IO-Link

Product Quality Policy

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This document has been prepared, approved, and released by the IO-Link Steering Committee.

Important notes:

NOTE 1 The IO-Link Community Rules shall be observed prior to the development and marketing of IO-Link products. The document can be downloaded from the www.io-link.com portal.

NOTE 2 Any IO-Link Device shall provide an associated IODD file. Easy access to the file and potential updates shall be possible. It is the responsibility of the IO-Link Device manufacturer to test the IODD file with the help of the IODD-Checker tool available per download from www.io-link.com.

NOTE 3 Any IO-Link devices shall provide an associated manufacturer declaration on the conformity of the device. A corresponding form with references to relevant documents is available per download from www.io-link.com.

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Conventions: In this specification the following key words (in **bold** text) will be used:

may:	indicates flexibility of choice with no implied preference.
should:	indicates flexibility of choice with a strongly preferred implementation.
shall:	indicates a mandatory requirement. Designers **shall** implement such mandatory requirements to ensure interoperability and to claim conformity with this specification.
highly recommended:	indicates that a feature shall be implemented except for well-founded cases. Vendor shall document the deviation within the user manual and within the test report.

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IO-Link Product Quality Policy –

Organization and procedures

1 Management summary – scope of this document

This policy describes the necessary procedures on how to attain a manufacturer declaration for an IO-Link Master or Device.

Furthermore, in clauses 4 and 5 it gives hints

- for the successful preparation of testing,
- for brand labelling, and
- for dealing with product variants.

2 Overview of related documents

The IO-Link Community uses a set of policies to organize work of its members, providers, and test centers and to maintain quality assurance (mainly interoperability) of member products as shown in Figure 1. The technical specifications ([2], [3], and [4]) are building a technical platform for a certain generation of Devices and Masters, for example "Package 2020", and its features are supposed to stay stable for several years.

Associated to a Package is a certain release of this Product Quality Policy document defining stability times and transitions from one Package to another.

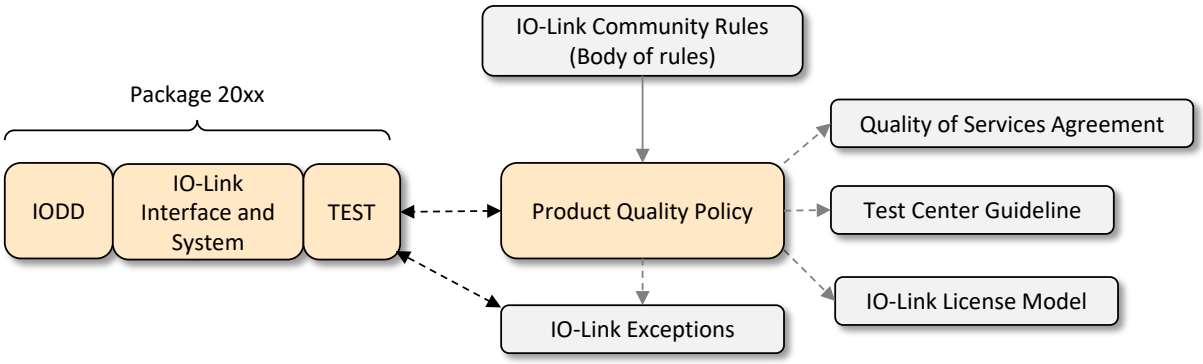

Figure 1 – Related documents

Table 1 provides information on IO-Link's technical and policy documents.

Table 1 – Subject of IO-Link's technical and policy documents

Title of document	Subject	Ref
IO-Link Interface and System	Specification of IO-Link interface, communication, and engineering technology	[1], [2]
IO-Link IO Device Description	Specification of IO-Link Device parameters in a formal language (XML)	[3]
IO-Link Test	Specification of TestCases for physical tests and behavioral tests for Devices and Master	[4]
IO-Link Community Rules (Body of rules between IO-Link members and the PNO)	This document governs the cooperation between IO-Link members or licensees and the PNO and describes the rights and obligations of the partners.	[5]

Title of document	Subject	Ref
IO-Link License Model	This document describes the license model for non-IO-Link members.	[6]
Quality of Services Agreement	The purpose of this agreement is to establish a quality assurance system between IO-Link Community and the IOL-Competence Centers (IOLCC) for the technologies of IO-Link.	[7]
Test Center Guideline	This document describes the preconditions for becoming a test laboratory accredited by IO-Link community. It additionally describes the rules for the performance of such an IOL Test Center (IOLTC).	[8]
IO-Link Exceptions	This document describes the change and exception management in case of implementation or test deviations.	[9]

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in [2], [3], and [4], as well as the following apply.

3.1.1
Master Tester
tool, intended to perform test cases for IO-Link Master according to the IO-Link test specification, approved by IO-Link quality authorities

3.1.2
Device Tester
tool, intended to perform test cases for IO-Link Devices according to the IO-Link test specification, approved by IO-Link quality authorities

3.1.3
IODD
electronic I/O and parameter description in XML of an IO-Link Device for its configuration and parameterization to match certain application requirements

3.1.4
DeviceID
unique IO-Link Device identification allocated by a vendor

3.1.5
VendorID
unique vendor identification assigned by the IO-Link Community

3.1.6
MasterID
unique IO-Link Master identification allocated by a vendor

3.1.7
OEM
original equipment manufacturer, providing a part or subsystem used in another company's assembled product

3.2 Symbols and abbreviated terms

IOLCC	IO-Link Competence Center
DUT	Device under test
MD	Manufacturer declaration
uC	Microcontroller
PL	Physical layer
IOLTC	IO-Link Test Center

4 Manufacturer declaration

4.1 General rules

- The Manufacturer Declaration states compliance to the IO-Link specifications and shall be signed by vendors based on tests according to IO-Link test specifications.
- Members are entitled to perform the required tests under their own responsibility. The Manufacturer Declaration has no expiring date.
- Non-members are obliged to have the tests required for the manufacturer declaration performed at an accredited IO-Link Test Center (IOLTC) and to pay for these tests as well for the license fee (according to the IO-Link Community Rules). After every 3 years (provided that no change has been made to the product properties), the license can be extended for another 3 years. If the device is unchanged, the manufacturer shall inform the IO-Link Support Center by sending a written note. Otherwise (for example if the device has been changed), the required steps for a new version of the manufacturer declaration shall be performed. For details see clause 4.4.

4.2 The way to manufacturer declaration (MD)

The preconditions for an MD are:

- Each Device or Master shall be listed in the MD,
- Masters or Devices having an identical IO-Link interface require only one MD,
- Prerequisites for Devices are Vendor ID and IODD,
- Prerequisite for Master is a MasterID

4.2.1 Rules for IO-Link members

The manufacturer of a Device or a Master shall perform the appropriate tests described in [4] and document the results in a test report.

Test exceptions for not implemented "highly recommended" features specified in [2] shall be documented within the user manual and within the test report for the manufacturer declaration.

After successful testing, the manufacturer/vendor

– shall sign the MD,

– shall archive both the test report and the MD on manufacturer site, and

– can sent the MD to the IO-Link Support Center for publication on the approved component list.

4.2.2 Rules for non-IO-Link members

To get the licensee granted, it is necessary for a non-IO-Link member to have the required tests performed at an accredited IOLTC and to pay for these test services as well as for the license fee (for details see [5]). The IOLTC issues a test report and the confirmation of a successfully passed test.

The test service shall be payed to the IOLTC, the license fee to the IO-Link Support Center.

Test exceptions for not implemented "highly recommended" features specified in [2] shall be documented within the user manual and within the test report for the manufacturer declaration.

After successful testing, the manufacturer/vendor

– shall sign the MD,

– shall archive both the test report and the MD on manufacturer site,

– shall send the MD and the confirmation of an IOLTC to the IO-Link Support Center for archiving purposes,

– can request publication on the approved component list.

4.3 Brand labelling and permitted Device deviations

Brand labeled products are functionally identical Devices distributed by different companies. Only differences in the outer design (e. g. housing), the product identification or parameter descriptions are permitted.

Brand labeled products require the VendorID (VID) of the branding company.

4.4 Additional procedures regarding re-testing

4.4.1 General approach

This clause describes the regulations for re-testing whenever changes have been made at an already tested Device or Master. Either a full test or a partial test shall be performed. This leads to a new test report and corresponding MD.

Due to the increasing complexity of Device variants, the following clause can only cope with fundamental deviations of the IO-Link interface (communication and/or timing). Other deviations should be negotiated between manufacturer and an IOLTC.

4.4.2 Devices

Table 2 shows the consequences of fundamental changes/deviations in a brand label Device.

Table 2 – Consequences of changes to the Device interface

Changes/deviations	New DeviceID	PL test	EMC test	Protocol test	New MD
Software changes in application new functions / parameters	X			X	X
Software changes influencing communication / timing	X	X		X	X
Hardware changes influencing communication		X	X		X
Bug fix in communication software NOTE				X	X
Bug fix in hardware		X	X		X
NOTE Communication software is part of the Device software, which represents the implementation of the protocol layers, data objects, methods and interfaces as defined in [2].					

4.4.3 Masters

Table 3 shows the consequences of fundamental changes/deviations in a brand label Master.

Table 3 – Consequences of changes to the Master interface

Changes/deviations	PL test	EMC test	Protocol test	New MD
Software changes in gateway application			X	X
Software changes influencing communication / timing			X	X
Hardware changes influencing communication	X	X		X
Bug fix in communication software NOTE			X	X
Bug fix in hardware	X	X		X
NOTE Communication software is part of the Device software, which represents the implementation of the protocol layers, data objects, methods and interfaces as defined in [2].				

5 Testing and test tools

5.1 Prerequisites for type testing

Table 4 shows the prerequisites for type testing of Device and Master.

Table 4 – Prerequisites for type testing

Type	Final product before release	IODD (checked, stamped)	VendorID	DeviceID	MasterID
Device	X	X	X	X	–
Master	X	–	X	–	X

5.2 Test of an IODD (only for Devices)

Every Device manufacturer shall provide an IODD file for the DUT. The IODD describes the features of a Device (I/O data structures and parameters), which are also used by Device testers for protocol tests.

The correctness of the IODD file shall be tested with the help of an appropriate IODD checker.

5.3 Test of the physical layer (PL) and EMC

The PL and EMC test shall be performed according to [2] and [4].

5.4 Test of the Protocol

The protocol test shall be performed according to [4]. In case of Devices a checked IODD shall be used for the test.

5.5 Tools for testing

There are several test systems on the market supporting tests and generating test reports, which are recommended by the IO-Link quality authority.

These test systems comprise

- Physical layer tester
- EMC tester
- Device tester (protocol)
- IODD checker
- Master tester

6 Quality center

The IO-Link community is operating a Quality Center for the clearing of MD relevant quality complaints or exceptions (see [9]) regarding IO-Link specifications and validity periods.

Complaints shall be reported in english language via e-mail to quality@io-link.com.

Annex A
(informative)
Validity of packages

A.1 Validity periods

All relevant IO-Link specifications required for a certain functional platform are bundled into a package. These packages have a dedicated validity period for implementation and release of products to the market. After the release of a new package the former package will be valid for a specified transition period. After expiration of the validity of a package no new Devices or Master shall be released to the market based on this package. Figure A.1 demonstrates the principle.

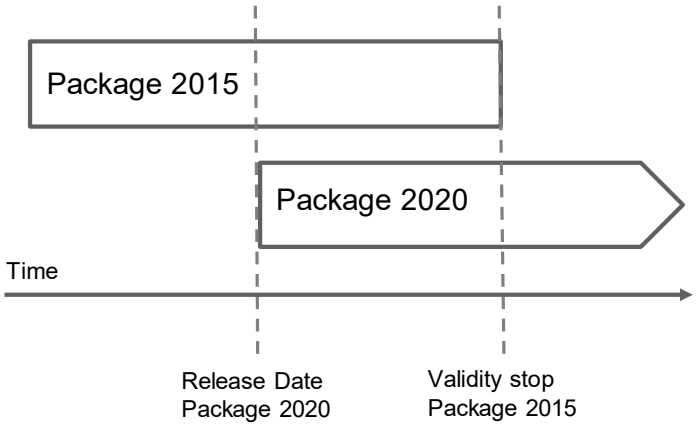

Figure A.1 – Principle of package validity

Table A.1 shows the validity periods for current IO-Link packages.

Table A.1 – Validity periods for current packages

Package	Release date	End of validity date
Package 2015	2015-03-07	2022-12-31
Package 2020	2021-02-01	open

A.2 Package 2020

Table A.2 shows the content of Package 2020.

Table A.2 – Content of Package 2020

Term	Version
IO-Link Interface and System Specification	V1.1.3
IO-Link Test Specification	V1.1.3
IODD – IO Device Description Specification	V1.1.3
Manufacurer declaration	2021-02-01
Corrigendum Package 2020	V1.0

Bibliography

[1] IEC 61131-9, Programmable controllers – Part 9: *Single-drop digital communication interface for small sensors and actuators (SDCI)*

[2] IO-Link Community, *IO-Link Interface and System, Order No. 10.002*

[3] IO-Link Community*, IO Device Description (IODD), Order No. 10.012*

[4] IO-Link Community*, IO-Link Test, Order No. 10.032*

[5] IO-Link Community, *IO-Link Community Rules (Body of Rules)*, Order No. 3.702

[6] IO-Link Community, *IO-Link License Model,* Order No. 10.302

[7] IO-Link Community, *IO-Link Quality of Services Agreement,* Order No. 10.052

[8] IO-Link Community, *IO-Link Test Center Guideline,* Order No. 10.142

[9] IO-Link Community, *IO-Link Exceptions*, Order No. 10.212

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