Siemens complete AS-Interface offering is found in Section 6 of the Siemens IK PI 2009 Catalog.

In this section you will find the Table of Contents for Section 6 of the Siemens IK PI 2009 catalog and overview information on AS-Interface and ASIsafe.

A PDF version of Section 6 on AS-Interface can be downloaded from the Siemens’ Internet Site at: [www.sea.siemens.com/ASInterfaceSupplement](http://www.sea.siemens.com/ASInterfaceSupplement)

IO-Link is a new communication module for sensors and actuators is also included in this section. You can find more information at: [www.siemens.com/IO-Link](http://www.siemens.com/IO-Link)
Control Circuit Components

AS-Interface, IO-Link

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IO-Link

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Overview

System components

Numerous system components are offered for implementing the communication. The key elements of a system installation are:

- Master interface modules for central control units such as SIMATIC S5 and SIMATIC S7, ET 200 M distributed peripherals
- AS-Interface shaped cables
- Network components such as repeaters/extenders
- Power supplies for slaves, modules for connection of standard sensors/actuators
- Actuators and sensors with integrated slave ASIC
- Safety modules for transmitting safe data through AS-Interface
- Address programming units for setting the slave address

Technical specifications

- Standard: EN 50295 / IEC 61158
- Topology: Line, star or tree structure (same as electrical wiring)
- Transmission medium: Unshielded two-conductor cable (2 x 1.5 mm²) for data and auxiliary power
- Connection methods: Contacting of the AS-Interface cable by insulation piercing method
- Maximum cable length: 100 m without repeater/extension; 200 m with extension plug; 600 m with repeater/extension and extension plug (parallel switching of repeaters)
- Maximum cycle time: 5 ms with full expansion; 10 ms when using A/B technology; profile-specific for Spec 3.0 slaves
- Number of stations per AS-Interface line: 31 slaves according to AS-Interface Spec. V2.0; 62 slaves (A/B technology) according to AS-Interface Spec. V2.1 and V3.0
- Number of binary sensors and actuators: Max. 124 I/124 O according to Spec. V2.0; Max. 248 I/186 O according to Spec. V2.1; Max. 496 I/496 O according to Spec. 3.0
- Access control: Cyclic polling master-slave method, cyclic data transfer by host (PLC, PC)
- Error safeguard: Identification and repetition of faulty message frames

More information

For the SIMATIC NET products referred to above (order numbers 6GK..., 6XV1...) please also note the conditions of application, which can be consulted on the Internet site quoted below.

You can find more information on the Internet at:

http://www.siemens.com/simatic-net/ik-info
Technology development of the AS-Interface

System limitations of AS-Interface specification

<table>
<thead>
<tr>
<th>AS-Interface specification</th>
<th>Maximum number of slaves</th>
<th>ASIsafe</th>
<th>Number of digital inputs</th>
<th>Number of digital outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version 2.0</td>
<td>31 Digital 31 Analog 31 ASIsafe 31</td>
<td>31 × 4 = 124</td>
<td>31 × 4 = 124</td>
<td></td>
</tr>
<tr>
<td>Version 2.1</td>
<td>62 Digital 31 Analog 31 ASIsafe 31</td>
<td>62 × 4 = 248</td>
<td>62 × 3 = 186</td>
<td></td>
</tr>
<tr>
<td>Version 3.0</td>
<td>62 Digital 62 Analog 31 ASIsafe 31</td>
<td>62 × 8 = 496</td>
<td>62 × 8 = 496</td>
<td></td>
</tr>
</tbody>
</table>

Expansions of AS-Interface Specification 2.1

- AS-Interface Specification 2.1 enables the number of network stations to be doubled from 31 to 62. Using the so-called expanded addressing system, the 31 addresses available in an AS-Interface network can be split into two.
- If this option is used for each of the 31 slaves, the maximum number of stations in an AS-Interface network is then 62. The so-called A/B slaves can have a maximum of four inputs and three outputs. Expanded addressing is only possible for digital slaves, not for analog slaves and safety-oriented slaves (ASIsafe).
- Another function of the AS-Interface Specification V2.1 is the integrated analog value transmission function. In this case “integrated” means that no special function blocks are required for accessing the analog values. It is just as easy to access the analog values as the digital values. The integrated analog value transmission function can be used with analog slaves which support the profiles 7.3 and 7.4.

Expansions of AS-Interface Specification 3.0

- The AS-Interface Specification 3.0 enables the connection of up to 1000 digital inputs and outputs (profile S-7.A.A: 8DI/8DO as A/B slave).
- New profiles have also enabled the option of expanded addressing for analog slaves.
- Acceleration of analog value transmission through “Fast Analog Profile”.
- Variable use of analog modules: Optional parameterization of resolution (12/14 bit) and 1 and 2-channel capability.
- Asynchronous serial protocol 100 baud or 50 baud, bidirectional.
AS-Interface masters

To be able to operate A/B slaves on an AS-Interface network you must also use master modules that meet the minimum requirements of Specification 2.1.

A/B technology is supported by the masters of the SIMATIC S7 and the DP/AS-Interface links from Siemens. Only standard slaves and A slaves (= A/B slave with an A address) can be operated on masters which do not support Specification 2.1.

The subaddress of A/B slaves is set to ‘A’ in the as-delivered state. The new masters that comply with Specification 3.0 support all new slave profiles, but are also fully backwards compatible.

The AS-Interface specification relevant for the respective slave is noted in the section “Selection and ordering data”. The exact slave profile is shown in the section “Technical specifications” in the Technical Information LV 1 T.

Communication cycle

<table>
<thead>
<tr>
<th>AS-Interface specification</th>
<th>Maximum cycle time</th>
<th>Slave profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version 2.0</td>
<td>5 ms</td>
<td>S-X.0, S-X.1, S-X.F</td>
</tr>
</tbody>
</table>

Standard slaves are queried in each cycle (max. cycle time: 5 ms). If only one A or B slave is installed at an address, this slave will be queried in each cycle (max. cycle time: 5 ms). If an A/B slave pair is installed at an address, the A slave will be queried in one cycle and the B slave in the next cycle (max. cycle time: 10 ms). If only standard and/or A slaves are installed in a network, the cycle time is identical to the standard masters (max. cycle time: 5 ms).

Benefits

- Reduction of master and power supply costs thanks to a higher number of slaves and I/Os per AS-Interface line
- Improved decentralization in plants with numerous, widely spread signals
- Further expansion of existing AS-Interface systems is possible

More information

More information about AS-Interface is available in the AS-Interface System Manual.

Overview

Secure communication and standard communication on AS-Interface

Safety is included

The ASIsafe concept supports the direct integration of safety-related components, such as EMERGENCY-STOP switches, protective door switches or safety light arrays, in the AS-Interface network. These are fully compatible with the familiar AS-Interface components (masters, slaves, power supplies, repeaters, etc.) according to IEC 62062/EN 50295 and are operated in conjunction with them on the yellow AS-Interface cable.

The signals of the safety sensors are evaluated by a safety monitor which not only monitors the switching signals of the safety sensors but also continuously checks that the data transmission works correctly. The safety monitor has one or two enabling circuits which are configured with two channels and are used to switch the machine or plant to the safe state. Sensors and monitors can be connected to any points of the AS-Interface network. Also, several monitors can be used on one network.

A failsafe controller or a special master is not required. The master regards safety slaves like all other slaves and receives the safety data solely for information purposes. Hence it is also possible to expand all existing AS-Interface networks.

ASIsafe ensures a maximum response time of 40 ms. This is the time between the signal being applied to the input of the safe slave and the output on the safety monitor being switched off.

Tested safety

The system was tested and approved by TÜV (Germany), NRTL (USA) and INRS (France). The transmission method for safety-oriented signals is configured for implementing applications up to Category 4 according to EN 954-1, up to PL e according to EN ISO 13849-1 and up to SIL 3 according to IEC 61508.

Software

With the asimon configuration software you can compile safety-oriented applications and transfer them into the monitor. The software also enables online diagnostics.

Benefits

- No failsafe PLC or special master is required for the ASIsafe Solution local (safety monitor)
- Alternatively integration in SIMATIC / SINUMERIK safety architectures with the help of DP/AS-i F-Link (ASIsafe Solution PROFIsafe)
- Simple system structure thanks to standardized AS-Interface technique
- Safety-related and standard data on the same bus
- Existing systems can be expanded quickly and easily
- Optimum integration in TIA (Safety Diagnostics) and Safety Integrated
- Safe signals can be combined in groups
- Inclusion of the safety signals in the plant diagnostics, also on existing HMI panels
- Approved to Category 4 according to EN 954-1 or PL e according to EN ISO 13849-1 or SIL 3 according to IEC 61508
- ASIsafe is certified by TÜV (Germany), NRTL (USA) and INRS (France)

Application

Integrated safety technology in the AS-Interface system is used wherever EMERGENCY-STOP pushbuttons, protective door interlocks, stop Category 0 and 1, two-hand operator controls and light arrays now installed.
Overview

IO-Link range

IO-Link is a new, innovative and standardized communication module for sensors and actuators - defined by the Profibus User Organization (PNO). IO-Link technology is based on the point-to-point connection of sensors and actuators to the control system. As such it is not a bus system but constitutes a considerable upgrade of the classic point-to-point connection. Extensive parameter and diagnostics data are transmitted in addition to the cyclic operating data for the connected sensor/actuators. The connection technology used is based on the same 3-wire connecting cables customary in today’s standard sensor systems.

Components of an IO-Link system:

Only 2 components are required to use IO-Link:

• IO-Link master
• IO-Link device (e.g. IO-Link sensor/actuator, IO-Link I/O module)

Compatibility of IO-Link

IO-Link guarantees compatibility between IO-Link-capable modules and standard modules as follows:

• IO-Link sensors/actuators can be operated on IO-Link modules (master) as well as on standard I/O modules.
• IO-Link sensors/actuators as well as today’s standard sensors/actuators can be used on IO-Link modules (masters).
• If conventional components are used in the IO-Link system, then of course only the standard functions are available at this point.

Expansion through IO-Link I/O modules

IO-Link compatibility also permits connection of standard sensors/actuators, i.e. conventional sensors/actuators can also be connected to IO-Link. This is done particularly economically with IO-Link I/O modules which enable several sensors/actuators to be connected to the control system simultaneously over one cable.

Analog signals

Another advantage of IO-Link technology is that analog signals are digitized already in the IO-Link sensor itself and are digitally transmitted by the IO-Link communication. As the result, faults are prevented and there is no extra cost for cable shielding.

Integration in STEP7

Integration of the device configuration in the STEP7 environment

• Easy and quick engineering
• Consistent data storage
• Speedy locating and rectifying of faults

Productivity is thus increased throughout all plant lifecycle phases – from configuration and start-up to operation. Thanks to the Siemens IO-Link solution, even sensors and actuators below fieldbus level can be integrated to optimum effect with all their capabilities in the Totally Integrated Automation (TIA) environment.

Selection and ordering data

| Version | Order No. | List Price $ per PU | PU (UNIT, SET, M) | PS* | Weight per PU approx.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IO-Link K20 modules</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Pin assignment</td>
<td>Connection method</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 inputs</td>
<td>Y</td>
<td>M12</td>
<td>3RK5 010-0BA10-0AA0</td>
<td>1</td>
<td>1 unit</td>
</tr>
<tr>
<td>8 inputs</td>
<td>Standard</td>
<td>M8</td>
<td>3RK5 010-0CA00-0AA0</td>
<td>1</td>
<td>1 unit</td>
</tr>
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</table>

Siemens Industry, Inc.
Industrial Controls Catalog

Product Category: AS-Interface
## Technical specifications

<table>
<thead>
<tr>
<th>IO-Link K20 module</th>
<th>IO-Link K20 module</th>
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</thead>
<tbody>
<tr>
<td>4 digital inputs</td>
<td>8 digital inputs</td>
</tr>
<tr>
<td>M12</td>
<td>M8</td>
</tr>
<tr>
<td>Y assignment</td>
<td>Standard assignment</td>
</tr>
<tr>
<td>3RK5 010-0BA10-0AA0</td>
<td>3RK5 010-0CA00-0AA0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of I/O sockets</th>
<th>2</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO-Link operating mode</td>
<td>COM 2 (38.4 kBit/s)</td>
<td>COM 2 (38.4 kBit/s)</td>
</tr>
<tr>
<td>Supply voltage through IO-Link master</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Inputs
- Sensor supply, short-circuit resistant: Yes
- Current carrying capacity, sensor supply max.: mA 200
- Current carrying capacity of sockets 1 ... 4 total max.: mA 200
- Current carrying capacity of sockets 5 ... 8 total max.: mA 200
- Input current at digital input with signal "1" min.: mA 11
- Input current at digital input with signal "0" max.: mA 1.5
- Input voltage at digital input with signal "1" min.: V 10

### Parameters/diagnostics
- Parameterizable input delay: Adjustable per module (1 ms, 3 ms, 15 ms, 20 ms)
- Parameterizable inversion of the input signal: Adjustable per input
- Diagnostic signals through IO-Link: Overload/short-circuit sensor supply

### Status displays
- IO-Link communication indicator: Green/red dual LED
- IO-Link device indicator: Green/red dual LED
- Inputs/outputs indicator: Green LED per channel

### Degree of protection
- IP67

### Approvals
- CE (available)
- UL/CSA (submitted)

### Maximum cable length
- Between master and I/O module: m 20

### EMC properties
- Immunity to electromagnetic interference acc. to IEC 60947-1: Environment A (industrial area)
- Emitted electromagnetic interference acc. to IEC 60947-1: CISPR11, environment A (industrial area)

### Ambient temperature
- °C -25 ... +70

### Storage temperature
- °C -40 ... +85

### Mounting and dimensions
- Type of mounting: Wall mounting on front or side
- Dimensions W x H x D: mm 20 x 108 x 45

### Dimensional drawings

### Schematics

Terminal assignment for input, M8 socket, standard assignment

Terminal assignment for input, M12 socket, Y assignment