IO-Link

Supplemental Rules for Cooperation between IO-Link Members and the PNO

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IO-Link System of Rules

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In case of doubt the German version shall be binding.

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1 Motivation and objective

In 2003 a Working Group (TC3/WG16) was established within the PROFIBUS Nutzerorganisation e.V. (PNO) to develop a cost-effective point-to-point communication technology between sensors/actuators and fieldbus nodes or controllers. The companies interested in IO-Link have joined together as IO-Link members for the purposes of coordinating and organizing the further development and dissemination of this technology.

Following completion of the first version of the specification for the communication part in October 2006, the first version of the system of rules for the cooperation between TC3/WG16 and IO-Link members was developed. That system of rules had a validity period of 3 years, which ended on December 31, 2009.

This version of the rules describes the cooperation between the IO-Link members and the PNO as of January 2010.

1.1 Technology

Even today, most of the sensors used in production technology still consist of simple electromechanical switches whose signal status is made accessible by means of so-called remote I/Os of the controller when fieldbus technology is used. The connection for the 24 V power supply and the switching signal is usually made via a 3-wire cable. Over time, these simple switches have been supplemented with sensor types that use optical, inductive, capacitive, transformer and other physical effects in order to achieve advantages such as no-contact operation, simpler adjustment, etc. This trend was facilitated by the availability of tiny, low-cost, and robust microcontrollers. However, this 3-wire connection technology does not permit the use of engineering tools or controllers to parameterize these very flexible, high-performance sensors or the display of the necessary detailed diagnostic messages. Because most microcontrollers used also have a UART interface, it stood to reason to create a more intelligent design of the "last meter" between sensor and controller or fieldbus node. Added to that is the fact that the new IO-Link communication will be integrated in existing mounting formats and 3-wire connection technology and, thus, the product range does not have to be expanded. Of course, the IO-Link technology described applies equally to sensors and actuators used in production technology.

1.2 Fieldbus independence

Manufacturers of sensors with conventional 3-wire connection technology did not have to give any thought to the usability of their sensors on the fieldbuses available on the market. Switching signals and connection technologies are extensively standardized and adequately decoupled due to the lack of digital communication. In fact, with the emergence of IO-Link the connection technology has remained the same. However, the mapping of the sensor user data onto the cyclic bus traffic, the sensor parameters onto the starting parameterization of the fieldbuses and/or reparameterization during operation, and the sensor diagnostic information onto the diagnostics reporting and help systems of the fieldbuses represents an additional technical challenge. On the one hand, the integration into a certain fieldbus should be as seamless as possible, while on the other hand, it should be independent of the fieldbus.

1.3 Acceptance of other organizations

The requirement just mentioned is also the reason behind the creation of these rules, in order to define a clear understanding and action framework for all participants. It should also define, among other things, the relationship between the IO-Link members and the PROFIBUS Nutzerorganisation e.V. (PNO), the role of the PNO, and the relationship to other fieldbus organizations. The goal is to promote their acceptance of IO-Link.

1.4 Responsibilities

In addition to the rules defined here, the PNO has authoritative control as soon as the technologies represented by it (e.g., PROFIBUS, PROFINET, or the engineering associated with these) are affected.

2 Organization within PNO

The IO-Link Specifications V1.0 were developed jointly within WG16 of TC3 and published.

In order to better respond to the global interest in IO-Link, the PNO Advisory Board decided to establish a new Technical Committee (TC6 "IO-Link") at its meeting on September 25, 2009. The organizational structure in effect up to then, consisting of a working group with various subgroups, is being transferred 1:1 to TC6.

The existing "TC/WG Guidelines" [A1], the supplemental “IPR-Rules” of the PNO containing specifications for handling intellectual property rights (patents and copyrights) [A2], and the “Document Management” [A3] of the PNO and its bylaws also apply to the IO-Link members without exception. Supplemental rules are presented in this paper and its appendices.

2.1 TC6, IO-Link

The working groups of TC6 will address various topics. Specifically, these topics are:

1. Technology, currently WG1
2. Marketing, currently WG2
3. Integration, currently WG3
4. Profiles, currently WG4

Possible future topics include:

Quality assurance, Wireless, IO-Link Safety, etc.

2.1.1 Organization of TC6

The activities of TC6 are carried out strictly in accordance with §1 of the “TC/WG Guidelines”. The central task of the IO-Link members is to decide on the technical development of the IO-Link technology. Included under this is the independent establishment of connections with other organizations in coordination with the PNO Board of Directors.

All members of PROFIBUS&PROFINET International (PI) can also serve as members of and participate in the WGs of TC6 IO-Link; they must however acknowledge these rules in writing.

Interested companies must submit an application for membership to the PNO Support Center. The application form requests information on the technologies supported (IO-Link, PROFIBUS, PROFINET) in products and services.

The PNO Support Center will inform the TC6 Leader.

Development and marketing of IO-Link products using IO-Link logos is only permitted if the company:

1. Has become an IO-Link member and has acknowledged these rules in writing
2. Has issued a manufacturer's declaration using a test tool released by TC6

2.1.2 Work processes

The IO-Link members consist of the founding members (members up to the cut-off date of March 24, 2006), members that joined after this cut-off date but before the merging date of December 31, 2009, and all companies joining after this date.

The prerequisite for obtaining membership is

– written acknowledgement of these rules (written document).

Note: As a result of opening the membership to non-PNO members, the possibility of participation shall be offered from research or user groups.

The IO-Link members meet once per year (General Meeting). Every 3 years, the General Meeting will elect a **Steering Committee**, consisting of approximately 5-15 company representatives (including Spokesperson). Each member (company) can nominate a candidate for this. The WG Leaders of TC6 (IO-Link), who are nominated by the Steering Committee and confirmed by the PNO Advisory Board, become automatic members of the Steering Committee. At the IO-Link General Meeting, the members of the Steering Committee will be elected from a nominated list of applicants (electoral list). The number of members selected always consists of at least one person more than the number of WG Leaders serving in the Steering Committee. If a new WG is established, a person on the electoral list will automatically move up to the SC.

Rights and obligations of IO-Link members:

– Definition of technological orientation
– Orientation of the standardization strategy (national and international)
– Confirmation of the annual planned budget for use of financial resources
– Worldwide promotion of the IO-Link technology (marketing)
– IO-Link integration in consultation with the fieldbus organizations
– Election of the Steering Committee
– Definition of and amendments to this system of rules, which requires a 2/3 majority decision

Each IO-Link member can run for election to the Steering Committee.

When the IO-Link group is dissolved, all rights for the IO-Link technology, results of the IO-Link work, and financial resources from contributions will be transferred to the legal successor organization.

2.2 Steering Committee (SC)

The Steering Committee steers the implementation of technology- and marketing-related measures in the individual WGs. If required, the WG Leader can set up sub-working groups within the WG for a limited time period and appoint a sub-WG Leader.

Rights and obligations of the SC:

– Election of the SC spokesperson
– Nomination of a TC Leader for TC6 (Spokesperson and TC6 Leader should be the same person); the TC6 Leader is automatically a member of the SC
– Nomination of the WG Leaders
– Steering of the technology development (additions to standards, profile creation, testing)
– Steering of the IEC-related activities

– Approval and steering of the actions decided in the Marketing WG
– Release of financial resources

The Steering Committee meets 4 to 6 times per year, as needed.

Meeting minutes are prepared for each meeting and are stored on the PNO project server “IO-Link Projects”. Each IO-Link member has access rights to this server.

The SC reports on its main activities and use of financial resources at the annual General Meeting.

Any member can submit questions to the SC. The topics raised will be handled at one of the next meetings.

The decision-making process within the IO-Link membership is shown in Figure 1.

The following rules apply to the Steering Committee:

– All members in the Steering Committee (companies) have only one vote.
– Proxies:
  – Elected SC members of member organizations (companies) can appoint a proxy in their company to exercise the voting right
  – WG Leaders can have their voting right exercised by a representative of their own company as well as by a particular representative of another company.
– The SC can make decisions when at least 3 members are present. Absent members or proxies are not counted in the vote.
– Members will be notified in good time (at least 2 weeks) of pending decisions.
– All decisions are deemed accepted with a simple majority. Exception: organizational changes require approval by a 2/3 majority.
–

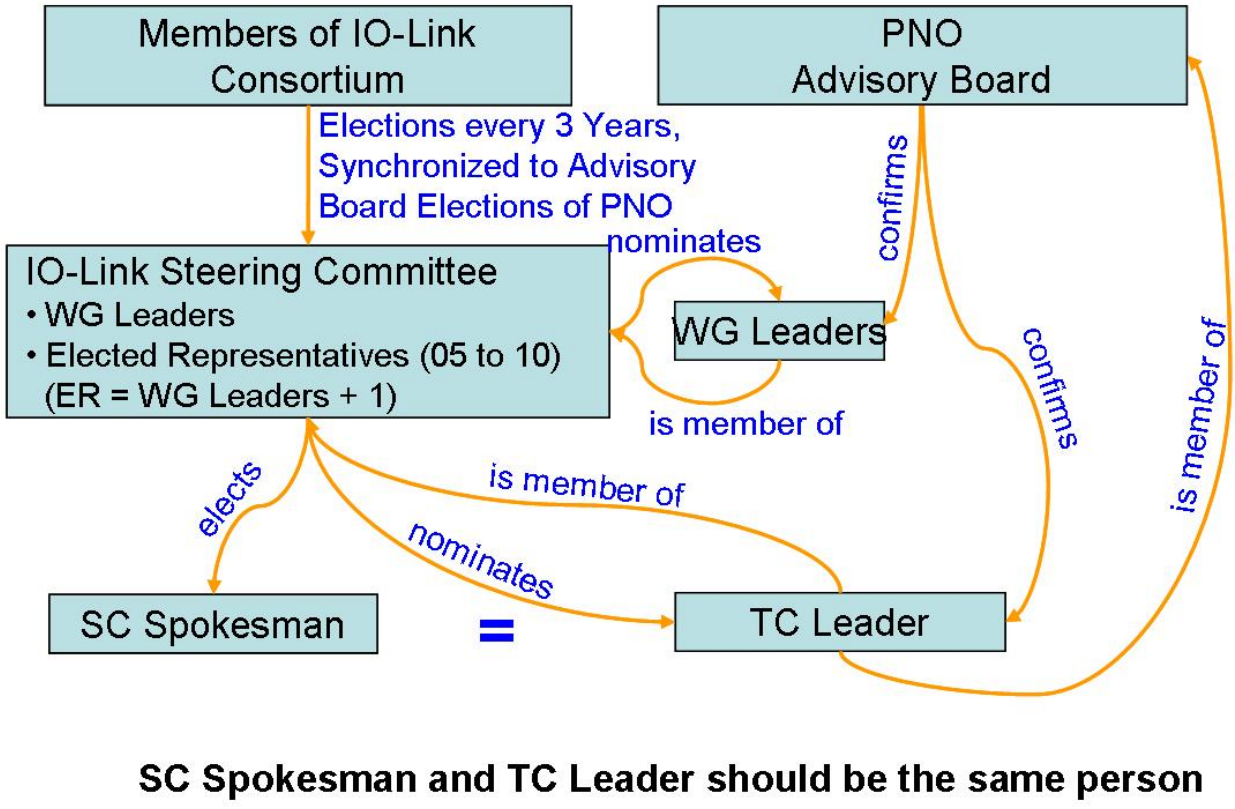

Figure 1.: Decision flow

Role of the Spokesperson

– Convenes the SC and the annual General Meeting.

– Serves as moderator of the SC meetings and the General Meeting.

– Performs external IO-Link communications (e.g., press, international standards committees, other fieldbus organizations).

– Reviews conflict CRs reported to him and brings about a decision

Role of the TC6 Leader

– Coordinates all activities of the Support Center with regard to IO-Link

– Represents the IO interests in the PNO, and vice versa

– Reports to the PNO Advisory Board

– The TC6 Leader is automatically a member of the SC

– Represents the SC spokesperson

2.3 Conformity and certification

For IO-Link Master and IO-Link devices, a manufacturer's declaration of IO-Link conformity will be required as soon as the IO-Link General Meeting has developed an appropriate test and test specification as well as an automatic protocol tester for IO-Link Master and IO-Link devices that can be purchased or licensed by all PI members. The format of the manufacturer's declaration will be defined by the IO-Link members and described in the test and test specification. A certification requirement may be decided on by the IO-Link General Meeting at a later time.

For IO-Link Master with fieldbus connection, the relevant certification or conformity guidelines of the respective fieldbus organizations apply.

2.4 Competence Centers and Test Centers

The IO-Link General Meeting can approve accreditation of Competence Centers and Test Centers for IO-Link technology.

Bus Competence Centers and Test Centers, such as those of PI, can also be qualified for IO-Link technology, in order to serve as a complete contact for IO-Link Master devices with bus connection.

3 Finances/member contributions

The one-time IO-Link contribution of €10,000 to be paid for new members up to the end of 2009 has been eliminated as of January 1, 2010. Instead, starting from this date IO-Link members will be assigned a portion of the annual PNO member contributions, which is calculated based on members' activity in the PNO, minus costs incurred in the Support Center.

The following scheme is used to calculate the financial contributions to be used for IO-Link activities:

- PNO members, if they join exclusively for the purpose of working on IO-Link: 100% of the annual contribution of these members

- PNO members that also want to work on IO-Link: 20% of annual contribution

- IO-Link members that do not join the PNO (exceptions with strategic importance for IO-Link with separate cooperation agreement): 80% of annual contribution of these members (20% goes to covering the expenses within the PNO, e.g., to execute a cooperation agreement)

- Subtracted (prior to transfer of financial contributions to TC6) are the annual services provided by the PNO Support Center for IO-Link. The expenses of the previous year are used as the basis for calculating these services.

The PNO determines both the member contributions as well as the costs for IO-Link and documents this information in the form of a profit/loss statement on an annual basis (at the end of the calendar year). Each IO-Link member is entitled to view the data though the Leader of TC6 IO-Link.

The budget for the fiscal year (calendar year) of the IO-Link members is based on the data presented by the PNO. The resources for IO-Link are managed by the PNO Support Center.

If the budget is used up by IO-Link projects or at the decision of IO-Link members, additional projects can be decided on according to “TC/WG Guidelines” [A1]. §6 of the "TC/WG-Guidelines" describes in detail the transaction of a project financed by an IO-Link member.[1].

The contributions indicated above are reviewed annually with the Support Center and the TC6 Spokesperson or TC6 Leader.

One-time contributions paid before December 31, 2009 will not be refunded.

3.1 Appropriation

The budget must be used for IO-Link technology and IO-Link marketing projects.

3.2 Release of resources

The Steering Committee will present an annual budget plan at the General Meeting for approval (planned expenditures for marketing, technology, etc.). If the General Meeting has approved the plan at its annual meeting, the Steering Committee will decide on the use of the budget. The decisions are by simple majority and must be secured within the framework of the budget plan. Timely notification of a pending funding decision must be included in a SC Meeting announcement issued according to the rules.

3.3 Cash audits

For every plenary meeting of the TC6 (IO-Link) SC, the PNO Support Center will inform the TC6 Leader of the current status of resources along with a forecast. He will inform the SC during the meeting.

The cash audit is performed as part of the overall annual audit of the PNO. The report is issued as part of the PNO General Meeting.

The results will be announced in the meeting minutes and during the IO-Link General Meeting.

4 Documents

Rules for creating documents are specified in §3 of the "TC/WG Guidelines". As a deviation to these guidelines, the IO-Link specification is not labeled as "PNO confidential", in order to make it accessible to other bus organizations. The same applies to the bus-specific integration specifications outside PROFIBUS DP and PROFINET IO.

Rules for the layout, the required formal parameters, the creation and review processes, and the distribution of a document are specified in the “Document Management” of the PNO [A3].

[1] Adherence to an orderly project sequence ensures adherence to functionality, schedule, quality, and budget requirements.

4.1 Special rules for IO-Link

Deviating from these rules, it is specified that the IO-Link documents will be formatted differently from the PNO design. In spite of that, the requirement remains to use a format template that complies with IEC requirements.

4.2 IEC

The IO-Link technology will be standardized within the IEC. The IO-Link General Meeting will make the decisions necessary for this (NP, specification of IEC WG responsible, standardization path, etc.)

5 Marketing

The IO-Link members have a common interest in introducing the IO-Link technology as quickly and broadly as possible. Their interest also extends to acceptance by other fieldbuses. In addition to dissemination via the standard PNO channels (TC6/WG2 Marketing, PNO Support Center), other marketing activities are therefore needed and permitted. However, these must not be formulated so as to not damage the PNO and the PI members.

5.1 Web server

The TC6 can also set up a neutral server that contains the technical information and marketing activities. However, PNO-specific information is only available by means of corresponding links to the IO-Link Projects Web server.

A different specification applies to the distribution of documents, in that the IO-Link specifications can also be offered for download on Web servers of other fieldbus organizations and on the neutral IO-Link Web page.

5.2 Trade fair appearance

The PNO extends an offer to TC6, under the usual conditions, of exhibit space in the PNO booths at various trade fairs and will be considerate of neutrality requests, to the extent possible. The procedures at international trade fairs will be governed by the Regional PROFIBUS&PROFINET Associations (RPA). The PNO Support Center will provide support for these.

Notwithstanding this offer, the IO-Link members are free to arrange their own trade fair activities.

5.3 Contact with associations

In coordination with the PNO Support Center, the SC can contact industrial associations (e.g., VDMA, ZVEI, VDA, etc.) as a PNO representative and jointly conduct marketing activities. The PNO Support Center also provides support for this. Activities going beyond this require coordination with the PNO Board of Directors.

5.4 Contact with other fieldbus organizations or companies

Contacts with fieldbus organizations and companies that belong to or drive other fieldbus organizations require the approval of the PNO Board of Directors. For its part, the PNO is obligated to enable cooperation agreements with the above-indicated companies or organizations for purposes of cooperation with IO-Link. This should ensure the degree of dissemination of IO-Link worldwide.

The IO-Link members must be informed about these types of activities, and negotiations must be coordinated or carried out jointly with them.

If necessary, the SC can decide on special rules regarding member contributions without the consent of the General Meeting.

366 ### 5.5 Publications

367 It is recommended that important publications be coordinated with the IO-Link members and that the
368 press office of the PNO Support Center be integrated (copied).

369 ### 5.6 Slide layout

370 The TC6 administers an independent, uniform layout for slide presentations. This layout will be
371 placed on the PNO Web server, as well as on the neutral IO-Link Web server, for download and must
372 be used for all cross-fieldbus presentations. For all PNO-relevant topics that pertain to the basic in-
373 formation of IO-Link and its integration in PROFIBUS DP or PROFINET IO, the PI slide templates
374 may be used.

375 ## 6 IO-Link logo

376 The IO-Link technology will be disseminated under its own logo (Figure 2).

377

378 Figure 2: IO-Link logo

379 The rights for the logo as represented in Figure 2, including its colors, have been transferred to the
380 PNO (formerly Balluff and ifm) and must be used without any alteration. It is currently protected in
381 Germany (EU) and the United States. It is available for download on the IO-Link Web pages in the
382 protected area. When used in countries in which it is protected, it must be marked with ®.

383 Usage rights for logo:

384 – Free to any PI member in conjunction with presentations and publications

385 – In conjunction with products of IO-Link members that have certified their products with a tool re-
386 leased by TC6 and confirmed this with a manufacturer's declaration (Section 2.3)

387 – For all members that have acknowledged these rules (according to Section 2.1.2)

7 Patents and property rights

The rules for handling patents and property rights in conjunction with the IO-Link technology are specified in the current and new “IPR Rules” document of the PNO [A2]. These rules must be observed.
The following is specified in deviation to these rules:

– The use of relevant property rights of the IO-Link technology, including for other fieldbuses such as PROFIBUS, as defined in the specification, is granted free of charge to members of the PNO and its related regional organizations (RPA).

– The usage rights are granted only for the purpose of implementing the IO-Link technology defined in the IO-Link specification, and not for independent modification or further development.

– Sublicensing to a third party (non-affiliated company) is permitted exclusively for the purpose of manufacturing and sales of IO-Link products. No rights going beyond this will be granted.

– Every IO-Link licensee is obligated to grant usage rights for IO-Link-relevant property rights to the IO-Link members free of charge.

– Acknowledgement of these obligations is the prerequisite for IO-Link membership.

The IO-Link-relevant property rights are listed in Appendix B.

A.1 TC/WG guideline

[A1] Guidelines for the Technical Committees and Working Groups of the PROFIBUS Nutzerorganisation e.V. (PNO) (TC/WG Guidelines), Version 3.2, April 2007

A.2 IPR rules of the PNO including specifications for handling of intellectual property rights (patents and copyrights)

[A2] Intellectual Property Rights (IPR) Policy of the PROFIBUS Nutzerorganisation e.V. (PNO), Version 1.1, April 2007

A.3 Document management

[A3] Document Management Guideline of PROFIBUS Nutzerorganisation e.V., Version 1.3, February 2007

Annex B IO Link patents

The following table gives an overview of the IO-Link-relevant patents and their license terms.

Patent number	Company	License term acc. to IEC
DE 102005 014783 A1	Continental (formerly Siemens VDO)	Usage license granted free of charge
Patent family: DE000010030845A1, EP000001168271A3, EP000001168271A2, US020010056516A1, US000006889282B2	ABB	Usage license granted free of charge
DE 10211939 A1	Sick	Usage license granted free of charge
US 2003/0200 323 A1	Sick	Usage license granted free of charge
DE 100 54 288 A1	Festo	Application procedure not yet complete
DE 102004035831 A1	Siemens	Relevance in clarification

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