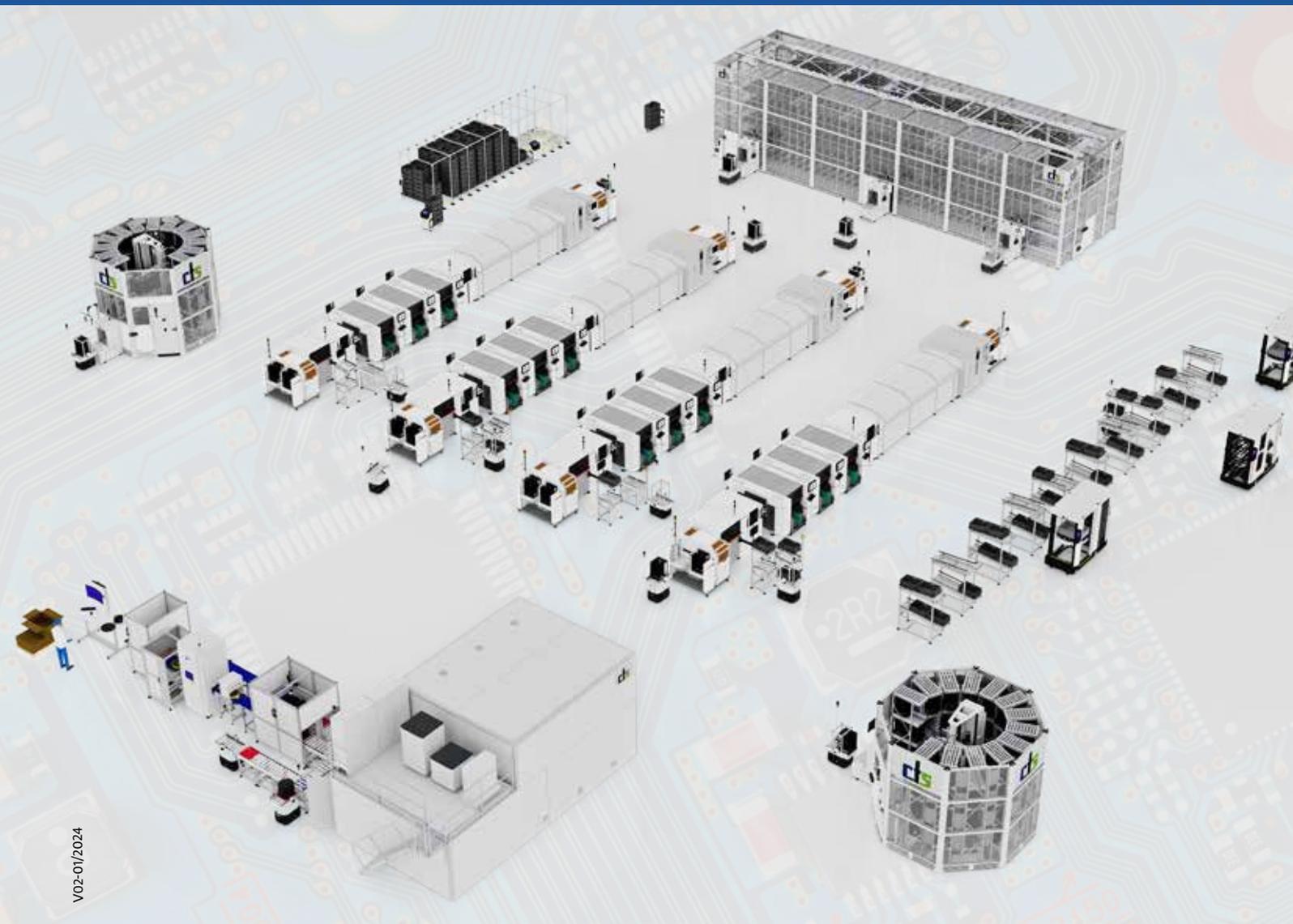# SMART ELECTRONIC FACTORY

With our solutions to the lived Industry 4.0

Efficient. Flexible. Just-in-time.

The challenges for the electronics industry are constantly growing!

How can these be overcome?

We at cts are experts in smart intralogistics and support our customers in the transformation to a smart factory!

From goods receipt with complete reel recording and storage in the Gigaflex Storage Center to buffering of the PCB magazines in the cts Smart Warehouse and Mini Smart Warehouse. Our storage solutions are an intelligent, modular and highly effective way to store component reels and PCB magazines. By significantly reducing shopfloor occupancy, these allow you to save valuable floor space on the production floor!

Automatic supply of storage solutions and equipment using AMRs of various sizes and payloads provides a flexible, reliable and traceable solution and optimizes your material flow. The customized mini buffer solutions (cts transferstations) reliably compensate for small asynchronies in the production flow.

The use of different AMRs, partly from several manufacturers, is easily possible through our middleware sloXis®. sloXis® combines all elements of a modern industrial plant: Starting with AMRs from different manufacturers with different functionalities, small buffers up to the smart warehouse. The software is the central interface to the MES/ERP.

From our Mularis Ecosystem we also offer a Material Management System (MMS) for the goods on the shopfloor - whether in stations, warehouses or shelves.

In combination with the Material Flow Controller (MFC), the materials are then distributed fully automatically coordinated based on the MES detailed planning records.

Mini Smart Warehouse

Smart Warehouse

Mobile Robots

Handover Stations

Reel-Storage
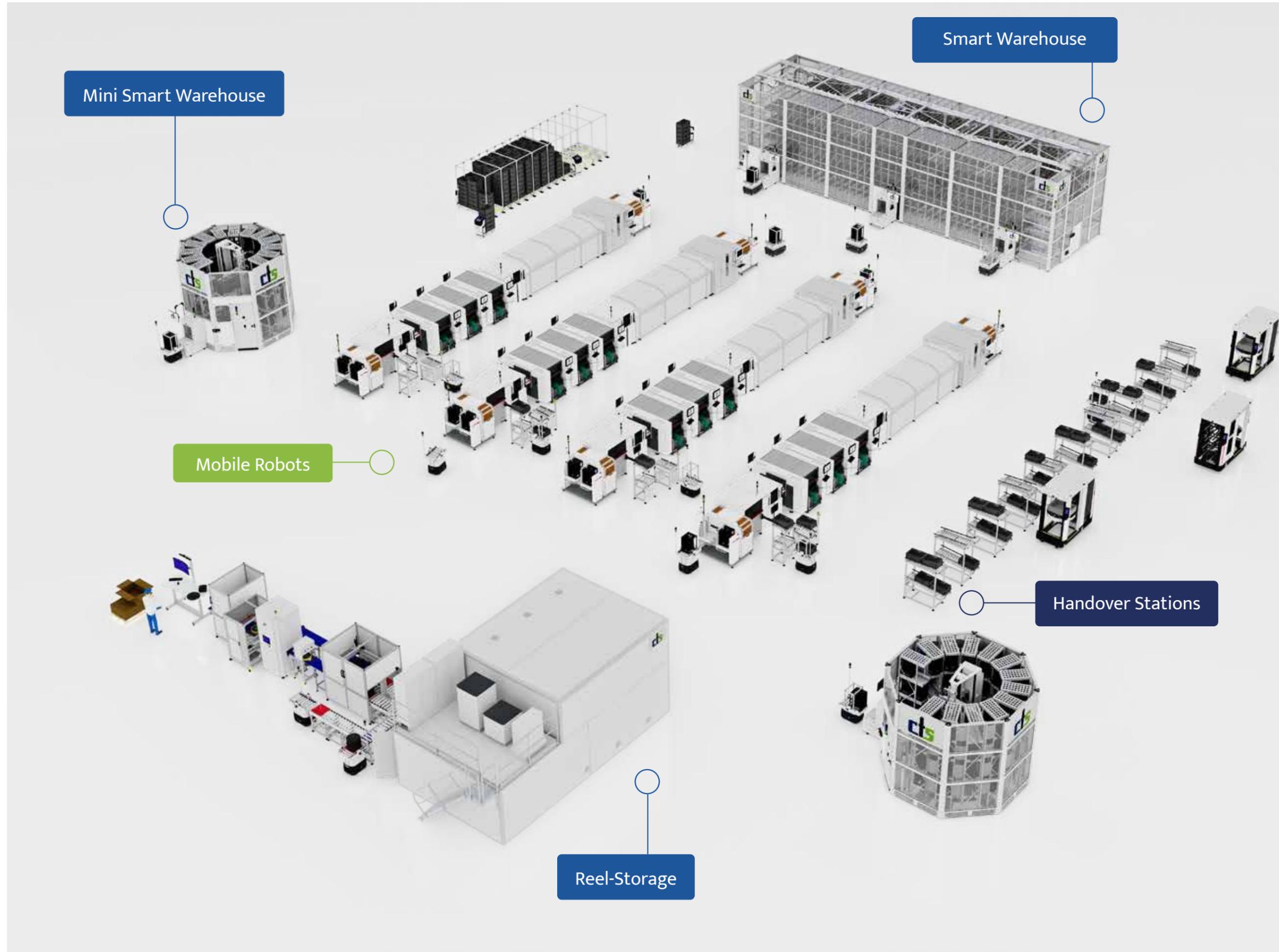
cts Smart Warehouse and Mini Smart Warehouse

The requirements in terms of flexibility and product variance are constantly increasing, more demanding material flows require powerful and innovative solutions!

The requirements in terms of flexibility and product variance are constantly increasing, more demanding material flows require powerful and innovative solutions! For efficient production, it is crucial that the required goods are stored in a space-saving manner and close to production. Our Smart Warehouse systems are an intelligent, modular and highly effective way of doing this. At the core of the warehouse moves an innovative, space-saving gripping system. This ensures effective storage and retrieval. With our Smart Warehouse solutions you have the possibility to store magazines, FOSBs, trays or KLTs, traceable and fully automatically deliverable by means of AMR.

By significantly reducing shopfloor occupancy, valuable space can be saved in the production area. The storage capacities of the Smart Warehouse range from 400 to 1100 PCB magazines with a footprint of 8.5m/4.2m/4.4m to 17.8m/4.2m/4.4m. The size of the Smart Warehouse can be customized to meet your needs.

Modularity and space savings at the in/out storage ports
The in/out storage ports can be placed at different positions on a side. A port requires only one shelf space. During storage, PCB magazines are identified and optionally matched with customer master data. During retrieval, this information can be cross-checked again.

Mini-Smart-Warehouse
The cts Mini-Smart-Warehouse closes the gap to its established big brother. It is aimed at companies with a storage requirement of <300 magazines. With two basic footprints of 4.2m,x4.2m as well as 4.8mx4.8m, it is an efficient and space-saving solution that can fit in almost any production facility. Thanks to flexible heights, the available installation space can be used perfectly. The Mini-Smart-Warehouse is also suitable for decentralized storage solutions.

Options for expanding the Mini-Smart-Warehouse
The Mini-Smart-Warehouse can be expanded by another Mini Warehouse at any time. In terms of construction, this is possible on almost any side. By means of a connection port, any number of warehouses can be linked together. The warehouse solution adapts flexibly to your production!

The processes, software and handling are identical to the large Smart Warehouse.

Our warehouse solutions for the perfect combination with AMR systems
The storage/retrieval ports have a software interface for AMR. Thus, there is the possibility of a complete automation of the material flow. We accompany you on the way to the Smart Factory and advise you on further possibilities to optimize your production.

The advantages at a glance:

• Intelligent, modular and highly effective

• Significant reduction of shopfloor occupancy due to high storage density

• Automatic loading/unloading by AMR

• Individual adaptations possible

• ISO6- variant for FOSB storage (Mini-Warehouse)

• ISO7 variant for FOSB storage

Autonomous Mobile Robots (AMR/AGV) in Production

AMRs of different sizes and payloads increase productivity in production and logistics processes while reducing error rates and improving material traceability.

Due to our very broad knowledge in the field of "Autonomous Mobile Robots" (AMR) we are able to develop an individual solution for each customer. cts offers you the know-how for a successful and trouble-free integration into new and existing production environments.

The modern industrial robots can be used in almost all industries. Completely according to your individual wishes, requirements and application areas.

We work with the following AMR base manufacturers:

- Omron (We are Omron Solution Partner)
- MiR
- AGILOX (ONE and ODM)
- Magazino (SOTO)

The suitable cts software components
Thanks to our cts middleware sloXis®, the individual elements (AMRs, machines, storage locations ...) can be easily and quickly connected and clearly displayed. So you always have an overview of your production.

In addition, with our cts MMS, we offer software for managing your material on the shopfloor - whether in manual racks, floor roller conveyors or intelligent warehouses, as well as fully automatic distribution with the MFC.

Different payloads, different transport options
We have AMRs for different payloads in our program. The fully automatic transport of KLTs, magazines up to pallets is possible without any problems.

The advantages at a glance:

- Increased productivity in production and logistics processes
- Reduction of the error rate
- Improved material traceability
- Individual adaptations through multifunctional design variants
- Immediately usable, no structural measures necessary for the orientation of the AMRs

Magazine transport:
The automatic supply and disposal of SMT production lines with PCB magazines is a typical application for the use of autonomous mobile robots. Our RGMZ series is perfectly adapted to this and in combination with automatic supply from the cts Smart Warehouse (or your own central or distributed storage system) to/from the production lines/buffers you get a clear competitive advantage.

KLT-Transport:
Distribution from a picking or Kanban warehouse to the assembly line or pre-assembly station is demanding due to space constraints. With current AMR technologies, sharing of confined space between humans and robots is much more feasible than with classic AGV concepts. Our RG, HVSRG, RG2S, RG-TLM model series offer a wide range of transport automation options, from classic frontal conveying to automatic height-adjustable transfers to lateral transfers as well as simultaneous transfers on 2 levels.

Small load carrier transportation:
The AGILOX ODM omnidirectional dolly mover was designed for the intelligent transportation of small load carriers. The compact vehicle moves autonomously and navigates freely in the production area or warehouse, guaranteeing a flawless internal material flow. The AGILOX ODM can pick up dollies with a maximum weight of 300 kg to a maximum lifting height of 250 mm and transport them to their destination.

Pallet transport:
Pallet transportation has long been an automated process. This often takes place in closed, classic warehouse environments. In production environments, especially in mixed traffic with other participants, AGVs reach their limits. The AGILOX ONE is highly flexible and suitable for dynamic environments with different road users. The AGILOX ONE can be equipped with different fork lengths, making pallet transportation even more flexible.

Supply Chain-Roboter SOTO:
With the Supply Chain Robot SOTO we expand our AMR range for even more transport capacity! The SOTO brings materials just-in-time and completely autonomously to the assembly line and reacts flexibly to a changing demand. The SOTO can completely replace or interact with picking trucks or tugger trains. The SOTO transports different KLT sizes and weights and is operational for up to 20 hours a day. It can be flexibly configured, relieves employees and works together with machines, vehicles and workers.

Our mini buffers: : the cts transferstations

Despite innovative technology solutions, unexpected delays can occur again and again at production plants, which make it necessary to buffer again directly at the production line.

Partly the processes themselves require a new, minimal buffering directly at the line. cts offers so-called mini buffers, which are also called transfer stations. These are available in different designs and serve as a short-term intermediate storage area directly at the lines.

We accompany you through the entire project process

1. Consulting phase
Technology introduction AMR
Advantages/Disadvantages
Recommendations for introduction

2. Identification
Use cases/application definition
Suitable vehicle types, fleet size
IT infrastructure, machine connection
Budgeting

3. Offer
Individual offer elaboration
Clear solution description

4. Project implementation
Careful implementation
Regular coordination

5. Delivery
Test and delivery release
Delivery

6. Commissioning
Installation
Commissioning
Instruction

7. After Sales
Maintenance
Support and spare parts packages

SMT-Reel storage – the Gigaflex Reel-Storage Center

The Gigaflex Storage Center is the material, logistics and order picking center for all SMT component reels in electronics manufacturing. It offers an enormous storage volume in the smallest possible space: more than 50.000 7" reels can be stored on a floor area of approx. 50 m². Of course with full transparency and traceability!

Intelligent picking and Material supply
Intelligent, automatic picking, which is directly linked to the Enterprise Resource Planning System, the SMT lines and, if necessary, other systems, makes it possible to provide the material just-in-time. The material requirements of the production lines can also be processed automatically and without manual handling via AMR fleets.

The Gigaflex Storage Center consists of a complete climate zone with a relative humidity of <5ºrH to enable the storage of MSL critical reels. Therefore it provides a fully integrated MSL material handling system.

Thermal treatment processes can be fully integrated
In addition to the standard climate zone, dedicated zones for the re-drying process can be integrated in the Gigaflex Storage Center without additional air conditioning of the total volume - efficient and energy-saving!

The advantages at a glance:

- Highest storage packing density
- Intelligent picking
- Warehouse management and inventory system
- Automated material supply
- Integration of different climate zones possible
- Flexible expansion concept
- Integration of ERP/MES systems possible without any problems

sloXis® Middleware

Production processes in industry must become increasingly flexible and efficient. To achieve this, AMRs of various weights and designs are used and take over the internal flow of materials.

Robots from different manufacturers often have to work together. The problem here is that each manufacturer has its own non-standardized master control software or fleet management. These are not compatible with each other, and direct cooperation between AMRs is not possible. In addition, ideally all machines and robots should be bundled in one software, so that the MES/ERP systems have only one point of contact.

Our intelligent data hub between AMRs, fleet managers, production machines, MES and ERP

Our cross-platform middleware sloXis® combines all elements, starting with the AMRs of different manufacturers with different functionality, via small buffers up to the Smart Warehouse. The software is openly designed to be able to connect and integrate further participants in the best possible way while forming the central interface to the MES/ERP.

Via native interfaces to different manufacturers as well as core functions of the open VDA5050 standard, the middleware combines various AMR from different manufacturers in a heterogeneous fleet. The integration of conventional floor conveyors, production machines, fire alarm systems, peripheral devices is possible without any problems.

Take control of your goods distribution into your own hands

With SmartSignalManager in sloXis, you can configure your automatic material flow between manufacturing processes on a graphical, web-based interface.

Reporting and dashboard functions

You have the current running and planned orders always and everywhere in view. The sloXis reporting and dashboard functions show you optimization potentials and increase the efficiency of your intralogistics. You also have access to all transport processes for evaluation and tracking.

Everything in view with the "Universal Map"

The "Universal Map" is a virtual map of your production environment. Not only does it give you an overview of all transport robots and other road users, it also provides you with all relevant data on your machines and equipment in real time with just one click.

Safety in case of fire:

In order to define fire protection zones and escape zones of the AMRs individually for your production, sloXis® connects to the fire alarm system. In case of fire, the AMRs are directed via the universal map.

cts Material-Flow-Controller (MFC)

The cts MFC is used for MES detailed planning with regard to intralogistics processes. Based on the detailed planning records and in conjunction with the cts MMS and cts WMS as well as the sloXis® middleware, the MFC orchestrates the material flow in production.

With forecast calculations and exception handling scenarios, the MFC optimizes the intralogistics process flow in production.

One of the key elements is the connection to the hardware and software systems of the store floor, such as:

- MES as master system
- Small intermediate buffer stations, only equipped with a PLC (no WMS)
- Automatic storage systems with WMS
- AMRs & AGVs through sloXis® middleware
- Manual buffers managed by MMS
- Shopfloor loading/unloading devices as process sources and devices that identify the load carriers

How does the MFC work?

The MES creates the detailed planning log. This includes the sequence of process steps including dependency on the previous steps, expected time to complete a process step, basic information such as product name, product number, number of carriers, number of products. This MES data must be translated into a master data record that can be processed by the MFC Executioner.

Master data configuration: Definition of environment, machines, interfaces

Which machines are connected to which interfaces? Which data is queried/must be sent? Correlation of device names to MES names, correlation of devices to AMR destinations and route.

Configuration of process execution in the NoCode/LowCode environment

Process execution, exception handling, transport order fulfillment, callback information to MES alerting, notification

Configure dashboards and specific HMI sites in the NoCode/LowCode environment

Creating and configuring dashboards, information sites and operation sites

Process execution

When a carrier is identified, the system checks whether a data record already exists in MFC. If none exists, the MES is prompted to send the execution data record for the transmitted carrier ID. If available, MFC checks the current process step and the next process step according to the data record.