

# Leading Software Solutions for Wire Harness Production



4Wire EAS  
Extended Assembly System

# 4Wire EAS - Extended Assembly System

## Control of Complex Assembly Processes

### 4Wire EAS

The production areas after the cutting area are moving more and more into focus. The manufacturers of wire harnesses need more efficiency, improved quality assurance and more transparency in these areas.

4Wire EAS delivers all of this. With EAS, complex products, right up to complete wire harnesses and the associated production plans, can be described. EAS controls production and documents all work steps. Processing standards ensure that uniform procedures and parameters are used. Quality and test plans ensure a high-quality standard.

When 4Wire EAS is used together with 4Wire CAO, the two systems together enable complete documentation of production and comprehensive traceability.

### Customizability

Many elements that are the foundation of the basic system framework can be defined and reconfigured, enabling for a quick and convenient response to changing requirements.

### Material

Any material can be represented in EAS with its appropriate master data information. Both defining the required material types and their properties is part of the system or customization concept.

This approach yields several benefits, e.g. it enables for responding to new manufacturing requirements quickly. It also helps to ensure process and data integrity by utilizing defined data types for specific material properties (wire cross section areas, colors, etc.).

### Processes

Processes are the most fundamental elements within EAS. They can be defined freely by naming them, but each process definition can also contain its own specific description of the element constellation allowed.

Order	State	Processes	Sequence	Setup required	Planned time (min)	Predicted start date	Target date
Workplace: BT188T_001							
Workplace: CST_001							
KB-SW_W_FLY_2,00 mm²_650mm.9	New	Crimp, Cut, Strip	1		4.4	10/21/2021, 2:28 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.12	New	Crimp, Cut, Strip	6		4.4	10/21/2021, 2:48 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.8	New	Crimp, Cut, Strip	4		4.4	10/21/2021, 2:39 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.7	New	Crimp, Cut, Strip	5		4.4	10/21/2021, 2:44 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.12	New	Crimp, Cut, Strip	6		4.4	10/21/2021, 2:48 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.11	New	Crimp, Cut, Strip	7		4.4	10/21/2021, 2:52 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.10	New	Crimp, Cut, Strip	8		4.4	10/21/2021, 2:57 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.5	New	Crimp, Cut, Strip	9		4.4	10/21/2021, 3:01 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.4	New	Crimp, Cut, Strip	10		4.4	10/21/2021, 3:06 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.3	New	Crimp, Cut, Strip	11		4.4	10/21/2021, 3:10 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.2	New	Crimp, Cut, Strip	12		4.4	10/21/2021, 3:14 PM	9/16/2021, 1:19 PM
KB-SW_W_FLY_2,00 mm²_650mm.1	New	Crimp, Cut, Strip	13		4.4	10/21/2021, 3:19 PM	9/16/2021, 1:19 PM
Workplace: Formboard 01							
Workplace: Formboard 02							

4Wire EAS sequencing

EAS uses the defined processes to control:

- The provision of process related data (and QA activities) for each production plan
- The validation of the content of each production plan
- The capabilities of each equipment instance (e.g. machines)

### Articles

Articles being produced in cutting area have a relatively simple structure. In subsequent production areas (“P2”, “P3”) articles become more complex. They continue processing of previously produced articles, creating modules up to complete wire harnesses. In EAS articles of these different levels of complexity and their hierarchies can be described in detail.

Information on articles manufactured with CAO gets transferred to EAS, where they can be used as a structured input material for further articles.

### Production Plans

In EAS articles define what is being produced, but the information on how to produce it is in the production plans. There can be multiple production plans for each article to represent manufacturing variants.

Each production plan consists of a “Bill of material” and a list of “Work steps”. Work steps represent one or several “Process steps” that are carried out as a consistent sequence on the same workplace. Each of these process steps can reference all involved BoM elements, including elements inside their substructure and will hold additional, process related data.

### Process Related Data

There are currently two types of information that process steps can be provided with, mostly differing in their context of definition and scope.

“Processing standards” are depending on a certain constellation of used material/components. Consequently, processing standards can be applied automatically by evaluating a process step.

“Processing instructions” represent information that are specific to the production plan/article and must be provided explicitly when defining the article definition.

### Production Quality

EAS offers the possibility to define QA activities (measurements), that will be requested to be carried out at certain times during the manufacturing workflow. Measurements can either be linked to process related data (which leads to an automatic assignment) or defined freely.

## Equipment

Any type of equipment can be represented in EAS. Using categories such as tools, machines or benches, EAS enables to describe equipment on the different "hierarchy levels" of a workplace in detail.

That enables for a very flexible definition of different manufacturing environments, always adapted to the appropriate degree of detail. Each equipment entity can be enriched with detailed constraints that could reflect technical limitations as well as organizational aspects.

## Traceability

Both product and process traceability is supported by EAS. That means the composition of each produced article can always be traced, selected additional process related data can be persisted together with the product traceability model.

## Product Traceability

EAS supports product traceability across all levels of production. Components can be traced for each assembly up to the final product down to raw material.

Depending on the available information in the production workflow (e.g. providing lot information on raw materials, splitting production units on resupply, etc.), different levels of traceability details can be displayed.

## Process Traceability

While component genealogy is always being traced, process information is considered an optional, configurable part of the traceability model. Information that can be persisted are the processes themselves, used equipment, process related data, detailed time stamps, etc.

## Connectivity

EAS is intended to deal with a major challenge for a system operating in the preassembly area, which is the requirement to connect to a variety of different devices. For facilitating these integration scenarios, EAS provides generic, easy to use interfacing services.

## Native Vendor Interfaces

Most devices delivered by commonly established vendors come with dedicated interface connectivity. EAS supports these native interfaces to ensure optimal utilization of the equipment capabilities.

## General Device Interfaces

Especially in the P2 area, there are devices that are not covered. These could be devices from smaller vendors or custom-built equipment, providing different interfacing solutions or no integrated connectivity at all (only achievable by additional augmentation). EAS provides a foundation to connect these devices for the most important use cases by exposing general connectivity options.

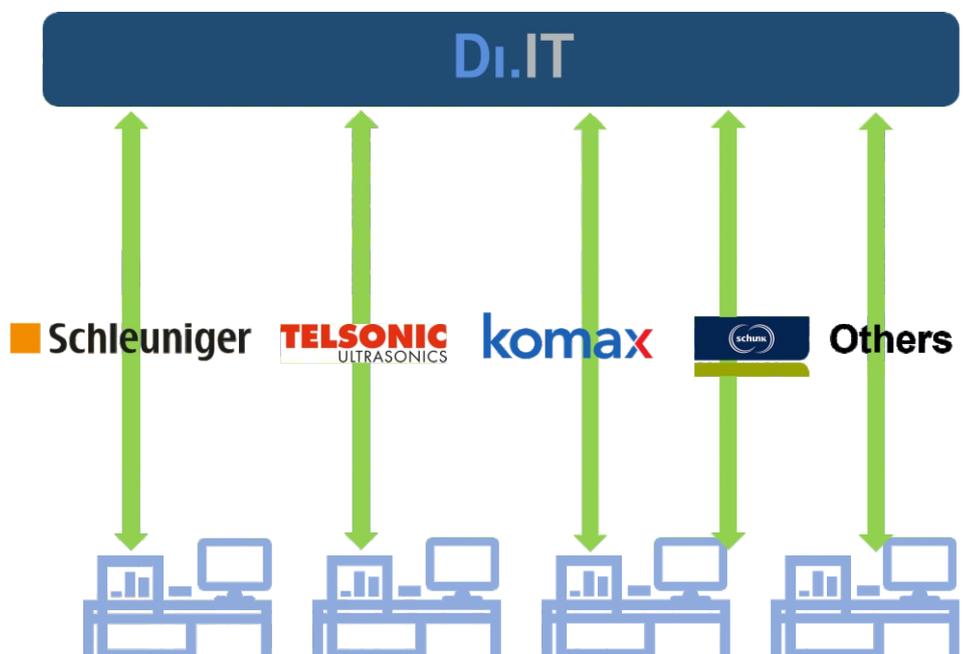
## System Requirements

EAS runs as services (separated by "Office" and "ShopFloor" applications), and can be operated in a variety of environments (regarding operating system, database etc.).

The EAS clients are provided as web interfaces, so any device able to run a modern (chromium based) browser can be used as a display device, e.g. budget-priced tablets at workplaces in the shop floor area.

The screenshot displays the Di.IT software interface. At the top, it shows the user 'max.mustermann' and the job 'BT1887\_001'. The main area is titled '0\_6753977.8 / 20' and 'Twist\_P2\_3Wires\_SpotTape\_SubArticles'. It features a 'Process steps (3)' section with detailed parameters for 'TwistMulti' and 'Twist Wires', including values for 'TwistedWireLength', 'TwistedWirePitchLength', and 'TwistedWireOpenEndA'. To the right, there is a 3D wire diagram showing four wires (red, green, black, and blue) with dimensions like 135, 1500, and 80. The bottom of the interface includes a 'Batch 3' status bar with '6 → 10' units, '5' good units, and '1' bad unit, along with buttons for 'Refill', 'Sample', 'Finish Batch', and 'Summary'.

4Wire EAS shopfloor production



## Complementary Systems

### 4Wire CAO Cutting and Assembly Optimization

The software solution 4Wire CAO is the leading manufacturing execution system for the cutting area and assembly. It is the only system, that is used worldwide and supports all languages.

The system has interfaces to machines from Schleuniger, Artos, Komax, Shin-Maywa, Schäfer, Yazaki and others, that are continuously updated in close cooperation with the machine manufacturers. That is why 4Wire CAO has the latest and the largest scope of functions that can be regarded as a de facto standard.

The software solution 4Wire CAO is flexible, scalable and efficient and already successfully installed by many successful companies. Due to its modularity, 4Wire CAO is also beneficial for small and medium-size companies.

### 4Wire KPI Dashboard Key Performance Indicators

Reliable figures from ongoing production are an important management control tool. The data collected in the 4Wire CAO system can be calculated both as standardized and customized figures.

The 4Wire KPI Dashboard visualizes the figures and presents them extremely clear.

Key Performance Indicators (KPI) are process indicators used to measure the progress and degree of fulfillment of important objectives and critical success factors in wire harness production.

The ability to compare figures is a prerequisite for measuring plant and machines with comparable charts at group level.

## Locations

### Head Office Krailling/Munich DiIT GmbH

Justus-von-Liebig-Ring 11a  
D-82152 Krailling near Munich  
Phone +49 (0)89 - 89 32 50 - 0  
Fax +49 (0)89 - 89 32 50 - 50  
info@diit.de  
www.diit.de

### Branch Office Berlin

Am Borsigturm 33  
D-13507 Berlin  
Phone +49 (0)30 - 64 0996 - 37  
Fax +49 (0)30 - 64 0996 - 36  
sales@diit.de

### Branch Office Mexico/USA

1370-B Pullman Drive, Suite A  
TX-79936 El Paso  
Phone +1 915 856 8868  
Fax +1 915 856 7825

### Branch Office China

108, BH Center  
7755 Zhongchun Rd  
Shanghai 201101  
Phone +86 (21) 6252 6677  
Fax +86 (21) 6240 8655