Benefiting all along the line ...

... with unified positioning

AS-Interface

Answers for industry.
Why waste time when there is a rapid alternative?

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AS-i Technology with a System

Sensors and actuators play an important role in automated processes. Sensors are the eyes and ears of the process control – whether in logistic centers where light barriers check the position of a package on roller belts or in beverage filling systems where the correct level is so important.

For a long time, these signal transmitters and sensors were connected up in the old-fashioned way: Every sensor and actuator was individually connected to the higher-level control using parallel wiring. This was often a time-consuming – and therefore costly – undertaking.

Today, you can do away with all of this – to your advantage. This is because AS-Interface provides you with a bus system that connects all of the automation nodes in the field with the higher-level control – unbeatably simple, reliable and unified.

This brochure will tell you how AS-Interface makes all of this possible, the additional advantages that it can offer you and how you can benefit from AS-Interface in conjunction with our automation technology.
What is AS-Interface?

The AS-Interface (AS-i) – or more precisely, actuator-sensor interface – is the simple and effective networking system for the field level. As an open, non-proprietary bus system, it transfers process- and machine-related digital and analog signals. It also acts as a universal interface between basic digital actuators and sensors and higher-level controls. What makes it so outstanding is the fact that the AS-Interface system distinguishes itself by providing such a high degree of simplicity and effectiveness. When compared to other fieldbus systems, it is by far the most favorably-priced networking solution. It is therefore no surprise that AS-Interface has established itself to become a permanent benchmark in industrial automation. This is not only because it is extremely simple to handle and quick to install, but also because it is especially flexible when it comes to retrofits. Furthermore, it is extremely rugged – even under the toughest of conditions.

Well-proven and in line with what is required in practice: an international industrial standard

Since it was introduced into the market in 1994, over 10 million AS-Interface nodes have been installed in plants and systems in the widest range of industry sectors. Since 1999, AS-Interface has been standardized according to EN 50295 and internationally, to IEC 62026-2 industrial standards. This represents a success and clearly acknowledges the strong, international organization – the AS-International Association – that is continually focusing on further developing AS-Interface. Today, the backing of approximately 300 members – including the most significant manufacturers of automation technology – will continue to ensure that AS-Interface will also dominate the market in the future – further establishing its status as the simplest and most cost-effective solution.
Safe, reliable and flexible: Industrial communication with AS-Interface

At a first glance, it isn’t easy for even experts to understand the structure of a complex automation system. Many control devices operate together networked on various data networks and protocols. This is the reason it has become usual to assign control levels to specific hierarchies. They differ, for instance, in their speed, degree of protection, or type or use of the data to be transferred.

In order to make the tasks and the position of AS-Interface clear within the control hierarchy of industrial communications, some details regarding the networking of the individual levels are provided below:

- At the supervisory control level, host computers – and sometimes even complete factories – are networked together. Industrial Ethernet is a suitable method for transferring the Megabytes of data involved at this level, but only if there is no requirement for real time/deterministic data transfer of this data.
- However, at the supervisory control level, PROFIBUS and PROFINET have proven themselves when it comes to networking controls and devices requiring deterministic data transfer.
- AS-Interface is used at the lowest level of the network hierarchy – the actuator-sensor level. At this level, there are low amounts of data transfer, but a high number of connected devices all with the requirement for real time/deterministic capability. AS-Interface is ideal for this environment plus it has the added advantages of being extremely simple to handle, quick to install and is extremely flexible.

With the trend in automation to utilize PROFINET in the future for system topologies, Siemens has now developed the new IE/AS-i LINK PN IO. This means that while AS-Interface still offers a real alternative to conventional wiring at the field level, it now has the capability of direct integration into Industrial Ethernet. This will allow users the capability to develop real integrated system topologies for today’s diverse system requirements.
Our competence when it comes to AS-Interface

Back in 1990, Siemens – together with about another dozen companies – kicked off the AS-Interface. Just a short time later, the AS-International Association was founded – a user organization, that today has about 300 members.

From the very beginning, we have put a lot of energy into further developing the AS-Interface system. We are proud of the fact that we played a major role in achieving the milestones regarding standardization and development. Thanks to our power of innovation, our AS-i products are always the first in the marketplace that comply with the AS-Interface specification.

As innovation driver and trendsetter in the area of automation and drive systems – also in the AS-Interface area –, we have assumed a leading position in the market. We are proud to state that a major proportion of the 10 million AS-i nodes presently in the field were installed with Siemens technology.

Our confidence in AS-Interface

We also consequentially use the benefits of AS-Interface in our own, highly automated production plants – for instance in our Amberg and Cham plants. Our test laboratory in Amberg, completed at the beginning of 2004, is the latest proof of the confidence that Siemens has in the AS-Interface. In Amberg, low-voltage controls can be tested with currents of 150,000 Amps. All of the Emergency Stop switches in the test laboratory are connected to the safety monitors in the control cabinet via ASiSafe®. The power supply for the 20 kV thyristor switch is enabled when all of the safe AS-i slaves signal their O.K. and we can then trigger the computer-controlled “high current pulse”.

“There is no easier and safer concept than AS-Interface!”
Mr. Walker, department head of the Siemens test laboratory
Our philosophy: Totally Integrated Automation

Siemens Totally Integrated Automation™ is the integrated solution platform for all industrial sectors – with a unique seamless portfolio of matched products and solutions. With Totally Integrated Automation, the complete workflow of your plant can be consistently automated and sustainably optimized on all levels.

The implementation of Totally Integrated Automation is demonstrated, for example, with the special features of AS-i master from Siemens. Devices can be easily configured and extensive diagnostic information be collated for the user. This information is then made available at the designated operator stations within the control area via PROFIBUS or PROFINET (this could be the operator panel or main control room). Alternatively, comprehensive diagnostic information can be called up at any time on the on-site operation display or via a standard browser. The diagnostic information includes manifold parameters down to the indication of the module condition of safety-related AS-i slaves in STEP 7 HW Config. Previously, the weighty manuals of slave suppliers had to be browsed through to find the correct parameter values for STEP 7. With the AS-i slaves by Siemens, this parameter search can be handled quite easily as a slave catalog modeled on PROFIBUS DP and PROFINET I/O accomplishes this fault-prone task and considerably eases engineering. Via an integrated operation display or the web server in the AS-i Link, the lower-level AS-i line can be completely commissioned. Even the complete IO test of all digital and analog slaves is executed on site without connection to the higher-level system. During operation, the user has access to detailed diagnostic information – directly on the display of the AS-i Link or on all operator panels throughout the plant, which, if required, immediately localize the fault and essentially reduce downtimes.

Our offer to you: everything from a single source

Siemens offers all components for installation, operation and maintenance of an AS-Interface network from a single source, e.g. a complete range of masters integrated in Totally Integrated Automation (among them the only safety-related master worldwide), numerous slaves for the control cabinet or for the field, diverse AS-i power supply units and general accessories as well as special network components such as repeaters or our AS-i extension plug by means of which the operating range of AS-i segments can be extended to 200 m. For an overview of our complete product portfolio, please refer to page 22 et seq. of this brochure.

Rational and safe wheel assembly:
ASIsafe protects persons and machines against damage also with short cycle times. Adam Opel AG Rüsselsheim relies on tried-and-tested field bus systems for its wheel assembly and realizes the required safety technology in the field easily and cost-efficiently with ASIsafe by Siemens.
**Integrated safety technology:**

**Safety Integrated**

Only Siemens has embedded AS-Interface into the unique, higher-level Safety Integrated safety concept in the form of ASIsafe. What makes this so unique is that the safety system is already integrated into the standard components. With this as basis, our Safety Integrated portfolio encompasses everything – from failsafe controllers through failsafe communications with the standard PROFIBUS (using the PROFIsafe® protocol) and AS-Interface (ASIsafe) field buses down to a complete portfolio for the sensor-actuator level. You can choose between the “small” solution ASIsafe solution local (ASIsafe as “safe island” under a standard PLC as well as standard AS-i master and safety monitor) and the cell-spanning and cross-plant ASIsafe integration with DP/AS-i F-Link under a failsafe control (ASIsafe solution PROFIsafe). Details on the structure and functional principle of ASIsafe are available on page 20 et seq.

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**Your advantages with Safety Integrated:**

- High degree of cost effectiveness thanks to minimal hardware and lower installation time and costs
- The safety system and standard automation are integrated to form a complete system
- Safety-related communications are simply implemented using standard fieldbuses
- Engineering costs are lowered using standard software which is also applicable to the safety system
- Simple to handle – enjoying a high level of acceptance with operating personnel
- Effective, fast diagnostic functions – for the highest up-time availability of machines, plants and systems
- Products, systems, solutions and service – from a single source
All around the globe:

AS-Interface worldwide

It goes without saying:
Everything for worldwide use

All AS-i components from Siemens are certified according to national and international standards: for instance, for marine engineering, as well as UL/CSA for the North American market.

Around the globe:
Comprehensive service and support

Our high-performance service and support portfolio provides you with competent and fast support on all issues regarding our complete portfolio – worldwide around the clock.

Proven many times over: AS-i in use

Our many years of automation know-how, the well-proven quality of our products and the superior technology of AS-Interface are connections you can rely on. This applies both to standard applications as well as individual requirements. You can always obtain tailored solutions from us that sustainably increase your productivity.

The positive effects produced by the harmonic and efficient combination of Siemens products and AS-Interface are illustrated by numerous reference examples. The following pages are to give you a rough idea of these advantages.

For UPS, the decision to use AS-Interface was especially the right one as a result of the implementation speed: It took just two weeks to upgrade the system and this was carried out with the old system still operational so that sorting was not disturbed. The new system was commissioned in just one day between two shifts.
AS-Interface in use:
Application examples

“Thanks to the modular concept, baggage was able to be handled after an extremely short commissioning time. The simplicity and flexibility of AS-Interface allowed the individual conveyor elements to be quickly and easily connected up.”

Mr. Gerle, Project Manager, Electrical Planning, Siemens AG, Logistics and Assembly Systems (L&A)

Every piece of baggage to the right aircraft – Munich Airport depends on AS-Interface

As a result of its size and the short construction time, the expansion of Terminal 2 of the Munich Airport was a most challenging transportation project. In just 10 months, a complex baggage handling system was implemented over an area of 260,000 m². It handles 100,000 pieces of baggage per day with a minimum connecting time of only 30 minutes – up until now, absolutely unique in Europe. The Siemens Logistics and Assembly Systems (L&A) Group – a leading supplier of logistical and production automation worldwide – solved this task brilliantly. One of the reasons for this success was these logistics professionals used AS-Interface when coupling the sensor-actuator level.

Solution details

- The 40-km-long baggage handling system was realized in just 10 months
- 27,000 sensors with a response time of 4 ms quickly and precisely localize the baggage
- Extremely fast construction of the typical concept is also easy to expand (a total of 11,000 standard conveyor elements)
- Pre-assembly, test operation as well as shorter commissioning times thanks to the simple AS-Interface wiring
- The complexity in the control cabinet is reduced by using a distributed architecture for the about 20,000 drives
Flexible and safe maintenance of Munich’s trams with ASIsafe

Today, 90 modern low-floor vehicles ensure attractive tram operation in Munich. The tram system is subject to the rigors of day-to-day operation and must be regularly serviced and maintained to ensure smooth operation. The tram is positioned over a 40-m-long pit cover in order to be able to remove the axle. The individual segments of the cover can be opened and closed using hatches that are pneumatically actuated. In order that neither the operating personnel are injured nor the vehicle damaged during this highly automated maintenance procedure, Munich’s tram operators use AS-Interface and its safety-related version ASIsafe.

Solution details

- The total of 102 individually controllable, pneumatic hatches are optimally secured using Emergency Stop pushbuttons in every operator panel
- The 500 sensors and actuators were simply cabled and easily connected up in spite of the extremely restricted space using just eight AS-i networks
- Enormous cost savings were realized by integrating the safety system with ASIsafe
- The system was able to be quickly and easily installed thanks to the straightforward AS-Interface structure – without having a negative impact on the ongoing maintenance services

AS-i in Germany’s largest empty bottle sorting system for Bier Schneider

The company Dr. Wievelhöfe in Telgte designed and constructed an empty bottle sorting system for Bier Schneider in Dortmund. This system is the largest of its type in Germany. The system has a footprint of 60 m x 30 m and extends over three levels. Every hour, up to 6,000 crates with an extremely wide range of empty bottles are identified and distributed to a total of 14 stations. AS-Interface was used to couple the signal I/O of the sorting equipment to four SIMATIC S7-300® controllers.

Solution details

- The complete cabling of the I/O and peripheral devices of this huge system was reduced to only eight AS-Interface lines
- The plant was able to be essentially standardized as the complete installation was reduced to just a few cables
- Engineering and commissioning times were shortened

“We have a modern maintenance system where the pit cover can be opened and closed using the automatically moved hatches. ASIsafe ensures safe, reliable operation. The overall concept has really proven itself in practice so much that in addition to servicing vehicles – for which it was originally intended – it is also used for brief intermediate checks.”

Mr. Vogel, Area Manager, Tram Workshops, City of Munich

“By using AS-Interface, we were able to construct the system on time – and what was especially important – at a favorable cost. The shorter engineering times played a decisive role in achieving these goals.”

Mr. Pelz, Manager of Electrical Design, Dr. Wievelhöfe, Telgte
The high-speed laser beam cutting machine symbolizes the Trumpf Company. On the field level, the machine – including all of the auxiliaries and feeder systems – is completely networked using AS-Interface. The modular design of the Trumpf machine comprising standard components – requiring a distributed installation – meant that AS-Interface was the optimum solution. Not only are the PLC I/O modules eliminated by using AS-Interface, the number of sockets required in the control cabinet to connect the machine is also significantly reduced. And when the machine is expanded, the control cabinet is not affected.

**Solution details**

- Faster and more flexible implementation of customer-specific machine solutions as well as expansions due to the standardized I/O interfaces
- The spare parts stock has been reduced thanks to the standardized components
- An additional safety bus is not required as a result of the safety technology integrated in AS-i
- The weight was able to be reduced as many connecting cables were eliminated

Although the hardware costs were higher for Trumpf, the lower mounting and installation costs fully compensated for this. Additional cost savings were also able to be achieved in the area of logistics, service and stock inventory, thanks to AS-Interface.
**With its self-constructed bio heating unit, Schößwendter Holz in Saalfelden/Salzburg – a woodworking operation – can cover its own energy requirements in an especially environmentally friendly way. Up until now, the fuel bunker had to be manually filled by employees working around the clock. Today, a fully automatic crane system handles this task. Just the same as for many similar systems, the crane system builder involved here – A+S Schuster from Peiting – made a decision to connect the distributed I/O through AS-Interface. This significantly simplified the installation. By the way: Only bark is burnt which is a by-product when tree trunks are cut and worked in this plant.**

**Solution details**

- Planning, installation/mounting and commissioning were significantly simplified due to the fact that up to 7 motor starters can be connected to a power bus.
- The hardware was engineered extremely quickly thanks to the standardization of the I/O modules, compact starter and operator equipment and devices.
- An enormous amount of space was saved in the control cabinet due to the distributed structure of the peripheral functions.

**AS-Interface simplified a lot of things with the Schößwendter Holz woodworking operation in Saalfelden/Salzburg. For instance, when it comes to service/maintenance – this is because interrupted and broken cables can now be simply localized. This is also true when the system is being expanded, e.g. if additional sensors are required. Everything runs in an optimum fashion with AS-Interface.**

**The company GreCon Dimter Holzoptimierung from Alfeld, Germany, was able to reduce the installation times of its finger-jointing systems by almost 60% by intelligently networking the numerous sensors and actuators with AS-Interface.**

**About 60% less installation time – AS-Interface in finger-jointing systems**

The company GreCon Dimter Holzoptimierung at home in Alfeld, Germany, is a global market leader in the area of package finger-jointing systems. Typical end products from this extremely cost-effective woodworking system are finger-jointed, bonded wooden panels, flooring surfaces, wooden flooring blocks as well as windows sections, furniture and all types of wooden strips. The wooden pieces are combined to form a packet and are then located on the milling table using a positioning unit. The packets are then clamped together and milled using a double milling unit. This is a process that requires many sensor and actuator signals. It is also a clear case for AS-Interface that directly acquires the signals where they occur via I/O field modules. These field modules are networked with one another and thanks to the clever, well-conceived structure result in a huge amount of cost-saving potential for GreCon Dimter Alfeld.

**Solution details**

- Mounting and installation times are reduced by about 60% – from 14 to 6 hours.
- Power cabling is minimized as motors are controlled in a distributed fashion.
- An enormous amount of time is saved when installing the machines at the end customer.
Everything at a glance:
The AS-Interface system in detail

**Structure**

**System-based simplicity: the structure**

An AS-Interface system comprises a master, an AS-i power supply unit and the nodes – the so-called slaves. The AS-Interface master uses cyclic polling to exchange data with the slaves.

In one cycle, four data bits are exchanged in the incoming direction and four data bits in the outgoing direction. A special AS-i power supply unit ensures that data and power can be transferred along one and the same cable. This means that data and power are simultaneously transferred using a two-conductor cable – and complex cable assemblies are therefore a thing of the past.

**Competencies**

**The head of the network: the AS-Interface master**

The AS-Interface master forms the connection to higher-level controls. It independently organizes the data traffic on the AS-Interface line and, in addition to the signal call-up, is responsible for parameter settings, monitoring and diagnostic functions. This applies both to standard applications with AS-Interface and for safety-related applications with ASIsafe.

**Yellow marvel: the AS-Interface cable**

The yellow, flat cable is characteristic for the AS-Interface. Data and power for the sensors are transferred along this cable. A second, black flat cable is used to supply the actuators with 24 V. Both of these cables use the piercing technology, specifically developed for AS-i. This allows every node to be simply snapped onto the two profiled cables at any location – also with the correct polarity.

**Optimally supplied: AS-Interface power supply units**

The special AS-Interface power supply units generate a regulated 30 V DC with a high degree of stability and low residual ripple. They supply the electronics of the network which means the AS-i modules and the master, as well as the connected sensor system. As a result of the integrated data decoupling, the power supply units separate the data and power – as both are simultaneously transferred along the two-conductor AS-Interface cable.
**Wide selection: AS-Interface slaves**

The nodes connected to AS-Interface – the so-called AS-Interface slaves – include, in addition to the AS-i electronics, the possibility of connecting sensors and actuators. Up to 62 slaves in the widest variety of versions can be installed in an AS-i network: You can either choose between I/O modules that are installed in a control cabinet or modules that are directly used in the field. You can also use sensors and actuators that already have an integrated AS-i slave and can therefore be directly connected to an AS-interface cable.

**Connecting AS-Interface networks**

**Direct or distributed:**

**Flexible connection possibilities**

AS-Interface is available in two versions when it comes to connecting it to automation solutions:

1. **AS-Interface – directly connected to the control**
   AS-Interface can be directly connected to programmable logic control systems extremely easily. The AS-i master is connected just as simply as standard S7 I/O modules.

2. **AS-Interface as subsystem**
   In addition to being directly connected to a master within the PLC rack, AS-Interface can be used as part of a distributed architecture, as a feeder/subsystem for higher-level bus systems or systems. Gateways or links are used for this philosophy such as the PROFIBUS or PROFINET gateways. This enables the end user to be more flexible in the general cabling layout of the system; some higher-level systems are more restricted in their cabling technology when compared to AS-Interface. It also allows for the configuration and commissioning of a control station or a working cell prior to the programming and completion of the central control station. This makes commissioning much easier and reduces time.

**Key data (AS-i Spec. 3.0)**

**Not too much and not too little: Optimized for digital data**

AS-Interface is precisely aligned to the requirements of the lowest field level: Real-time-capable, low data volumes and a high number of connected devices. This is the reason that for AS-Interface – in every cycle –, four data bits are exchanged in the incoming and outgoing direction between the master and each of the up to 62 slaves. Put briefly: Many sensors and actuators are addressed in real time – really making it the optimum fieldbus system.

**Digital or analog: Both are possible**

For AS-Interface, analog values are transferred by the master – autonomously controlled and monitored. 16-bit analog values can be just as simply coupled in as digital inputs and outputs. This means that conversion and transfer times of less than 100 ms can be easily achieved.

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**The direct connection to the control**

![Diagram of AS-Interface connection](image)

- **PLC**
- **AS-i master**
- **Slaves**
- **Power supply unit**

**AS-Interface as subsystem**

- **PROFINET**
- **IE/AS-i LINK PN IO**
- **DP/AS-i LINK**
- **Advanced**
- **Power supply unit**

**Table: Key data**

<table>
<thead>
<tr>
<th>No. of slaves</th>
<th>Max. 62 (A/B technology)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of I/Os</td>
<td>496 inputs and 496 outputs (Spec. 3.0)</td>
</tr>
<tr>
<td>Medium</td>
<td>Non-shielded 2-wire cable for data and power</td>
</tr>
<tr>
<td>Cycle time</td>
<td>Max. 10 ms (20 ms)</td>
</tr>
<tr>
<td>Data transfer</td>
<td>Digital and analog (16 bit)</td>
</tr>
<tr>
<td>Cable length</td>
<td>Standard: 100 m; can be extended to 600 m using additional components</td>
</tr>
</tbody>
</table>
Flexible structure, simple to engineer

Whether as line, star or tree-type topology – thanks to the rugged principle of operation, there are neither restrictions regarding the structure nor network topology. Using AS-Interface, you can optimally adapt your installation system to the plant or machine and when it comes to planning, engineering and installation, you can save a lot of time. Plants and systems can also be implemented more quickly and more simply.

Your advantages over the plant life cycle

- It is not necessary to take into account the detailed mechanical design and structure of the plant when planning and engineering
- Buses can be branched at a favorable price without having to use any repeaters
- More simple on-site installation thanks to the flexible topology
- Pre-configured bus cables are not required
- Systems can be simply expanded
Rugged data transfer, reliable in operation

A modulation technique – specifically developed for the AS-Interface – ensures extremely rugged data transfer and the highest degree of availability in operation. An intelligent data protocol secures the complete system and therefore makes it especially insensitive to noise and disturbances. This is the reason that you can comfortably do away with additional grounding or cable shielding.

This means that the favorably priced AS-Interface cables can be used. These cables can be extremely flexibly and simply routed just the same as in a conventional electrical installation. No special components are required – neither to connect the slaves nor for the branches.

One instead of a thousand cables

One of the main reasons that AS-Interface was developed was to reduce the amount of cable assemblies required. The trigger was the immense cabling costs that were incurred when connecting the field level to the automation system. Another reason that the AS-Interface was developed was due to the high number of potential fault sources and the associated plant downtimes. The cost savings are significant: For instance, according to a study carried out by the Technical University of Munich, by using AS-Interface, 25% of the costs of the electrical automation for a milling machine were saved. The cost-saving potential as a result of fewer cables applies to the engineering, installation and commissioning phases. Not only this, but plant downtimes can be reduced thanks to the more straightforward and transparent structure.

Your advantages over the plant life cycle

- Simple and fast cable routing just the same as for conventional electrical installation
- Slaves can be connected without a special connector
- High degree of data integrity

Planning Engineering Installation Commissioning Maintenance Expansion

Your advantages over the plant life cycle

- Engineering is simpler thanks to the straightforward transparent structure
- Fast installation and commissioning
- The simple structure minimizes potential fault causes and reduces downtimes
**Quickly installed, simply serviced thanks to the piercing technology**

The modular technology is typical for the AS-i system. Slaves are used comprising two sections: A mounting plate as lower section and an upper section – the module itself. The cable is located between these two sections – just like a sandwich. It is amazing just how simply and reliably nodes can be connected at any location along the flat AS-Interface cable.

An innovative insulation displacement method – the so-called piercing technology – makes it all possible. And this is how it works: The contact pin of a module pierces the cable insulation and establishes a reliable contact to the copper conductors. If a slave is removed, the pin is withdrawn and the hole automatically closes at the insulation location thanks to the self-healing capability of the cable (for EPDM cables). A connection with an incorrect polarity is excluded as a result of the cable geometry.

Thanks to this innovative installation system, AS-Interface not only speeds up the configuration, but also the service/maintenance of plants and machines. Even personnel that have received little training can easily replace the devices. This means that the system can be expanded more quickly therefore reducing downtimes.

**Your advantages over the plant life cycle**

- Installation and commissioning times are reduced as slaves can be quickly connected with incorrect polarity protection
- I/O modules can be quickly and simply replaced
- Slaves can be simply added or removed

Cross-section of an AS-Interface cable illustrating the piercing technology
High degree of freedom without control cabinets: Modular AS-Interface I/O

AS-Interface modules are available in a wide range of versions. Generally, they have extremely high degrees of protection – up to IP69K. This means that they are optimally suited for field installation without any control cabinet. Commissioning is simplified and faster thanks to the LEDs that are used to display the status and signal diagnostics on the modules.

At the press of a button: Configuring the system using plug & play

An AS-Interface network can be extremely simply and quickly configured – in just two steps:
- Step 1: The nodes are addressed using the AS-i addressing device
- Step 2: The nodes are configured by just pressing a button on the master

The master quickly identifies all of the slaves in a list. These slaves can then be addressed via the host, e.g. SIMATIC S7. This means that the slaves do not have to be especially configured. The AS-i modules are automatically assigned to the I/O area of the control. When a module is replaced, the master automatically assigns an address to it. Specialist personnel are therefore not required.

Your advantages over the plant life cycle
- Engineering central control cabinets and connecting them up is simpler
- Costs are reduced and the installation resources are minimized thanks to the distributed structure in the field
- Operation and maintenance are simplified due to the high diagnostics capability

Your advantages over the plant life cycle
- Nodes are automatically identified and configured
- Addresses are quickly assigned using the AS-i programming device
- Nodes can be quickly and simply replaced using plug & play
Integrated safety technology:

**ASIsafe**

Exploiting the saving potential of AS-Interface also in safety technology? This can be achieved with ASIsafe (AS-Interface Safety at Work) as the safety-related version of AS-Interface allows both standard and safe data on only one bus system. EMERGENCY-STOP buttons, door interlocking mechanisms and many further I/Os can be directly connected to AS-i comfortably and safely – certified by the TÜV (German Technical Inspectorate) up to PL e / Cat. 4 and SIL 3. Also existing applications can be easily and rapidly expanded by safety-relevant functions. No other supplier offers ASIsafe in such a scalable scope: from small safety islands to system-spanning Safety Integrated architectures.

**ASIsafe solution local: the safety monitor**

Safety technology can be so easy and efficient. The local ASIsafe solution requires only two components: a safety monitor and safe slaves. Neither a failsafe PLC nor special masters are necessary. The safety monitor monitors the safe inputs which are detected via the safe slaves, connects them through a parameterizable logic and provides for a safe switch-off via integrated safety relays. All data are transferred via a dynamized, safe protocol. The safety monitor receives a specific telegram from each slave per cycle, which continuously changes in accordance with a defined algorithm. The disconnection logics are parameterized via a configuration software, which supports differentiated responding to the safe stations’ tripping. If, e.g. in fault or alarm cases, a telegram is not received, the safety monitor initiates disconnection via its two-channel enabling circuits after a maximum period of 40 msec (worst case).

Diagnostic data of the safety monitor can be called up via the control, which bears many advantages. The most decisive aspect: the safety components need to be additionally wired. Ready-made operating and monitoring images allow for the visualization of safety-relevant occurrences on the available SIMATIC HMI panels.

**ASIsafe solution PROFIsafe: the DP/AS-i F-Link**

Thanks to the DP/AS-i F-Link, also comprehensive safety applications benefit from the AS-i advantages now. The link allows for the use of AS-i under failsafe SIMATIC or SINUMERIK controls. Closing the gap in bus-based safety technology, it translates ASIsafe telegrams for the PROFIsafe protocol. Safe signals are detected as usually with the rugged IP67 ASIsafe slaves. The available F-PLC is responsible for evaluation. However, the system also responds on the PROFIsafe level, optionally by means of F-DO/F-RO modules in a central rack or with the failsafe distributed I/O.

The DP/AS-i F-Link is the first choice for:
- configurations including a high number of safe slaves
- configurations including a multitude of disconnection circuits
- a safety-related processing on the higher-level field bus levels
- comprehensive and complex logical connections

And there has never been more TIA at AS-i: configuration and parameterization are realized via STEP 7 HW Config as is the case with PROFIsafe slaves. The safe logic is programmed with the virtually unlimited possibilities of STEP 7 Distributed Safety in F-KOP or F-FUP. The comprehensive library of TÜV-certified function modules provides for particularly efficient and structured application programs. Diagnostics is also realized with the STEP 7 system functions as well as on the on-site devices by messages on the display.

<table>
<thead>
<tr>
<th>Possible number of safe slaves</th>
<th>ASIsafe</th>
</tr>
</thead>
<tbody>
<tr>
<td>31</td>
<td>up to SIL3 (IEC 61508)</td>
</tr>
<tr>
<td>Safety Integrity level</td>
<td>up to PL e / Cat. 4 (DIN EN ISO 13849-1)</td>
</tr>
<tr>
<td>Safety category</td>
<td>max. 40 msec (worst case)</td>
</tr>
</tbody>
</table>

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**ASIsafe solution local: structure and components**

- Standard PLC and standard master
- Standard AS-i power supply unit
- Standard slave

**Diagnosis of ASIsafe slaves in STEP 7**

**Parameterization of ASIsafe slaves in STEP 7 HW Config**

**ASIsafe diagnostics via SIMATIC HMI panel**

**Graphical configuration with ASIsafe via asimon V3**

**ASIsafe solution PROFIsafe: structure and components**

- SIMATIC S7-300F
- Visualization HMI panel
- DP/AS-i F-Link
- SIMATIC ET 200S
- DI/DO and AI/AO

**Signal flow of safety-related signals and evaluation via the safety monitor**

**Extended ASIsafe diagnostics (through regular I/O transfer)**

**F-DI**

**EMERGENCY STOP**

**Standard slaves**

**AS-Interface line**

**Signal flow of safety-related signals down to the PLC (PROFIsafe level)**

**Signal flow for digital and analog standard signals**
The AS-Interface product portfolio from Siemens

**Master**
The AS-Interface master establishes the connection to the higher-level control systems. It automatically organizes the data transfer on the AS-Interface cable and handles the interrogation of the signals, the parameter settings and monitoring and diagnostic functions.

- Connection of up to 62 AS-Interface slaves (A/B technology)
- Integrated analog value transmission
- No configuration required; optional: upload of AS-Interface configuration in STEP 7 with S7-300 master
- Easy operation in input/output addressing range
- Supply voltage monitoring on the AS-Interface profile cable

**Your advantage:** Can be simply coupled to SIMATIC S7-300, SIMATIC S7-200 or SIMATIC C7

**Master for SIMATIC**

**Links to PROFIBUS DP or PROFINET IO**

- IP20 housing
- Single and double master acc. to Spec. 3.0
- User-friendly diagnostics and commissioning
- PROFINET IO communications with process data view
- Vertical integration (standard web interface, SNMP)
- Integrated Ethernet 2-Port Switch (RUAS, ERTEC inside)
- Devices can be changed without a programming device (optional using C-PLUG)

**Your advantage:** Compact network transition from AS-Interface to PROFIBUS or Industrial Ethernet integrated in STEP 7

**Safety-related link to PROFIBUS DP**

- IP20 housing
- In one single device: One AS-i V3 Master and one 2-channel ASIsafe monitor
- The ability to transfer safe input singles from ASIsafe through to the PROFIsafe network
- The exchange of digital and analog I/O data as per the DPIAS-i LINK Advanced
- Configuration is via STEP 7 utilizing the distributed safety option

**Your advantage:** Compact network transition for an optimum realization of ASIsafe on PROFIsafe

**AS-Interface power supplies**
AS-Interface power supplies generate a regulated 30 V DC voltage with a high stability and low residual ripple. They operate according to the principle of a primary switched-mode regulator. They are an integral component of the AS-Interface network and allow data and power to be simultaneously transferred along one cable.

**Power supply units**

- IP20 housing
- Wide power range (from 3 A to 8 A)
- Removable terminal blocks
- Integrated overload and ground fault detection
- Diagnostics memory, remote signal and remote reset
- Ultra-wide range input for the 8 A version

**Your advantage:** Optimum power for every application
**Slaves**

Slaves contain the AS-Interface electronics and connection options for sensors and actuators in the field as well as in the control cabinet. A total of up to 62 slaves (A/B technology) can be connected to one bus. Slaves then cyclically exchange their data with a control module (master).

<table>
<thead>
<tr>
<th>Compact modules K60, K45 and K20</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image showing K60, K45, K20 modules]</td>
</tr>
<tr>
<td>- IP65/IP67 housing, IP68/IP69K also available</td>
</tr>
<tr>
<td>- Especially compact dimensions from a width of 20 mm</td>
</tr>
<tr>
<td>- ATEX-certified modules available for hazardous Zone 22</td>
</tr>
<tr>
<td>- M8/M12 connection sockets</td>
</tr>
<tr>
<td>- Up to 8 inputs and 4 outputs</td>
</tr>
<tr>
<td>- Extended address mode (62 slaves: 1A,1B ... 31A, 31B) available (also acc. to AS-i Spec. 3.0)</td>
</tr>
<tr>
<td>- Correct polarity always guaranteed when connecting up</td>
</tr>
<tr>
<td>- Rail and panel mounting possible</td>
</tr>
<tr>
<td>- Mounting of the module on baseplate with only one screw</td>
</tr>
<tr>
<td>- Diagnostic LEDs</td>
</tr>
<tr>
<td>- AS-i/AS-i data coupler available in K60 design</td>
</tr>
</tbody>
</table>

*Your advantage: Installation and commissioning times are reduced by up to 40%*

<table>
<thead>
<tr>
<th>Analog modules K60</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image showing K60 module]</td>
</tr>
<tr>
<td>- IP65/IP67 housing</td>
</tr>
<tr>
<td>- Directly senses or supplies analog signals locally</td>
</tr>
<tr>
<td>- 2/4-channel</td>
</tr>
<tr>
<td>- Input modules for up to 4 current transducers, voltage transducers or thermal resistance transducers</td>
</tr>
<tr>
<td>- Output modules for current or voltage</td>
</tr>
<tr>
<td>- Fast analog modules available in the extended address mode (62 slaves: 1A, 2A ... 31A, 31B) according to Spec. 3.0</td>
</tr>
</tbody>
</table>

*Your advantage: Analog values can be simply connected*

<table>
<thead>
<tr>
<th>SlimLine and flat modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image showing SlimLine and flat modules]</td>
</tr>
<tr>
<td>- IP20 housing</td>
</tr>
<tr>
<td>- Up to 16 inputs</td>
</tr>
<tr>
<td>- Extended address mode (62 slaves: 1A,1B ... 31A, 31B) available (also acc. to AS-i Spec. 3.0)</td>
</tr>
<tr>
<td>- Narrow SlimLine modules starting at a width of 22.5 mm</td>
</tr>
<tr>
<td>- SlimLine has removable terminal blocks that are protected against finger touch and cannot be accidentally interchanged</td>
</tr>
<tr>
<td>- Low-profile flat modules for small control enclosures and where space is restricted</td>
</tr>
<tr>
<td>- Connected through screw or spring-loaded terminals</td>
</tr>
<tr>
<td>- Rail and panel mounting possible</td>
</tr>
<tr>
<td>- Diagnostic LEDs</td>
</tr>
</tbody>
</table>

*Your advantage: Modules can be accommodated in control cabinets and small local control enclosures in the field*

<table>
<thead>
<tr>
<th>Counter modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image showing counter module]</td>
</tr>
<tr>
<td>- IP20 housing</td>
</tr>
<tr>
<td>- They evaluate pulses</td>
</tr>
<tr>
<td>- Connected through removable screw or spring-loaded terminals</td>
</tr>
</tbody>
</table>

*Your advantage: Pulses can be evaluated that even exceed the clock-cycle frequency of AS-Interface*
### Compact starters for AS-Interface (IP56/67)

- IP65/IP67 housing
- Up to 5.5 kW at 400/500 V AC
- Electromechanical or electronic design
- Optionally with brake contact

Your advantage: No local control cabinets are required thanks to the complete pre-wired load feeder in IP65

### 24 V DC starters

- IP65/IP67 housing
- Direct starters, double direct starters or reversible starters
- Up to 70 W
- Quick stop function

Your advantage: Basic motor starters in a well-proven module design for 24 V DC motors

### Motor starters for ECOFAST

- IP65/IP67 housing
- Standardized interface according to the ECOFAST specifications (in conformance with DESINA)
- Switching function – mechanical or electronic for soft starting

Your advantage: Space saving in the control cabinet, the starters can either be installed close to the motor or plugged onto the motor

### Load feeders

- IP20 housing
- Available either completely pre-wired or as individual components
- Power range up to max. 7.5 kW
- Power bus in combination with a busbar system (> 200 A)

Your advantage: Complete, pre-assembled load feeders simplify applications with AS-Interface

### Compact starters (IP20)

- Degree of protection IP20
- Integration of the SIRIUS 3RA6 compact starter in AS-Interface via an AS-i add-on module (A/B technology)
- Space-optimizing thanks to simple plug connection of the add-on module directly on the compact starter
- Optionally also with 2 local inputs for safe disconnection
- Bit assignment of signals according to usual standard for SIRIUS motor starters

Your advantage: Particularly compact solution with minimum wiring expenditures for control via AS-Interface
AS-Interface for LOGO!

- AS-i slave to connect to LOGO!
- Distributed controller functionality
- 4 inputs/4 outputs (virtual)

Your advantage: Intelligence that can be used locally

Pushbuttons/indicator lights

- Can be mounted in a modular fashion according to individual requirements
- Metal and plastic versions
- Extended and address mode
- Lamp holder with integrated LED

Your advantage: Complete 3SB3 operator system with simple AS-Interface connection for your plant or system

Signaling columns

- Many optical and acoustic elements can be combined
- Up to 4 signal elements can be connected using adapter elements
- With LEDs or incandescent lamps
- Extended address mode (62 slaves: 1A,1B ... 31A, 31B) available

Your advantage: Signaling columns to monitor production sequences and to visually and acoustically issue an alarm in emergency situations with a simple AS-Interface connection

Communications-capable contactors 55 to 250 kW

- Contactors from 55 to 250 kW
- Control and message signals via the AS-Interface
- Indication of remaining lifetime (RLT) via the AS-Interface

Your advantage: It is possible to quickly and simply change over from automatic to local control; this means that automatic control via AS-interface can be disabled and a contactor can be manually controlled – for instance during commissioning or when faults develop.
ASIsafe
ASIsafe allows safety-related components to be integrated into an AS-Interface network – for example: EMERGENCY STOP pushbuttons, protective door switches or safety light arrays. The advantages of the simple AS-Interface wiring still apply.

Safety monitor/extended safety monitor
- Core element of the ASIsafe Solution local
- Monitoring of safe stations and interlinking of safe inputs
- Removable shockproof and reversal-protected terminal blocks
- Safe disconnection via 1 or 2 double-channel enabling circuits
- Optional: with extended working memory and integrated ON and OFF delay as well as pulse functions (extended safety monitor)
- Optional: control of a distributed safe output or safe coupling of two AS-i networks (device version 3)
- Easy and safe configuration of the safety monitor via the graphical PC software asimon V3

Your advantage: Easily configurable safety functions up to PL e / Category 4 or SIL 3*

Safety modules
- IP65/IP67 or IP20 housing
- Especially compact dimensions from a width of 20 mm
- 2 or 4 inputs in PL c / Category 2 or SIL 2* or 1 or 2 inputs in PL e / Category 4 or SIL 3*
- 4 safe inputs or 2 additional standard outputs available on the module
- Special K45F LS version for connection of electronic safety sensors with testing semiconductor outputs

Your advantage: Safety-related signals can be simply connected up – whether in the control cabinet or in the field

EMERGENCY STOP
- IP65/IP67 housing
- EMERGENCY STOP can be directly connected to AS-Interface
- Metal or plastic versions

Your advantage: Tried-and-tested operating elements can be easily and directly connected to ASIsafe

Position switches/cable-operated switches
- IP65 housing
- Direct connection of position switches or cable-operated switches for the detection of safe signals
- ASIsafe electronics already integrated in the housing
- Available with separate operating mechanism or solenoid interlocking
- Molded-plastic or metal-enclosed

Your advantage: Conventional wiring of the safety functions is no longer necessary

Contactless (electronic sensitive) protective devices
- IP65 housing
- Can be directly and safely connected to AS-Interface
- Up to SIL 2* (laser scanners) or SIL 3* (light grids / curtains)
- Also with integrated muting function

Your advantage: Active and optical protection for personnel – can be directly connected to ASIsafe

*In accordance with DIN EN ISO 13489-1 or IEC 61508
Service and Support

Information

Easy download of catalogs and information material
The latest catalogs, customer magazines, brochures, demo software and special bargain packages are available for ordering or download from our Information and Download Center:
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www.siemens.com/lowvoltage/configurators

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24/7-access to a comprehensive information and ordering platform for products and systems of the low-voltage controls and distribution portfolio? Comprehensive information on our complete portfolio? Product selection, order tracking, service, support and training information? All this can be conveniently found at our Mall at:
www.siemens.com/lowvoltage/mall

Newsletter
Always up to date: Our regular newsletter provides you with topical information on our industrial controls and power distribution products. Simply register at:
www.siemens.com/lowvoltage/newsletter

Online support
Reports and technical data sheets on our products can be found at:
www.siemens.com/lowvoltage/support
Commissioning / operation | Service | Training

**Online support**

Detailed technical information on our products and systems of the low-voltage controls and distribution portfolio, product support and further services and support based on helpful support tools can be found at:

[www.siemens.com/lowvoltage/support](http://www.siemens.com/lowvoltage/support)

**Technical Assistance**

You are looking for the right product suit- ing your application? You have technical questions, require spare parts or want to localize a regional expert? Our experienced team of engineers and techni- cians will be pleased to assist you:

- Personally from Monday to Friday, 8.00 am to 5.00 pm (CET) via telephone support: +49 911 895-5900
- Via e-mail: technical-assistance@siemens.com
- Via fax: +49 911 895-5907

At [www.siemens.com/lowvoltage/technical-assistance](http://www.siemens.com/lowvoltage/technical-assistance), you can also access the Siemens Service & Support Internet platform for Industry Automation and Drive Technologies. Here, you can search the FAQ database for information and solutions matching your task or directly send your questions to our technical consultants via the support request.

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Our training centers at numerous sites worldwide offer individual training pro- grams covering all fields of automation and industrial solutions. Moreover, with the help of our online courses and vari- ous learning software, you can acquire new know-how even more time- and cost-efficiently. More information on our comprehensive SITRAIN training pro- gram is available on the Internet at [www.siemens.com/sitrain-cd](http://www.siemens.com/sitrain-cd)

Or contact us personally:

- via information hotline: +49 1805 25 36 11 or
- Fax: +49 1805 23 56 12
System Components and Accessories
Accessories to help when mounting, installing and using AS-Interface, as well as individual components.

Increasing the range
- Extends an AS-i segment up to 200 m with extension plug (without an additional power supply)
- Extends by one bus segment with AS-i repeater
- Maximum expansion is increased (for a combination) up to 600 m

Your advantage: Infrastructure costs are reduced, more applications can be addressed and a higher degree of freedom when designing the plant or system

Addressing device
- Addresses all AS-Interface network nodes (standard and extended and address mode)
- Reads out the I/O and ID codes of the slaves
- Parameterizes the slave (ID1 or analog parameter)
- Measures the AS-Interface voltage
- Allows outputs to be directly set and slave inputs to be read in
- Saves the complete plant/system configuration

Your advantage: Extremely simple way of addressing and parameterizing a slave

Analyzer
- Checking the quality and function of an AS-Interface installation
- Transmission of data via RS232 interface to a PC
- Evaluation using software
- Easy to use
- Automatically generated test protocols
- Advanced trigger functions permit precise analysis
- Error burst display permits preventive diagnosis
- Process data (standard and safety) can be monitored on-line

Your advantage: Quality assessment of an AS-Interface network with protocol printout, analysis on-site and remote diagnostics

Cable
- The trapezoidally shaped cable prevents incorrect polarity connections
- Cables for a wide range of application conditions using the appropriate, optimized materials
- Special versions are available according to UL Class 2

Your advantage: Devices can be quickly connected to AS-Interface and replaced using piercing technology

Distributor/M12 branch
- The AS-i profiled cable with a high degree of protection can be simply routed
- Branch from AS-i and Uaux on a round cable
- Connection of slaves with an M12 bus socket
- Especially simple to handle

Your advantage: The AS-i profiled cable can be easily routed and branched

Special modules
- Enhanced diagnostics – ground faults are detected, displayed (LED) and signaled (2 outputs)
- Higher degree of operational safety through overvoltage protection

Your advantage: Ground faults are identified and protection is provided against overvoltages on AS-i
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