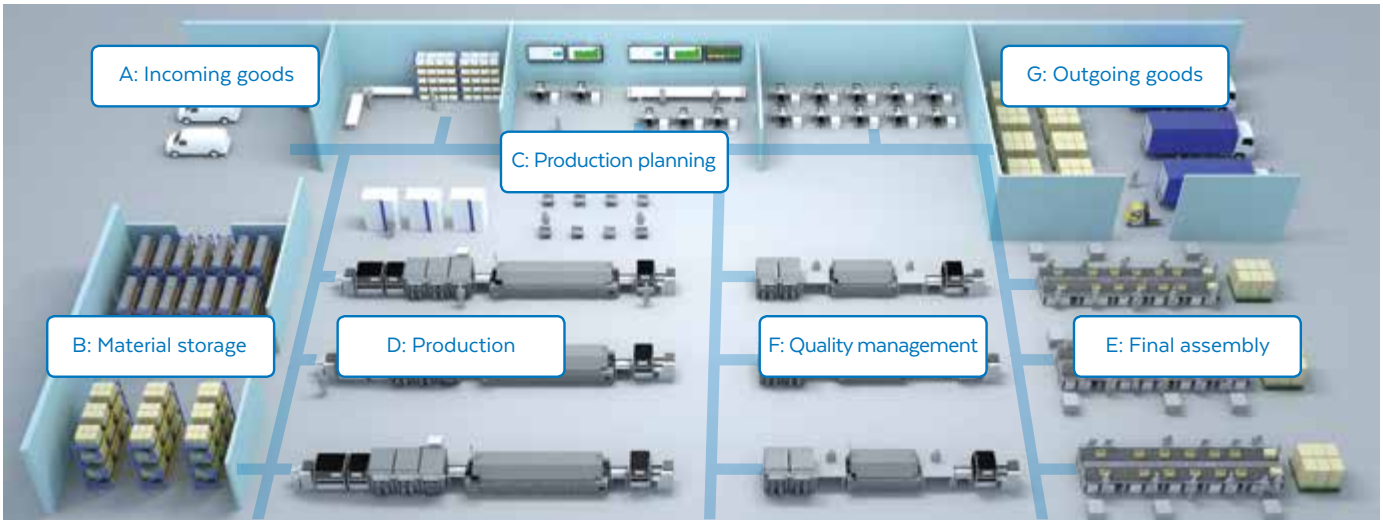
TOGETHER TOWARDS INDUSTRY 4.0

Head towards the future together with your powerful partner JUKI: You do not have to renew your entire machine pool to advance towards Industry 4.0. What you need instead is an intelligent and flexible software solution. A pioneer in the field of modern line solutions, we have long been cooperating intensively with our partners in order to create a large number of modular functions and interfaces that meet your requirements and needs in a flexible way. Thus, you are perfectly prepared for tomorrow‘s market requirements.

TOGETHER TOWARDS INDUSTRY 4.0

EXEMPLARY ILLUSTRATION OF AN SMD PRODUCTION LINE



A: Incoming goods	B: Material storage	C: Production planning	D: Production	E: Final assembly	F: Quality management	G: Outgoing goods
Automatic booking	Intelligent storage	Intelligent optimisation	Connection of screenprinters	Integration into the data network	Full traceability	Automatic booking
Data import	Fully automated and modular	Easy programming	Closed-loop SPI printers	Material control	Full reporting	Data export
Control picture	Integrating customers' storage facilities	Data preparation	Feeder setup control		Error prevention	
Unique ID	Flexible buffer storage	User-guided setups	Cluster setup		User control and documentation	
Connection of ERP systems and MES	Automatic material planning	WIP monitoring	Chaotic setup		Maintenance support	
	Fast order picking	WIP reduction	Inventory reconciliation		Production analysis	
	Ideal material flow	Safe FIFO procedure	Automatic material request			
	Inventory control		MSD control			
	Dry storage		LED binning control			
			Kitting control			
			Connection of reflow ovens			
			Line Solution			

A: INCOMING GOODS

The JUKI Software Solution minimises material management efforts as soon as the goods arrive. Starting right here, material flow optimisation continues during production and covers the entire material cycle.

ISM Material Incoming Station

AUTOMATIC BOOKING AND DATA IMPORT

- Freely selectable intervals for reconciling the materials managed by JUKI as well as customers‘ ERP systems/MES
- Where volumes fall short of the respective minimum quantities, materials will be reordered in a short time
- Automatic and reliable scanning of the manufacturer‘s information affixed on the material (barcode) using a corresponding camera system
- Easy-to-learn special suppliers‘ labels
- Registered material will be automatically added into both your customers‘ ERP systems/MES and the JUKI database
- Automatic creation of a unique ID for material traceability

A: INCOMING GOODS

CONTROL PICTURE

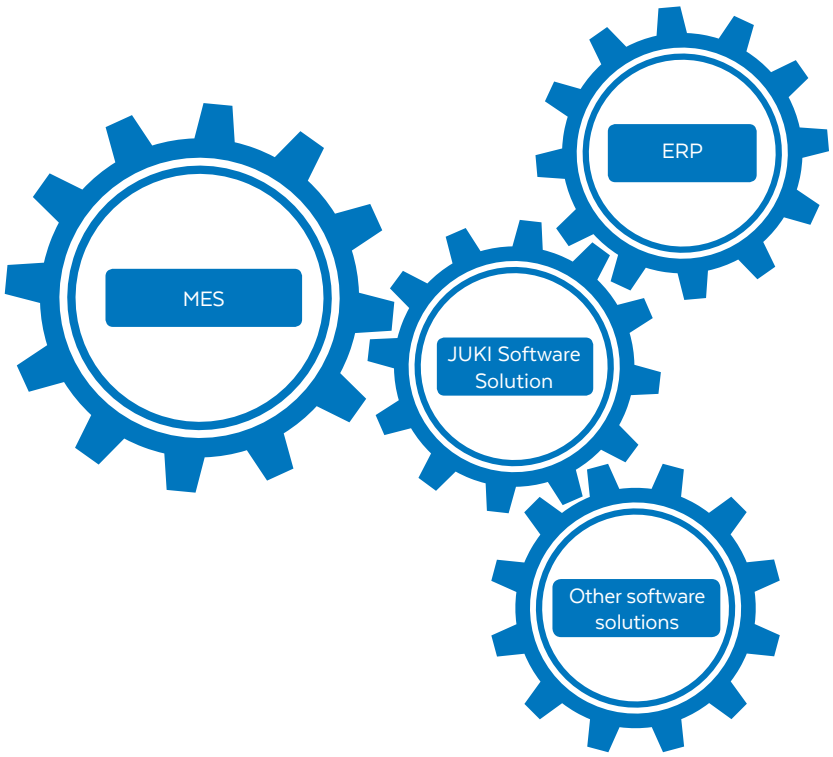
With the aid of the incoming goods desk and the automated towers, the goods are automatically registered and documented with a photo, which is a vital element for material traceability. After disposal of an empty component reel, the reel continues to exist as a documented picture. All important information will thus remain safeguarded. Even after years, the picture and the required information can be retrieved at any time for material traceability purposes.

UNIQUE ID

The unique ID is a consecutive number that only exists once in the system. It identifies the material container explicitly, whilst ensuring full, complete material traceability and the performance of FIFO procedures. Using the JUKI Software, it is possible to either create a unique ID or to adopt an existing ID from an ERP system/MES. Apart from that, the unique ID will be linked to the incoming goods data.

CONNECTION OF ERP SYSTEMS AND MES

Industry 4.0 requires relevant data to be collected and processed at the corresponding interfaces. The JUKI Line Solution can be ideally integrated into existing ERP systems/MES. Matching interfaces are available for this purpose. They can be used to exchange data related to material management, but also those data that are vital for production planning and the production status. This direct data exchange ensures that two parallel systems will always show perfectly synchronised data inventories. Unnecessary production downtimes are thus avoided.



B: MATERIAL STORAGE

JUKI supplies semi-automatic and automatic storage systems that are customised with additional JUKI hardware and the JUKI Software Solution. The transition on your way towards Industry 4.0 can occur successively in coordinated steps without having to dispense with the software's many advantages.

INTELLIGENT STORAGE

A pioneer in the field of line solutions, JUKI has been intensively cooperating with its partners for many years in order to implement intelligent storage solutions. These include customised ERP system/MES connections, a perfect material flow, automatic bookings, the connection to existing storage and production systems and many other solutions. Based on a storage analysis and a personal conversation, we will design an individual storage solution for each customer.

FULLY AUTOMATED AND MODULAR

JUKI's storage systems are able to store and remove up to 54 component reels. The storage systems are selforganising in order to make perfect use of the storage space. Thanks to their modular design, the systems can be supplemented at any time or be easily installed in another location. Apart from that, existing storage systems can be integrated in modules. In this way, your storage management will always be flexible and upgradable. Automatic transport robots move the requested material to the desired location in the production facility.

Fully automated loading and extraction

Automatic Guided Vehicle

INTEGRATING CUSTOMERS' STORAGE FACILITIES

When it comes to modular warehouse design, it is important to convert the existing warehouse into an intelligent warehouse.
At the same time, successive modernisation requires existing warehouses to be integrated into the JUKI system. This applies equally to existing modern storage systems and simple warehouse systems which are to be replaced at a later point in time. As regards simple storage systems, the storage locations are furthermore optimised for increased efficiency during loading and extracting. This happens through conversion into a dynamic (chaotic) storage system and route optimisation for the warehouse staff. You can profit from this optimisation from the very first adjustment level.

B: MATERIAL STORAGE

FLEXIBLE BUFFER STORAGE AND AUTOMATIC MATERIAL PLANNING

In order to optimise the material flow, buffer storages such as Kanban or supply storages will be established in production. These can also be modified using JUKI's storage systems and intelligent software solutions. Inventories can be settled and extracted cyclically in the production-related buffer storage. Moreover, it is possible to automatically request material or to place material orders in the ERP system/MES. Materials can in future also be transported automatically.

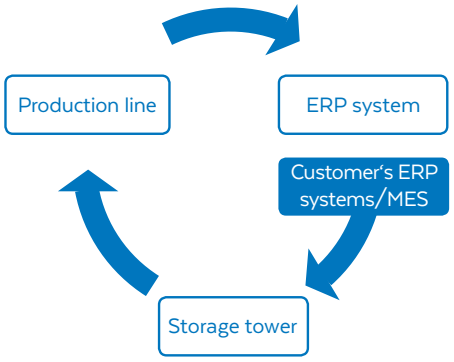
FAST ORDER PICKING

Without intelligent storages, delays may occur when picking the material for upcoming productions. Such delays may be caused, for example, by incorrectly stored material or material that is missing due to inventory deviations. Further reasons are existing automatic systems that work too slowly and often have only one material extraction point as well as staff shortages and different storage locations for one and the same article. You can forget about these potential difficulties when using JUKI's intelligent software solution.

- Dynamic (chaotic) and safe storage
- Elimination of human mistakes
- Correct inventories
- Fast and automatic loading and extraction
- Flexible and modular
- Extreme minimisation and simplification of manual activities

IDEAL MATERIAL FLOW

First and mainly, JUKI focuses on creating the perfect storage and software concept, in cooperation with the customer, without limiting itself to its own hardware and software. JUKI considers production lines that are already in use (also those of other brands), existing storage systems, local opportunities, existing ERP systems/MES and financial possibilities. In doing so, maximum flexibility is achieved. The aim is to achieve an ideal, not a perfect material flow, which also reduces inventories in a reasonable way.



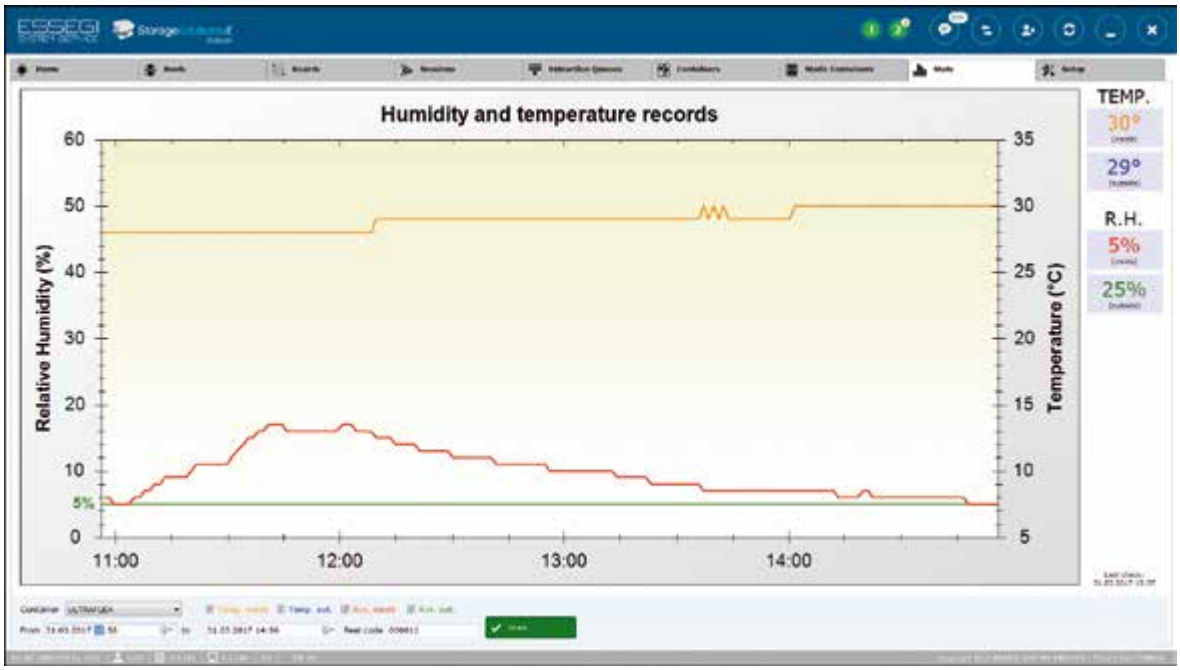
INVENTORY CONTROL

Good inventory control is a vital element for avoiding production downtimes caused by a lack of material. At the same time, it is possible to avoid unnecessary capital commitment due to excessively high inventories. Using the JUKI Software Solution, the actually processed components can be tracked. Besides, the current storage locations are always known, since accidentally incorrect storage is no longer possible. The same applies to material that is currently used in production and has not yet been removed. In order to be able to reorder material in due time, it is possible to update the inventories in the ERP system/MES at desired intervals. The total inventory can thus be optimised and minimised.

B: MATERIAL STORAGE

DRY STORAGE

When it comes to moisture sensitive devices, it is important that they are always stored in a dry place in order to avoid quality problems. Apart from offering corresponding dry storage facilities, JUKI can also include existing systems. Special software monitors whether or not the material is in one of the dry cabinets and whether the specified storage conditions are being followed.
Expired material will automatically be blocked for production. This ensures that only faultless goods will be processed. The criteria for storage and monitoring according to JEDEC J-STD-033 are thus followed.



Temperature and humidity indicator

C: PRODUCTION PLANNING

Excellent production planning is an important key to avoiding downtimes. Using several important tools, JUKI's software promotes smooth preparation.

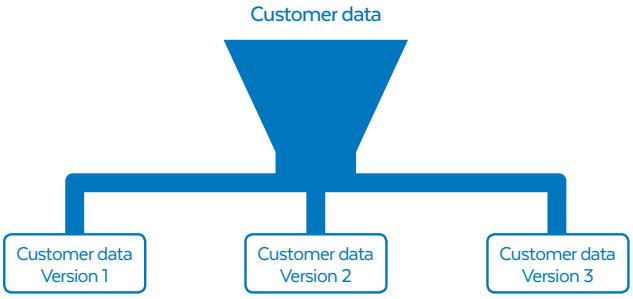
EASY PROGRAMMING AND INTELLIGENT OPTIMISATION

JUKI's software converts coordinate data into machine programmes at the click of a mouse. The required programming effort is low, and incorporated changes can easily be transferred to other programmes. Thanks to the optimised material positions, even large batch sizes can be produced in fast cycle times. Furthermore, reference can be made to existing setups in order to accelerate quick changeovers. Related and different products can ideally be combined in one setup. Where required, fixed setups can also be defined and used.

C: PRODUCTION PLANNING

DATA PREPARATION

The data for the required programme creation are available in different formats and can be converted to match the respective line layout. Thanks to the converter programmes, CSV, TXT and several CAD files as well as machine files etc. are easily and quickly changed into the matching format.



USER-GUIDED SETUPS, WIP MONITORING AND WIP REDUCTION

Where non-intelligent storage systems are concerned, it is usually easier for operators to take new component reels from the warehouse instead of searching for an existing reel in the production area. However, this leads to increased work in progress (WIP).

The JUKI Software Solution ideally supports operators during the setup process and/or when providing material for the setup process. Even feeder trolleys that are not reserved for production are connected to JUKI'S intelligent software. Thus, the exact location of the required material is always known.

First, operators will see which feeder trolley provides the largest amount of the needed material. After that, the software displays where exactly further required WIP can be found and what materials are still to be extracted. While the material is being extracted automatically, the feeder trolley with the existing material can be prepared. This drastically reduces both the setup preparation time and WIP.

C: PRODUCTION PLANNING

FIRST IN – FIRST OUT

The first in, first out method ensures that expired materials will not be used for production, which could otherwise lead to quality problems. Thanks to the unique ID assigned to each material by the JUKI Software, each material can be located regardless of its location. As well as the automatic warehouse, the JUKI Software also monitors the production lines, the setup locations and the feeder trolley spaces. Thus, it is impossible that newer goods are used accidentally. Quality problems, WIP and costs are reduced.

D: PRODUCTION

During production, software features are getting more important. Processes are to be monitored and interlinked. Besides, data must be collected for the tracing of goods or for quality monitoring and planning control. The JUKI Software Solution offers many features for tackling these challenges.

CONNECTION OF STENCIL AND CLOSED-LOOP SPI PRINTERS

Screen printing is an essential process in SMD production. According to studies, most quality problems can be traced back to stencil printing. That is why it is important to use software that monitors, locks and finally saves the relevant parameters for traceability purposes.

The JUKI Software Solution ensures that the machine programme, the squeegee, the stencil and the solder paste fits with the defaults of a current product. If operators accidentally use the wrong material or forget a verification process, production will not start. This solution helps avoid many quality problems and minimise costs. During the printer's setup process, operators receive instructions by the software, which promotes both the acceptance of the system and motivation to use it.

The stored parameters will also be saved for material traceability. Apart from that, the most important process parameters – squeegee pressure and squeegee speed – and all further relevant parameters will be documented for each product. Screen printers can be combined with an SPI (Solder Paste Inspection System) from JUKI. With highest precision and the 3D resolution required for this purpose, the SPI (Solder Paste Inspection System) monitors the print result for every single pad. Thanks to the closed-loop connection, the result obtained for quality improvement can directly affect the screen printer by stopping the process. Furthermore, incorrect printing positions can be automatically adjusted, while increasing dirtiness is prevented by additional, automatic cleaning.

D: PRODUCTION

FEEDER SETUP CONTROL

Even though the setup has already been optimally prepared, there is still the risk of material being relocated, exchanged or removed afterwards. The JUKI Software Solution monitors all component feeders in their positions so that any changes are detected immediately when production begins. Production will not start until the correct setup has been restored. Moreover, it is impossible to load wrong material during production, to mix up feeder trolleys or to use blocked material (e.g. when the shelf life of MSDs has expired).

CLUSTER SETUP AND CHAOTIC SETUP

The JUKI Software Solution offers many possibilities for customising the production of SMD lines. Apart from setting the ideal and fastest cycle time for a product (individual optimisation), several setups/products can be combined into one setup (cluster setup). While minimising changeover times, it is nevertheless possible to achieve high component placement rates for individual products. Cluster setups are mainly recommended for related products (variants) or individual products in low quantities in order to minimise downtimes.

Furthermore, the software also allows for chaotic setups. Required material can be randomly prepared on the feeder trolleys. The respective position will then be used for placement. Since ideal cycle time reductions are often impossible, chaotic setups are mainly suitable for situations where few additional materials are needed at short notice for unplanned variants. However, chaotic setups can also be used when the cycle time does not play any role, e.g. when producing samples.

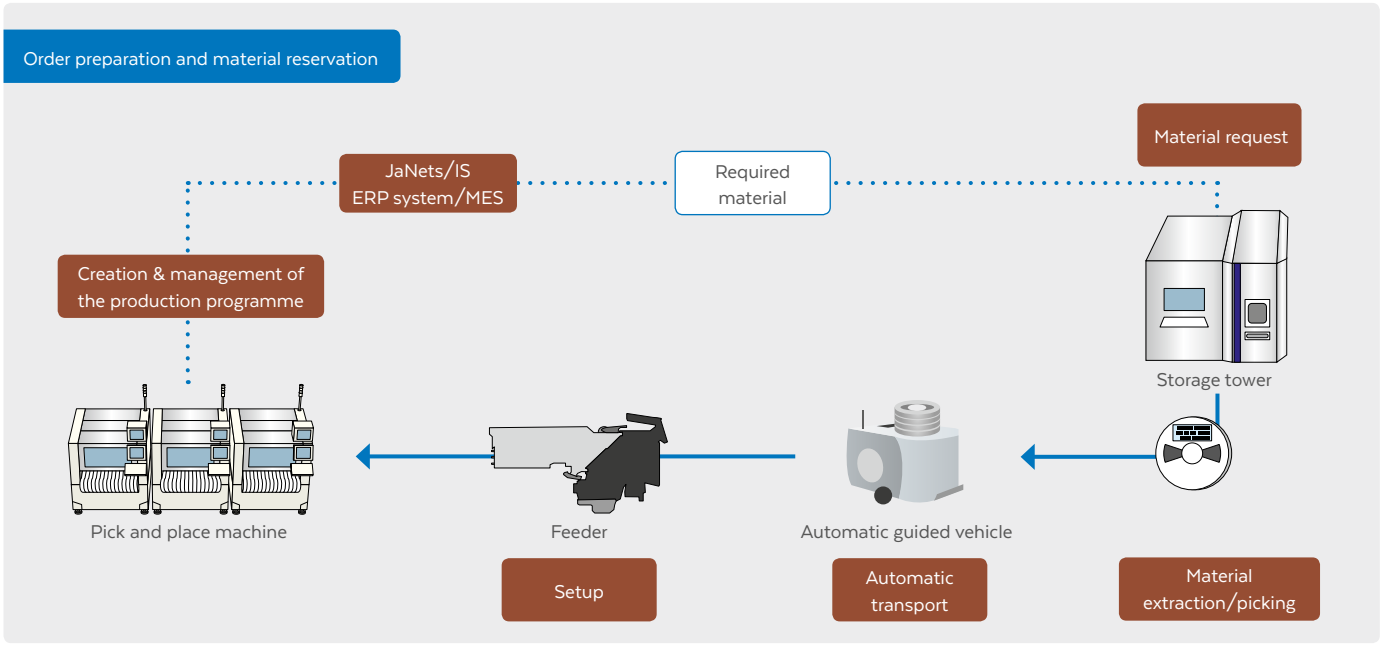
The JUKI Software Solution also offers further setup optimisation features.

INVENTORY RECONCILIATION AND AUTOMATIC MATERIAL REQUEST

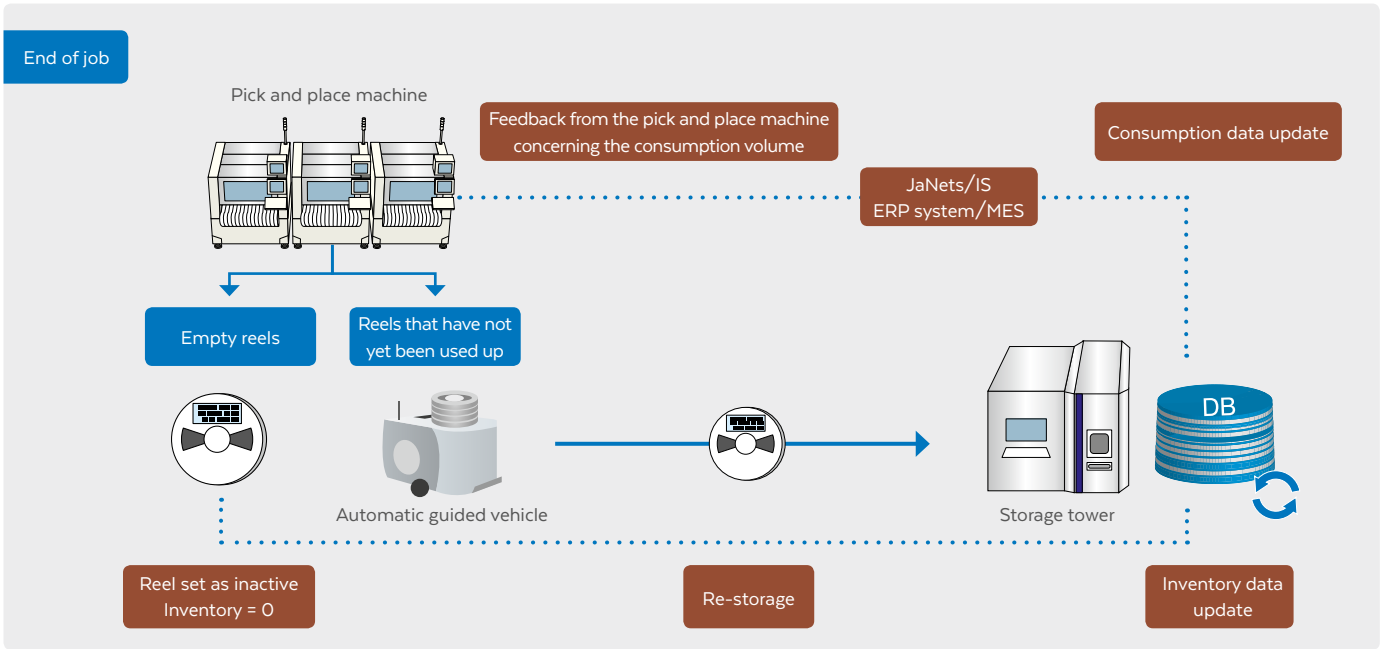
Using the JUKI Software Solution, your material inventories are always kept up to date. In terms of material monitoring, each component pick-up is counted in each set-up location of the placement machines, even when a defective component is being discarded. After a PCB has been completely equipped with components, the respective inventories are updated on the JUKI server. This information can be processed at predefined intervals either immediately or at any other desired point in time (e.g. ERP system/MES). If the minimum stock level has been reached in a certain location of the machine, this information can be visualised so that operators can prepare the requisite material in due time. When combined with JUKI storage systems, the material can also be directly and automatically extracted in order to minimise the required time even further.

D: PRODUCTION

FEEDER SETUP WITH STORAGE SYSTEM



POST-PRODUCTION STORAGE OF REMAINING MATERIAL



D: PRODUCTION

MSD CONTROL – CONTROL FOR MOISTURE SENSITIVE DEVICES

Moisture sensitive devices can be monitored according to their classes. As soon as the vacuum packaging has been removed and the component is set up for the first time, the processing time will be tracked. When the component is re-stored in a JUKI storage system with dryer option, the remaining processing time will stop. Compliance with the defined humidity inside the storage system is reliably monitored. Should this not be the case, the time will be counted down again and an error message will be issued. Expired material will be blocked for production. A corresponding tempering process can be straightforwardly communicated to the system.

LED BINNING CONTROL – LED LUMINANCE CLASS CONTROL

Where LEDs are concerned, the JUKI Software Solution also offers comprehensive features for the processing of sorted luminance classes.

In terms of production planning, a luminance class and its series resistors can be combined into a kit and reserved for a certain order. The placement programme adjusts this reservation automatically (different series resistors). Thus, operators are kept from accidentally using a wrong luminance class or a wrong series resistor. Production will be blocked when intending to use a non-reserved LED.

Luminance class changeover monitoring is possible as well. It is monitored whether or not the remainder of a luminance class will last for the entire PCB. Where the quantity is insufficient, the machine will automatically stop production so that the changeover can take place and the PCB will be completed with unmixed luminance classes.

KITTING CONTROL – ORDER RESERVATION CONTROL

Using the JUKI Kitting Control, material can be reserved for certain orders. Thus, it is impossible to accidentally use and consume material provided by the customer, and also your own material, for other orders.

REFLOW OVEN CONNECTION

During the soldering process, the JUKI Software Solution can monitor the selection of the correct solder profile. When selecting a wrong profile, no PCB will be loaded into the reflow oven. Since this solution helps prevent many quality problems right at the beginning, it also avoids costs. When setting up the oven, operators will be instructed by the software, which promotes both the acceptance of the system and motivation to use it.

LINE SOLUTION

The Line Solution does not offer only the individual solutions described, but it also combines them and interlinks them with other systems. The JUKI Software Solution offers many features for exchanging, using or processing the data obtained. These include the connection to existing ERP systems/MES or other software solutions as well as the modular design of the JUKI Software. Modular expansion can thus be achieved with step-by-step efficiency increase.

E: FINAL ASSEMBLY

Using the JUKI Software Solution, it is also possible to include reasonable measures for the final assembly.

INTEGRATION INTO THE DATA NETWORK

The final assembly data that are needed for material traceability can also be integrated to the server, which allows for central data management. This is vital, for example, where material-related data including batch information and further defined parameters are concerned. Here, performance of the first in, first out process can also be guaranteed. Apart from many other features, it is also possible to transfer and store related test results. The possibilities will be discussed individually with each customer, since the requirements for each product and the production steps are very different.

MATERIAL CONTROL

Using the JUKI Software Solution, the material used for the final assembly can be managed and controlled in the storage management. Inventories can be automatically updated in the ERP system/MES, for example to make sure that goods are reordered in nearly real-time. Thus, the FIFO process is ensured, while at the same time reducing inventories, optimising routes and saving costs.

F: QUALITY MANAGEMENT

Using the JUKI Software Solution, you will raise your production quality to a very high level. This includes both the classic product quality and error prevention support. It is not possible to install wrong or expired materials, load wrong programmes or use wrong tools. Many different JUKI software features support our customers in the areas of quality improvement and cost reduction.

TRACEABILITY AND REPORTING

Different monitoring and reporting processes are required to ensure material traceability. The JUKI Software Solution offers full traceability. Every single step in electronics manufacturing is documented – from the moment the goods arrive to the minute they are delivered. In the event that an end customer has a question concerning a defective device, all data can be checked completely. When a defective part of a component reel is concerned, for example, the following points can be reviewed:

- Point in time at which the reel was registered as an incoming good
- Exact component reel from which the part was taken (including a picture and the manufacturer‘s label)
- Point in time at which it was set-up for the machine
- Point in time at which the screen printing has been done, the stencil, paste, squeegee and printing parameters used
- SPI result for the component‘s pads
- Point in time at which the defective component was placed on the PCB, exact machine set-up location and the placement head used
- Point in time at which the soldering process took place / soldering programme and all important soldering parameters
- Final inspection result of the AOI
- Points in time at which further processing took place

For sure you can also check where the other parts of the component reel have been installed. A large number of different reports can be created.

F: QUALITY MANAGEMENT

ERROR PREVENTION, USER CONTROL AND DOCUMENTATION

Operators working in production are guided by the JUKI Software in such a way that they can set up or add material quickly and correctly. It is ensured that the correct material is located in the correct position and that the rules of first in, first out are ensured. In the event of errors, production will be blocked accordingly. Apart from that, storage processes and extractions from stock, setup and unloading processes, storage locations, automatic and manual inventory corrections as well as production lot times and machine data are exactly documented. When and where the respective material was used can also be tracked.

MAINTENANCE SUPPORT

The JUKI Software Solution allows you to monitor the feeder modules and plan the related maintenance works in order to keep the component pick-up rates at a continuously high level. In addition, you make sure that only frequently used modules will be maintained. Furthermore, the machines offer many self-check features with corresponding reactions. These, too, ensure continuously high production quality.

PRODUCTION ANALYSIS

The JUKI Software Solution also meets the requirement of being able to analyse an increasing number of different production data. These include all important assessments with regard to material traceability, all current inventory data, quality data of the respective machines as well as the production line's OEE data. Besides, you have the possibility to transfer the data to your customers' ERP systems/MES or to other software solutions, thus being able to make the respective analyses and decisions in this area, too. This is a key element on your way towards Industry 4.0.

G: OUTGOING GOODS

Finished goods that are ready to be delivered should be correctly posted to the warehouse. It should be clear what was produced and when, how and where this took place so that you are able to act anytime, but not required, to react. Many features of the JUKI Software support you in the fields of efficiency improvement and cost reduction.

AUTOMATIC BOOKING AND DATA EXPORT

Products that are interlinked with the JUKI Software Solution can be promptly and automatically booked into your customers' ERP systems/MES by means of data export. Depending on the possibilities offered by the existing systems, different, flexible interfaces are available. This applies to the respective production steps integrated by JUKI. It is possible, for example, to book the exact quantities of the material used for each completed PCB and to update the inventories accordingly. However, this can also be done after a production lot has been completed or after the end of a shift. The feature also works for final testing or during the packaging process.

09/2018_Rev01

European Headquarters:
JUKI Automation Systems GmbH
Neuburger Str. 41, 90451 Nuremberg, Germany

phone: +49 911 93 62 66 0
fax: +49 911 93 62 66 26
email: info@juki-smt.com

JUKI

www.juki-smt.com