

FS-Master Tester

for IO-Link Safety

1 Introduction

The IO-Link Community developed in recent years a functional safety communication system as an extension to its successful IO-Link interface and communication system.

In the meantime an associated Test and Assessment specification is going to be finalized and the IO-Link Community is looking for technology provider companies to support the member companies with the necessary equipment for conformance testing.

Figure 1 illustrates the overall testing efforts and the areas of responsibilities. The IO-Link Community is in charge of the IO-Link Safety conformance testing up to the IO-Link Safety layer. The Fieldbus organizations (or embedded system manufacturers) are in charge of the FSCP (Functional Safety Communication Profile) conformance testing. Thus, there is independence and the IO-Link Safety testing can be used for different integrations into fieldbuses or embedded safety controller systems.

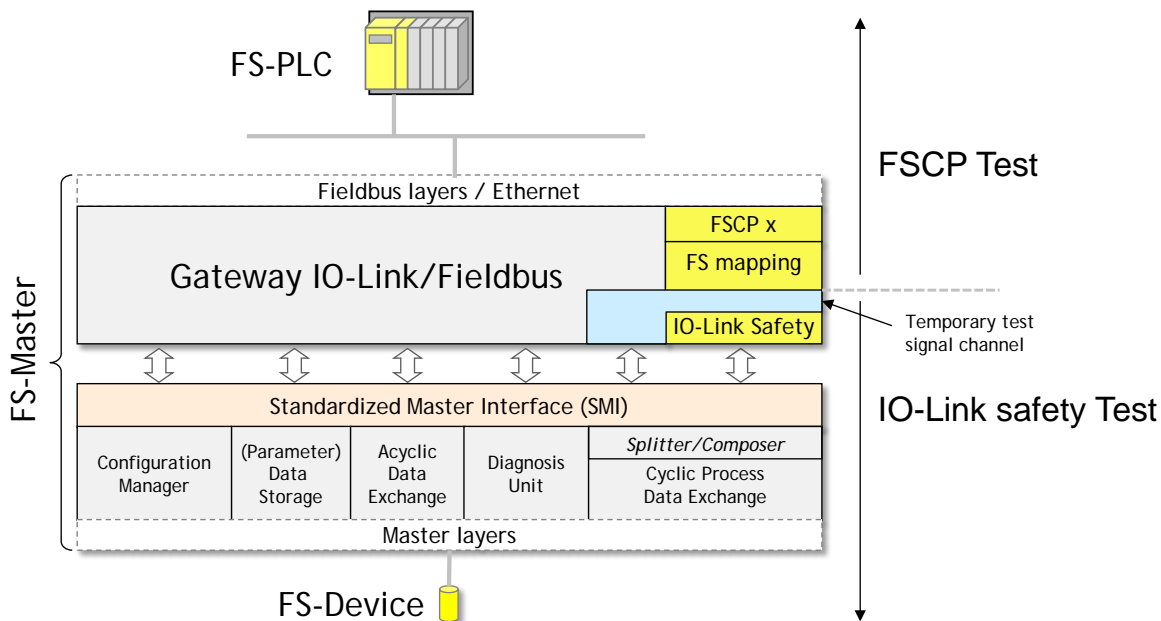


Figure 1 – Testing responsibilities and infrastructure

This independence is achieved by introducing a special layer (blue marked area) that can be switched on via a safety protocol parameter to establish a temporary test signal channel. This test signal channel uses the non-safety data transmission possibility within IO-Link messages parallel to the safety part.

Figure 1 illustrates also that the core Master is not safety-related. The safety-related parts are all located within the gateway above the core Master.

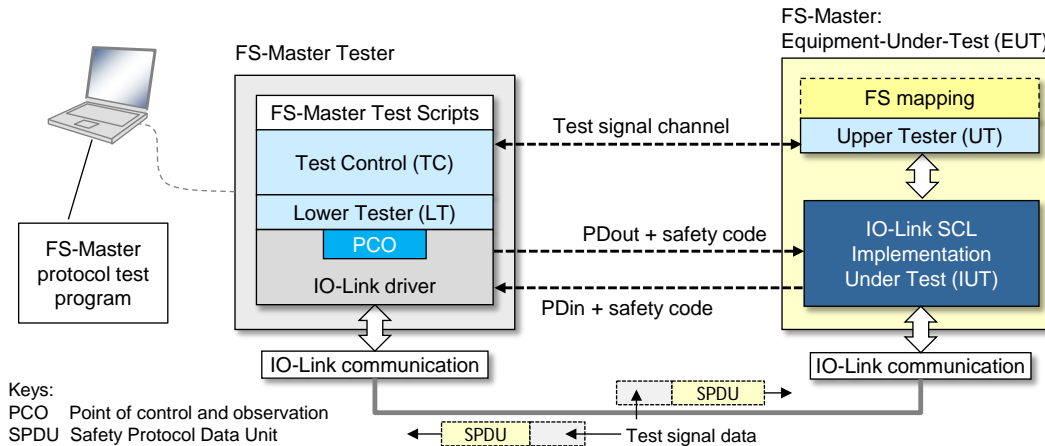


Figure 2 – Principle of the FS-Master testing

Figure 2 illustrates the physical and logical connections between FS-Master Tester and an FS-Master EUT (equipment under test). An FS-Master protocol test program in a laptop provides a GUI (graphical user interface) for control, feeds the FS-Master Tester with test scripts, and receives results for verdict logging.

The test scripts used by the FS-Master Tester are divided in two groups:

- a) SCL (safety communication layer) protocol scripts, which have been developed by the ifak institute in Magdeburg using simulation, model checking, and test case generation. All these steps have been assessed and approved by TÜV-SÜD.
- b) Supplementing test cases (test-to-fail) according to the test specification dealing with the securing mechanisms such as VerifyRecord at start-up, configuration of FS-Master, resilience of SCL communication against black channel drop-outs and splitter/composer faults, and (parameter) data storage misbehavior.

2 FS-Master Tester project and funding

The company TEConcept from Freiburg, Germany is already successfully providing IO-Link stacks and test equipment for non-safety IO-Link Master and Devices. They committed to provide FS-Master test equipment based on the current test specification as described above and presented an itemized development cost plan for the project (hardware and software).

This tester requires a new powerful and future-proof hardware allowing for safety conformance testing in a first step and later on non-safety testing additionally, depending on business success and marketing decisions.

The overall development costs add up to **130 T€**

The IO-Link Community is willing to fund an initial phase of the project with **30 T€**. This initial phase includes hardware design, support of test case developments and reviews, clarification of safety development concepts and assessments, as well as detailed project planning.

Figure 3 shows a possible project schedule with milestones.

Dependencies on the IO-Link Safety Test and Assessment specification exist. The draft version 1.0 for public review has to be ready by April 2019 and finalization after 3 months review shall be in July 2019.

Another dependency is safety assessment by TÜV-SÜD. Progress of the project is reported to the IO-Link Safety working group on a regular basis.

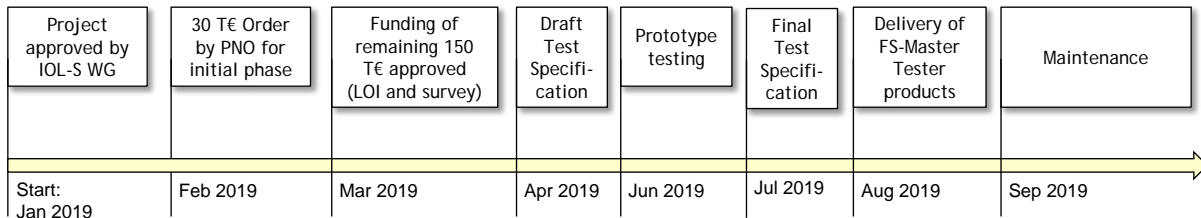


Figure 3 – Project schedule (informal)

It is planned to finance the remaining activities by sold FS-Master Tester products.

Purpose of this letter of intent and survey is to get feedback of the IO-Link member companies on whether they intend to acquire an FS-Master Tester under the above mentioned qualifications.

3 Letter of intent

Declaration of intent between IO-Link Community c/o PROFIBUS Nutzerorganisation e.V. and company:

Name _____

Address _____

We intend to acquire one or more FS-Master Tester approved by TÜV-SÜD within the next three years Yes

Manufacturer: The prize for one FS-Master Tester is 12 T€ _____

3rd party: The prize for one FS-Master Tester + License is 24 T€ _____

City _____ Date _____

Signature _____

Name _____