

The key to achieve a modern and efficient functional test with the EMS

1 Special features of FCT, a decisive process in production

Functional Test (FCT) is an essential process for electronic contract manufacturers (EMS). It is a critical step for quality control in the factory, but its implementation implies different requirements than those of the rest of the production processes, which can be more automatic thanks to the manufacturing documentation.

In the case of the functional test, in addition to the manufacturing documentation, we must know the functionalities and technical specifications of the product and also have a procedure or test sequence that allows to verify all functions in the most robust and optimal way possible.



DigiProces manufactures products for different OEMs in several sectors and they may be at different levels of maturity within their life cycle, but they all have something in common: success in their markets, which will lead to increasing production volumes.

The scenario described affects particularly the approach to the functional test process. As the volume of manufacturing increases, it is more critical to have a strict control of the production process and trace the units manufactured. For this reason, we need functional test equipment that is capable of withstanding high

production rates (strength, durability), always giving reliable and repetitive results (calibrated instruments, stable contacting) which are also traceable.

The fact that the EMS owns a common architecture for all the test stations, which must also be truly modular to adapt to the different requirements of each product, becomes fundamental. In addition, the likely international projection of the OEM leads to an equally international approach to the test strategy, which cannot be dependent on a functional test technology specific or unique to the EMS, but technologically and geographically independent.

When in the initial productive stages, if the functional test equipment that arrives at the production plant is provided by the OEM, they usually have the genetics of a product development environment and in most cases do not meet the conditions detailed above. Typically, they will be systems ad hoc designed for a specific product and with poor documentation. They will be equipment that does not use standard instruments and that will not allow the results to be tracked.

Besides, they are usually designed to connect the product and perform tests, a situation that totally differs from what is required in the productive environment, which is to connect and disconnect to pass through the equipment a production of hundreds or thousands of units per month. This will lead to wiring breakdowns, uncertainty in the results, false failures and, ultimately, delays in the final delivery dates after resolving each situation.

On the opposite side, we find the industrial test systems, designed for high-volume productions and based on standard and calibrated instruments, easily replicable and scalable and that can be adapted in a versatile way to new products. In addition, as they are standardized systems whose operation is known in detail, it is possible to perform maintenance and solve incidents by the EMS technicians, unlike what happens with ad hoc designed equipment, which offers little capacity for action without asking the customer for support, thus slowing down the resolution of any incident.

When industrial test systems are based on an EMS standard, the requirements regarding the demands of the production environment are met, but the homogeneity of the test equipment gets more difficult when several EMS are involved.

No robust test	Industrial test	Global industrial test
Ad hoc system architecture	Architecture of the standard system for an EMS in particular	Architecture of the test system independent of the EMS and with global support
Aimed at validating a design	Aimed at verifying the hardware assembly in mass productions	Aimed at verifying the hardware assembly in mass productions
Connected by cables/connectors	Contact by needles	Contact by needles
Use of other parts of the system or equipment to verify a circuit	Use of standard instrumentation and communication systems	Use of standard instrumentation and communication systems
Verification limited to functionalities	Verification as detailed as allowed by contactability	Verification as detailed as allowed by contactability
Dependence on the system designer	Based on a standard platform independent of the product	Based on a standard platform independent of the product
Limited and non-integrated results log (if it exists)	Detailed report with traceability in databases and production statistics	Detailed report with traceability in databases and production statistics
Based on functional firmware	Based on specific firmware for test	Based on specific firmware for test



2 Modular architectures with international support

DigiProces operates the 6TL modular systems as a strategy for its test department to successfully solve all the challenges that arise from the deployment of the test equipment in the EMS.

The architectures of the test equipment based on the modular genetics of 6TL start from a **base platform** that can be equipped with the necessary instrumentation to **easily adapt to specific needs**, as well as being able to integrate a wide variety of **switching and measurement boards**. Thanks to the modular architecture, for almost any new

functionality required by the product to be tested there is a 6TL solution, which can be in the form of a standard module or function block that can be quickly integrated.

Each new OEM product that requires high volume FCT will be integrated by the DigiProces test department in a cost and time efficient way. It is only necessary to add the specific fixture, which through its standard interconnection interface transfers the contacts of a specific circuit to all the instruments through the switching cards.



At the software level, DigiProces works with **Phi6 engine by 6TL** to manage the system and with **Teststand** as a sequencer, allowing a quick implementation of the new test method. Most test procedures can be performed with standardized instruments and it is not required to create new solutions every time.

Completing the cycle, our test data management tool provides us with a remotely accessible database where the results and statistics of each product, or a specific serial number in a manufacturing batch, can be monitored.

The work of the test department at the EMS, supported by the modular standard provided by 6TL, allows highly professional solutions to be applied to the test systems while complying with all requirements to ensure the test process is not a problems source but a control point that guarantees the functionality of the product wherever it is manufactured.



3

Case study.

Guiding the OEM to achieve international deployment of test equipment in record time

Description

After the increase in the production volumes of a OEM with a significant growth, the quality control of its products began to raise special relevance. When analyzing it, it was seen that these products either did not have a test solution or only had ad hoc, non-industrial systems, and that they would cause problems when new production volumes arrived.

The challenge

The test team at DigiProces took the initiative and anticipated to try to define as far in advance as possible a test strategy based on an industrial and modular system to get reliable, robust and traceable functional test equipment.

In addition, the solution had to be replicable and scalable, since the same products and others with very similar features would be manufactured in other EMS and it was interesting to maintain an equivalent standard that would work everywhere.

Solution

Based on our model with 6TL test platforms and fixtures adapted to each product, we define a verification system that allows having a standard for different products, being scalable to new needs and perfectly replicable, with calibrated standard instruments and equivalent results in reproductions of the same system. Besides, our traceability process, which can be checked remotely, allows the customer to access the test results of their productions live.

Replicas of platforms and fixtures have been installed in several EMS worldwide, standardizing the test of all its global production and allowing the OEM a remote monitoring of its test data in all geographical locations.

