













2/2	<b>Introduction</b>
	<b>AS-Interface</b>
	<u>Introduction</u>
2/7	Transmission technology
2/8	Configuration examples
2/9	Technical specifications
	<u>ASIsafe</u>
2/10	Introduction
2/12	AS-Interface safety monitors
2/14	AS-Interface safety modules
	<u>Masters</u>
2/20	CP 243-2
2/21	CP 343-2 P
	<u>Routers</u>
2/22	DP/AS-Interface Link 20E
	<u>Slaves</u>
	I/O modules for operation in the field
2/23	- Introduction
2/25	- Digital I/O modules, IP67 – K60
2/35	- Digital I/O modules, IP68 / IP69K – K60R
2/39	- Digital I/O modules, IP67 – K45
2/45	- Analog I/O modules, IP67 – K60
	I/O modules for operation in the control cabinet, IP20
2/48	- Introduction
2/50	- SlimLine
2/60	- F90 modules
2/65	- Flat modules
	Special integrated solutions
2/66	- AS-Interface communication modules
	Modules with special functions
2/70	- Counter modules
2/71	- Ground fault detection modules
2/73	- Overvoltage protection modules
2/75	AS-Interface connections for LOGO!
	<u>Power Supply Units</u>
2/76	AS-Interface power supplies, IP65
2/78	AS-Interface power supplies, IP20
	<u>Transmission Media</u>
2/82	AS-Interface shaped cables
	<u>System Components and Accessories</u>
2/83	Extension plug
2/86	Addressing units
2/87	AS-Interface analyzers

	<b>PROFIBUS</b>
	<u>System Overview</u>
2/88	Process or field communication
2/91	Communication overview
2/93	Configuration examples
2/94	Technical specifications

	<b>SIRIUS Modular System</b>
2/95	System overview

### Overview

	Order No.	Page
<b>AS-Interface / ASIsafe</b>		
<p>ASIsafe enables the integration of safety-oriented components in an AS-Interface network, for example:</p> <ul style="list-style-type: none"> <li>• EMERGENCY-STOP pushbuttons</li> <li>• Protective door switches</li> <li>• Safety light arrays</li> </ul> <p>The simple wiring of AS-Interface, which is a major advantage, is maintained.</p>		
 <p><b>AS-Interface safety monitors</b></p> <ul style="list-style-type: none"> <li>• Key element of ASIsafe</li> <li>• Monitors safe participants and links safe inputs</li> <li>• Ensures safe disconnection</li> <li>• Modular construction in according to individual requirements</li> <li>• Available with one or two release circuits with 2-channel configuration</li> <li>• New version of "Expanded safety monitor" with expanded RAM and integrated closing and opening delay and pulse functions</li> </ul> <p><i>Your advantage: Easy to configure safety functions up to Category 4</i></p>	3RK1, 3RK2	2/12
 <p>K45F</p>  <p>K60F</p>  <p>S22.5F (SlimLine)</p> <p><b>AS-Interface safety modules</b></p> <ul style="list-style-type: none"> <li>• Complete portfolio of ASIsafe modules</li> <li>• Degree of protection IP65/IP67 or IP20</li> <li>• Two inputs in Category 2 or one input in Category 4</li> <li>• Two standard outputs are available on the module in addition</li> </ul> <p><i>Your advantage: Easy integration of safe signals, be it in the cabinet or in the field</i></p>	3RK1	2/14
<b>Masters</b>		
<p>The AS-Interface master creates the connection to higher-level control systems. It automatically organizes the data traffic on the AS-Interface cable and sees not only to querying the signals but also to performing the parameter setting, monitoring and diagnostics functions.</p>		
 <p>CP 343-2 P for SIMATIC S7-300</p>  <p>CP 243-2 for SIMATIC S7-200</p> <p><b>Masters for SIMATIC</b></p> <ul style="list-style-type: none"> <li>• Connection of up to 62 AS-Interface slaves</li> <li>• Integrated analog value transfer</li> <li>• Configuring and uploading of AS-Interface configuration in STEP 7 with S7-300 Master</li> <li>• No configuration required</li> <li>• Easy operation in the input/output address range</li> <li>• Monitoring of the supply voltage on the AS-Interface shaped cable</li> </ul> <p><i>Your advantage: Easy connection to SIMATIC S7-300, to SIMATIC S7-200 or to SIMATIC ET 200X</i></p>	6GK7	2/20

	Order No.	Page
<b>AS-Interface / Routers</b>		
<p>As an alternative to the CPs, which are plugged directly in the controller it is also possible to use a gateway/link as AS-Interface master – at any position beneath the PROFIBUS DP.</p>  <p>DP/AS-Interface Link 20E</p> <p><b>Routers</b></p> <ul style="list-style-type: none"> <li>• Degree of protection IP20</li> <li>• PROFIBUS slave and AS-Interface master</li> <li>• Connection of up to 62 AS-Interface slaves</li> <li>• No configuration of the CP for AS-Interface required</li> <li>• Integrated analog value transfer with Link 20E</li> <li>• Configuring and uploading of AS-Interface configuration in STEP 7 with Link 20E possible</li> <li>• User-friendly selection of AS-Interface slaves when using DP/AS-Interface Link 20E</li> </ul> <p>Your advantage: Optimum transition to PROFIBUS, integrated in STEP 7</p>	6GK1	2/22
<b>AS-Interface / Slaves</b>		
<p>Slaves contain the AS-Interface electronics and connection options for sensors and actuators in the field and in the cabinet. A total of up to 62 slaves can be connected to one bus. The slaves then exchange their data in cyclic mode with a control module (master).</p>		
 <p>K45 digital module</p> <p><b>Field modules / Digital I/O modules IP67 – K45 and K60</b></p> <ul style="list-style-type: none"> <li>• Degree of protection IP65/IP67</li> <li>• Modules available with up to IP68/69K protection</li> <li>• ATEX-certified modules available for EX Zone 22</li> <li>• Connection sockets in M8/M12</li> <li>• Up to eight inputs and four outputs</li> <li>• A/B technology available</li> <li>• Contacting protected against polarity reversal</li> <li>• Standard rail mounting and wall mounting possible</li> <li>• Mounting of the module on the base plate using just one screw</li> <li>• Diagnostics LEDs</li> </ul> <p>Your advantage: Reduction of mounting and start-up times by up to 40 %</p>	3RK1, 3RK2	2/25, 2/39
 <p>K60 digital module</p> <p><b>Field modules / Analog I/O modules IP67 – K60</b></p> <ul style="list-style-type: none"> <li>• Degree of protection IP65/IP67</li> <li>• Detects or transmits analog signals locally</li> <li>• 2/4-channel</li> <li>• Input modules for up to four sensors with current signal, sensors with voltage signal or sensors with thermal resistor</li> <li>• Output modules for current or voltage</li> </ul> <p>Your advantage: Easy integration of analog values</p>	3RK1	2/45
 <p>K60 analog module</p>		



SlimLine



F90 modules



Flat module



**Cabinet modules**

- Degree of protection IP20
  - No M12 connectors required for connection
  - Up to 16 inputs
  - Slim type of construction of the SlimLine modules with width from 22.5 mm
  - Removable, finger-safe terminal blocks that cannot be mixed up (SlimLine)
  - Flat type of construction of the flat modules for small control boxes and confined conditions
  - Connection with screw-type or spring-loaded terminals
  - Standard rail mounting and wall mounting possible
  - Diagnostics LEDs
- Your advantage: Modules enable use in cabinets and small local control boxes

**Modules with special functions / Counter modules**

- Degree of protection IP20
  - For evaluation of pulses
  - Connection with screw-type or spring-loaded terminals
- Your advantage: Evaluation of pulses which exceed even the clock frequency of AS-Interface

**Modules with special functions / Ground fault detection modules**

- Degree of protection IP20
  - Display using LEDs
  - Two signal outputs
- Your advantage: Automatic diagnostics of ground faults on AS-Interface

**Modules with special functions / Overvoltage protection modules**


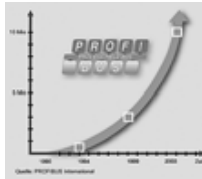

- Degree of protection IP67
  - Discharge through ground cable with oil-proof outer sheath
  - Protection at transition of lightning protection zones
- Your advantage: The AS-Interface overvoltage protection module protects downstream AS-Interface devices or individual sections in AS-Interface networks from conducted overvoltages

**AS-Interface connections for LOGO!**

- AS-Interface slave for the connection of LOGO!
  - Distributed controller functionality
  - Four inputs / four outputs (virtual)
- Your advantage: Intelligence can be used locally

Order No.	Page
3RG9, 3RK1	2/48
3RK1	2/70
3RK1	2/71
3RK1	2/73
3RK1	2/75

	Order No.	Page
<b>AS-Interface / Power Supply Units</b>		
<p>AS-Interface power supply units generate a controlled direct voltage of 30 V DC with high stability and low residual ripple, working according to the principle of a primary switchgear. They are an integral component of the AS-Interface network and enable the simultaneous transmission of data and power on one cable.</p>		
 <p>IP20, 3 A</p>  <p>IP20, 8 A</p>	<p><b>Power supply units</b></p> <p><i>Power supply units with degree of protection IP20 or IP65:</i></p> <ul style="list-style-type: none"> <li>• With wide performance spectrum from 2.4 to 8 A</li> <li>• Less space required thanks to compact dimensions</li> <li>• Easy and quick installation</li> <li>• Certified for global use</li> </ul> <p><i>Power supply units with degree of protection IP20:</i></p> <ul style="list-style-type: none"> <li>• Integrated ground-fault and overload detection saves the need for additional components and makes applications reliable</li> <li>• Diagnostics memory, remote indication and remote reset allow fast detection of faults in the system</li> <li>• Removable terminal blocks reduce downtimes</li> <li>• The ultra-wide input range enables single- and two-phase applications (8 A version)</li> </ul> <p><i>Your advantage: Optimum performance for each application.</i></p>	<p>3RX9</p> <p>2/76</p>
<b>AS-Interface / Transmission Media</b>		
<p>AS-Interface shaped cable for connection of network stations.</p>		
	<p><b>AS-Interface Shaped Cables</b></p> <ul style="list-style-type: none"> <li>• No polarity reversal thanks to trapezoidal shape</li> <li>• Cables made of optimized material for different working conditions</li> <li>• Special version according to UL Class 2 available</li> </ul> <p><i>Your advantage: Fast replacement and connection to AS-Interface by piercing method</i></p>	<p>3RX9</p> <p>2/82</p>
<b>AS-Interface / System Components and Accessories</b>		
<p>Accessories as mounting, installation and operating aids as well as individual components.</p>		
	<p><b>Extension plug</b></p> <ul style="list-style-type: none"> <li>• Extension of an AS-i segments to max. 200 m with an extension plug (without an additional power supply unit)</li> <li>• Maximum size increases (when combined) to more than 600 m</li> </ul> <p><i>Your advantage: Lower infrastructure costs, more possibilities of use and greater freedom for plant planning</i></p>	<p>3RK1, 6GK1</p> <p>2/83</p>
	<p><b>Addressing units</b></p> <ul style="list-style-type: none"> <li>• Addressing all stations of the AS-Interface network (standard and A/B slaves)</li> <li>• Reading out the I/O and ID codes of the slaves</li> <li>• Parameterization of the slaves (ID1 or analog parameters)</li> <li>• Measurement of AS-Interface voltage</li> <li>• Enables direct setting of outputs and reading in of a slave's inputs</li> <li>• Storage of complete plant configurations</li> </ul> <p><i>Your advantage: Easiest way to address and parameterize the slaves</i></p>	<p>3RK1</p> <p>2/86</p>

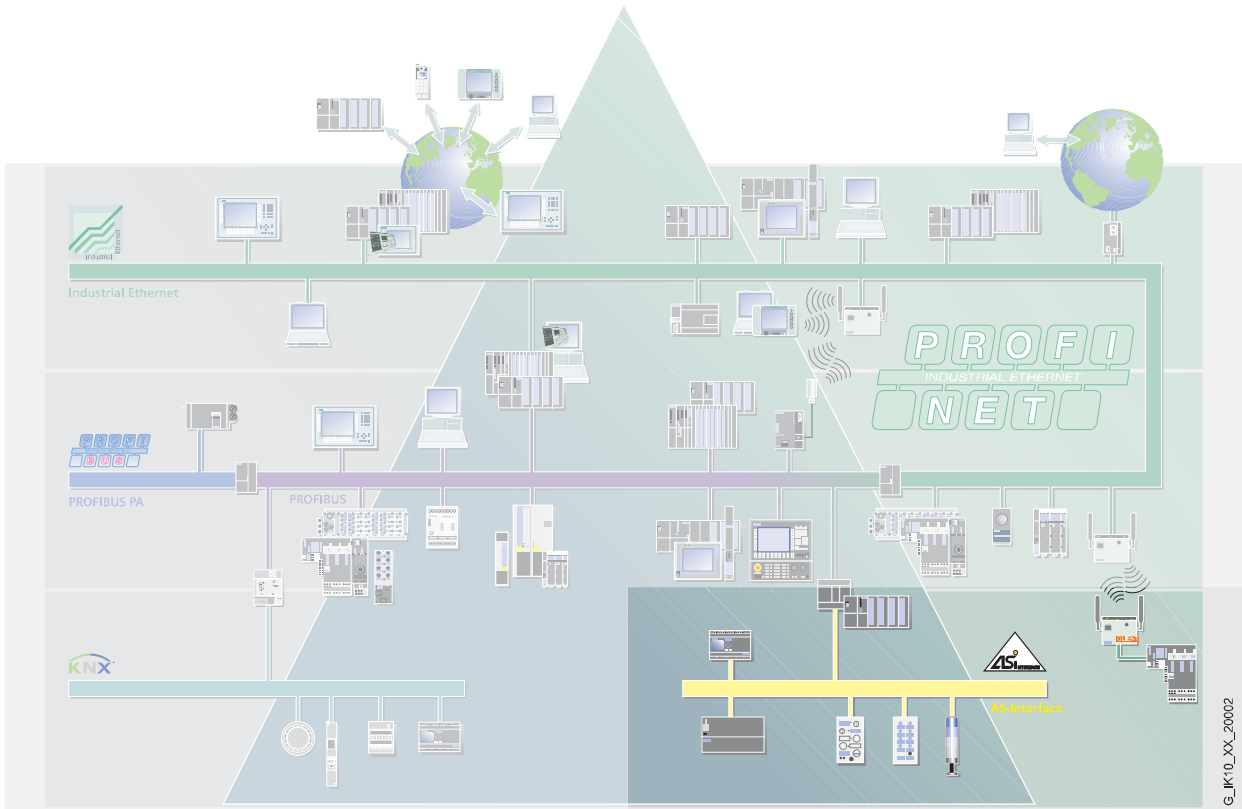
	Order No.	Page
 <p><b>AS-Interface analyzers</b></p> <ul style="list-style-type: none"> <li>• Diagnostic units for completely checking the quality and function of an AS-Interface installation</li> <li>• Transmission of collected data through an RS 232 interface to a PC, evaluation by software</li> <li>• Easy and user-friendly operation</li> <li>• Automatically generated test logs</li> <li>• Advanced trigger functions enable exact analysis</li> <li>• Process data can be monitored online</li> <li>• In addition to digital I/O data it is also possible to view analog values and safety slaves in data mode</li> </ul> <p>Your advantage: Preventative testing of an AS-Interface network is possible, recorded logs facilitate remote diagnostics</p>	3RK1	2/87
<p><b>PROFIBUS</b></p>  <ul style="list-style-type: none"> <li>• PROFIBUS is an efficient, open and robust bus system which guarantees smooth communication</li> <li>• The system is fully standardized, thus enabling standardized components from different manufacturers to be connected without problem</li> <li>• Configuring, commissioning and troubleshooting can be performed from any position; this means that the freely selectable communication relationships are very flexible, easy to implement and simple to change</li> <li>• Fast local assembly and commissioning using the FastConnect cabling system</li> <li>• Constant monitoring of the network components by means of a simple and effective signaling concept</li> <li>• High protection for your investment because existing systems can be expanded without repercussions</li> <li>• High availability thanks to ring redundancy with OLM</li> <li>• Optimum connection of the actuator-sensor level by router to AS-Interface (DP/AS-Interface Link 20E)</li> </ul>		2/88
<p><b>SIRIUS Modular System</b></p>  <ul style="list-style-type: none"> <li>• Load feeders up to 250 kW / 400 V are easy to implement from standard devices</li> <li>• Modular design: Everything fits together and can be combined</li> <li>• Economical and flexible thanks to seven compact sizes</li> <li>• Optimum variety with uniform accessories</li> <li>• Space-saving design with small unit width and butt-mounting type of construction up to 60 °C</li> <li>• Fast commissioning, short setting-up times and simple wiring</li> <li>• Connection to AS-Interface and PROFIBUS DP possible</li> <li>• Extremely long life, low maintenance and reliable</li> <li>• Global approvals and certifications such as IEC, UL, CSA, CCC, shipbuilding</li> <li>• Permanently secure mounting, screw- or snap-connection</li> <li>• Spring-loaded terminals: Quick and secure connection, vibration-proof and maintenance-free</li> <li>• Short delivery periods thanks to world-wide logistics network</li> <li>• Environment-friendly production and materials, recycling capability, low power loss</li> <li>• Clear-cut, ergonomic design (winner of the iF Product Design Award)</li> </ul>		2/95

### Overview

#### Transmission method

A key feature of AS-Interface technology is the use of a shared two-conductor cable for data transmission and the distribution of auxiliary power to the sensors/actuators. An AS-Interface power supply unit that meets the requirements of the AS-Interface

transmission method is used for this purpose. The AS-Interface cable provided for the wiring is mechanically coded and hence protected against polarity reversal and can be easily contacted with piercing terminals.



### Function

#### Operating modes

Generally, master interfaces have the following operating modes:

#### I/O data exchange

In this operating mode the inputs and outputs of the binary AS-Interface slaves are read and written.

#### Analog value transfer

AS-Interface masters according to the Complete AS-Interface Specification V2.1 support integrated analog value processing. This means that data exchange with analog AS-Interface slaves (according to Analog Profile 7.3 or 7.4) is just as easy as with digital slaves.

#### Command interface

In addition to I/O data exchange with binary and analog AS-Interface slaves the AS-Interface masters provide a number of other functions through the command interface. Hence it is possible, for example, for slave addresses to be issued, parameter values transferred or diagnostics information read out from user programs.

# AS-Interface Introduction

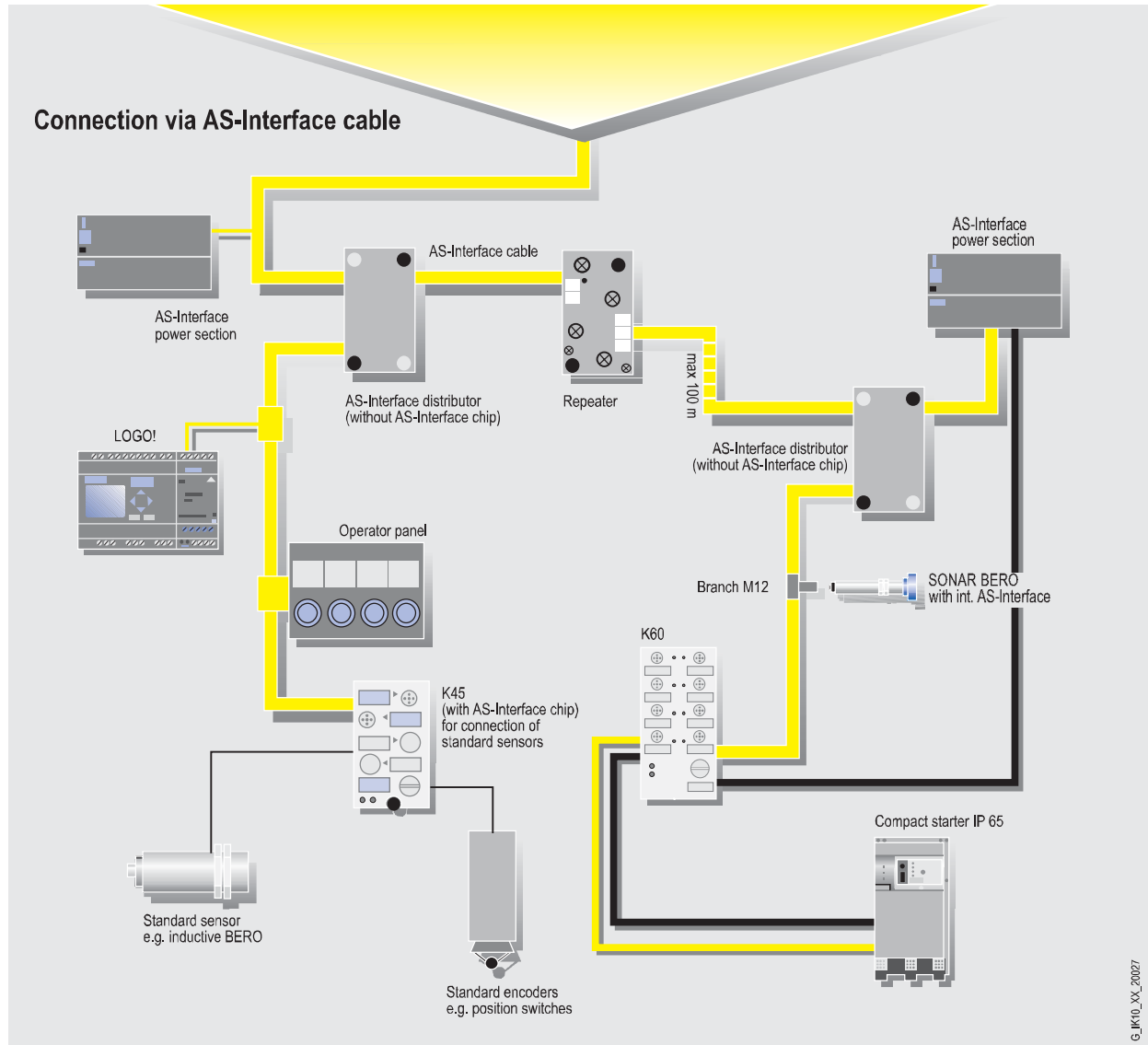
## Configuration examples

### Design

#### Process or field communication

AS-Interface is used where individual actuators and sensors are spaced apart over a machine (e.g. a bottle filling line, production line, etc.). It replaces complicated cable harnesses and connects binary and analog actuators and sensors such as proximity switches, valves and indicator lights to a controller, e.g. a SIMATIC or PC.

In practice this means: Installation is straightforward because data and power are conveyed together over one cable. No special know-how for installation and commissioning is required. And thanks to the simple laying of the cable, its clear-cut structure and special design there is not only far less risk of errors but also less effort during maintenance and servicing.



Example of a system configuration



# AS-Interface Introduction

## Technical specifications

2

### Technical specifications

<b>Standard</b>	EN 50295 / IEC 61158
<b>Topology</b>	Line, star or tree structure (same as electrical wiring)
<b>Transmission medium</b>	Unshielded two-conductor cable (2 x 1.5 mm <sup>2</sup> ) for data and auxiliary power
<b>Connection technique</b>	Contacting of the AS-Interface cable by insulation displacement method
<b>Maximum cable length</b>	100 m without repeater/extender; 200 m with extension plug; 300 m with repeater or extender 600 m with repeater/extender and extension plug (parallel connection of repeaters)
<b>Maximum cycle time</b>	5 ms with full expansion, 10 ms when using A/B technology
<b>Maximum number of stations</b>	31 slaves according to Complete AS-Interface Spec. V2.0; 62 slaves according to Complete AS-Interface Spec. V2.1 (A/B technology), integrated analog value transmission
<b>Number of binary sensors and actuators</b>	Max. 124 I/124 O according to Spec. V2.0; max. 248 I/186 O according to Spec. V2.1
<b>Access control</b>	Cyclic polling master slave method, cyclic data transfer by host (PLC, PC)
<b>Error safeguard</b>	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>

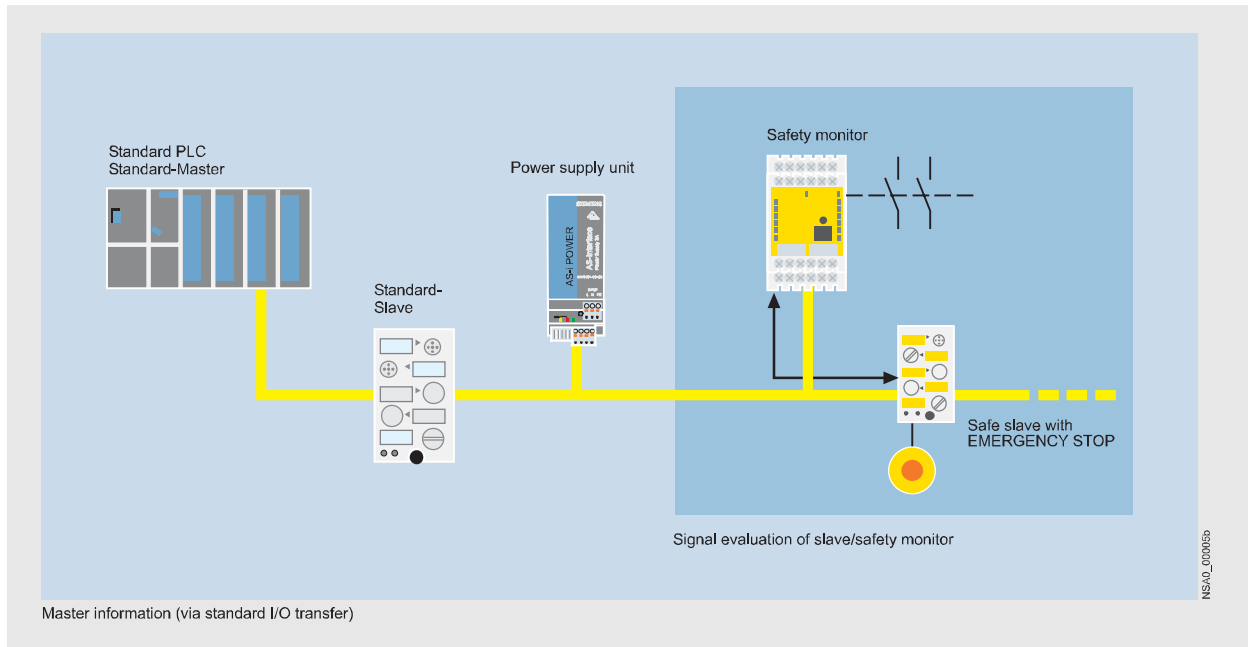
# AS-Interface

## ASIsafe

### Introduction

2

### Overview



#### 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.) in according to IEC 62061/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 designed so that applications up to Category 4 according to EN 954-1 and SIL 3 according to IEC 61508 can be realized.

#### Software

The safety-oriented applications can be compiled and transferred into the monitor using the configuration software. The software also enables online diagnostics.

### Design

The design of the safety systems is identical to the wiring of AS-Interface as it is known today.

The family of safe AS-Interface products comprises the safety monitor which monitors the safe stations. The range of safe stations comprises the safe modules and the safety-related sensors with integrated interface.

### Function

Like the standard stations, the safe stations send their information to the master after master calls. The safety monitor monitors this transmission from the safe stations to the master and switches

- Into the EMERGENCY-STOP scenario (when there are faults on the safe stations) or
- Into the safe state (when there is a broken cable)

The safety monitor is configured with software. The configuration comprises the input signals of the safe stations and the internal functions of the safety monitor. The safety monitor provides OR logic, AND logic, timer functions, buffer storage, etc.

### Integration

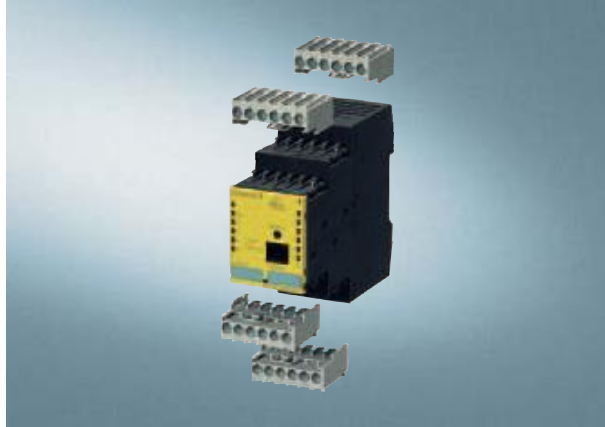
The existing infrastructure such as the master and the power supply unit can be used as before for integrating the safety systems in AS-Interface. For the safety systems the safety monitor is integrated as monitoring element and the safe stations as interface between the safe sensors and the system. The safe sensors can be used as before.

# AS-Interface ASIsafe

## AS-Interface safety monitors

2

### Overview



The safety monitor is the centerpiece of ASIsafe. A safe application is configured using a PC and the safety monitor. Various application-specific operating modes can be selected for this. They include, for example, an EMERGENCY-STOP function, tumbler and selection of stop Category 0 or Category 1.

To be able to make full use of the AS-Interface diagnostics options, the monitor can also be operated with an AS-Interface address if required. With the help of the diagnostics block for STEP7, which is included on the ASIsafe CD, the full diagnostics spectrum can be processed further in the higher-level PLC.

The monitor comes in two expansion levels:

- **Basic safety monitor** with starter set of blocks and basic functionality
- **Expanded safety monitor** with expanded features and functionality

Both expansion levels are available with one or two enabling circuits with two-channel configuration.

The safety monitor is used in an AS-Interface bus system to monitor protective devices, e.g. EMERGENCY-STOP switches. It is classified in Safety Category 4 according to EN 954-1.

According to IEC 61508 the safety monitor can be used in loops up to SIL3. The user must calculate the PFD value of the total loop.

ON period in months	Total operating time in years	PFD
3	10	$\leq 4 \times 10^{-5}$
6	10	$\leq 6 \times 10^{-5}$
9	10	$\leq 9 \times 10^{-5}$

Note: Depending on the choice of safety components used, the complete safety system may also be classified in a lower safety category.

### Function

#### Basic Safety Monitor versus Expanded Safety Monitor

	Basic safety monitor	Expanded safety monitor
Number of monitoring modules	32	48
Number of OR gates (inputs)	2	6
Number of AND gates (inputs)	--	6
Wildcards for monitoring modules	3	3
Deactivating of monitoring modules	3	3
Fault release	3	3
Diagnostics hold	3	3
A/B slaves for acknowledgment	3	3
Safe time functions	--	3
"Button" function	--	3
Debouncing of contacts	--	3

#### Number of monitoring modules

The number of devices which the safety monitor can process is increased with the *expanded safety monitor* from 32 to 48. Applications of greater complexity and size can thus be simulated in the safety monitor.

#### Logic OR operation

At the logic operation level two elements can be linked by OR operations in the basic version and up to six in the expanded version.

#### Logic AND operation

In addition to the standard AND operation in the main path of an enabling circuit, an AND operation can also be inserted in an OR operation on the *expanded safety monitor*. More than two elements can be linked in this AND.

#### Functions of the basic safety monitor

- **Wildcards and deactivating of monitoring modules**  
Wildcards are available for the configuration. These wildcards are integrated in the configuration and diagnostics and can be activated very easily if required. User-friendly and easy configuring is thus possible even when system configurations change.
- **Fault release**  
If a module detects a fault, the AS-Interface safety monitor goes into fault status. A differentiated fault release (reset) is now possible for this scenario. The fault release can be activated by an AS-Interface standard slave, e.g. a pushbutton, and is effective only on module level. The great advantage of this is that the entire safety monitor is no longer reset but only the module which is locked in the fault.
- **Buffer storage and "Diagnostics hold"**  
Momentary disconnections are saved in a buffer storage for diagnostics. Disconnections can also be "frozen" until an acknowledgment comes through a standard slave (function "Diagnostics hold").

### Additional functions of the expanded safety monitor

The following additional features are provided by only the *expanded safety monitor*:

- Safe time functions**  
 Timers with the following functions are available:
  - ON-delay
  - OFF-delay
  - pulse
- "Button" function**  
 Additional acknowledgment option for restarting the system using an additional button. In addition to the Service button on the safety monitor its function (restarting the system) can be placed on any button of a commanding and signaling device through configuration in the asimon software.
- Debouncing of contacts**  
 For debouncing the contacts it is possible to set a bounce time after which a system restart takes place.

### Compatibility

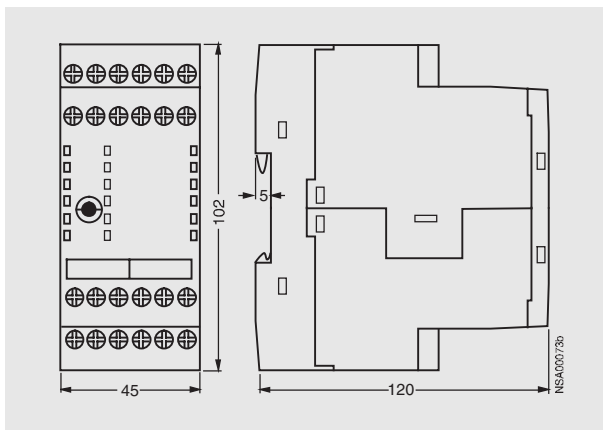
Already created configurations can be adopted in the "new" safety monitor without change.

All functions are designed for Category 4 according to EN 954-1. Safety monitor, monitoring and evaluation unit and slaves were certified by TÜV according to IEC 61508, NRTL (USA) and INRS (France).

### Technical specifications

Safety monitor 3RK1 105	
<b>Rated operational current</b>	
• $I_{el}/AC-12$	up to 250 V, 3 A
• $I_{el}/AC-15$	115 V, 3 A 230 V, 3 A
• $I_{el}/DC-12$	up to 24 V, 3 A
• $I_{el}/DC-13$	24 V, 1 A 115 V, 0.1 A 230 V, 0.05 A
<b>Response time in ms</b>	≤ 40
<b>Ambient temperature in °C</b>	0 ... +60
<b>Storage temperature in °C</b>	-40 ... +85

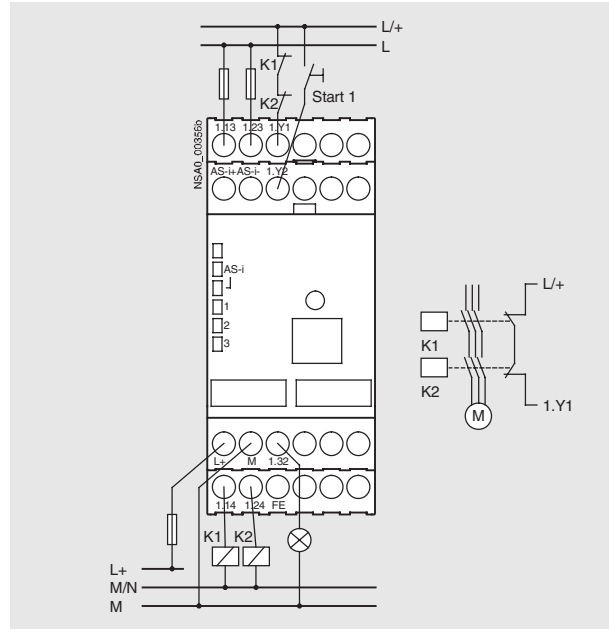
### Dimensional drawings



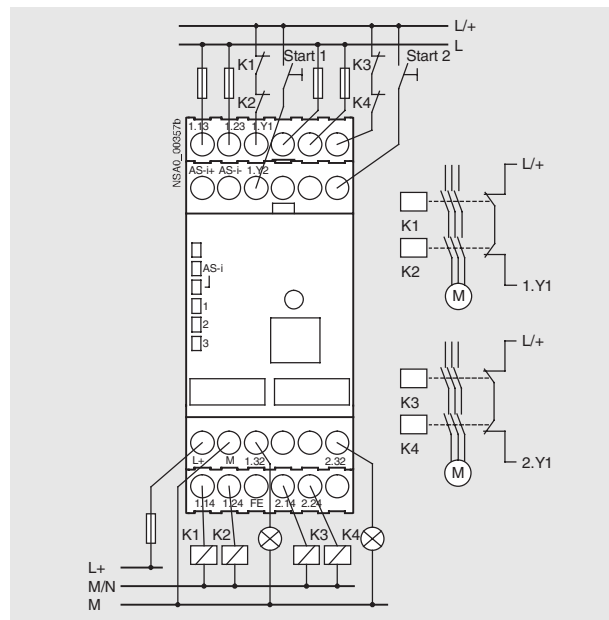
Safety monitor

### Schematics

The protective conductor must be connected to the FE connection if the terminal M is not connected to ground in the direct vicinity of the unit.



Safety monitor, with one enabling circuit



Safety monitor, with two enabling circuits

# AS-Interface

## ASIsafe

### AS-Interface safety modules

2

#### Overview



Safety modules for AS-Interface (ASIsafe modules) are available in the following versions:

- *K45F compact safety modules for operation in the field*  
The K45F compact safety module is initially equipped as standard with two "safe" inputs. For applications up to Category 2 according to EN 954-1 the two inputs can be assigned separately. If Category 4 is required, a two-channel input is available on the module. *A new addition to the range is the K45F module, which has two standard outputs in addition to the two safety inputs.*
- *K60F compact safety modules for operation in the field*  
The K60F compact safety module similarly has two standard outputs in addition to two safe inputs (see K45F for categories); power is supplied from either the yellow AS-Interface cable or as auxiliary voltage from the black 24 V DC cable
- *S22.5F SlimLine safety modules for operation in controlgear cabinets.*  
The S22.5F SlimLine safety module has two safety inputs. The safe linking of signals to ASIsafe networks in the cabinet is also possible therefore. For operation up to Category 2, both inputs can be assigned separately; if Category 4 is required, a two-channel input is available on the module. *New in the range are two S22.5F module versions which have two standard outputs in addition to the two safe inputs; power is supplied either from only the yellow AS-Interface cable or as auxiliary voltage from the black 24 V DC cable.*

### Technical specifications

	K45F safe compact module 2 inputs, safe		K60F safe compact module 2 inputs, safe	
	--	2 outputs, standard with $U_{aux}$ 2 F-DI / 2 DO 3RK1 405-1BQ20-0AA3	2 outputs, standard 2 F-DI / 2 DO 3RK1 405-0BQ00-0AA3	2 outputs, standard with $U_{aux}$ 2 F-DI / 2 DO with $U_{aux}$ 3RK1 405-1BQ00-0AA3
<b>AS-Interface chip</b>	SAP 5	SAP 5	SAP 5	SAP 5
<b>I/O configuration</b>	0	7	7	7
<b>ID/ID2 code</b>	B/F	B/F	B/F	B/F
<b>PFD value</b>	Makes no notable contribution to the PFD of the overall system, comprised of the AS-Interface bus and safety monitor	Makes no notable contribution to the PFD of the overall system, comprised of the AS-Interface bus and safety monitor	Makes no notable contribution to the PFD of the overall system, comprised of the AS-Interface bus and safety monitor	Makes no notable contribution to the PFD of the overall system, comprised of the AS-Interface bus and safety monitor
<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.5	26.5 ... 31.5	26.5 ... 31.5	26.5 ... 31.5
<b>Total current input in mA</b>	≤ 45	≤ 45	≤ 270	≤ 45
<b>Inputs</b>				
• Sensors	Mechanical switching contact	Mechanical switching contact	Mechanical switching contact	Mechanical switching contact
• Input current Low in mA	--	--	--	--
• Input current High in mA	$I_{peak} \geq 5$	$I_{peak} \geq 5$	$I_{peak} \geq 5$	$I_{peak} \geq 5$
<b>Assignment of inputs</b>	<ul style="list-style-type: none"> <li>• Pin1 and Pin2 = connection/switching contact</li> <li>• Pin3 and Pin4 = connection/switching contact</li> <li>• Pin5 = not assigned</li> </ul>	<ul style="list-style-type: none"> <li>• Pin1 and Pin2 = connection/switching contact</li> <li>• Pin3 and Pin4 = connection/switching contact</li> <li>• Pin5 = not assigned</li> </ul>	<ul style="list-style-type: none"> <li>• Pin1 and Pin2 = connection/switching contact</li> <li>• Pin3 and Pin4 = connection/switching contact</li> <li>• Pin5 = not assigned</li> </ul>	<ul style="list-style-type: none"> <li>• Pin1 and Pin2 = connection/switching contact</li> <li>• Pin3 and Pin4 = connection/switching contact</li> <li>• Pin5 = not assigned</li> </ul>
<b>Outputs</b>				
• Type of output	--	Solid-state	Solid-state	Solid-state
• Current carrying capacity in A per output DC 12 /13 typical	--	1	0.18	2
• Maximum aggregate current per module in A	--	Max. 2	Max. 0.18	Max. 4
• Socket assignment of outputs	--	<ul style="list-style-type: none"> <li>• 3 = "-"</li> <li>• 4 = output</li> <li>• 5 = ground terminal</li> </ul>	<ul style="list-style-type: none"> <li>• 3 = "-"</li> <li>• 4 = output</li> <li>• 5 = ground terminal</li> </ul>	<ul style="list-style-type: none"> <li>• 3 = "-"</li> <li>• 4 = output</li> <li>• 5 = ground terminal</li> </ul>
• Short-circuit protection	--	Built-in	Built-in	Built-in
• Induction protection	--	Built-in	Built-in	Built-in
• External power supply 24 V DC	--	Using black AS-Interface flat cable	--	Using black AS-Interface flat cable
• Watchdog	--	Built-in	Built-in	Built-in
<b>Assignment of outputs</b>				
• OUT 1 (D0)	--	Socket 3 – Pin 4	Socket 5 – Pin4	Socket 5 – Pin4
• OUT 2 (D1)	--	Socket 4 – Pin 4	Socket 6 – Pin4	Socket 6 – Pin4
<b>AS-Interface certificate</b>	Yes	Requested	Yes	Yes
<b>Approvals</b>	UL, CSA	UL, CSA	UL, CSA	UL, CSA
<b>Degree of protection</b>	IP67	IP67	IP67	IP67
<b>Ground terminal</b>	--	PIN5 of each M12 socket is connected to the grounding wrist strap in the mounting plate using a pin (applies to outputs, i.e. socket 3 and 4)	PIN5 of each M12 socket is connected to the grounding wrist strap in the mounting plate using a pin (applies to outputs, i.e. socket 5 and 6)	PIN5 of each M12 socket is connected to the grounding wrist strap in the mounting plate using a pin (applies to outputs, i.e. socket 5 and 6)
<b>Ambient temperature in °C</b>	-25 ... +85	-25 ... +85	-25 ... +85	-25 ... +85
<b>Storage temperature in °C</b>	-40 ... +85	-40 ... +85	-40 ... +85	-40 ... +85
<b>Number of I/O sockets</b>	2	4	4	4
<b>Status displays</b>				
• Display of I/Os	Yellow LED	Yellow LED	Yellow LED	Yellow LED
• $U_{aux}$	--	Green LED	--	Green LED
• Display of AS-Interface/ diagnostics	Green/red LED	Green/red LED	Green/red LED	Green/red LED
<b>Connection</b>	Using mounting plate for K45 compact module	Using mounting plate for K45 compact module	Using mounting plate for K60 compact module	Using mounting plate for K60 compact module
<b>Addressing procedure</b>	Front addressing socket	Front addressing socket	Front addressing socket	Front addressing socket

# AS-Interface ASIsafe

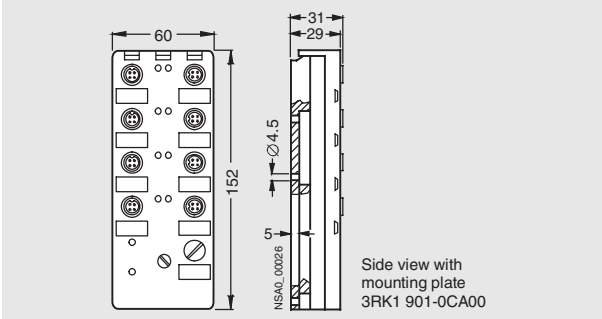
## AS-Interface safety modules

2

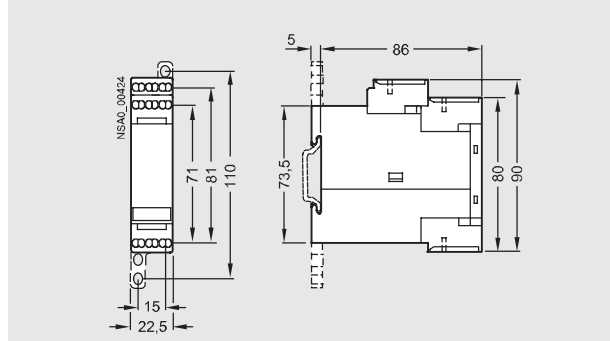
	SlimLine safety module S22.5F, with screw-type or spring-loaded terminal		
	2 inputs, safe		
	2 F-DI	2 outputs, standard	2 outputs, standard with $U_{aux}$
	3RK1 205-0BE00-0AA2 3RK1 205-0BG00-0AA2	2 F-DI / 2 DO 3RK1 405-0BE00-0AA2 3RK1 405-0BG00-0AA2	2 F-DI / 2 DO with $U_{aux}$ 3RK1 405-1BE00-0AA2 3RK1 405-1BG00-0AA2
<b>AS-Interface chip</b>	SAP 5	SAP 5	SAP 5
<b>I/O configuration</b>	0	7	7
<b>ID/ID2 code</b>	B/F	B/F	B/F
<b>PFD value</b>	Makes no notable contribution to the PFD of the overall system, comprised of the AS-Interface bus and safety monitor	Makes no notable contribution to the PFD of the overall system, comprised of the AS-Interface bus and safety monitor	Makes no notable contribution to the PFD of the overall system, comprised of the AS-Interface bus and safety monitor
<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.5	26.5 ... 31.5	26.5 ... 31.5
<b>Total current input in mA</b>	≤ 45	≤ 250	≤ 60
<b>Inputs</b>			
• Sensors	Mechanical switching contact	Mechanical switching contact	Mechanical switching contact
• Input current Low in mA	Contact open	Contact open	Contact open
• Input current High in mA	Contact closed	Contact closed	Contact closed
	$I_{peak} \geq 5$	$I_{peak} \geq 5$	$I_{peak} \geq 5$
<b>Assignment of inputs</b>	<ul style="list-style-type: none"> <li>F-IN1.1 and F-IN1.2 = connection of switching contact</li> <li>F-IN2.1 and F-IN2.2 = connection of switching contact</li> </ul>	<ul style="list-style-type: none"> <li>F-IN1.1 and F-IN1.2 = connection of switching contact</li> <li>F-IN2.1 and F-IN2.2 = connection of switching contact</li> </ul>	<ul style="list-style-type: none"> <li>F-IN1.1 and F-IN1.2 = connection of switching contact</li> <li>F-IN2.1 and F-IN2.2 = connection of switching contact</li> </ul>
<b>Outputs</b>			
• Type of output	--	Solid-state	Solid-state
• Current carrying capacity in A per output DC 12 /13 typical	--	0.15	0.7
• Maximum aggregate current per module in A	--	Max. 0.15	Max. 1.4
• Short-circuit protection	--	Built-in	Built-in
• Induction protection	--	Built-in	Built-in
• External power supply 24 V DC	--	--	Using black AS-Interface flat cable
• Watchdog	--	Built-in	Built-in
• Wiring of outputs	--	See section <i>Schematics / Wiring – SlimLine Safety Module S22.5F</i>	See section <i>Schematics / Wiring – SlimLine Safety Module S22.5F</i>
• Assignment of outputs - OUT 1 - OUT 2	-- --	DO D1	DO D1
<b>AS-Interface certificate</b>	Yes	Requested	Requested
<b>Approvals</b>	UL, CSA	UL, CSA	UL, CSA
<b>Mechanical specifications</b>			
• Degree of protection	IP20	IP20	IP20
• Shock load (IEC 60068-2-6)	15 g/11 ms	15 g/11 ms	15 g/11 ms
• Vibratory load (IEC 60068-2-27)	5 ... 500 Hz 5 ... 26 Hz: 0.75 mm amplitude 26 ... 500 Hz: 2 g	5 ... 500 Hz 5 ... 26 Hz: 0.75 mm amplitude 26 ... 500 Hz: 2 g	5 ... 500 Hz 5 ... 26 Hz: 0.75 mm amplitude 26 ... 500 Hz: 2 g
<b>Ground terminal</b>	--	--	--
<b>Ambient temperature in °C</b>	-25 ... +70	-25 ... +70	-25 ... +70
<b>Storage temperature in °C</b>	-40 ... +85	-40 ... +85	-40 ... +85
<b>Number of I/O sockets</b>	--	--	--
<b>Status displays</b>			
• Display of I/Os	Yellow LED	Yellow LED	Yellow LED
• $U_{aux}$	--	--	Green LED
• Display of AS-Interface/ diagnostics	Green/red LED	Green/red LED	Green/red LED
<b>Connection</b>	Using screw-type terminals or spring-loaded terminals	Using screw-type terminals or spring-loaded terminals	Using screw-type terminals or spring-loaded terminals
<b>Addressing procedure</b>	Front addressing socket	Front addressing socket	Front addressing socket



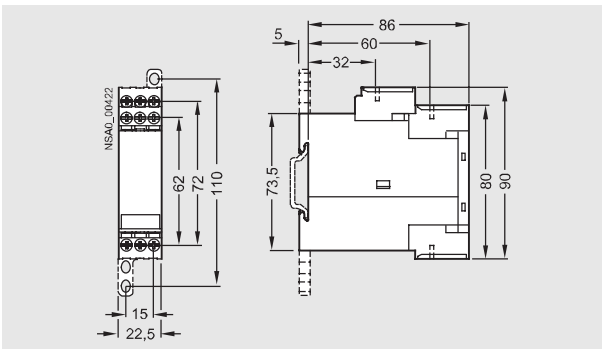
### Dimensional drawings



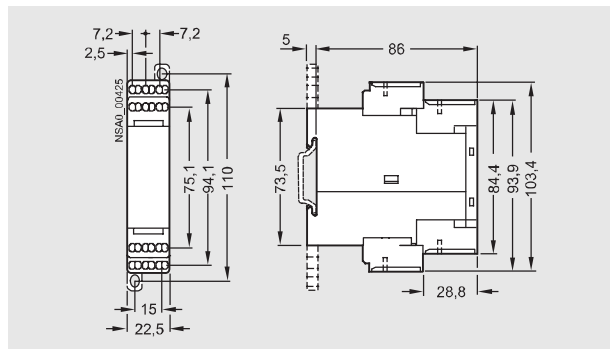
K60F compact safety module  
3RK1 405-0BQ00-0AA3  
3RK1 405-1BQ00-0AA3



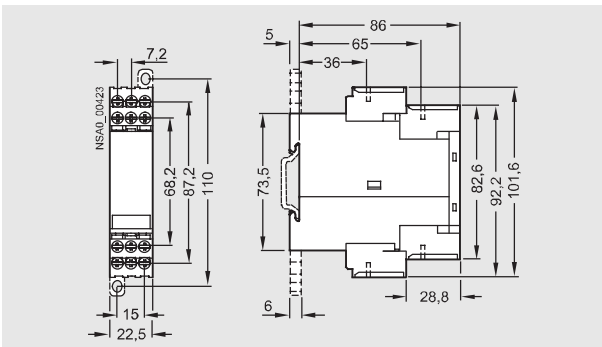
S22.5F SlimLine safety module, 2 F-DI, spring-loaded terminal  
3RK1 205-0BG00-0AA2



S22.5F SlimLine safety module, 2 F-DI, screw-type terminal  
3RK1 205-0BE00-0AA2



S22.5F SlimLine safety module, 2F-DI / 2 DO, spring-loaded terminal  
3RK1 405-0BG00-0AA2 (without  $U_{aux}$ )  
3RK1 405-1BG00-0AA2 (with  $U_{aux}$ )



S22.5F SlimLine safety module, 2F-DI / 2 DO, screw-type terminal  
3RK1 405-0BE00-0AA2 (without  $U_{aux}$ )  
3RK1 405-1BE00-0AA2 (with  $U_{aux}$ )

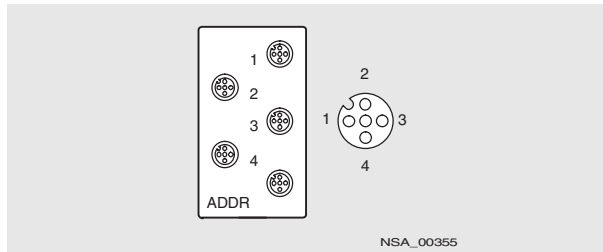
# AS-Interface ASIsafe

## AS-Interface safety modules

2

### Schematics

#### Logical assignments – K45F compact safety module

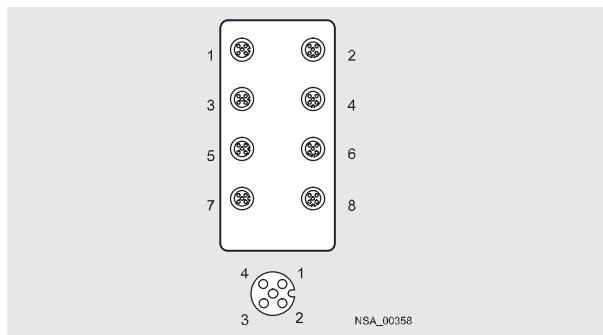


Socket	Assignment / data sheets / function
1	Pin 1 and Pin 2: Influences the bits D0 and D1 = Channel 1 Pin 3 and Pin 4: Influences the bits D2 and D3 = Channel 2 Pin 5 not assigned
2	Pin 1 and Pin 2: Influences the bits D2 and D3 = Channel 2 Pin 5 not assigned
3	Not assigned
4	Not assigned

If only a single-channel switch is to be connected to the module, it must be connected to Channel 1. The second channel must be bridged. This is done with the M12 connector 3RK1 901-1AA00 at socket 2.

Pin 3 of socket 1 is connected to Pin 1 of socket 2, and Pin 4 of socket 1 is connected to Pin 2 of socket 2. If both pairs of sockets are assigned, the inputs are linked.

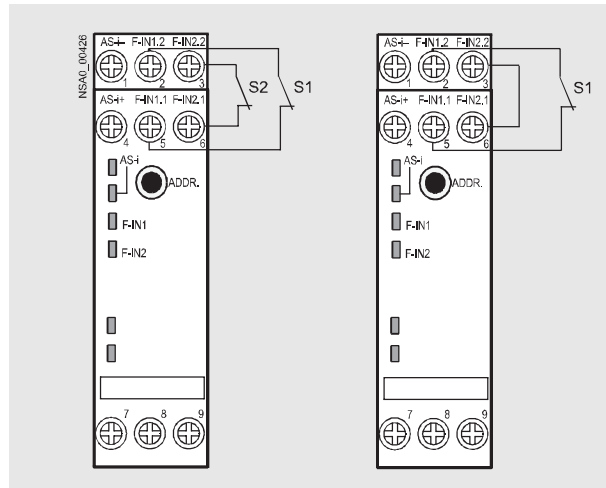
#### Logical assignments – K60F compact safety module



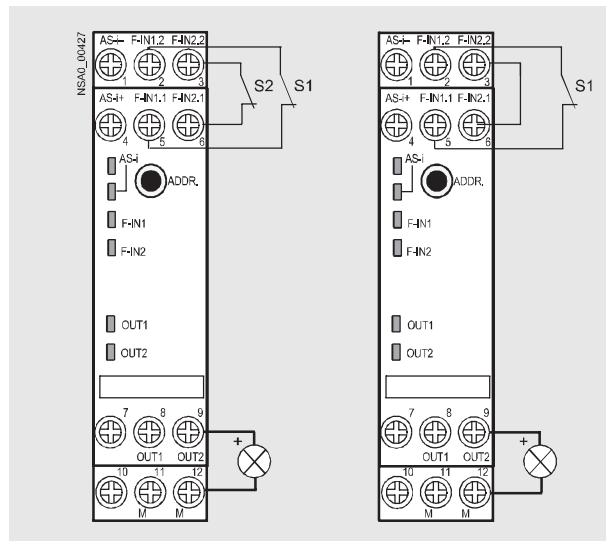
Socket	Assignment / data sheets / function
1	Pin 1 and Pin 2: Influences the bits D0 and D1 = Channel 1 Pin 3 and Pin 4: Influences the bits D2 and D3 = Channel 2 Pin 5: Not assigned
2	Pin 1 and Pin 2: Influences the bits D2 and D3 = Channel 2 Pin 5: Not assigned
3 / 4 / 7 and 8	Not assigned, closed in the factory
5	Pin 4: Output 1 Pin 3: -- Pin 5: Ground Pin 1 and Pin 2: Not assigned
6	Pin 4: Output 2 Pin 3: -- Pin 5: Ground Pin 1 and Pin 2: Not assigned

Pin 3 of socket 1 is connected to Pin 1 of socket 2, and Pin 4 of socket 1 is connected to Pin 2 of socket 2. If both pairs of sockets are assigned, the inputs are linked.

#### Wiring – S22.5F SlimLine safety module



Wiring for S22.5F SlimLine safety module, 2F-DI, Category 3 (left) and Category 4 (right)  
3RK1 205-0BE00-0AA2 (screw-type terminal)  
3RK1 205-0BG00-0AA2 (spring-loaded terminal)

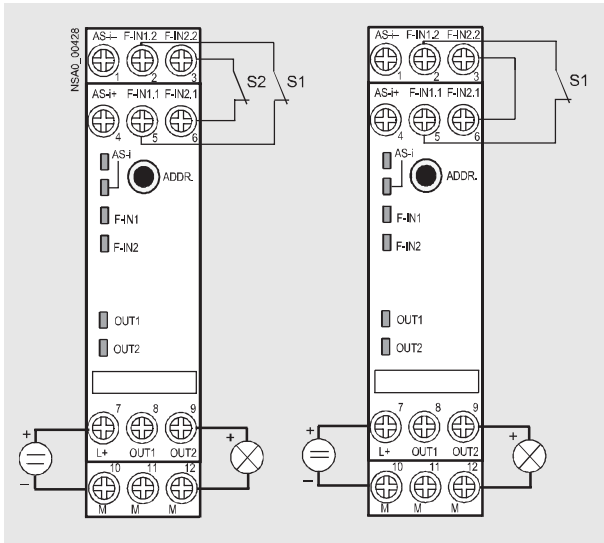


Wiring for S22.5F SlimLine safety module, 2F-DI / 2 DO without  $U_{aux}$ , Category 3 (left) and Category 4 (right)  
3RK1 405-0BE00-0AA2 (screw-type terminal)  
3RK1 405-0BG00-0AA2 (spring-loaded terminal)

# AS-Interface ASIsafe

## AS-Interface safety modules

2



Wiring for S22.5F SlimLine safety module, 2F-DI / 2 DO with  $U_{aux}$ .  
 Category 3 (left) and Category 4 (right)  
 3RK1 405-1BE00-0AA2 (screw-type terminal)  
 3RK1 405-1BG00-0AA2 (spring-loaded terminal)

# AS-Interface Masters

## CP 243-2

2

### Overview



The CP 243-2 is the AS-Interface master for the innovative SIMATIC S7-200 generation. This communications processor performs the following functions:

- Connection of up to 62 AS-Interface slaves and integrated analog value transmission (according to the extended AS-Interface Specification V2.1)
- Supports all AS-Interface master functions according to the extended AS-Interface Specification V2.1
- Status displays of operating states and indication of the functional readiness of connected slaves by means of LEDs in the front panel
- Fault indications (e.g. AS-Interface voltage fault, configuration fault) by means of LEDs in the front panel
- Compact enclosure in the design of the innovative SIMATIC S7-200 generation

### Design

The CP 243-2 is connected like an expansion module to the S7-200. It has:

- Two terminal connections for direct connection of the AS-Interface cable
- LEDs in the front panel for indicating the operating state and functional readiness of all connected and activated slaves
- Two pushbuttons for indicating the status information of the slaves, for switching over the operating state and for adopting the existing ACTUAL configuration as the DESIRED configuration.

### Function

The CP 243-2 supports all specified functions of the extended AS-Interface Specification V2.1. This means that up to 62 digital or 31 analog slaves can be operated on the AS-Interface through double address assignment.

Thanks to the integrated analog value processing it is just as easy to access the analog values as the digital values.

In the process image of the S7-200 the CP 243-2 occupies one digital input byte (status byte), one digital output byte (control byte), and 8 analog input and 8 analog output words. The CP 243-2 thus occupies two slots. The operating mode of the CP 243-2 can be set with the status byte and the control byte using the application program.

Depending on the operating mode the CP 243-2 saves either the I/O data of the AS-Interface slaves or diagnostics values in the analog address space of the S7-200, or it enables master calls (e.g. re-addressing of the slaves).

### Configuration

All connected AS-Interface slaves are configured at the press of a button. No further configuration of the CPs is required.

### Technical specifications

AS-Interface specification	V 2.1
<b>Interfaces</b>	
• Assignment of address space in the PLC	According to 2 I/O modules (8 DI/8 DO and 8 AI/ 8 AO)
• AS-Interface connection	Terminal connection
<b>Current consumption</b>	
• Using AS-Interface	Max. 100 mA
• Using backplane bus	Typical 220 mA at 5 V DC
<b>Power loss</b>	
	Approx. 2 W
<b>Permissible ambient conditions</b>	
• Operating temperature	
- Horizontal installation	0 °C to +55 °C
- Vertical installation	0 °C to +45 °C
• Transport/storage temperature	- 40 °C to +70 °C
• Relative humidity	Max. 95% at +25 °C
<b>Structural design</b>	
• Module format	S7-22x expansion module
• Dimensions (W x H x D) in mm	71.2 x 80 x 62 (H+16 mm with holes for wall fixing)
• Weight	Approx. 250 g
• Space required	1 mounting space

### Overview



The CP 343-2 P is the AS-Interface master for the SIMATIC S7-300 programmable controller and the ET 200M distributed I/O station. The communications processor performs the following functions:

- Connection of up to 62 AS-Interface slaves and integrated analog value transmission (according to the extended AS-Interface Specification V2.1)
- Supports all AS-Interface master functions according to the extended AS-Interface Specification V2.1
- Fault indications (e.g. AS-Interface voltage fault, configuration fault) by means of LEDs in the front panel
- Compact enclosure in the design of the SIMATIC S7-300
- Supports the configuration of the AS-Interface-network with STEP 7 V5.2 and higher

### Design

The CP 343-2 P is connected like an expansion module to the S7-300. It has:

- Two terminal connections for direct connection of the AS-Interface cable
- LEDs in the front panel for indicating the operating state and the functional readiness of all connected and activated slaves
- Pushbuttons for indicating the status information of the slaves, for switching over the operating state and for adopting the existing ACTUAL configuration as the DESIRED configuration.

### Mode of operation

In I/O operation the CP 343-2 P occupies 16 bytes in the analog address space of the SIMATIC S7-300. The I/O data of the standard slaves and A slaves are saved in this area. The I/O data of the B slaves can be accessed with the function "Read/write data record".

A and B slaves are slaves according to the expanded AS-Interface Specification V2.1. For invoking the AS-Interface master (e.g. to write parameters and read diagnostics values) a function call (FC) is available on a diskette which is supplied with the manual.

All connected AS-Interface slaves are configured at the press of a button. No further configuration of the CPs is required.

### Function

The CP 343-2 P supports all specified functions of the extended AS-Interface Specification V2.1. This means that up to 62 digital or 31 analog slaves can be operated on the AS-Interface through double address assignment. The integrated analog value processing permits easy access to the analog values.

### Configuration

All connected AS-Interface slaves are configured at the press of a button. No further configuration of the CPs is required.

The CP 343-2 P also supports configuring of the AS-Interface network with STEP 7 V5.2 and higher.

### Technical specifications

<b>AS-Interface specification</b>	V 2.1
<b>Bus cycle time</b>	5 ms with 31 slaves 10 ms with 62 Slaves
<b>Interfaces</b>	<ul style="list-style-type: none"> <li>• Assignment of analog address space in the PLC</li> <li>• AS-Interface connection</li> </ul>
<b>Supply voltage</b>	+5 V DC using backplane bus
<b>Current consumption</b>	<ul style="list-style-type: none"> <li>• Using backplane bus, typical</li> <li>• Using AS-Interface from the AS-Interface shaped cables, max.</li> </ul>
<b>Power loss</b>	2 W
<b>Permissible ambient conditions</b>	<ul style="list-style-type: none"> <li>• Operating temperature</li> <li>• Transport/storage temperature</li> <li>• Relative humidity, max.</li> </ul>
<b>Structural design</b>	<ul style="list-style-type: none"> <li>• Module format</li> <li>• Dimensions (W x H x D) in mm</li> <li>• Weight</li> <li>• Space required</li> </ul>
<b>Configuration software</b>	Optional: STEP 7 V5.2 and higher

# AS-Interface Routers

## DP/AS-Interface Link 20E

2

### Overview



DP/AS-Interface Link 20E connects PROFIBUS DP to AS-Interface. It performs the following functions:

- PROFIBUS DP slave and AS-Interface master
- Connection of up to 62 AS-Interface slaves and integrated analog value transmission (according to the Extended AS-Interface Specification V2.1)
- Supports all AS-Interface master functions according to the Extended AS-Interface Specification V2.1, i.e. master class M3
- Supply from AS-Interface cable; hence no additional power supply required
- Supports the uploading of the AS-Interface configuration in STEP 7 V5.2 and higher

### Design

- Compact enclosure in degree of protection IP20 for standard rail mounting
- LEDs in the front panel for indicating the operating state and the functional readiness of all connected and activated slaves
- Setting option for PROFIBUS DP address by pressing a button
- LED indication of the PROFIBUS DP slave address, DP bus faults and diagnostics
- Two pushbuttons for switching over the operating state and for adopting the existing ACTUAL configuration as the DESIRED configuration
- Power is supplied over the AS-Interface shaped cable

### Function

DP/AS-Interface Link 20E enables a DP master to access all the slaves of an AS-Interface segment. According to the extended specification (V2.1) up to 62 slaves with 4 inputs and 3 outputs each can now be connected.

DP/AS-Interface Link 20E occupies as standard 32 bytes of input data and 32 bytes of output data in the DP master in which the I/O data of the connected AS-Interface slaves are stored. The size of the input/output buffer can be compressed so that only the required memory space of the DP master is occupied.

PROFIBUS DP masters are able in addition to initiate AS-Interface master calls (e.g. to write parameters, change addresses, read diagnostics values) through the acyclic PROFIBUS services.

### Configuration

DP/AS-Interface Link 20E can be configured on PROFIBUS using STEP 7 or COM PROFIBUS.

The manual comes with the type and GSD files so that configuration is also possible on versions in which DP/AS-Interface Link 20E is not yet included as standard.

The configuration of the AS-Interface segment can be defined either by means of STEP 7 or simply by adopting the ACTUAL configuration. Commissioning is also possible without PROFIBUS.

With STEP 7 configuring the AS-Interface configuration can be uploaded in STEP 7 V5.2 and higher.

### Technical specifications

<b>AS-Interface bus cycle time</b>	5 ms with 31 slaves 10 ms with 62 slaves
<b>PROFIBUS transmission rate</b>	Max. 12 Mbits
<b>Supported AS-Interface master profiles</b>	M3 (according to Complete AS-Interface Specification V2.1)
<b>Configuring the AS-Interface</b>	Using pushbuttons on the front panel or with STEP 7 V5.1 SP2
<b>Interfaces</b>	
• AS-Interface connection	Clamping contacts
• Connection to PROFIBUS	9-pole Sub D socket
<b>Supply voltage</b>	
• From AS-Interface cable	According to AS-Interface specification EN 50295
<b>Current consumption</b>	
• From AS-Interface cable	Max. 200 mA
<b>Load capacity</b>	
<b>5 V DC at PROFIBUS connection</b>	Max. 90 mA
<b>Power loss</b>	3.7 W
<b>Installation</b>	Standard mounting rail or direct mounting
<b>Degree of protection</b>	IP20
<b>Permissible ambient conditions</b>	
• Operating temperature	
- Horizontal mounting	0 °C to +60 °C
- Vertical mounting	0 °C to +45 °C
• Transport and storage temperature	-40 °C to +70 °C
• Relative humidity	Max. 95% at +25 °C
<b>Structural design</b>	
• Module format	S7-200 design
• Dimensions (W x H x D) in mm	90 x 80 x 60
• Weight	Approx. 200 g

# AS-Interface Slaves

I/O modules for operation in the field  
Introduction

2

## Overview



K60



K45

The AS-Interface compact modules belong to a new generation of AS-Interface modules with a high degree of protection. There are digital and analog compact modules.

They are comprised of a top part, the actual module, and a bottom part which is referred to as the mounting plate. The top part contains the entire electronics, connection options for sensors/actuators, an addressing socket and status/diagnostics LEDs.

The mounting plate is used to receive the AS-Interface flat cables and enables mounting on a wall or standard mounting rail.

Compact modules come in two series:

- Series K60
- Series K45

# AS-Interface Slaves

## I/O modules for operation in the field Introduction

2

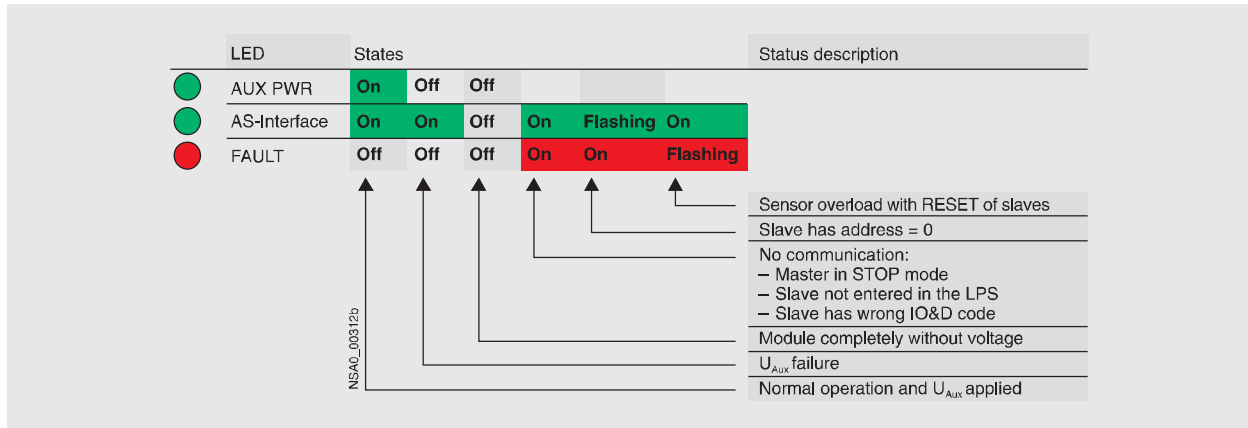
### Function

The AS-Interface compact modules have a large diagnostics display. This enables diagnostics at a glance.

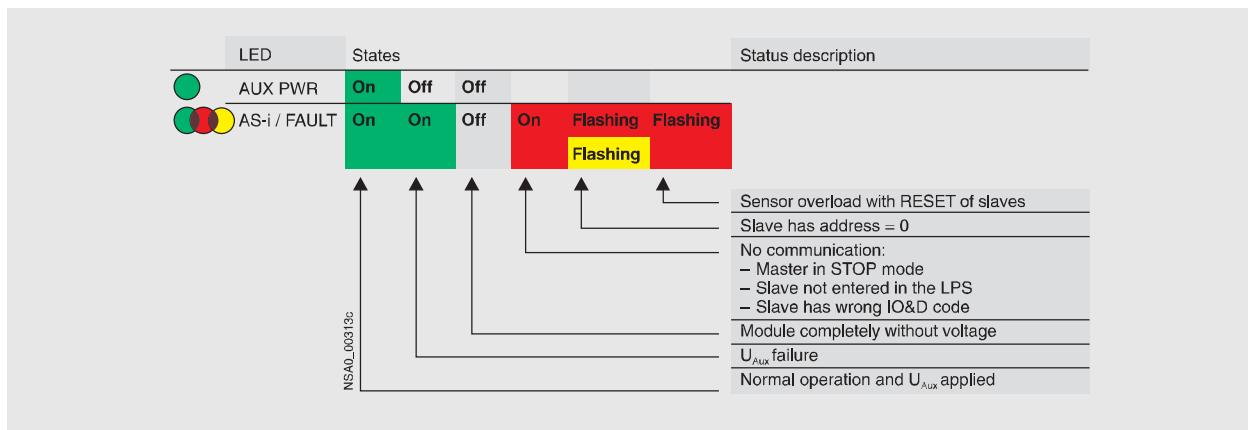
The status of a module is indicated by either two LEDs or one dual LED using steady or flashing light.

Compact modules of the K60 series have three LEDs for diagnostics indication.

Compact modules of the K45 series have one single LED and one dual LED (two-color LED) for status and diagnostics indication.



LED diagnostics indications of the K60 compact modules



LED diagnostics indications of the K45 compact modules



### Overview

The K60 digital AS-Interface compact modules are characterized by optimized handling characteristics and greater user-friendliness compared to the user modules. They permit the assembly times and start-up times of AS-Interface to be reduced by up to 40%.

AS-Interface modules from the K60 compact series are comprised of two parts:

- A mounting plate
- The compact module

The mounting plate receives the AS-Interface shaped cables and the compact module. Two versions are offered for:

- Wall mounting
- Standard rail mounting

AS-Interface modules from the compact series have a connection option for PE conductors. Addressing can also be performed in the installed state using an addressing socket integrated in the compact module.

#### **K60 compact modules with a maximum of four digital inputs and outputs**

These compact modules contain the communication electronics and the M12 standard connections for inputs and outputs. Using M12 standard connectors, a maximum of four sensors and four actuators can be simply and reliably connected to the compact module.

The mounting plate and the compact module are joined together by means of a screw, with simultaneous contacting of the AS-Interface cable by the service-proven insulation piercing method.

#### **K60 compact modules with a maximum of eight digital inputs**

These modules have eight digital inputs for connection through M12 connectors.

The module requires two AS-Interface addresses for processing all eight inputs. As with every compact module, the addressing can be performed through a double addressing socket.

#### **K60 compact modules for use in hazardous areas (ATEX)**

Two versions of the K60 modules are available for use in Zone 22 hazardous areas according to Classification II 3D (dusty atmosphere, non-conductive dust). The version with four inputs and four outputs has the designation (Ex) II 3D T75°C IP65X and the version with four inputs has the designation (Ex) II 3D T60°C IP65X.

Special conditions have to be observed for the safe operation of these devices. In particular the module must be protected by suitable measures from mechanical damage. Other conditions for safe operation see section *Technical Specifications*.

### Design

#### **K60 compact module**



The compact modules are mounted on mounting plates in just two moves:

- Insert the AS-Interface flat cables in the mounting plate
- Hook in the module and fix it with a screw

Contacting with the AS-Interface cable is performed by the insulation displacement terminals integrated in the top section when screwed on.

Addressing is performed using an integrated addressing socket. The M12 sockets which are not required must be closed with 3RK1 901-1KA00 caps in order to guarantee the quoted degree of protection. The compact module with eight digital inputs requires two AS-Interface addresses. Addressing is performed using a double addressing socket integrated in the module.

#### **K60 mounting plates**

The K60 mounting plate serves as a fixture for digital and analog K60 compact modules. It has cable fixtures for the yellow and black AS-Interface flat cable.

If both the yellow and black AS-Interface cables are to be routed completely through the module, no additional seals are required.

Additional seals are required only if one or both cables are to be terminated in the module. In this case additional seals (straight and shaped) have to be inserted in the mounting plate. These seals are not included in the scope of supply and must be ordered separately (3RK1 902-0AR00).

# AS-Interface

## Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K60

2

### Technical specifications

#### Technical specifications common to all digital I/O modules IP67 – K60

<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6
<b>Input circuit</b>	PNP
<b>Inputs</b>	
• Sensor supply using AS-Interface	Short-circuit and overload resistant
• Sensors	2- and 3-conductor
• Voltage range in V	20 ... 30
• Switching level High in V	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 6
<b>Outputs</b>	
• Type of output	Solid-state
• Short-circuit protection	Built-in
• Induction protection	Built-in
• External power supply 24 V DC	Using black AS-Interface flat cable
• Watchdog	Built-in
<b>AS-Interface certificate</b>	Yes (or requested for in case of new units)
<b>Approvals</b>	UL, CSA, shipbuilding (or requested for in case of new units)
<b>Degree of protection</b>	IP67
<b>Ground terminal</b>	PIN5 of each M12 socket is connected to the grounding wrist strap in the mounting plate using a pin
<b>Ambient temperature in °C</b>	-25 ... +85
<b>Storage temperature in °C</b>	-40 ... +85
<b>Status displays</b>	
• Display of I/Os	Yellow LED
• Display of $U_{aux}$	Green LED
• Display of AS-Interface/diagnostics	Green/red LED
<b>Connection</b>	Using mounting plate for K60 compact module
<b>Note 1</b>	All K60 compact modules are delivered with high-grade steel screws/sockets
<b>Note 2</b>	An external additional supply (AUX POWER) of 20 to 30 V DC is required for the supply of the output circuits. The additional supply must comply with VDE 0106 (PELV), protection class III.

# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K60

2

	<b>8 inputs/ 2 outputs 2 ampere A/B slave Special assignment 3RK2 400-1HQ00-0AA3</b>	<b>8 inputs -- Standard slave Y-II assignment 3RK1 200-0DQ00-0AA3</b>	<b>8 inputs -- A/B slave Y-II assignment 3RK2 200-0DQ00-0AA3</b>
<b>Total current input in mA</b>	≤ 300	≤ 270	≤ 270
<b>Current carrying capacity for all inputs (T<sub>u</sub> ≤ 40 °C) in mA</b>	200	200	200
<b>Socket assignment of inputs</b>	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection
<b>Outputs</b>			
• Current carrying capacity in A per output DC 12 /13 typical	2	--	--
• Maximum aggregate current per module in A	4	--	--
• Socket assignment of outputs	3 = "-" 4 = output 5 = ground connection	--	--
<b>Slave type</b>	A/B slave	Standard slave	A/B slave
<b>I/O configuration</b>	0 (addr. 1) / 7 (addr. 2)	0	0
<b>ID/ID2 code</b>	I/O (addr. 1 and 2)	1/F	I/O
<b>Assignment of data bits</b>			
• Socket 1	PIN4 = IN1(D0) (addr. 1) PIN2 = IN2(D1) (addr. 1)	PIN4 = IN1(D0) (addr. 1) PIN2 = IN2(D1) (addr. 1)	PIN4 = IN1(D0) (addr. 1) PIN2 = IN2(D1) (addr. 1)
• Socket 2	PIN4 = IN2(D1) (addr. 1)	PIN4 = IN2(D1) (addr. 1)	PIN4 = IN2(D1) (addr. 1)
• Socket 3	PIN4 = IN3(D2) (addr. 1) PIN2 = IN4(D3) (addr. 1)	PIN4 = IN3(D2) (addr. 1) PIN2 = IN4(D3) (addr. 1)	PIN4 = IN3(D2) (addr. 1) PIN2 = IN4(D3) (addr. 1)
• Socket 4	PIN4 = IN4(D3) (addr. 1)	PIN4 = IN4(D3) (addr. 1)	PIN4 = IN4(D3) (addr. 1)
• Socket 5	PIN4 = IN1(D0) (addr. 2) PIN2 = IN2(D1) (addr. 2)	PIN4 = IN1(D0) (addr. 2) PIN2 = IN2(D1) (addr. 2)	PIN4 = IN1(D0) (addr. 2) PIN2 = IN2(D1) (addr. 2)
• Socket 6	PIN4 = IN2(D1) (addr. 2)	PIN4 = IN2(D1) (addr. 2)	PIN4 = IN2(D1) (addr. 2)
• Socket 7	PIN4 = OUT1(D0) (addr. 2) PIN2 = IN3(D2) (addr. 2)	PIN4 = IN3(D2) (addr. 2) PIN2 = IN4(D3) (addr. 2)	PIN4 = IN3(D2) (addr. 2) PIN2 = IN4(D3) (addr. 2)
• Socket 8	PIN4 = OUT2(D1) (addr. 2) PIN2 = IN4(D3) (addr. 2)	PIN4 = IN4(D3) (addr. 2)	PIN4 = IN4(D3) (addr. 2)
<b>Number of I/O sockets</b>	8	8	8
<b>Note</b>	Module requires two addresses	Module requires two addresses	Module requires two addresses

# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K60

2

	4 inputs/ 4 outputs		
	2 ampere Standard slave Y-II assignment 3RK1 400-1DQ00-0AA3	2 ampere Standard slave Standard assignment 3RK1 400-1CQ00-0AA3	1 ampere Standard slave Y-II assignment 3RK1 400-1DQ01-0AA3
<b>Total current input in mA</b>	≤ 270	≤ 270	≤ 270
<b>Current carrying capacity for all inputs (T<sub>u</sub> ≤ 40 °C) in mA</b>	200	200	200
<b>Socket assignment of inputs</b>	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection	PIN 1 = sensor supply L+ PIN 2 = data input I PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection
<b>Outputs</b>			
• Current carrying capacity in A per output DC 12 /13 typical	2	2	1
• Maximum aggregate current per module in A	4	4	4
• Socket assignment of outputs	3 = "-" 2/4 = output 5 = ground connection	3 = "-" 4 = output 5 = ground connection	3 = "-" 2/4 = output 5 = ground connection
<b>Slave type</b>	Standard slave	Standard slave	Standard slave
<b>I/O configuration</b>	7	7	7
<b>ID/ID2 code</b>	F/F	0/F	F/F
<b>Assignment of data bits</b>			
• Socket 1	PIN4 = IN1(D0) PIN2 = IN2(D1)	PIN2/4 = IN1(D0)	PIN4 = IN1(D0) PIN2 = IN2(D1)
• Socket 2	PIN4 = IN2(D1)	PIN2/4 = IN2(D1)	PIN4 = IN2(D1)
• Socket 3	PIN4 = IN3(D2) PIN2 = IN4(D3)	PIN2/4 = IN3(D2)	PIN4 = IN3(D2) PIN2 = IN4(D3)
• Socket 4	PIN4 = IN4(D3)	PIN2/4 = IN4(D3)	PIN4 = IN4(D3)
• Socket 5	PIN4 = OUT1(D0) PIN2 = OUT2(D1)	PIN4 = OUT1(D0)	PIN4 = OUT1(D0) PIN2 = OUT2(D1)
• Socket 6	PIN4 = OUT2(D1)	PIN4 = OUT2(D1)	PIN4 = OUT2(D1)
• Socket 7	PIN4 = OUT3(D2) PIN2 = OUT4(D3)	PIN4 = OUT3(D2)	PIN4 = OUT3(D2) PIN2 = OUT4(D3)
• Socket 8	PIN4 = OUT4(D3)	PIN4 = OUT4(D3)	PIN4 = OUT4(D3)
<b>Number of I/O sockets</b>	8	8	8

# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K60

2

	<b>4 inputs/ 4 outputs 1 ampere Standard slave Standard assignment 3RK1 400-1DQ03-0AA3</b>	<b>4 inputs/ 3 outputs 2 ampere A/B slave Y-II assignment 3RK2 400-1FQ03-0AA3</b>	<b>4 inputs/ 2 outputs 2 ampere Standard slave Y-II assignment 3RK1 400-1MQ00-0AA3</b>
<b>Total current input in mA</b>	≤ 270	≤ 270	≤ 270
<b>Current carrying capacity for all inputs (<math>T_u \leq 40^\circ\text{C}</math>) in mA</b>	200	200	200
<b>Socket assignment of inputs</b>	PIN 1 = sensor supply L+ PIN 2 = data input I PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection
<b>Outputs</b>			
• Current carrying capacity in A per output DC 12 /13 typical	1	2	2
• Maximum aggregate current per module in A	4	4	4
• Socket assignment of outputs	3 = "-" 4 = output 5 = ground connection	3 = "-" 2/4 = output 5 = ground connection	3 = "-" 2/4 = output 5 = ground connection
<b>Slave type</b>	Standard slave	A/B slave	Standard slave
<b>I/O configuration</b>	7	7	7
<b>ID/ID2 code</b>	0/F	A/2	F/F
<b>Assignment of data bits</b>			
• Socket 1	PIN2/4 = IN1(D0)	PIN4 = IN1(D0)	PIN4 = IN1(D0)
• Socket 2	PIN2/4 = IN2(D1)	PIN2 = IN2(D1)	PIN2 = IN2(D1)
• Socket 3	PIN2/4 = IN3(D2)	PIN4 = IN2(D1)	PIN4 = IN2(D1)
• Socket 4	PIN2/4 = IN4(D3)	PIN4 = IN3(D2)	PIN4 = IN3(D2)
• Socket 5	PIN4 = OUT1(D0)	PIN2 = IN4(D3)	PIN2 = IN4(D3)
• Socket 6	PIN4 = OUT2(D1)	PIN4 = IN4(D3)	PIN4 = IN4(D3)
• Socket 7	PIN4 = OUT3(D2)	PIN4 = OUT1(D0)	PIN4 = OUT1(D0)
• Socket 8	PIN4 = OUT4(D3)	PIN2 = OUT2(D1)	PIN2 = OUT2(D1)
		PIN4 = OUT2(D1)	PIN4 = OUT2(D1)
		PIN4 = OUT3(D2)	Not assigned (closed)
		Not assigned (closed)	Not assigned (closed)
<b>Number of I/O sockets</b>	8	7	6

# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K60

2

	4 inputs	2 x 2 inputs / 2 x 2 outputs	4 outputs
	-- Standard slave Y-II assignment 3RK1 200-0CQ00-0AA3	1 ampere Standard slave Y-II assignment 3RK1 400-1DQ02-0AA3	2 ampere Standard slave Y-II assignment 3RK1 100-1CQ00-0AA3
<b>Total current input in mA</b>	≤ 270	≤ 270	≤ 270
<b>Current carrying capacity for all inputs (T<sub>u</sub> ≤ 40 °C) in mA</b>	200	200	200
<b>Socket assignment of inputs</b>	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection	--
<b>Outputs</b>			
• Current carrying capacity in A per output DC 12 /13 typical	--	1	2
• Maximum aggregate current per module in A	--	4	4
• Socket assignment of outputs	--	3 = "-" 2/4 = output 5 = ground connection	3 = "-" 2/4 = output 5 = ground connection
<b>Slave type</b>	Standard slave	Standard slave	Standard slave
<b>I/O configuration</b>	0	7	8
<b>ID/ID2 code</b>	1/F	F/F	1/F
<b>Assignment of data bits</b>			
• Socket 1	PIN4 = IN1(D0) PIN2 = IN2(D1)	PIN4 = IN1(D0) PIN2 = IN2(D1)	--
• Socket 2	PIN4 = IN2(D1)	Not assigned (closed)	--
• Socket 3	PIN4 = IN3(D2) PIN2 = IN4(D3)	PIN4 = IN3(D2) PIN2 = IN4(D3)	--
• Socket 4	PIN4 = IN4(D3)	Not assigned (closed)	--
• Socket 5	Not assigned (closed)	PIN4 = OUT1(D0) PIN2 = OUT2(D1)	PIN4 = OUT1(D0) PIN2 = OUT2(D1)
• Socket 6	Not assigned (closed)	Not assigned (closed)	PIN4 = OUT2(D1)
• Socket 7	Not assigned (closed)	PIN4 = OUT3(D2) PIN2 = OUT4(D3)	PIN4 = OUT3(D2) PIN2 = OUT4(D3)
• Socket 8	Not assigned (closed)	Not assigned (closed)	PIN4 = OUT4(D3)
<b>Number of I/O sockets</b>	4	4	4

# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K60

2

	<b>4 inputs/ 4 outputs</b> <b>Version ATEX (Ex) II 3D X</b> <b>2 ampere</b> <b>Standard slave</b> <b>Y-II assignment</b> <b>3RK1 400-1DQ05-0AA3</b>	<b>4 inputs</b> <b>Version ATEX (Ex) II 3D X</b> <b>--</b> <b>Standard slave</b> <b>Y-II assignment</b> <b>3RK1 200-0CQ05-0AA3</b>
<b>Total current input in mA</b>	≤ 270	≤ 270
<b>Current carrying capacity for all inputs (T<sub>u</sub> ≤ 40 °C) in mA</b>	200	200
<b>Socket assignment of inputs</b>	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection	PIN 1 = sensor supply L+ PIN 2 = data input II PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection
<b>Outputs</b>		
• Current carrying capacity in A per output DC 12/13 typical	2	--
• Maximum aggregate current per module in A	4	--
• Socket assignment of outputs	3 = "-" 2/4 = output 5 = ground connection	--
<b>Slave type</b>	Standard slave	Standard slave
<b>I/O configuration</b>	7	0
<b>ID/ID2 code</b>	F/F	1/F
<b>Assignment of data bits</b>		
• Socket 1	PIN4 = IN1(D0) PIN2 = IN2(D1)	PIN4 = IN1(D0) PIN2 = IN2(D1)
• Socket 2	PIN4 = IN2(D1)	PIN4 = IN2(D1)
• Socket 3	PIN4 = IN3(D2) PIN2 = IN4(D3)	PIN4 = IN3(D2) PIN2 = IN4(D3)
• Socket 4	PIN4 = IN4(D3)	PIN4 = IN4(D3)
• Socket 5	PIN4 = OUT1(D0) PIN2 = OUT2(D1)	Not assigned (closed)
• Socket 6	PIN4 = OUT2(D1)	Not assigned (closed)
• Socket 7	PIN4 = OUT3(D2) PIN2 = OUT4(D3)	Not assigned (closed)
• Socket 8	PIN4 = OUT4(D3)	Not assigned (closed)
<b>Number of I/O sockets</b>	8	4
<b>Prescribed use</b>	Use in Zone 22 hazardous areas according to Classification II 3D (dusty atmosphere, non-conductive dust), resistance to shock: 1 joule Conformance with Directive 94/9/EC (ATEX) is verified through compliance with the standards EN 50281-1-1 and EN 60947-5-2	
<b>Identifying markings</b>	(Ex) II 3D T75°C IP65X	(Ex) II 3D T60°C IP65X
<b>Limiting conditions for safe operation</b>	<ul style="list-style-type: none"> <li>• Suitable measures must be taken to protect the module from mechanical damage.</li> <li>• All M12 connectors must be secured by a lock-clip against unauthorized opening such that the connector cannot be disconnected by hand but only by destroying the lock-clip. A suitable lock-clip is available from Binder GmbH + Co., Elektrische Bauelemente KG, Postfach 1152, 74148 Neckarsulm, Germany, Tel. +49 (0)7132/325-0, Fax +49 (0)7132/325-150, info@binder-connector.de, Article No. 16-0977-000</li> <li>• All the M12 sockets which are not assigned must be closed with 3RK1 901-1KA01 caps (tamper-proof version) such that they cannot be released by hand.</li> <li>• Addressing the module using the 3RK1 904-2AB01 addressing unit is only permitted outside the EX-Zone 22.</li> <li>• When the addressing operation is finished, the addressing socket must be closed with a 3RK1 901-1KA01 sealing cap (tamper-proof version) such that it cannot be released by hand.</li> <li>• If an additional supply (AUX POWER) is required, it must comply with VDE 0106 (PELV), protection class III.</li> </ul>	
<b>Installation and commissioning</b>	<ul style="list-style-type: none"> <li>• The devices are approved for an ambient temperature of -25 to +85 °C.</li> <li>• The devices must be configured, connected and commissioned by qualified, responsible personnel only. An incorrect response may cause serious injury to persons and damage to property.</li> <li>• It is assumed that personnel are familiar with the assignment of classes to the permitted hazardous zones.</li> <li>• The plug connectors and AS-Interface cables must not be connected or disconnected when live.</li> <li>• The units require no maintenance.</li> <li>• No modifications or repairs are allowed to be carried out on the units.</li> <li>• All the above points must be observed in the event of replacement.</li> <li>• See also Regulations for Installation EN 60079-14 / EN 50281-1-2.</li> </ul>	

# AS-Interface

## Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K60

2

	K60 mounting plates		Distribution board
	For wall mounting 3RK1 901-0CA00	For standard rail mounting 3RK1 901-0CB01	-- 3RK1 901-1NN00
<b>Ambient temperature in °C</b>	-40 ... +85	-40 ... +85	-40 ... +85
<b>Degree of protection</b>	IP67 with screw-mounted K60 compact module	IP67 with screw-mounted K60 compact module	IP65 with screw-mounted top
<b>Connection technique</b>	For shaped AS-Interface cable, contacting using insulation displacement terminals integrated in the compact module	For shaped AS-Interface cable, contacting using insulation displacement terminals integrated in the compact module	For shaped AS-Interface cable, yellow or black, contacting using insulation displacement terminals integrated in the top
<b>Installation</b>	<ul style="list-style-type: none"> <li>• Wall mounting</li> <li>• On profile system (corresponding sliding blocks required)</li> <li>• Hole spacing compatible with K45 mounting plate for wall mounting</li> </ul>	<ul style="list-style-type: none"> <li>• Standard rail mounting</li> </ul>	<ul style="list-style-type: none"> <li>• Standard rail mounting/wall mounting</li> <li>• On profile system (corresponding sliding blocks required)</li> <li>• Hole spacing also compatible with FK/FK-E coupling module (user module)</li> </ul>
<b>Note</b>	Additional seals are required only when the flat cables end in the module (3RK1 902-0AR00)	Additional seals are required only when the flat cables end in the module (3RK1 902-0AR00)  For the previous version of the 3RK1 901-0CB00 standard rail mounting it is also possible to order the standard rail adapter separately as a spare part: 3RX1 660-0B. This adapter is not required for the new 3RK1 901-0CB01 version.	A distribution board can perform the following functions: <ul style="list-style-type: none"> <li>• Configuration of network structures (branch function)</li> <li>• Splitting of cable segments (splitting function)</li> <li>• Sealing of cable ends in the module (sealing function)</li> </ul> To terminate one or both cables in the distribution board, seals (straight and shaped ) for inserting in the bottom of the distribution board are required. These seals are not included in the scope of supply and must be ordered separately (3RK1 902-0AR00). If both cables are to be routed completely through the module, no additional seals are required.

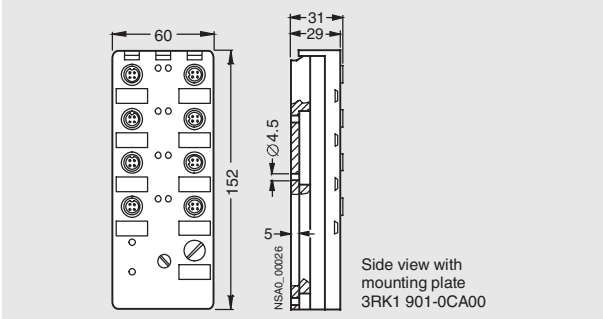


# AS-Interface Slaves

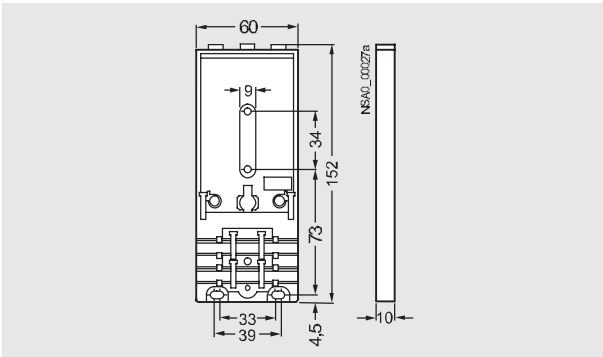
I/O modules for operation in the field  
Digital I/O modules, IP67 - K60

2

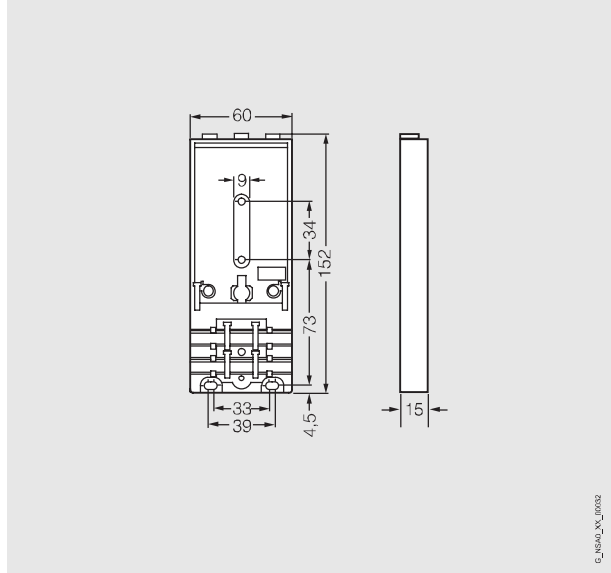
## Dimensional drawings



I/O module



3RK1 901-0CA00 mounting plate for mounting on a wall



3RK1 901-0CB01 mounting plate for mounting on a standard mounting rail

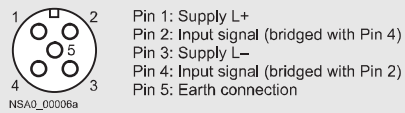
# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K60

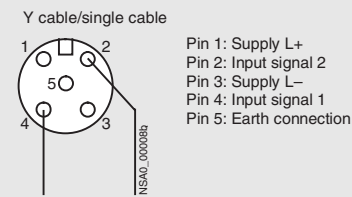
2

## Schematics

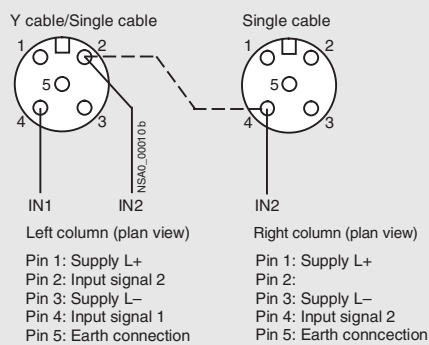
### Terminal assignment for input, pnp (M12 socket)



#### Standard assignment

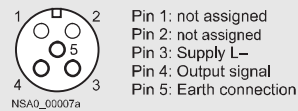


#### Y assignment

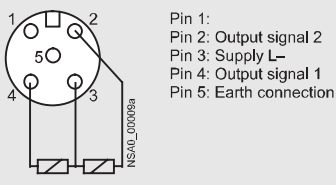


#### Y-II assignment

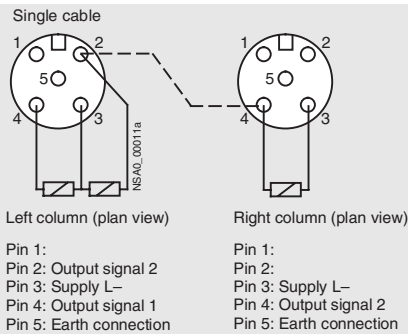
### Terminal assignment for output, pnp (M12 socket) 24 V DC



#### Standard assignment



#### Y assignment



#### Y-II assignment

# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP68 / IP69K - K60R

2

## Overview



Modules with degree of protection IP67 cannot be used in areas exposed to permanently high levels of humidity, in applications with drilling emulsions and cutting oils or when cleaning with high-pressure cleaners. The answer for these applications is provided by the expansion of the K60 compact modules with the K60R module with IP68/IP69K protection.

The K60R modules are connected instead of the AS-Interface flat cable using a round cable with M12 cable box. The AS-Interface bus cable and the 24 V DC auxiliary power supply are routed in this case in a shared round cable.

IP68 protection permits many new applications, which were impossible with the former field modules with degree of protection IP67. In applications such as filling plants or machine-tools the K60R with degree of protection IP68 enables the module to be used directly in zones exposed to permanent loading by humidity. It is thus possible to make even more rigorous savings in wiring with AS-Interface. IP68 test conditions see section *Design / Tests IP68/IP69K*.

Cleaning with high-pressure cleaners, such as is regularly performed in the food drinks industry for instance, is possible without difficulty (IP69K).

In applications with tow chains, many users rely on placing the AS-Interface bus cable in a round cable. With the K60R module there is a round cable connection for direct connection to a round cable. No adapter is required.

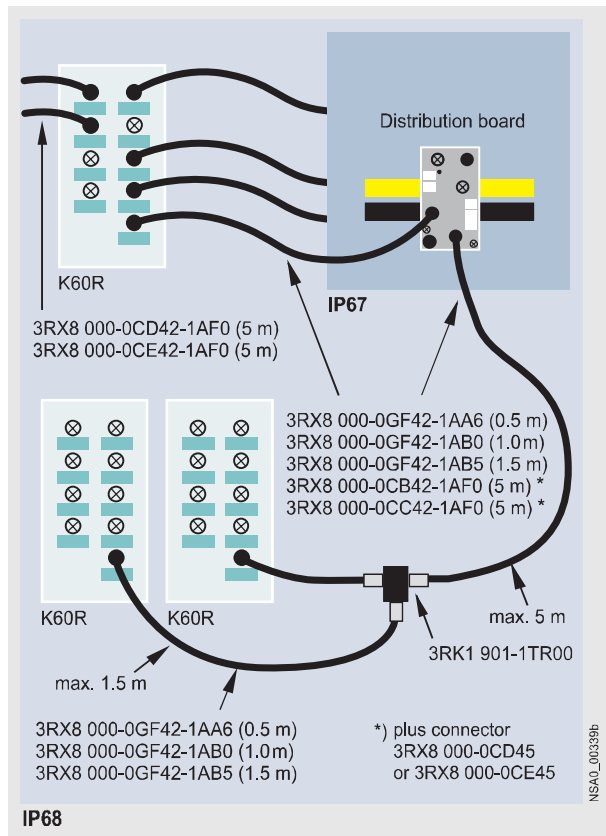
## Mounting

The same mounting plates are used as for the K60 modules. Instead of using flat cables the K60R is connected using a 4-pole round cable with an M12 connection. With the K60R the mounting plate thus serves only as a fixture and ground terminal.

## Addressing

Addressing is performed using the same socket as for the bus connection. Connecting the module to the 3RK1 904-2AB01 addressing unit is performed using a standard M12 cable (e.g. 3RX8 000-0GF32-1AB5). If the older version of the 3RK1 904-2AB00 addressing unit is used, a special addressing cable (3RK1 901-3RA00) is required. When the mounting is finished, the module is connected with the addressing cable to the addressing unit and addressed. The addressing cable is then removed and the module connected to the bus line.

## Connection



## K60R connection options

In the IP67 environment the service-proven standard components are connected using flat cables. Spur lines are laid into the IP68 environment by means of a round cable distribution board (3RK1 901-1NR00). The module is connected with a round cable to an M12 cable box. For this purpose the module has an M12 bus connection instead of the former addressing socket. The AS-Interface bus cable and the 24 V DC auxiliary power supply are routed together in a 4-pole round cable. There must be no ground conductor in this round cable. Connection to ground is made through the mounting plate.

In the IP68 environment only cables with extruded M12 connectors may be used. These cables are available preassembled as an M12 cable plug/cable box version:

- 3RX8 000-0GF42-1AA6: 0.5 m long
- 3RX8 000-0GF42-1AB0: 1.0 m long
- 3RX8 000-0GF42-1AB5: 1.5 m long

To connect the distribution board and the K60R module over long distances it is also possible to use freely configurable cables with an M12 cable box and an open cable end, which are fitted with an M12 plug (straight version: 3RX8 000-0CD45, 3RX8 000-0CE45 angle plug) and connected to the distribution board. This cable is available in two versions:

- 3RX8 000-0CB42-1AF0: 5 m long, with M12 cable box
- 3RX8 000-0CC42-1AF0: 5 m long, with M12 angle cable box

To connect more than one K60R module to one spur line, the spur line can be split again using a T distributor (3RK1 901-1TR00) with IP68 protection.

# AS-Interface Slaves

## I/O modules for operation in the field Digital I/O modules, IP68 / IP69K - K60R

2

Please note the following boundary conditions: The configuration guidelines for AS-Interface generally apply. For all M12 connecting cables the maximum permissible current is limited to 4 A. The cross-section of these cables amounts to just 0.34 mm<sup>2</sup>. For connection of the K60R modules the previously mentioned M12 connecting cables with a maximum length of 5 m can be used for the spur lines. The voltage drop caused by the ohmic resistance (approx. 0.11 Ω/m) must be taken into account. The maximum load of the 3RK1 901-1NR00 round cable distribution board amounts to 4 A in total for all four connections.

In applications with exclusively round cable wiring the AS-Interface bus cable and the 24 V DC auxiliary voltage can be routed together for up to 20 m when using a round cable of 4 x 1.5 mm<sup>2</sup>. For greater cable lengths two separate cables with 2 x 1.5 mm<sup>2</sup> each are used. For these applications no round cable distribution board (3RK1 901-1NR00) is required. Distribution to the K60R modules is then performed with a terminal box and the previously mentioned M12 connecting cables.

### Tests IP68/IP69K

K60R modules were tested with the following tests:

- **Stricter test than IP67:** 90 min 1.8 m depth of water (IP67: 30 min at 1 m depth of water)
- **Salt water test:** Five months in salt water, 20 cm deep, at room temperature
- **Test with particularly creepable oil:** Five months completely under oil at room temperature
- **Test with drilling emulsion:** Five months at room temperature (components of the drilling emulsion: Anionic and non-ionic emulsifiers, paraffinic low-aromatic mineral oil, boric acid alkanolamines, corrosion inhibitors, oil content 40 %)
- **Test in oil bath (Excelence 416 oil) with alternating oil bath temperature:** 130 cycles of 15 to 55 °C, two months
- **Cleaning with a high-pressure cleaner according to IP69K:** 80 to 100 bar, 10 to 15 cm distance, time per side > 30 sec, water temperature 80 °C

To simulate requirements as realistically as possible the modules were artificially aged prior to the tests by 15 temperature cycles of -25/+85 °C. During the test the modules were connected to 3RX1 connecting cables. Unassigned connections were closed with 3RK1 901-1KA00 sealing caps.

Note: Sealing caps and M12 connections must be tightened with the correct torque.

### Technical specifications

	<b>4 inputs / 4 outputs IP68/IP69K Standard assignment 3RK1 400-1CR00-0AA3</b>
<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6
<b>Total current input in mA</b>	≤ 270
<b>Input circuit</b>	PNP
<b>Inputs</b>	
• Sensor supply using AS-Interface	Short-circuit and overload resistant
• Sensors	2- and 3-conductor
• Voltage range in V	20 ... 30
• Current carrying capacity for all inputs (T <sub>u</sub> ≤ 40 °C) in mA	200
• Switching level High in V	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 6
• Socket assignment of inputs	PIN 1 = sensor supply L+ PIN 2 = data input I PIN 3 = sensor supply L- PIN 4 = data input I PIN 5 = ground connection
<b>Outputs</b>	
• Type of output	Solid-state
• Current carrying capacity in A per output DC 12 /13 typical	2
• Maximum aggregate current per module in A	4
• Socket assignment of outputs	3 = "-" 4 = output 5 = ground connection
• Short-circuit protection	Built-in
• Induction protection	Built-in
• External power supply 24 V DC	Shared round cable connection with AS-Interface connection through M12 female connector
• Watchdog	Built-in
<b>Slave type</b>	Standard slave
<b>I/O configuration</b>	7
<b>ID/ID2 code</b>	0/F

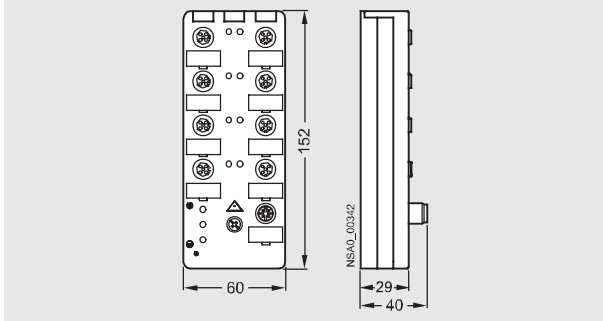
<b>4 inputs / 4 outputs IP68/IP69K Standard assignment 3RK1 400-1CR00-0AA3</b>	
<b>Assignment of data bits</b>	
• Socket 1	PIN2/4 = IN1(D0)
• Socket 2	PIN2/4 = IN2(D1)
• Socket 3	PIN2/4 = IN3(D2)
• Socket 4	PIN2/4 = IN4(D3)
• Socket 5	PIN4 = OUT1(D0)
• Socket 6	PIN4 = OUT2(D1)
• Socket 7	PIN4 = OUT3(D2)
• Socket 8	PIN4 = OUT4(D3)
<b>AS-Interface certificate</b>	Yes
<b>Approvals</b>	UL, CSA, shipbuilding
<b>Degree of protection</b>	IP68/IP69K with 3RK1 901-0CA00 mounting plate IP68 test conditions see section <i>Design / Tests IP68/IP69K</i> . The degree of protection is achieved only when all M12 connections are tightened with the correct torque. The I/O sockets which are not required must be closed with 3RK1 901-1KA00 caps.
<b>Ground terminal</b>	PIN5 of each M12 socket is connected to the grounding wrist strap in the mounting plate using a pin
<b>Ambient temperature in °C</b>	-25 ... +85
<b>Storage temperature in °C</b>	-40 ... +85
<b>Number of I/O sockets</b>	8
<b>Status displays</b>	
• Display of I/Os	Yellow LED
• Display of $U_{aux}$	Green LED
• Display of AS-Interface/diagnostics	Green/red LED
<b>Connection</b>	Using mounting plate for K60 compact module
<b>Note 1</b>	All K60 compact modules are delivered with high-grade steel screws/sockets
<b>Note 2</b>	An external additional supply (AUX POWER) of 20 to 30 V DC is required for the supply of the output circuits. The additional supply must comply with VDE 0106 (PELV), protection class III.
<b>Round cable distribution boards IP67 AS-i / <math>U_{aux}</math> flat cable on 4 x M12, passive without LED 3RK1 901-1NR00</b>	
<b>Function</b>	Connection of the K60R modules to AS-Interface flat cable in an IP67 environment
<b>Operational voltage in V</b>	26.5 ... 31.6 DC (AS-Interface)
<b>Voltage range in V</b>	20 ... 30 DC
<b>Current carrying capacity for all M12 sockets, total in A</b>	4
<b>Socket assignment</b>	1 = AS-i "+" 2 = $U_{aux}$ "+" 3 = AS-i "-" 4 = $U_{aux}$ "+"
<b>Connection</b>	4 x M12 socket (for connection of K60R modules)
<b>Degree of protection</b>	IP67
<b>Ambient temperature in °C</b>	-25 ... +85
<b>Storage temperature in °C</b>	-40 ... +85
<b>Number of M12 sockets</b>	4
<b>Connection</b>	Using contact pins on FKE coupling module (included in delivery)
<b>M12-T distribution boards 3RK1 901-1TR00</b>	
<b>Function</b>	For connection of several K60R units to one M12 spur line
<b>Voltage range in V</b>	20 ... 30 DC
<b>Current carrying capacity total in A</b>	4 at T = 40 °C
<b>Connection</b>	M12
<b>Degree of protection</b>	IP68
<b>Ambient temperature in °C</b>	-25 ... +85
<b>Storage temperature in °C</b>	-25 ... +85
<b>Number of M12 sockets</b>	1 x M12 connector / 2 x M12 box

# AS-Interface Slaves

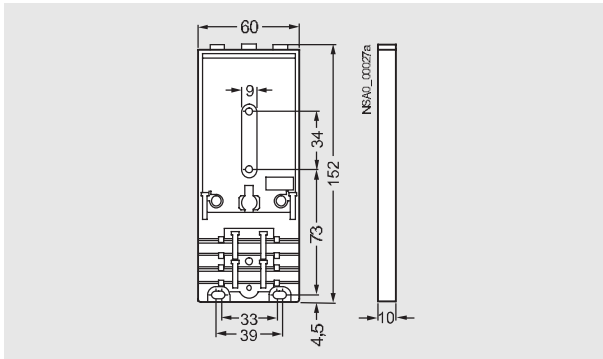
I/O modules for operation in the field  
Digital I/O modules, IP68 / IP69K - K60R

2

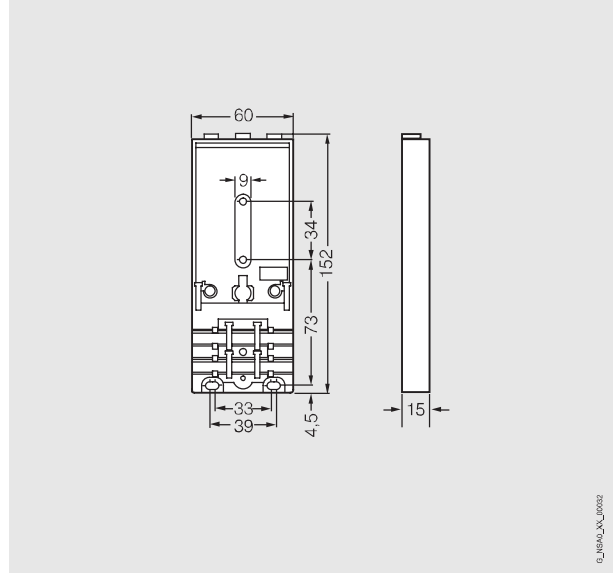
## Dimensional drawings



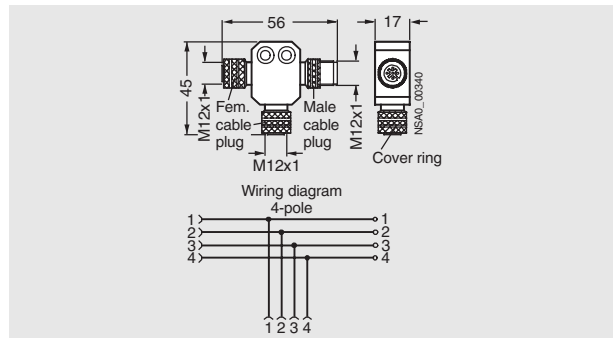
I/O module



3RK1 901-OCA00 mounting plate for mounting on a wall



3RK1 901-OCB01 mounting plate for mounting on a standard mounting rail



M12-T distribution board

# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K45

## Overview

The K45 compact modules are the ideal supplement to the K60 large compact modules, which have proven their worth in industry. They are the logical consequence for rounding off the bottom end of the existing product spectrum.

The acclaimed advantages of the existing K60 compact modules are fully emulated by the far smaller K45 modules. Their footprint is the same as that of the user modules. However, they have a mounting depth which is only two-thirds of the user module and hence an exact match for the compact module family.

Yet in spite of these small dimensions all the modules have large labels and an integrated addressing socket.

Two mounting plates are offered for the K45 compact modules:

- The first mounting plate has a hole pattern that is identical to that of the K60 compact modules. This means that K60 compact modules can be mounted together with K45 modules in an aligned arrangement. The flat cables can be inserted in the recesses of the mounting plates where they cause no hindrance.
- The second mounting plate comes with the hole pattern and the standard rail mounting of the user modules integrated.

Mounting the flat cables is now easier than ever. The yellow and black AS-Interface flat cable can be inserted into the mounting plates from the left or right regardless of the position of the coding lug. The correct polarity of the applied voltages is always guaranteed.

Sensors/actuators are connected using M12 sockets. The 4E module can be ordered optionally with M8 connection sockets.

## Design

### Installation



- Place the AS-Interface flat cables (yellow or yellow and black) in the corresponding wiring duct of the mounting plate. Any direction is possible.
- Hook the module top in the mounting plate.
- Fasten the top to the mounting plate using just one screw.

### Mounting options



- Standard rail mounting using 3RK1 901-2DA00 mounting plate.
- Wall mounting using 3RK1 901-2EA00 mounting plate.
- Mounting (horizontal and vertical fixing are both possible) on generally available profile systems using screw-on sliding blocks (max. M5, not included in delivery) on 3RK1 901-2EA00 or 3RK1 901-2DA00 mounting plate.

### Addressing

Addressing is performed using the integrated addressing socket.

The M12 sockets which are not required must be closed with 3RK1 901-1KA00 caps in order to guarantee the quoted degree of protection.

# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K45

2

## Technical specifications

### Technical specifications common to all digital I/O modules IP67 – K45

<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6
<b>Reverse polarity protection U AS-Interface</b>	Built-in
<b>Input circuit</b>	PNP
<b>Inputs</b>	
• Sensor supply using AS-Interface	Short-circuit and overload resistant
• Sensors	2- and 3-conductor
• Voltage range in V	20 ... 30 <sup>1)</sup>
• Switching level High in V	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 6
<b>Outputs</b>	
• Type of output	Solid-state
• Short-circuit protection	Built-in
• Induction protection	Built-in
• External power supply 24 V DC	Using black AS-Interface flat cable
• Watchdog	Built-in
<b>AS-Interface certificate</b>	Yes (or requested for in case of new units)
<b>Approvals</b>	UL, CSA, shipbuilding (or requested for in case of new units)
<b>Degree of protection</b>	IP67 (IP65 with M8 snap-fitting connection)
<b>Ground terminal</b>	Using PIN5 of the M12 sockets and outgoing feeder using 2.8-mm flat connector (no ground terminal with M8 sockets)
<b>Ambient temperature in °C</b>	-25 ... +85
<b>Storage temperature in °C</b>	-40 ... +85
<b>Status displays</b>	
• Display of I/Os	Yellow LED
• Display of $U_{aux}$	Green LED
• Display of AS-Interface/diagnostics	Green/red dual LED
<b>Connection</b>	Using mounting plate for K45 compact module
<b>Note 1</b>	All K45 compact modules are delivered with high-grade steel screws/sockets
<b>Note 2</b>	An external additional supply (AUX POWER) of 20 to 30 V DC is required for the supply of the output circuits. The additional supply must comply with VDE 0106 (PELV), protection class III.

1) For 3RK2 400-1BQ20-0AA3  $U_{min} = 16.5$  V



# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K45

2

	4 inputs		
	Standard slave		
	Standard assignment		
	M12 3RK1 200-0CQ20-0AA3	M8 screw-type terminal 3RK1 200-0CT20-0AA3	M8 snap-action terminal 3RK1 200-0CU20-0AA3
<b>Total current input in mA</b>	≤ 270	≤ 270	≤ 270
<b>Current carrying capacity for all inputs (<math>T_u \leq 40^\circ\text{C}</math>) in mA</b>	200	200	200
<b>Socket assignment of inputs</b>	PIN1 = sensor supply L+ PIN3 = sensor supply L- PIN4 + 2 = data input PIN5 = ground terminal	PIN1 = sensor supply L+ PIN3 = sensor supply L- PIN4 = data input	PIN1 = sensor supply L+ PIN3 = sensor supply L- PIN4 = data input
<b>Slave type</b>	Standard slave	Standard slave	Standard slave
<b>I/O configuration</b>	0	0	0
<b>ID/ID2 code</b>	0/F	0/F	0/F
<b>Assignment of data bits</b>			
• Socket 1	PIN4/2 = IN1(D0)	PIN4 = IN1(D0)	PIN4 = IN1(D0)
• Socket 2	PIN4/2 = IN2(D1)	PIN4 = IN2(D1)	PIN4 = IN2(D1)
• Socket 3	PIN4/2 = IN3(D2)	PIN4 = IN3(D2)	PIN4 = IN3(D2)
• Socket 4	PIN4/2 = IN4(D3)	PIN4 = IN4(D3)	PIN4 = IN4(D3)
<b>Number of I/O sockets</b>	4	4	4

	4 inputs		
	A/B slave		
	Standard assignment		
	M12 3RK2 200-0CQ20-0AA3	M8 screw-type terminal 3RK2 200-0CT20-0AA3	M8 screw-type terminal 3RK2 200-0CU20-0AA3
<b>Total current input in mA</b>	≤ 270	≤ 270	≤ 270
<b>Current carrying capacity for all inputs (<math>T_u \leq 40^\circ\text{C}</math>) in mA</b>	200	200	200
<b>Socket assignment of inputs</b>	PIN1 = sensor supply L+ PIN3 = sensor supply L- PIN4 + 2 = data input PIN5 = ground terminal	PIN1 = sensor supply L+ PIN3 = sensor supply L- PIN4 = data input	PIN1 = sensor supply L+ PIN3 = sensor supply L- PIN4 = data input
<b>Slave type</b>	A/B slave	A/B slave	A/B slave
<b>I/O configuration</b>	0	0	0
<b>ID/ID2 code</b>	A/0	A/0	A/0
<b>Assignment of data bits</b>			
• Socket 1	PIN4/2 = IN1(D0)	PIN4 = IN1(D0)	PIN4 = IN1(D0)
• Socket 2	PIN4/2 = IN2(D1)	PIN4 = IN2(D1)	PIN4 = IN2(D1)
• Socket 3	PIN4/2 = IN3(D2)	PIN4 = IN3(D2)	PIN4 = IN3(D2)
• Socket 4	PIN4/2 = IN4(D3)	PIN4 = IN4(D3)	PIN4 = IN4(D3)
<b>Number of I/O sockets</b>	4	4	4

# AS-Interface Slaves

## I/O modules for operation in the field Digital I/O modules, IP67 - K45

2

	<b>2x2 inputs</b> -- <b>A/B slave</b> <b>Y assignment</b> <b>M12</b> <b>3RK2 200-0CQ22-0AA3</b>	<b>2 inputs / 2 outputs</b> <b>Current carrying capacity of outputs: 2 A<sup>1)</sup></b> <b>Standard slave</b> <b>Standard assignment</b> <b>M12</b> <b>3RK1 400-1BQ20-0AA3</b>	<b>2 x (1 input/1 output)</b> <b>Current carrying capacity of outputs: 0.2 A</b> <b>Standard slave</b> <b>Y assignment</b> <b>M12</b> <b>3RK1 400-0GQ20-0AA3</b>
<b>Total current input in mA</b>	≤ 270	≤ 270	≤ 270
<b>Current carrying capacity for all inputs (<math>T_u \leq 40^\circ\text{C}</math>) in mA</b>	200	200	200 <sup>2)</sup>
<b>Reverse polarity protection <math>U_{aux}</math></b>	Does not apply	By coding	$U_{aux}$ not required
<b>Socket assignment of inputs</b>	PIN1 = sensor supply L+ PIN3 = sensor supply L- PIN4 + 2 = data input PIN5 = ground terminal	PIN1 = sensor supply L+ PIN2 = data input PIN3 = sensor supply L- PIN4 = data input PIN5 = ground terminal	PIN1 = sensor supply L+ PIN2 = output PIN3 = sensor supply L- PIN4 = data input PIN5 = ground terminal
<b>Outputs</b> • Current carrying capacity in A per output DC 12 /13 typical • Maximum aggregate current per module in A	-- --	2 <sup>1)</sup> 3	0.2 <sup>2)</sup> 0.2 <sup>2)</sup>
<b>Slave type</b>	A/B slave	Standard slave	Standard slave
<b>I/O configuration</b>	0	3	3
<b>ID/ID2 code</b>	A/0	0/F	F/F
<b>Assignment of data bits</b> • Socket 1 • Socket 2 • Socket 3 • Socket 4	PIN4 = IN1(D0) PIN2 = IN2(D1) -- -- PIN4 = IN3(D2) PIN2 = IN4(D3)	PIN4/2 = IN1(D0) PIN4/2 = IN2(D1) PIN4 = OUT3(D2) PIN4 = OUT4(D3)	PIN4 = IN1(D0) PIN2 = OUT3(D2) -- -- PIN4 = IN2(D1) PIN2 = OUT4(D3)
<b>Number of I/O sockets</b>	2	4	2

1) The typical current carrying capacity per output increases with version "E12" from 1.5 to 2 A (available since approx. 07/2003).

2) Aggregate current for all inputs and outputs max. 200 mA.

	<b>4 outputs</b> <b>Current carrying capacity of outputs: 1 A</b> <b>Standard slave</b> <b>Standard assignment</b> <b>M12</b> <b>3RK1 100-1CQ20-0AA3</b>	<b>3 outputs</b> <b>Current carrying capacity of outputs: 1 A</b> <b>A/B slave</b> <b>Standard assignment</b> <b>M12</b> <b>3RK2 100-1EQ20-0AA3</b>	<b>2 outputs / 2 inputs</b> <b>Current carrying capacity of outputs: 2 A</b> <b>A/B slave</b> <b>Standard assignment</b> <b>M12</b> <b>3RK2 400-1BQ20-0AA3</b>
<b>Total current input in mA</b>	≤ 45	≤ 45	≤ 270
<b>Current carrying capacity for all inputs (<math>T_u \leq 40^\circ\text{C}</math>) in mA</b>	200	200	200
<b>Reverse polarity protection <math>U_{aux}</math></b>	By coding	By coding	By coding
<b>Socket assignment of inputs</b>	--	--	PIN1 = sensor supply L+ PIN2 = data input PIN3 = sensor supply L- PIN4 = data input PIN5 = ground terminal
<b>Outputs</b> • Current carrying capacity in A per output DC 12 /13 typical • Maximum aggregate current per module in A	1 3	1 3	2 3
<b>Slave type</b>	Standard slave	A/B slave	A/B slave
<b>I/O configuration</b>	8	8	B
<b>ID/ID2 code</b>	0/F	A/0	A/0
<b>Assignment of data bits</b> • Socket 1 • Socket 2 • Socket 3 • Socket 4	PIN4 = OUT1(D0) PIN4 = OUT2(D1) PIN4 = OUT3(D2) PIN4 = OUT4(D3)	PIN4 = OUT1(D0) PIN4 = OUT2(D1) PIN4 = OUT3(D2) n/a	PIN4/2 = IN3(D2) PIN4/2 = IN4(D3) PIN4 = OUT1(D0) PIN4 = OUT2(D1)
<b>Number of I/O sockets</b>	4	3	4

# AS-Interface Slaves

I/O modules for operation in the field  
Digital I/O modules, IP67 - K45



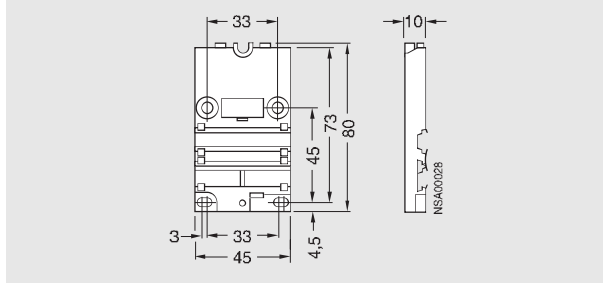
	K45 mounting plates		Distribution board	Cable terminating pieces
	For wall mounting 3RK1 901-2EA00	For standard rail mounting 3RK1 901-2DA00	-- 3RK1 901-1NN00	-- 3RK1 901-1MN00
<b>Ambient temperature in °C</b>	-40 ... +85	-40 ... +85	-40 ... +85	40 ... +85
<b>Degree of protection</b>	IP67 with screw-mounted K45 compact module	IP67 with screw-mounted K45 compact module	IP65 with screw-mounted top	IP67 with inserted shaped AS-Interface cable
<b>Connection technique</b>	For shaped AS-Interface cable, contacting using insulation displacement terminals integrated in the compact module	For shaped AS-Interface cable, contacting using insulation displacement terminals integrated in the compact module	For shaped AS-Interface cable, yellow or black, contacting using insulation displacement terminals integrated in the top	PG gland with integrated seal (seal shaped with AS-Interface cable profile)
<b>Installation</b>	<ul style="list-style-type: none"> <li>• Wall mounting</li> <li>• On profile system (corresponding sliding blocks required)</li> <li>• Hole spacing compatible with K60 mounting plate</li> </ul>	<ul style="list-style-type: none"> <li>• Standard rail mounting/ wall mounting</li> <li>• On profile system (corresponding sliding blocks required)</li> <li>• Hole spacing compatible with FK/FK-E coupling module (user module)</li> </ul>	<ul style="list-style-type: none"> <li>• Standard rail mounting/ wall mounting</li> <li>• On profile system (corresponding sliding blocks required)</li> <li>• Hole spacing compatible with FK/FK-E coupling module (user module)</li> </ul>	<ul style="list-style-type: none"> <li>• Cable terminating piece can be fastened, e.g. to a machine, using the integrated eyelet</li> </ul>
<b>Note</b>	Insertion of AS-Interface cable, yellow and black, possible from any direction	Insertion of AS-Interface cable, yellow and black, possible from any direction	<p>A distribution board can perform the following functions:</p> <ul style="list-style-type: none"> <li>• Configuration of network structures (branch function)</li> <li>• Splitting of cable segments (splitting function)</li> <li>• Sealing of cable ends in the module (sealing function)</li> </ul> <p>To terminate one or both cables in the distribution board, seals (straight and shaped ) for inserting in the bottom of the distribution board are required. These seals are not included in the scope of supply and must be ordered separately (3RK1 902-0AR00). If both cables are to be routed completely through the module, no additional seals are required.</p>	--

# AS-Interface Slaves

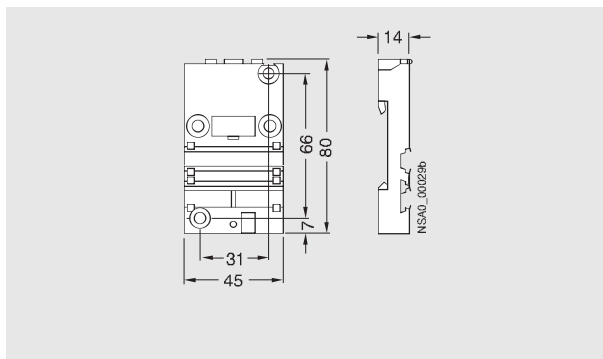
I/O modules for operation in the field  
Digital I/O modules, IP67 - K45

2

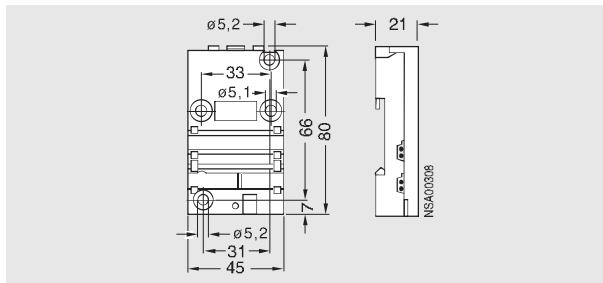
## Dimensional drawings



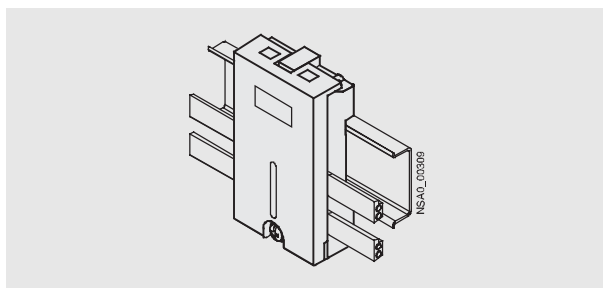
3RK1 901-2EA00 mounting plate for wall mounting  
Hole pattern and fixing options identical to that of K60 compact modules



3RK1 901-2DA00 mounting plate for standard rail mounting  
Hole pattern and fixing options identical to that of user modules



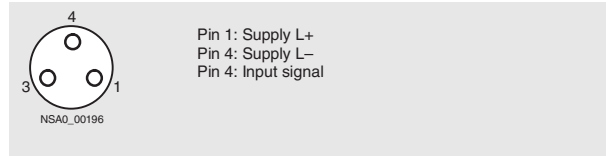
3RK1 901-1NN00 distribution board



3RK1 901-1NN00 distribution board

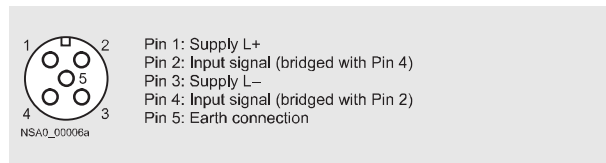
## Schematics

### Terminal assignment for input, pnp (M8 socket)



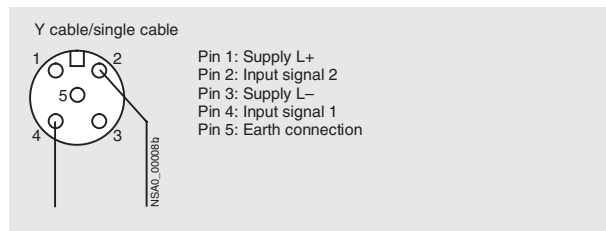
Standard assignment

### Terminal assignment for input, pnp (M12 socket)



Standard assignment

### Terminal assignment for input, pnp (M12 socket)



Y assignment

### Terminal assignment for output, pnp (M12 socket) 24 V DC



Standard assignment

### Overview



AS-Interface analog modules from the K60 compact series detect or issue analog signals locally. These modules are linked to the higher level controller through an AS-Interface master according to Specification 2.1.

The analog modules are divided into five groups:

- Input module for sensors with current signal
- Input module for sensors with voltage signal
- Input module for sensors with thermal resistor
- Output module for current actuators
- Output module for voltage actuators

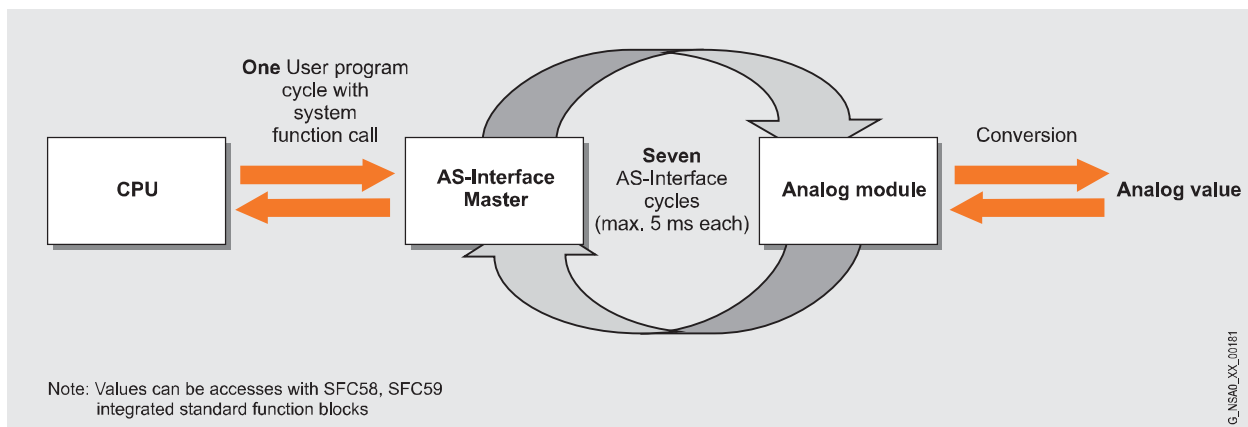
The input modules are available with two or four input channels. It is in addition possible to convert the two-channel module to using only one input channel, thus enabling very short transmission times. The conversion is effected by means of a jumper plug at socket 3.

The output modules are configured as two-channel modules as standard.

The input and output channels are electrically isolated from the AS-Interface network. If sensors with a higher power requirement are to be connected, more power can be supplied through the auxiliary voltage as an alternative to the internal supply.

In the manual the modules are presented in great detail along with their technical specifications and in-depth notes on operation. Sample function blocks round off the manual.

### Function



Data transfer according to analog profile 7.3/7.4

With analog profile 7.3/7.4 at least seven AS-Interface cycles must be passed through before transmission is completed.

**This requires the use of a master according to Extended Specification V2.1.**

With input modules the complete analog value is then available in the AS-Interface master. Preprocessing is thus performed in the master.

With the next system function call the user program brings the analog value as one value into the user program. Hence the analog value is very quickly updated.

The analog value transmission allies in reverse order for the output modules as well.

In total this results in the following conversion and transmission time<sup>1)</sup>:

	1 channel	2 channels	4 channels
Conversion and transmission time	max. 95 ms	max. 235 ms	max. 435 ms

1) With presetting: smoothing function deactivated; line filter 50 Hz

# AS-Interface

## Slaves

I/O modules for operation in the field  
Analog I/O modules, IP67 - K60

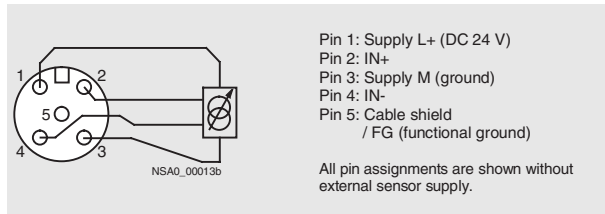
2

### Technical specifications

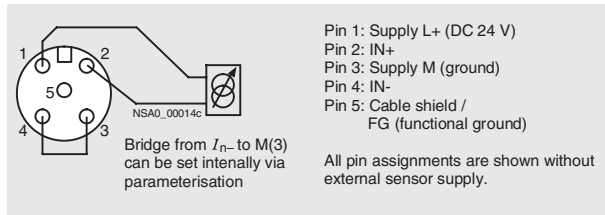
	Analog I/O modules, IP67 – K60
Slave type	Analog slave
Profile	7.3
Number format	S7
Operational voltage according to AS-Interface specification in V	26.5 ... 31.6
Total current input of the module including connection of sensors / actuators in mA	150
Current transfer with connection of two sensors in mA (without $U_{aux}$ infeed)	Max. 46
Additional supply of sensors through $U_{aux}$ in V	24 ... 30
Current transfer from $U_{aux}$ with connection of two sensors in mA	Max. 500
Current transfer with connection of two current / voltage actuators in mA	Max 30 / max. 24
I/O configuration	7
ID code	3
AS-Interface certificate	Available soon
Certification	UL, CSA, shipbuilding
Degree of protection	IP67 (with inserted cables)
Ambient temperature in °C	-20 ... +60
Storage temperature in °C	-40 ... +85
Display of AUX PWR ( $U_{aux}$ )	Green LED
Display of AS-i	Green LED
Display of FAULT	Red LED
Connection	Using mounting plate for K60 compact module

### Schematics

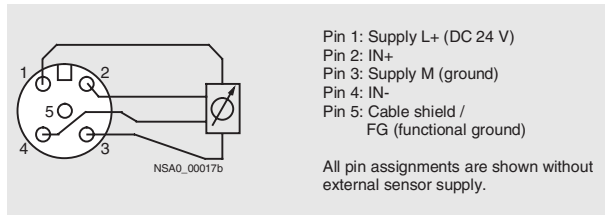
#### Pin assignment for input module



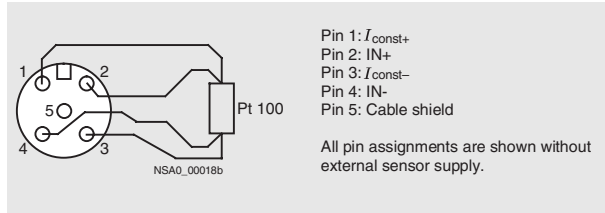
Current input for 4-conductor sensor



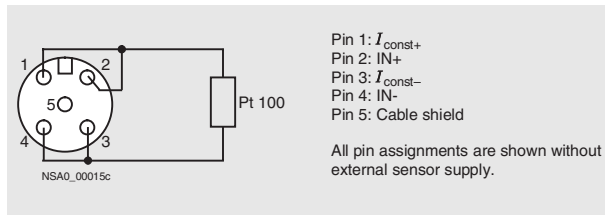
Current input for 2-conductor sensor



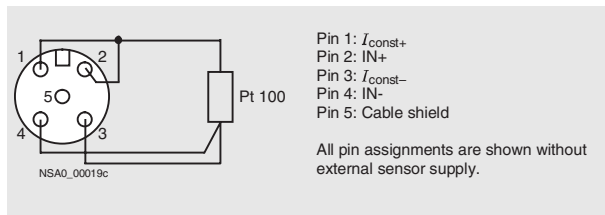
Voltage input for 4-conductor sensor



Thermal resistor for 4-conductor sensor

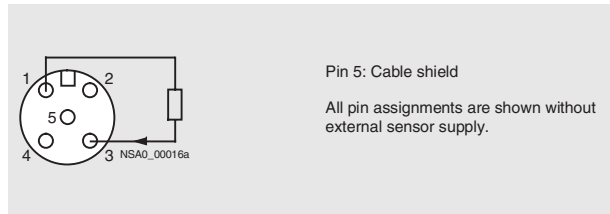


Thermal resistor for 2-conductor sensor

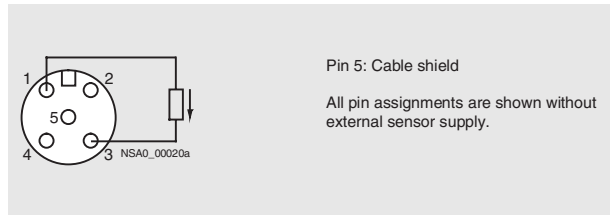


Thermal resistor for 3-conductor sensor

#### Pin assignment for output module



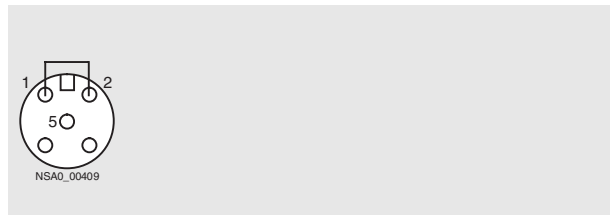
Current output



Voltage output

#### Connection of the 2-channel input modules for single-channel use

The 3RK1 901-1AA00 input bridge can also be used for this purpose.



# AS-Interface Slaves

I/O modules for operation in the control cabinet,  
IP20, Introduction

2

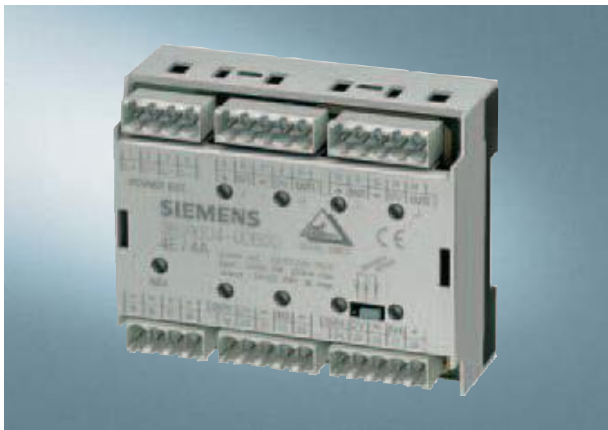
## Overview



SlimLine S22.5/S45



Flat module



F90 module

For AS-Interface applications inside cabinets there are various module series for the most diverse requirements:

- SlimLine S22.5
- SlimLine S45
- F90 modules
- Flat module

All modules of these series can be snap-mounted directly on a standard mounting rail or be fastened using screws.

AS-Interface modules in IP20 have direct terminals for the AS-Interface cables and therefore do not require a lower part.

Series	Spectrum	Mounting on 35 mm standard mounting rail according to EN 50022	Wall mounting using push-in lugs (Order No.: 3RP1 903)	Other possibilities
SlimLine S22.5	<ul style="list-style-type: none"> <li>• 4I (standard and A/B modules)</li> <li>• 4O</li> <li>• 2I/2O (steady-state/relay outputs)</li> <li>• Counters<sup>1)</sup></li> <li>• Ground fault detection module<sup>1)</sup></li> </ul>	✓	✓	--
SlimLine S45	<ul style="list-style-type: none"> <li>• 4I/4O (steady-state/relay outputs)</li> <li>• 4I/4O with floating I/Os</li> <li>• 4I/3O (A/B modules)</li> </ul>	✓	✓	--
F90 modules	<ul style="list-style-type: none"> <li>• 4I/4O (screw-type terminal connection)</li> <li>• 4I/4O (connection using Combicon connector)</li> <li>• 16I</li> </ul>	✓	--	--
Flat module	<ul style="list-style-type: none"> <li>• 4I/4O (screw-type terminal connection)</li> </ul>	--	--	Integrated lugs for screw fixing

1) More information about these modules:  
See Catalog LV 1 / chapter *Systems* / section *AS-Interface / Slaves / Modules with Special Functions*  
See A&D Mall / section *Low-Voltage Controls / SIRIUS Industrial Controls / Systems / AS-Interface / Slaves / Modules with Special Functions*



## Function




### Addressing

All modules of the Slimline S22.5, S45 and F90 series and the flat module can be addressed through an integrated addressing socket in the mounted state as well. An addressing unit (3RK1 904-2AB01 AS-Interface addressing and diagnostics unit) is required for this.

### LED diagnostics indications

#### SlimLine series

AS-Interface modules of the SlimLine series have not only status displays for inputs and outputs but also two additional LEDs for indicating the status of the module.


LED	States	Status description
 AUX PWR <sup>1)</sup>	On Off Off	
 AS-Interface	On On Off On Flashing On	
 FAULT	Off Off Off On On Flashing	
	↑ ↑ ↑ ↑ ↑ ↑	Sensor overload with RESET of slaves
		Slave has address = 0
		No communication:
		- Master in STOP mode
		- Slave not entered in the LPS
		- Slave has wrong IO&D code
		Module completely without voltage
		$U_{Aux}$ failure Normal operation and
		$U_{Aux}$ applied

NSA0\_00318a

1) LED not available on 3RK1 400-0BE00-0AA2, 3RK1 402-0BE00-0AA2 and 3RK1 100-0CE00-0AA2.

#### F90 module (16I)



All modules of this series have not only status displays for inputs and outputs but also an LED for the AS-Interface voltage.

LED	States	Status description
 AS-Interface	On Off	
	↑ ↑	AS-Interface voltage not applied
		AS-Interface voltage applied

NSA0\_00319

#### Flat module and F90 module (4I/4O)

The flat module and the F90 modules with four inputs and four outputs have a dual LED for a diagnostics function.

LED	States	Status description
 AUX PWR	On Off Off	
 AS-i / FAULT	On On Off On Flashing Flashing	
		Sensor overload with RESET of slaves
		Slave has address = 0
		No communication:
		- Master in STOP mode
		- Slave not entered in the LPS
		- Slave has wrong IO&D code
		Module completely without voltage
		$U_{Aux}$ failure
		Normal operation and $U_{Aux}$ applied

NSA0\_00313c

# AS-Interface Slaves

I/O Modules for operation in the control cabinet,  
IP20, SlimLine

2

## Overview

### *SlimLine modules of the S22.5 and S45 series*

The AS-Interface series of modules for the "SlimLine" cabinet with IP20 protection creates space in the cabinet and in distributed local boxes.

For these modules the priority was placed on a narrow type of construction. They have a width of only 22.5 mm or 45 mm.

Standard sensors/actuators and the AS-Interface cable can be connected using screw-type or spring-loaded terminals.

Integrated adapters enable mounting on a standard mounting rail. Disassembly from the standard mounting rail is quick and easy and requires no tools.

With an additional accessory the modules can also be screwed on.

All modules are fitted at the front with LEDs which indicate the module's status.

An addressing socket integrated at the front enables the module to be addressed also when it is installed.

In addition to the digital input/output modules there are modules of construction type S22.5 with special functions. These include:

- Counter module
- Ground fault detection module

More information about these modules, see

- Catalog LV 1 / chapter *Systems* / section *AS-Interface / Slaves / Modules with Special Functions*
- A&D Mall: Section *Low-Voltage Controls / SIRIUS Industrial Controls / Systems / AS-Interface / Slaves / Modules with Special Functions*

## Design

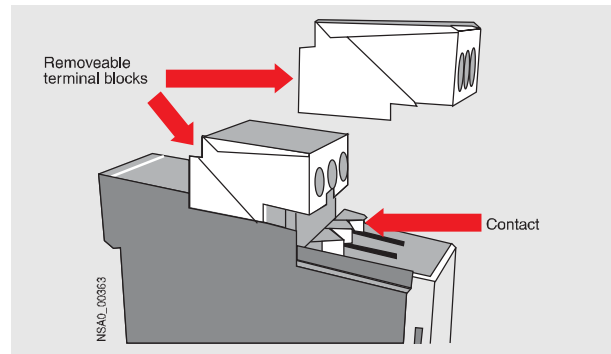
### *Removable terminals*

The removable terminal is the innovative connection method by Siemens for AS-Interface SlimLine modules of the S22.5 and S45 series. This allows the complete terminal block to be quickly and easily assembled and disassembled. The connections do not have to be detached for this purpose.

#### Note

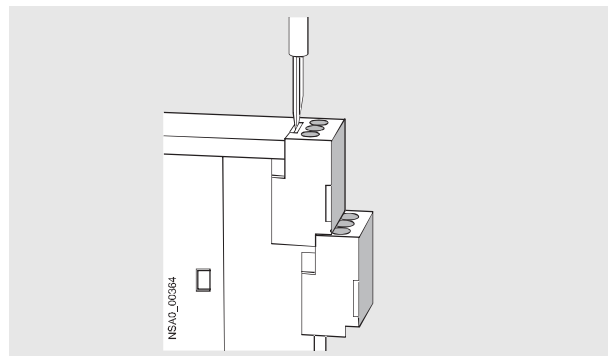
Before the terminal blocks are removed, the unit must be de-energized.

## Features



- *Service-proven terminal technology*  
The new type of construction of the removable terminal means that the conductors remain easy to connect. The old conductor cross-sections can still be used.
- *Variable connection methods*  
All modules are available with screw-type and spring-loaded connections.
- *Coding*  
The coding ensures that the terminal blocks cannot be mixed up (EN 50178).
- *Withdrawal and vibration safety*  
The terminal blocks are latched to the enclosure. The terminal blocks can be detached with the help of a VDE0100T410 (IEC-4-41) screwdriver. The terminal blocks cannot be detached unintentionally.
- *Finger-safe*  
The contacts are finger-safe according to DIN 61140 (IEC 60529) even if the unit is removed.
- *Labeling*  
All terminal connections are printed onto the terminal block which allows the unit to be factory-fitted.

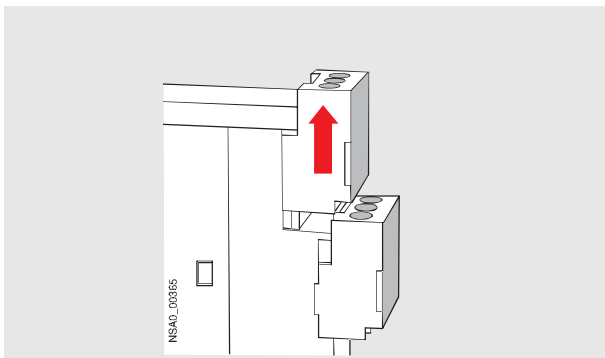
### Unlocking the removable terminal



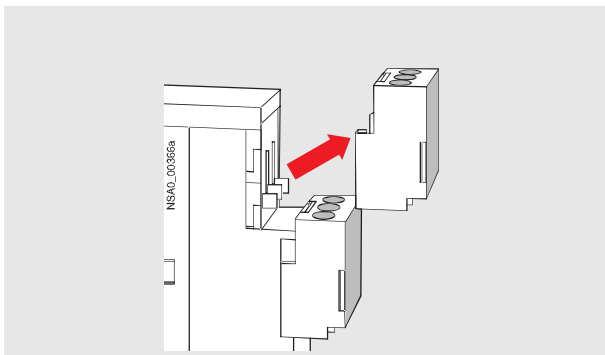
Step 1: release latch with screwdriver

# AS-Interface Slaves

I/O Modules for operation in the control cabinet,  
IP20, SlimLine

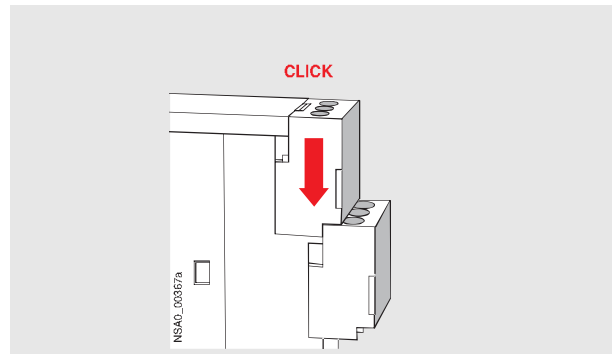


Step 2: pull terminal to the front



Step 3: lift terminal

Locking the removable terminal



Push terminal to the back until it latches

Customer benefits

- Quick replacement of the basic unit minimizes maintenance costs and reduces downtimes
- The coding of the terminals prevents mistakes during replacement
- Configuration without unit possible
- Finger-safe during replacement
- Easy screw-type and spring-loaded connection

## Technical specifications

### Technical specifications common to all SlimLine modules

<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6
<b>Input circuit</b>	PNP
<b>AS-Interface certificate</b>	Yes (or requested for in case of new units)
<b>Approvals</b>	UL, CSA, shipbuilding (or requested for in case of new units)
<b>Degree of protection</b>	IP20
<b>Ambient temperature in °C</b>	-25 ... +70
<b>Storage temperature in °C</b>	-40 ... +85
<b>Status displays</b>	<ul style="list-style-type: none"> <li>• Display of I/Os: Yellow LED</li> <li>• Display of AS-i: Green LED</li> <li>• Display of FAULT: Red LED</li> </ul>
<b>Note</b>	An external additional supply (AUX POWER) of 20 to 30 V DC is required for the supply of the output circuits. The additional supply must comply with VDE 0106 (PELV), protection class III.

# AS-Interface

## Slaves

I/O Modules for operation in the control cabinet, IP20, SlimLine

### SlimLine S22.5

2

	4 inputs Screw-type connection		
	Standard slave 2-conductors 3RK1 200-0CE00-0AA2	Standard slave 2- and 3-conductors 3RK1 200-0CE02-0AA2	A/B slave 2- and 3-conductors 3RK2 200-0CE02-0AA2
<b>Total current input in mA</b>	≤ 50	≤ 270	≤ 270
<b>Inputs</b>			
• Sensor supply using AS-Interface	Short-circuit and overload resistant	Short-circuit and overload resistant	Short-circuit and overload resistant
• Voltage range in V	20 ... 30	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply in mA	--	200	200
• Connection of sensors	2-conductor technology	2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High in V	≥ 10	≥ 10	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5
<b>I/O configuration</b>	0	0	0
<b>ID/ID2 code</b>	0/F	0/F	A/0
<b>Assignment of data bits</b>			
• Data bit D0	IN1	IN1	IN1
• Data bit D1	IN2	IN2	IN2
• Data bit D2	IN3	IN3	IN3
• Data bit D3	IN4	IN4	IN4
<b>Connection</b>	Using screw-type terminals	Using screw-type terminals	Using screw-type terminals

	4 inputs Spring-loaded connection Standard slave 2-conductors 3RK1 200-0CG00-0AA2	4 inputs Spring-loaded connection Standard slave 2- and 3-conductors 3RK1 200-0CG02-0AA2	4 inputs Spring-loaded connection A/B slave 2- and 3-conductors 3RK2 200-0CG02-0AA2
<b>Total current input in mA</b>	≤ 50	≤ 270	≤ 270
<b>Inputs</b>			
• Sensor supply using AS-Interface	Short-circuit and overload resistant	Short-circuit and overload resistant	Short-circuit and overload resistant
• Voltage range in V	20 ... 30	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply in mA	--	200	200
• Connection of sensors	2-conductor technology	2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High in V	≥ 10	≥ 10	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5
<b>I/O configuration</b>	0	0	0
<b>ID/ID2 code</b>	0/F	0/F	A/0
<b>Assignment of data bits</b>			
• Data bit D0	IN1	IN1	IN1
• Data bit D1	IN2	IN2	IN2
• Data bit D2	IN3	IN3	IN3
• Data bit D3	IN4	IN4	IN4
<b>Connection</b>	Spring-loaded terminal connection	Spring-loaded terminal connection	Spring-loaded terminal connection
<b>Conductor cross-sections in mm<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• Solid: 2 × (0.25–1.5)</li> <li>• Finely stranded with end sleeve: 2 × (0.25–1)</li> <li>• Finely stranded without end sleeve: 2 × (0.25–1.5)</li> <li>• AWG conductors, solid or stranded: AWG 2 × (24–16)</li> </ul>	<ul style="list-style-type: none"> <li>• Solid: 2 × (0.25–1.5)</li> <li>• Finely stranded with end sleeve: 2 × (0.25–1)</li> <li>• Finely stranded without end sleeve: 2 × (0.25–1.5)</li> <li>• AWG conductors, solid or stranded: AWG 2 × (24–16)</li> </ul>	<ul style="list-style-type: none"> <li>• Solid: 2 × (0.25–1.5)</li> <li>• Finely stranded with end sleeve: 2 × (0.25–1)</li> <li>• Finely stranded without end sleeve: 2 × (0.25–1.5)</li> <li>• AWG conductors, solid or stranded: AWG 2 × (24–16)</li> </ul>
<b>Note</b>	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>

# AS-Interface Slaves

I/O Modules for operation in the control cabinet,  
IP20, SlimLine

2

	2 inputs/ 2 outputs		
	Screw-type connection Standard slave 2-conductors PNP transistor (2 A) 3RK1 400-0BE00-0AA2	Screw-type connection Standard slave 2-conductors Relays 3RK1 402-0BE00-0AA2	Spring-loaded connection Standard slave 2-conductors PNP transistor (2 A) 3RK1 400-0BG00-0AA2
<b>Total current input in mA</b>	≤ 50	≤ 50	≤ 50
<b>Inputs</b>			
• Sensor supply using AS-Interface	Short-circuit and overload resistant	Short-circuit and overload resistant	Short-circuit and overload resistant
• Voltage range in V	20 ... 30	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply in mA	--	--	--
• Connection of sensors	2-conductor technology	2-conductor technology	2-conductor technology
• Switching level High in V	≥ 10	≥ 10	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5
<b>Outputs</b>			
• Type of output	Transistor (PNP)	Relay	Transistor (PNP)
• Current carrying capacity in A per output DC 12 /13 typical	2	--	2
• Maximum aggregate current per module in A	4	--	4
• Short-circuit protection	Built-in	External back-up fuse	Built-in
• Induction protection	Built-in	Does not apply	Built-in
• Reverse polarity protection	Not installed	Does not apply	Not installed
• External power supply 24 V DC	Using terminals: • Terminal 7 = "+" • Terminal 10 = "-"	Does not apply	Using terminals: • Terminal 7 = "+" • Terminal 10 = "-"
• $I_{th}$	--	6	--
• AC-15	--	3	--
• DC-13, 24 V	--	1	--
• DC-13, 110 V	--	0.2	--
• DC-13, 230 V	--	0.1	--
• Watchdog	Built-in	Built-in	Built-in
<b>I/O configuration</b>	3	3	3
<b>ID/ID2 code</b>	0/F	0/F	0/F
<b>Assignment of data bits</b>			
• Data bit D0	IN1	IN1	IN1
• Data bit D1	IN2	IN2	IN2
• Data bit D2	OUT1	OUT1	OUT1
• Data bit D3	OUT2	OUT2	OUT2
<b>Connection</b>	Screw-type terminals	Screw-type terminals	Spring-loaded terminal connection
<b>Conductor cross-sections in mm<sup>2</sup></b>	--	--	<ul style="list-style-type: none"> <li>• Solid: 2 × (0.25–1.5)</li> <li>• Finely stranded with end sleeve: 2 × (0.25–1)</li> <li>• Finely stranded without end sleeve: 2 × (0.25–1.5)</li> <li>• AWG conductors, solid or stranded: AWG 2 × (24–16)</li> </ul>
<b>Note</b>	--	--	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>

# AS-Interface

## Slaves

I/O Modules for operation in the control cabinet, IP20, SlimLine

2

	<b>2 inputs/ 2 outputs</b> <b>Spring-loaded connection</b> <b>Standard slave</b> <b>2-conductors</b> <b>Relay</b> <b>3RK1 402-0BG00-0AA2</b>	<b>4 outputs</b> <b>Screw-type connection</b> <b>Standard slave</b> -- <b>PNP transistor (1 A)</b> <b>3RK1 100-1CE00-0AA2</b>	<b>4 outputs</b> <b>Spring-loaded connection</b> <b>Standard slave</b> -- <b>PNP transistor (1 A)</b> <b>3RK1 100-1CG00-0AA2</b>
<b>Total current input in mA</b>	≤ 50	≤ 40	≤ 40
<b>Inputs</b>			
• Sensor supply using AS-Interface	Short-circuit and overload resistant	--	--
• Voltage range in V	20 ... 30	--	--
• Current carrying capacity for sensor supply in mA	--	--	--
• Connection of sensors	2-conductor technology	--	--
• Switching level High in V	≥ 10	--	--
• Input current Low/High in mA	≤ 1.5 / ≥ 5	--	--
<b>Outputs</b>			
• Type of output	Relay Changeover contact, floating	Solid state (PNP)	Solid state (PNP)
• Current carrying capacity in A per output DC 12 /13 typical	--	1	1
• Maximum aggregate current per module in A	--	2	2
• Short-circuit protection	External back-up fuse required	Built-in	Built-in
• Induction protection	Does not apply	Built-in	Built-in
• Reverse polarity protection	Does not apply	Built-in	Built-in
• External power supply 24 V DC	Does not apply	Using screw-type terminals: • Terminal 7 = "+" • Terminal 10 = M	Using screw-type terminals: • Terminal 7 = "+" • Terminal 10 = M
• $I_{th}$	6	--	--
• AC-15	3	--	--
• DC-13, 24 V	1	--	--
• DC-13, 110 V	0.2	--	--
• DC-13, 230 V	0.1	--	--
• Watchdog	Built-in	Built-in	Built-in
<b>I/O configuration</b>	3	8	8
<b>ID/ID2 code</b>	0/F	0/F	0/F
<b>Assignment of data bits</b>			
• Data bit D0	IN1	OUT1	OUT1
• Data bit D1	IN2	OUT2	OUT2
• Data bit D2	OUT1	OUT3	OUT3
• Data bit D3	OUT2	OUT4	OUT4
<b>Connection</b>	Spring-loaded terminal connection	Screw-type terminals	Spring-loaded terminal connection
<b>Conductor cross-sections in mm<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• Solid: 2 × (0.25–1.5)</li> <li>• Finely stranded with end sleeve: 2 × (0.25–1)</li> <li>• Finely stranded without end sleeve: 2 × (0.25–1.5)</li> <li>• AWG conductors, solid or stranded: AWG 2 × (24–16)</li> </ul>	--	<ul style="list-style-type: none"> <li>• Solid: 2 × (0.25–1.5)</li> <li>• Finely stranded with end sleeve: 2 × (0.25–1)</li> <li>• Finely stranded without end sleeve: 2 × (0.25–1.5)</li> <li>• AWG conductors, solid or stranded: AWG 2 × (24–16)</li> </ul>
<b>Note</b>	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>	--	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>

# AS-Interface Slaves

I/O Modules for operation in the control cabinet,  
IP20, SlimLine

2

## SlimLine S45

	4 inputs/ 4 outputs Screw-type connection Standard slave		
	2- and 3-conductors PNP transistor (1 A) 3RK1 400-1CE00-0AA2	2- and 3-conductors PNP transistor (2 A) 3RK1 400-1CE01-0AA2	2- and 3-conductors (floating) PNP transistor (1 A) floating 3RK1 402-3CE01-0AA2
<b>Total current input in mA</b>	≤ 270	≤ 270	≤ 40
<b>Inputs</b>			
• Sensor supply using AS-Interface	Short-circuit and overload resistant	Short-circuit and overload resistant	Short-circuit and overload resistant
• Voltage range in V	20 ... 30	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply in mA	200	200	200
• Connection of sensors	2- and 3-conductor technology	2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High in V	≥ 10	≥ 10	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5
<b>Outputs</b>			
• Type of output	Solid-state	Solid-state	Solid-state
• Current carrying capacity in A per output DC 12 /13 typical	1	2	1
• Maximum aggregate current per module in A	4	4	4
• Short-circuit protection	Built-in	Built-in	Built-in
• Induction protection	Built-in	Built-in	Built-in
• Reverse polarity protection	Built-in	Built-in	Built-in
• External power supply 24 V DC	• Terminal 13 = L24+ • Terminal 19 = M24	• Terminal 13 = L24+ • Terminal 19 = M24	• Sensor supply: - Terminal 13 = U <sub>s+</sub> - Terminal 19 = U <sub>s-</sub>  • Actuator supply: - Terminal 14 = L+ - Terminal 20 to 24 = M
• I <sub>th</sub>	--	--	--
• AC-15	--	--	--
• DC-13, 24 V	--	--	--
• DC-13, 110 V	--	--	--
• DC-13, 230 V	--	--	--
• Watchdog	Built-in	Built-in	Built-in
<b>I/O configuration</b>	7	7	7
<b>ID/ID2 code</b>	0/F	0/F	0/F
<b>Assignment of data bits</b>			
• Data bit D0	IN1/OUT1	IN1/OUT1	IN1/OUT1
• Data bit D1	IN2/OUT2	IN2/OUT2	IN2/OUT2
• Data bit D2	IN3/OUT3	IN3/OUT3	IN3/OUT3
• Data bit D3	IN4/OUT4	IN4/OUT4	IN4/OUT4
<b>Connection</b>	Using screw-type terminals	Using screw-type terminals	Using screw-type terminals
<b>Note</b>	--	--	The module has four floating inputs and four floating switching outputs. An external additional supply of 20 to 30 V DC according to VDE 0106 (PELV) protection class III is required for the supply of the input and output circuits.

# AS-Interface

## Slaves

I/O Modules for operation in the control cabinet, IP20, SlimLine

2

	4 inputs/ 4 outputs		
	Screw-type connection Standard slave 2- and 3-conductors Relay 3RK1 402-3CE00-0AA2	Spring-loaded connection Standard slave 2- and 3-conductors PNP transistor (1 A) 3RK1 400-1CG00-0AA2	Spring-loaded connection Standard slave 2- and 3-conductors PNP transistor (2 A) 3RK1 400-1CG01-0AA2
<b>Total current input in mA</b>	≤ 270	≤ 270	≤ 270
<b>Inputs</b>			
• Sensor supply using AS-Interface	Short-circuit and overload resistant	Short-circuit and overload resistant	Short-circuit and overload resistant
• Voltage range in V	20 ... 30	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply in mA	200	200	200
• Connection of sensors	2- and 3-conductor technology	2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High in V	≥ 10	≥ 10	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5
<b>Outputs</b>			
• Type of output	Relays	Solid-state	Solid-state
• Current carrying capacity in A per output DC 12 /13 typical	--	1	2
• Maximum aggregate current per module in A	--	4	4
• Short-circuit protection	External back-up fuse 6 A gL/gG	Built-in	Built-in
• Induction protection	Does not apply	Built-in	Built-in
• Reverse polarity protection	--	Built-in	Built-in
• External power supply 24 V DC	Does not apply	• Terminal 13 = L24+ • Terminal 19 = M24	• Terminal 13 = L24+ • Terminal 19 = M24
• $I_{th}$	5	--	--
• AC-15	3	--	--
• DC-13, 24 V	1	--	--
• DC-13, 110 V	0.2	--	--
• DC-13, 230 V	0.1	--	--
• Watchdog	Built-in	Built-in	Built-in
• I/O configuration	7	7	7
<b>ID/ID2 code</b>	0/F	0/F	0/F
<b>Assignment of data bits</b>			
• Data bit D0	IN1/OUT1	IN1/OUT1	IN1/OUT1
• Data bit D1	IN2/OUT2	IN2/OUT2	IN2/OUT2
• Data bit D2	IN3/OUT3	IN3/OUT3	IN3/OUT3
• Data bit D3	IN4/OUT4	IN4/OUT4	IN4/OUT4
<b>Connection</b>	Using screw-type terminals	Spring-loaded terminal connection	Spring-loaded terminal connection
<b>Conductor cross-sections in mm<sup>2</sup></b>	--	• Solid: 2 × (0.25–1.5) • Finely stranded with end sleeve: 2 × (0.25–1) • Finely stranded without end sleeve: 2 × (0.25–1.5) • AWG conductors, solid or stranded: AWG 2 × (24–16)	• Solid: 2 × (0.25–1.5) • Finely stranded with end sleeve: 2 × (0.25–1) • Finely stranded without end sleeve: 2 × (0.25–1.5) • AWG conductors, solid or stranded: AWG 2 × (24–16)
<b>Note</b>	--	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>



	<b>4 inputs/ 4 outputs</b> <b>Spring-loaded connection</b> <b>Standard slave</b> <b>2- and 3-conductors</b>	
	<b>PNP transistor (1 A)</b> <b>3RK1 402-3CG01-0AA2</b>	<b>Relays</b> <b>3RK1 402-3CG00-0AA2</b>
<b>Total current input in mA</b>	≤ 40	≤ 270
<b>Inputs</b>		
• Sensor supply using AS-Interface	Short-circuit and overload resistant	Short-circuit and overload resistant
• Voltage range in V	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply in mA	200	200
• Connection of sensors	2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High in V	≥ 10	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5
<b>Outputs</b>		
• Type of output	Solid-state	Relays
• Current carrying capacity in A per output DC-12 /13 typical	1	--
• Maximum aggregate current per module in A	4	--
• Short-circuit protection	Built-in	External back-up fuse 6 A gL/gG
• Induction protection	Built-in	Does not apply
• Reverse polarity protection	Built-in	Built-in
• External power supply 24 V DC	Sensor supply: • Terminal 13 = U <sub>s+</sub> • Terminal 19 = U <sub>s-</sub> Actuator supply: • Terminal 14 = L+ • Terminal 20 to 24 = M	Does not apply
• I <sub>th</sub>	--	5
• AC-15	--	3
• DC-13, 24 V	--	1
• DC-13, 110 V	--	0.2
• DC-13, 230 V	--	0.1
• Watchdog	Built-in	Built-in
<b>I/O configuration</b>	7	7
<b>ID/ID2 code</b>	0/F	0/F
<b>Assignment of data bits</b>		
• Data bit D0	IN1/OUT1	IN1/OUT1
• Data bit D1	IN2/OUT2	IN2/OUT2
• Data bit D2	IN3/OUT3	IN3/OUT3
• Data bit D3	IN4/OUT4	IN4/OUT4
<b>Connection</b>	Spring-loaded terminal connection	Spring-loaded terminal connection
<b>Conductor cross-sections in mm<sup>2</sup></b>	<ul style="list-style-type: none"> <li>• Solid: 2 × (0.25–1.5)</li> <li>• Finely stranded with end sleeve: 2 × (0.25–1)</li> <li>• Finely stranded without end sleeve: 2 × (0.25–1.5)</li> <li>• AWG conductors, solid or stranded: AWG 2 × (24–16)</li> </ul>	<ul style="list-style-type: none"> <li>• Solid: 2 × (0.25–1.5)</li> <li>• Finely stranded with end sleeve: 2 × (0.25–1)</li> <li>• Finely stranded without end sleeve: 2 × (0.25–1.5)</li> <li>• AWG conductors, solid or stranded: AWG 2 × (24–16)</li> </ul>
<b>Note 1</b>	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>
<b>Note 2</b>	The module has four floating inputs and four floating switching outputs. An external additional supply of 20 to 30 V according to VDE 0106 (PELV) protection class III is required for the supply of the input and output circuits.	--

# AS-Interface

## Slaves

I/O Modules for operation in the control cabinet,  
IP20, SlimLine

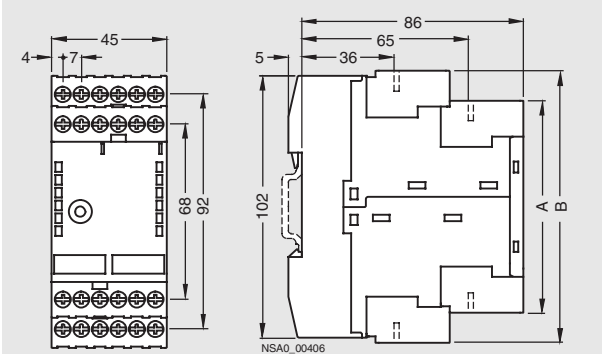
2

	4 inputs/ 3 outputs	
	Screw-type connection A/B slave 2- and 3-conductors PNP transistor (2 A) 3RK2 400-1FE00-0AA2	Spring-loaded connection A/B slave 2- and 3-conductors PNP transistor (2 A) 3RK2 400-1FG00-0AA2
<b>Total current input in mA</b>	≤ 270	≤ 270
<b>Inputs</b>		
• Sensor supply using AS-Interface	Short-circuit and overload resistant	Short-circuit and overload resistant
• Voltage range in V	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply in mA	200	200
• Connection of sensors	2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High in V	≥ 10	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 5	≤ 1.5 / ≥ 5
<b>Outputs</b>		
• Type of output	Solid-state	Solid-state
• Current carrying capacity in A per output DC-12 /13 typical	2	2
• Maximum aggregate current per module in A	4	4
• Short-circuit protection	Built-in	Built-in
• Induction protection	Built-in	Built-in
• Reverse polarity protection	Built-in	Built-in
• External power supply 24 V DC	<ul style="list-style-type: none"> <li>Terminal 13 = L24+</li> <li>Terminal 19 = M24</li> </ul>	<ul style="list-style-type: none"> <li>Terminal 13 = L24+</li> <li>Terminal 19 = M24</li> </ul>
• $I_{th}$	--	--
• AC-15	--	--
• DC-13, 24 V	--	--
• DC-13, 110 V	--	--
• DC-13, 230 V	--	--
• Watchdog	Built-in	Built-in
<b>I/O configuration</b>	7	7
<b>ID/ID2 code</b>	A/0	A/0
<b>Assignment of data bits</b>		
• Data bit D0	IN1/OUT1	IN1/OUT1
• Data bit D1	IN2/OUT2	IN2/OUT2
• Data bit D2	IN3/OUT3	IN3/OUT3
• Data bit D3	IN4	IN4
<b>Connection</b>	Using screw-type terminals	Spring-loaded terminal connection
<b>Conductor cross-sections in mm<sup>2</sup></b>	--	<ul style="list-style-type: none"> <li>Solid: 2 × (0.25–1.5)</li> <li>Finely stranded with end sleeve: 2 × (0.25–1)</li> <li>Finely stranded without end sleeve: 2 × (0.25–1.5)</li> <li>AWG conductors, solid or stranded: AWG 2 × (24–16)</li> </ul>
<b>Note</b>	--	Detachment tool for spring-loaded terminal connection: see section <i>Accessories</i>

# AS-Interface Slaves

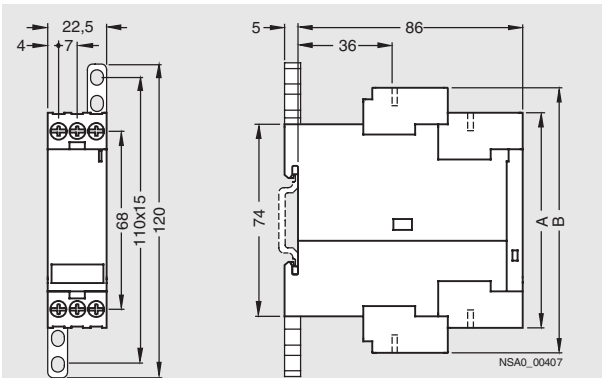
I/O Modules for operation in the control cabinet, IP20, SlimLine

## Dimensional drawings



	A	B
<b>Standard terminal</b>		
Spring-type terminal	84,3	107,6
Screw-type terminal	81	104
<b>Removeable terminal</b>		
Spring-type terminal	84	108
Screw-type terminal	83	106

SlimLine S45

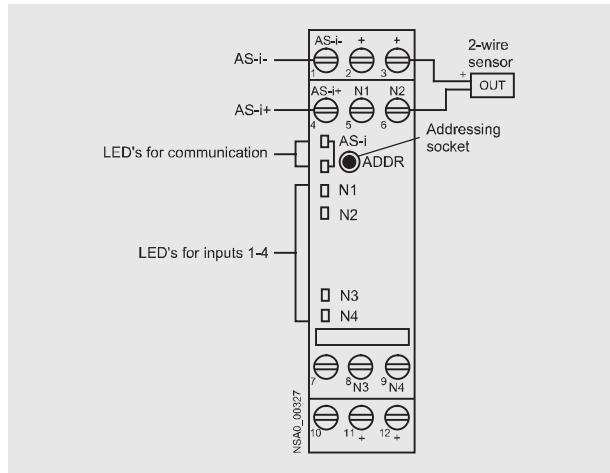


	A	B
<b>Standard terminal</b>		
Spring-type terminal	81,6	101,6
Screw-type terminal	80	100
<b>Removeable terminal</b>		
Spring-type terminal	84	103
Screw-type terminal	83	102

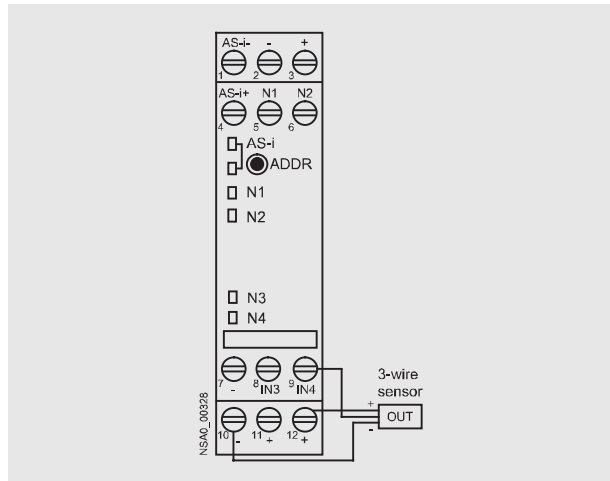
SlimLine S22.5

## Schematics

### Switching example for SlimLine S22.5

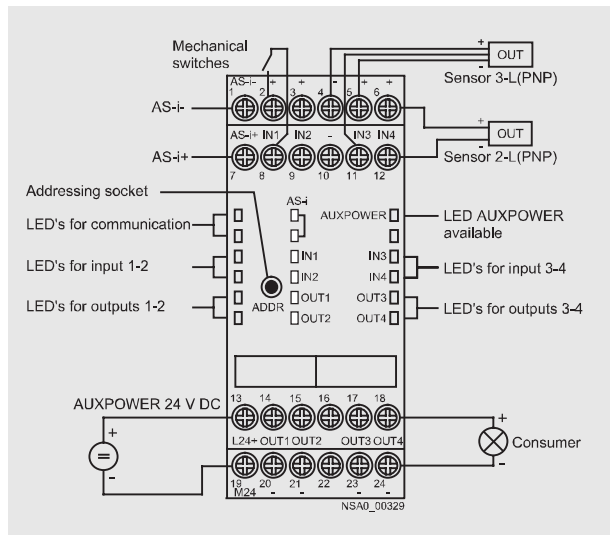


3RK1 200-OCE00-0AA2



3RK1 200-OCE02-0AA2

### Switching example for SlimLine S45



# AS-Interface

## Slaves

I/O Modules for operation in the control cabinet, IP20, F90 modules

2

### Function

#### Mode of operation of the 16I module (3RG9 002-0DE00 and 3RG9 004-0DE00)

The 16 inputs are organized in four groups of four inputs each.

Only one group is allowed to be activated at a time. The PLC activates each group one after the other and reads the four items of input information from each group into the process image of the inputs (PAE). The user program assigns the items of input information to the respective groups, i.e. the output image (PAA) of the PLC must match the set output of the module or items of input information would otherwise be read by a wrong group.

With disrupted AS-Interface transmission it can take three AS-Interface cycles (15 ms) for the output image (AA) of the slave to match the output image of the master and hence that of the PLC. Similarly it can take three AS-Interface cycles to transmit the input image of the slave. If message frames on the particular slave are disrupted for more than three successive AS-Interface cycles, a "Config Error" results on the master. The input image in the master is set to "Zero" and the error bit is set in the PLC.

#### Example: Behavior of the AA and EA in the master and in the slave when the AS-Interface transmission is disrupted

AS-Interface-cycle	PLC		Master		Module		Note
	PIQ	PII	QI	II	QI	II	
	1000	xxxx					
1	1000	xxxx	0111	xxxx	xxxx	xxxx	fault in MC or SR
2	1000	xxxx	0111	xxxx	xxxx	xxxx	fault in MC or SR
3	1000	xxxx	0111	EEEE	1000	EEEE	I invalid because of switchover time in module
4	1000	xxxx	0111	xxxx	1000	EEEE	fault in MC or SR
5	1000	xxxx	0111	xxxx	1000	EEEE	fault in MC or SR
6	1000	xxxx	0111	EEEE	1000	EEEE	no fault in MC or SR
		1000	EEEE	0111			

NSA0\_00321

**Legend:**  
 QI Output image  
 II Input image  
 MC Master call  
 PIQ Process image of the outputs  
 PII Process image of the inputs  
 SR Slave response  
 PLC Programmable logic controller

The example shows that the AA and EA in the master and in the slave do not match each other until after six AS-Interface cycles. The PLC cycle is asynchronous in relation to the AS-Interface cycle. Hence the time it takes the AA and EA from the master and the PLC to match each other is increased by one AS-Interface cycle and one PLC cycle.

Equation for the cycle time:

$$4 \times ((6 \times 5 \text{ ms}) + 5 \text{ ms} + 10 \text{ ms}) = 180 \text{ ms}$$

### Note 1

The following function blocks (FB) are available for the sequence control:

- FB 21 (E16-2433) for the AS-Interface master CP2433 (AG S5-95 U)
- FB 22 (E16-2430) for the AS-Interface master CP2430 (AG S5-115 U)
- FC 22 for S7

The time between two calls of the FB for a module must amount to at least 30 ms in order for the switching states of the inputs to be read in reliably.

### Note 2

Programming examples are available from Technical Assistance, Tel. +49 (0) 911 895-5900 or the Internet:

You can find more information on the Internet at:

<http://www.siemens.com/as-interface>

# AS-Interface Slaves

I/O Modules for operation in the control cabinet,  
IP20, F90 modules

2

## Technical specifications

	4 inputs/ 4 outputs			
	1 A Screw-type terminals 3RG9 002-0DB00	2 A Screw-type terminals 3RG9 002-0DA00	1 A Combicon connection 3RG9 004-0DB00	2 A Combicon connection 3RG9 004-0DA00
<b>Slave type</b>	Standard slave			
<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6			
<b>Total current input in mA</b>	≤ 270			
<b>Input circuit</b>	PNP			
<b>Inputs</b>	Short-circuit and overload resistant			
• Sensor supply using AS-Interface	20 ... 30			
• Voltage range in V	200			
• Current carrying capacity for sensor supply in mA	2- and 3-conductor technology			
• Connection of sensors	≥ 10			
• Switching level High in V	≤ 1.5 / ≥ 5			
• Input current Low/High in mA				
<b>Outputs</b>	Solid-state			
• Type of output	1	2	1	2
• Current carrying capacity in A DC 12 / DC 13 typical	4	6	4	6
• Total current of all outputs in A	Built-in			
• Short-circuit protection	Built-in			
• Induction protection	Installed using screw-type terminals		Installed using Combicon plug connector	
• External power supply 24 V DC	Built-in			
• Watchdog				
<b>I/O configuration</b>	7			
<b>ID/ID2 code</b>	0/F			
<b>Assignment of data bits</b>	IN1/OUT1			
• Data bit D0	IN2/OUT2			
• Data bit D1	IN3/OUT3			
• Data bit D2	IN4/OUT4			
• Data bit D3				
<b>AS-Interface certificate</b>	Yes			
<b>Approvals</b>	UL, CSA, shipbuilding			
<b>Degree of protection</b>	IP20			
<b>Ambient temperature in °C</b>	-25 ... +70			
<b>Storage temperature in °C</b>	-40 ... +85			
<b>Displays</b>	Yellow LEDs			
• Inputs/outputs	Green LED			
• AS-i voltage	Using screw-type terminals		Using Combicon plug connector	
<b>Connection</b>	Possible using integrated addressing socket			
<b>Addressing procedure</b>				
<b>Note</b>	An external additional supply (AUX POWER) of 20 to 30 V DC is required for the supply of the output circuits. The additional supply must comply with VDE 0106 (PELV), protection class III.			

# AS-Interface

## Slaves

I/O Modules for operation in the control cabinet,  
IP20, F90 modules

2

	<b>4 inputs/ 4 outputs</b>	
	<b>2 A, floating</b>	
	<b>Screw-type terminals</b> <b>3RG9 002-0DC00</b>	<b>Combicon connection</b> <b>3RG9 004-0DC00</b>
<b>Slave type</b>	Standard slave	
<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6	
<b>Total current input in mA</b>	≤ 30	
<b>Input circuit</b>	PNP	
<b>Inputs</b>		
• Sensor supply using AS-Interface	Short-circuit and overload resistant	
• Voltage range in V	20 ... 30	
• Current carrying capacity for all inputs in mA	200	
• Connection of sensors	2- and 3-conductor technology	
• Switching level High in V	≥ 10	
• Input current Low/High in mA	≤ 1.5 / ≥ 5	
<b>Outputs</b>		
• Type of output	Solid-state	
• Current carrying capacity in A DC 12 / DC 13 typical	2	
• Total current of all outputs in A	6	
• Short-circuit protection	Built-in	
• Induction protection	Built-in	
• External power supply 24 V DC	Using screw-type terminals	Using Combicon plug connector
• Watchdog	Built-in	
<b>I/O configuration</b>	7	
<b>ID/ID2 code</b>	0/F	
<b>Assignment of data bits</b>		
• Data bit D0	IN1/OUT1	
• Data bit D1	IN2/OUT2	
• Data bit D2	IN3/OUT3	
• Data bit D3	IN4/OUT4	
<b>AS-Interface certificate</b>	Yes	
<b>Approvals</b>	UL, CSA, shipbuilding	
<b>Degree of protection</b>	IP20	
<b>Ambient temperature in °C</b>	-25 ... +70	
<b>Storage temperature in °C</b>	-40 ... +85	
<b>Displays</b>		
• Inputs/outputs	Yellow LED	
• AS-i voltage	Green LED	
<b>Connection</b>	Using screw-type terminals	Using Combicon plug connector
<b>Addressing procedure</b>	Possible using integrated addressing socket	
<b>Note 1</b>	The module has four floating inputs and four floating switching outputs. An external additional supply of 20 to 30 V DC according to VDE 0106 (PELV) protection class III is required for the supply of the input and output circuits.	
<b>Note 2</b>	An external additional supply (AUX POWER) of 20 to 30 V DC is required for the supply of the output circuits. The additional supply must comply with VDE 0106 (PELV), protection class III.	

# AS-Interface Slaves

I/O Modules for operation in the control cabinet,  
IP20, F90 modules

2

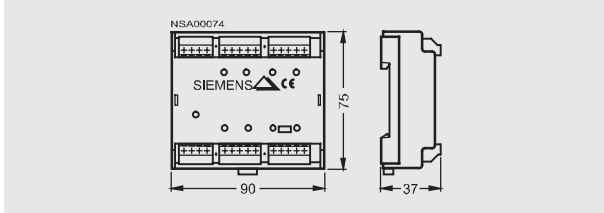
	<b>16 inputs</b>						
	<table border="1"> <tr> <td><b>Screw-type terminals</b></td> <td><b>Combicon connection</b></td> </tr> <tr> <td><b>PNP transistor</b></td> <td><b>PNP transistor</b></td> </tr> <tr> <td><b>3RG9 002-0DE00</b></td> <td><b>3RG9 004-0DE00</b></td> </tr> </table>	<b>Screw-type terminals</b>	<b>Combicon connection</b>	<b>PNP transistor</b>	<b>PNP transistor</b>	<b>3RG9 002-0DE00</b>	<b>3RG9 004-0DE00</b>
<b>Screw-type terminals</b>	<b>Combicon connection</b>						
<b>PNP transistor</b>	<b>PNP transistor</b>						
<b>3RG9 002-0DE00</b>	<b>3RG9 004-0DE00</b>						
<b>Slave type</b>	Standard slave						
<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6						
<b>Total current input in mA</b>	≤ 70						
<b>Input circuit</b>	PNP						
<b>Inputs</b>							
• Sensor supply using AS-Interface	Short-circuit and overload resistant						
• Voltage range in V	20 ... 30						
• Connection of sensors	Mechanical contacts						
• Signal 1 $U_{in}$	20 ... 30 V ≥ 3 mA						
<b>Group signal</b>							
• Current carrying capacity $I_{out}$	≤ 25 mA						
• Output voltage $U_{out}$	20 ... 30 V						
<b>Watchdog</b>	Built-in						
<b>I/O configuration</b>	7						
<b>ID/ID2 code</b>	F/F						
<b>Assignment of data bits</b>							
• Data bit D0	Group signal G1 (D0)inputs I 1.1 to I 1.4 (D0 to D3)						
• Data bit D1	Group signal G2 (D1)inputs I 2.1 to I 2.4 (D0 to D3)						
• Data bit D2	Group signal G3 (D2)inputs I 3.1 to I 3.4 (D0 to D3)						
• Data bit D3	Group signal G4 (D3)inputs I 4.1 to I 4.4 (D0 to D3)						
<b>AS-Interface certificate</b>	Yes						
<b>Approvals</b>	UL, CSA, shipbuilding						
<b>Degree of protection</b>	IP20						
<b>Ambient temperature in °C</b>	-25 ... +70						
<b>Storage temperature in °C</b>	-40 ... +85						
<b>Displays of inputs/outputs</b>	Yellow LED						
<b>Connection</b>	Using screw-type terminals      Using Combicon plug connector						
<b>Addressing procedure</b>	Possible using integrated addressing socket						
<b>Note 1</b>	The module has four input groups. Each input group has four inputs and a group signal for the voltage supply of the inputs. The input groups are activated individually by setting of the respective group signal by the control system. The switching states of the assigned inputs are then read in.						
<b>Note 2</b>	Function block required						
<b>Note 3</b>	An external additional supply (AUX POWER) of 20 to 30 V DC is required for the supply of the output circuits. The additional supply must comply with VDE 0106 (PELV), protection class III.						

# AS-Interface Slaves

I/O Modules for operation in the control cabinet,  
IP20, F90 modules

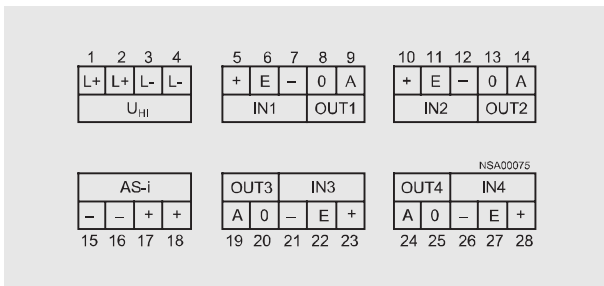
2

## Dimensional drawings

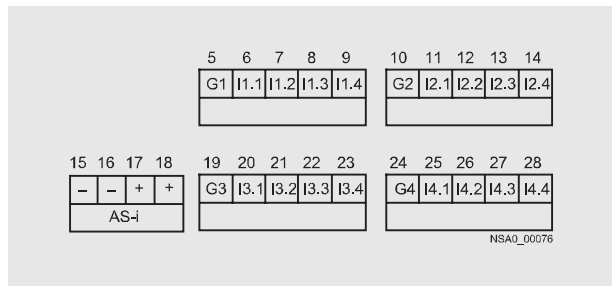


## Schematics

### Terminal assignment



3RG9 002-0D.00  
3RG9 004-0D.00



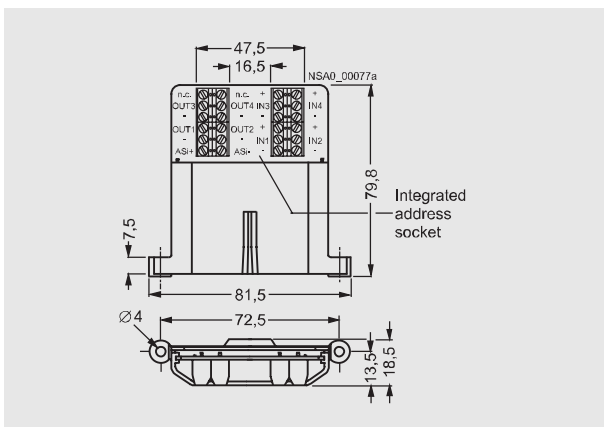
3RG9 002-0DE00  
3RG9 004-0DE00



## Technical specifications

	<b>Flat module</b> <b>4 inputs/ 4 outputs</b> <b>200 mA for all I/Os</b> <b>Screw-type terminals</b> <b>3RK1 400-0CE00-0AA3</b>
<b>Slave type</b>	Standard slave
<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6
<b>Total current input in mA</b>	≤ 270
<b>Input circuit</b>	PNP
<b>Inputs</b>	
• Sensor supply using AS-Interface	Short-circuit and overload resistant
• Voltage range in V	20 ... 30
• Current carrying capacity for all inputs in mA	200
• Connection of sensors	2- and 3-conductor technology
• Switching level High in V	≥ 10
• Input current Low/High in mA	≤ 1.5 / ≥ 5
<b>Outputs</b>	
• Type of output	Solid-state
• Current carrying capacity in mA (DC 12 / DC 13)	200
• Short-circuit protection	Built-in
• Induction protection	Built-in
• External power supply 24 V DC	Not required (supply of all inputs and outputs using AS-Interface cable)
<b>Watchdog</b>	Built-in
<b>I/O configuration</b>	7
<b>ID/ID2 code</b>	F/F
<b>Assignment of data bits</b>	
• Data bit D0	IN1/OUT1
• Data bit D1	IN2/OUT2
• Data bit D2	IN3/OUT3
• Data bit D3	IN4/OUT4
<b>AS-Interface certificate</b>	Yes
<b>Degree of protection</b>	IP20
<b>Ambient temperature in °C</b>	-25 ... +85
<b>Storage temperature in °C</b>	-40 ... +85
<b>Displays of inputs/outputs</b>	
• AS-i voltage	Green LED
• FAULT	Red LED
<b>Connection</b>	Using screw-type terminals
<b>Addressing procedure</b>	Using integrated addressing socket

## Dimensional drawings



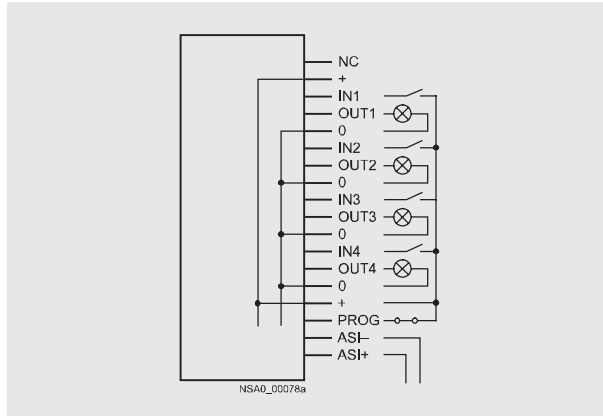
# AS-Interface Slaves

## Special integrated solutions AS-Interface communications modules

2

### Overview

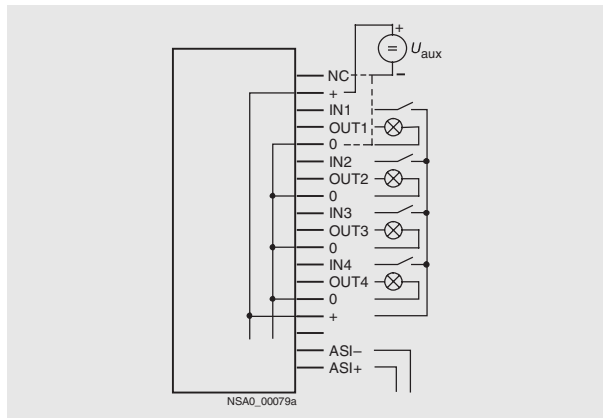
#### 3RK1 400-0CD00-0AA3 AS-Interface communications module for printed-circuit board installation



With the 4I/4O module for printed-circuit board mounting it is possible for up to four mechanical contacts to be queried or indicator lights to be operated, the necessary power being provided by the AS-Interface system (yellow AS-Interface cable).

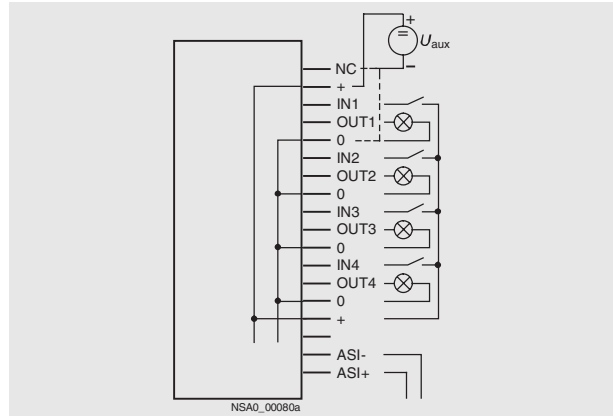
*Note: If the switching outputs are overloaded, the module does not respond to invoking by a master.*

#### 3RK1 400-0CD01-0AA3 AS-Interface communications module for printed-circuit board installation



With the 4I/4O module for printed-circuit board mounting it is possible for up to four mechanical contacts to be queried or indicator lights to be operated, the necessary power for the inputs and outputs being provided from the auxiliary voltage (24 V PELV). If (+) is connected to  $U_{aux+}$  and (NC) to  $U_{aux-}$ , the outputs are not short-circuit and overload resistant; if  $U_{aux-}$  is connected to (0), the outputs are overload and short-circuit resistant (maximum summation current 200 mA). In this case the module does not respond even to invoking by a master when the switching outputs are overloaded.

#### 3RG9 005-0SA00 AS-Interface communications module for printed-circuit board installation



With the 4I/4O module for printed-circuit board mounting it is possible for up to four mechanical contacts to be queried or indicator lights to be operated, the power for inputs and outputs being provided from an auxiliary voltage (24 V PELV). If (+) is connected to  $U_{aux+}$  and (NC) to  $U_{aux-}$ , the outputs are not short-circuit and overload resistant; if  $U_{aux-}$  is connected to (0), the outputs are overload and short-circuit resistant (maximum summation current 200 mA). In this case the module does not respond even to invoking by a master when the switching outputs are overloaded.

# AS-Interface Slaves

## Special integrated solutions AS-Interface communications modules

2

### 3RK1 400-1CD00-0AA2 AS-Interface communications module for printed-circuit board installation

Connection	Connection pad <sup>1)</sup>
ASi+	27, 29
ASi-	28, 30
Sensor+	17, 18, 23, 24
Sensor-	13, 14, 19, 20
IN1	21
IN2	22
IN3	15
IN4	16
$U_{aux+}$ (L24+)	2, 4
$U_{aux-}$ (M24)	1, 3
OUT1	9
OUT2	10
OUT3	5
OUT4	6
OUT-	7, 8
Not assigned	11, 12, 25, 26

1) Note: pad numbering, see section *Dimensional Drawings*

With the 4I/4O module for printed-circuit board mounting it is possible for up to four mechanical contacts or 3-conductor sensors according to IEC 947-5-2 to be connected or indicator lights to be operated, the power for the short-circuit resistant solid-state switching outputs being provided from an auxiliary voltage (24 V PELV).

Installation is very easy using a "Card Edge Board-to-Board-Connector". This connector can be ordered for vertical and horizontal mounting from the company AMP, for example:

- 180° version for vertical mounting (AMP):  
Order No. 530843-2
- 90° version for horizontal mounting (AMP):  
Order No. 650118-1

If the inputs are loaded with more than 200 mA, the module does not respond to invoking by a master.

### 3RK1 200-0CD00-0AA2 AS-Interface communications module for printed-circuit board installation

Connection	Connection pad <sup>1)</sup>
ASi+	27, 29
ASi-	28, 30
Sensor+	17, 18, 23, 24
Sensor-	13, 14, 19, 20
IN1	21
IN2	22
IN3	15
IN4	16
Not assigned	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 25, 26

1) Note: pad numbering, see section *Dimensional Drawings*

With the 4I module for printed-circuit board mounting it is possible for up to four mechanical contacts or 3-conductor sensors to be connected, the power for inputs being provided from AS-Interface cable.

Installation is very easy using a "Card Edge Board-to-Board-Connector". This connector can be ordered for vertical and horizontal mounting from the company AMP, for example:

- 180° version for vertical mounting (AMP):  
Order No. 530843-2
- 90° version for horizontal mounting (AMP):  
Order No. 650118-1

If the inputs are loaded with more than 200 mA, the module does not respond to invoking by a master.

# AS-Interface Slaves

## Special integrated solutions AS-Interface communications modules

2

### Technical specifications

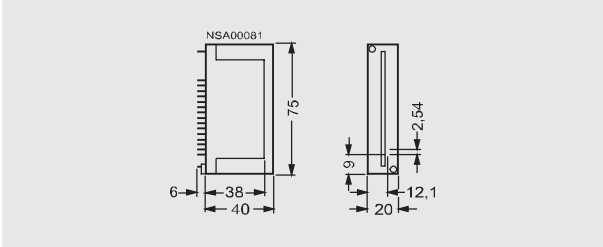
	4 inputs / 4 outputs Supply of I/Os using AS-Interface cable (max. 200 mA) Printed-circuit board with solder pins, pro- tected by enclosure  3RK1 400-0CD00- 0AA3	4 inputs / 4 outputs Supply of I/Os using external auxiliary voltage (24 V PELV) Printed-circuit board with solder pins, pro- tected by enclosure  3RK1 400-0CD01- 0AA3	4 inputs / 4 outputs Supply of I/Os using external auxiliary voltage (24 V PELV) Printed-circuit board with solder pins for horizontal mounting  3RG9 005-0SA00	4 inputs / 4 outputs Supply of outputs using external auxiliary voltage (24 V PELV) Printed-circuit board with gold-plated direct connector for 30-pole male connector socket for simple installation with direct connector  3RK1 400-1CD00-0AA2	4 inputs -- Printed-circuit board with gold- plated direct connector for 30-pole male connector socket for simple installation with direct connector  3RK1 200-0CD00-0AA2
<b>Slave type</b>	Standard slave	Standard slave	Standard slave	Standard slave	Standard slave
<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6
<b>Total current input in mA</b>	≤ 270	≤ 25	≤ 25	≤ 270	≤ 270
<b>Input circuit</b>	PNP	PNP	PNP	PNP	PNP
<b>Inputs</b>					
• Sensor supply	Using AS-Interface	Using $U_{aux}$	Using $U_{aux}$	Using AS-Interface cable	Using AS-Interface cable
• Switching voltage in V	20 ... 30	20 ... 30	20 ... 30	20 ... 30	20 ... 30
• Switching current in mA	≥ 3	≥ 3	≥ 3	--	--
<b>Outputs</b>					
• Type of output	Solid-state	Solid-state	Solid-state	Solid-state	--
• Load voltage in V	20 ... 30	19 ... 30	19 ... 30	$U_{aux}$ -0.8 V	--
• Short-circuit protection	Built-in	Built-in	Built-in	Built-in	--
• Induction protection	--	--	--	Installed (freewheel diode)	--
• External power supply 24 V DC	Using solder pins	Using solder pins	Using solder pins	Using printed-circuit board contacts	--
<b>Summation current for all inputs and outputs in mA</b>	200	200	200	200	200
<b>I/O configuration</b>	7	7	7	7	0
<b>ID/ID2 code</b>	0/F	0/F	0/F	0/F	0/F
<b>Assignment of data bits</b>					
• Data bit D0	IN1/OUT1	IN1/OUT1	IN1/OUT1	IN1/OUT1	IN1
• Data bit D1	IN2/OUT2	IN2/OUT2	IN2/OUT2	IN2/OUT2	IN2
• Data bit D2	IN3/OUT3	IN3/OUT3	IN3/OUT3	IN3/OUT3	IN3
• Data bit D3	IN4/OUT4	IN4/OUT4	IN4/OUT4	IN4/OUT4	IN4
<b>Approvals</b>	UL, CSA, shipbuilding	UL, CSA, shipbuilding	UL, CSA, shipbuilding	--	--
<b>Degree of protection</b>	IP20 enclosure connecting pins IP00	IP20 enclosure connecting pins IP00	IP00	IP00	IP00
<b>Ambient temperature in °C</b>	-25 ... +70	-25 ... +70	-25 ... +70	-25 ... +70	-25 ... +70
<b>Storage temperature in °C</b>	-40 ... +80	-40 ... +80	-40 ... +80	-40 ... +85	-40 ... +85
<b>Displays</b>	None	None	None	AS-i: Green Fault: Red I/O: Yellow L24+: Green	AS-i: Green Fault: Red Inputs: Yellow
<b>Display LED status</b>	--	--	--	AS-i On On Flashes On	Fault Off On On Flashes
					Status OK No data traffic Zero address Overload (sensor)

# AS-Interface Slaves

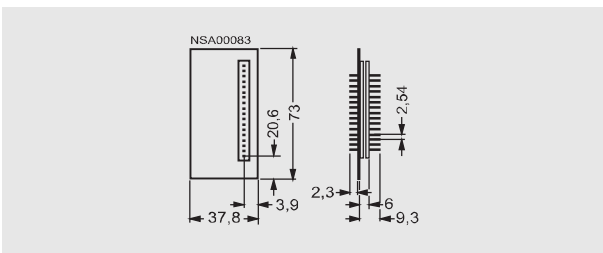
Special integrated solutions  
AS-Interface communications modules

2

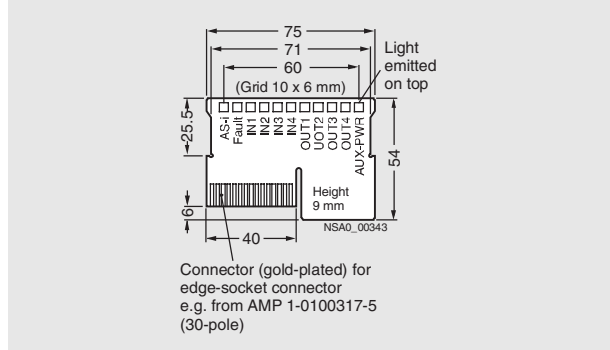
## Dimensional drawings



3RK1 400-0CD00-0AA3  
3RK1 400-0CD01-0AA3



3RG9 005-0SA00



3RK1 400-1CD00-0AA2  
3RK1 200-0CD00-0AA2  
Pad numbering on front: 29, 27, 25, ..., 5, 3, 1  
Pad numbering on rear: 30, 28, 26, ..., 6, 4, 2

# AS-Interface

## Slaves

### Modules with special functions Counter modules

2

#### Overview

This module is used to send hexadecimally coded count values (LSB=D0, MSB=D3) to a higher level controller. The count value is increased by one for each valid count pulse at terminal 8. Beginning at 0, the module counts up to 15 and then begins again at 0. The controller adopts the current value and determines the number of pulses between two host invocations through subtraction from the previous value. The total number of count pulses is determined by adding these differences.

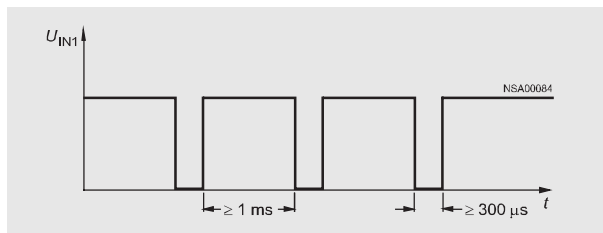
For the values sent to be unambiguous, no more than 15 count values are allowed between two host invocations or AS-Interface master invocations at terminal 8. The maximum permissible transmission frequency is calculated from these times:

$$f_{U_{max}} = 15 / T_{max}$$

$T_{max}$ : maximum possible transmission time from the slave to the host

Another condition for the maximum frequency is the pulse shaped required. For the counter to accept a pulse as valid, a Low must have been applied at the input for at least 300  $\mu$ s and a High for at least 1 ms. This results in a controller-independent maximum frequency of

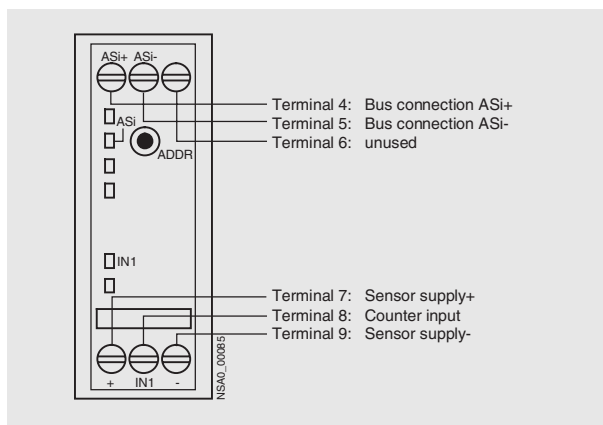
$$f_{Z_{max}} = 1 / 1.3 \text{ ms} = 769 \text{ Hz for the counter module (see graph NSA00084).$$



If the time criterion stipulated in the graph NSA00084 is violated, the count value is rejected.

The counter is active only for the reset parameter P2 (default). The counter is deleted when P2 is set, and the incoming count pulses are not registered until after P2 is reset again.

*Note: A customized function block is necessary or must be programmed.*



Connection options

#### Technical specifications

	Counter modules	
	With screw-type terminal connection 3RK1 200-0CE03-0AA2	With spring-loaded terminal connection 3RK1 200-0CG03-0AA2
Slave type	Standard slave	
Operational voltage according to AS-Interface specification in V	26.5 ... 31.6	
Total current input in mA	≤ 170	
Input	<ul style="list-style-type: none"> <li>• Sensor supply using AS-Interface</li> <li>• Assignment</li> <li>• Voltage range in V</li> <li>• Current-carrying capacity in mA</li> <li>• Switching level Low/High in V</li> <li>• Input current Low/High in mA</li> </ul>	
I/O configuration	0	
ID code	F	
AS-Interface certificate	Yes	
Approvals	UL, CSA, shipbuilding	
Degree of protection	IP20	
Ambient temperature in °C	-25 ... +70	
Storage temperature in °C	-40 ... +85	
Displays	<ul style="list-style-type: none"> <li>• AS-i</li> </ul> <p>Green LED on + Red LED off = Status OK Green LED off + Red LED on = No data traffic Green LED flashes + Red LED on = Zero address Green LED off + Red LED flashes = Overload (sensor)</p>	
Connection	Screw-type terminals	Spring-loaded terminals
Conductor cross-sections in mm <sup>2</sup>	<ul style="list-style-type: none"> <li>• Solid</li> <li>• Finely stranded with end sleeve</li> <li>• Finely stranded without end sleeve</li> <li>• AWG conductors, solid or stranded</li> </ul>	
	--	2 × (0.25–1.5)
	--	2 × (0.25–1)
	--	2 × (0.25–1.5)
	--	AWG 2 × (24–16)

### Overview

"... Ground faults in control circuits must not result in a machine's unintentional starting or hazardous movements, nor must they prevent it from stopping (EN 60204, Part 1 or DIN VDE 0113)."

The AS-Interface ground detection module is used to meet these requirements. Using this module from the SlimLine series, ground faults in AS-Interface systems can be reliably detected and reported.

The following ground faults are detected:

- Ground fault from AS-i "+"
- Ground fault from AS-i "-"
- Ground fault from sensors and actuators which are supplied from the AS-Interface voltage.

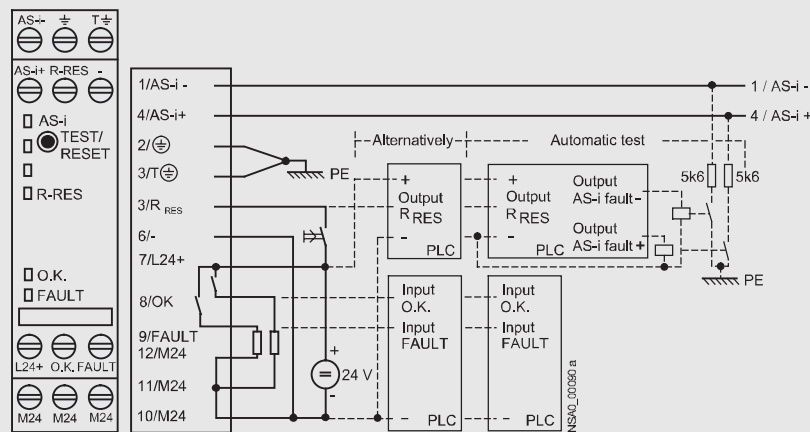
One module per AS-Interface network is required.

### Function

A ground fault is detected by the module, is indicated by an LED and is signaled by two signal outputs (1st: OK, 2nd: Fault). The ground fault signal is stored in the module. The ground fault must first be eliminated in order to be able to reset the module by switching off the the AS-Interface voltage, by using a reset button or by applying a High level to the floating remote reset input. The reset

button can also be used for function checking. External auxiliary voltages are not monitored for ground faults with this module.

*Note: The ground fault detection module is a passive module without IC and as such does not need its own address on the AS-Interface network.*



Terminal	Designation
1	AS-i – connection
2	Connection for system earth
3	Connection for system earth (for test function)
4	As-i + connection
5	Remote reset input (R-RES)
6	Remote reset ground (-)
7	External voltage supply for signaling outputs L24+
8	Signaling output O.K.
9	Signaling output FAULT (earth fault signaling)
10	External voltage supply for signaling outputs M 24
11	Negative connection for signaling output M 24
12	Negative connection for signaling output M 24

Connection options

# AS-Interface Slaves

## Modules with special functions Ground fault detection modules

2

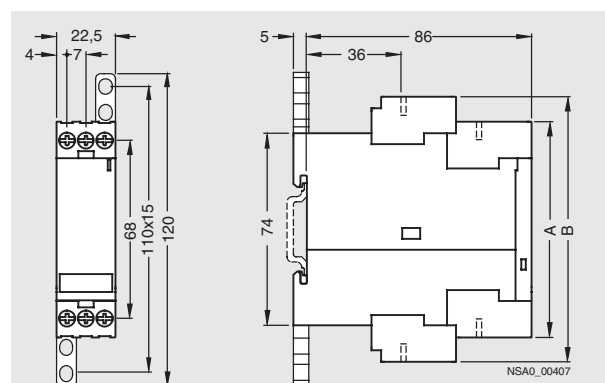
### Technical specifications

	Ground fault detection module	
	With screw-type terminal connection 3RK1 408-8KE00-0AA2	With spring-loaded terminal connection 3RK1 408-8KG00-0AA2
<b>Total current input in mA</b>	≤ 40	
<b>Reverse polarity protection</b>	Built-in	
<b>Ground fault</b>	10% $U_{AS-i} \leq U_{GND} \leq 90\% U_{AS-i}$	
<b>Low signal range</b>		
• $I_{IN}$ in mA	≤ 1.5	
<b>High signal range</b>		
• $U_{IN}$ in V	≥ 10	
• $I_{IN}$ in mA	≥ 6	
<b>Current-carrying capacity<sup>1)</sup></b>		
• DC 12 in A	1 (max. 2 per module)	
• DC 13 in A	500 (24 V) <sup>2)</sup>	
• DC 13 in mA	200 (48 V) <sup>2)</sup>	
<b>Operating cycles DC 12</b>	$2 \times 10^6$	
<b>Rated operational voltage range in V</b>	24 ... 48 DC	
<b>Degree of protection</b>	IP20	
<b>Dimensions (W x H x D) in mm</b>	102 x 22.5 x 92	
<b>Rated temperature in °C</b>	25	
<b>Ambient temperature in °C</b>	-25 ... +70	
<b>Storage temperature in °C</b>	-40 ... +85	
<b>Addressing procedure</b>	The module does not need its own AS-Interface address	
<b>Connection</b>	Screw-type terminal connection	Spring-loaded terminal connection
<b>Conductor cross-sections in mm<sup>2</sup></b>		
• Solid	--	2 x (0.25–1.5)
• Finely stranded with end sleeve	--	2 x (0.25–1)
• Finely stranded without end sleeve	--	2 x (0.25–1.5)
• AWG conductors, solid or stranded	--	AWG 2 x (24–16)
<b>Note</b>	If repeaters are used, a ground fault detection module must be used for each AS-Interface segment (number of AS-Interface power supply units = number of ground fault detection modules)	

1)  $U_{aux}$  should be protected by a 2 A slow fuse.

2) The endurance of the relay can be increased if inductive loads are connected using freewheel diodes.

### Dimensional drawings



	A	B
<b>Standard terminal</b>		
Spring-type terminal	81,6	101,6
Screw-type terminal	80	100
<b>Removeable terminal</b>		
Spring-type terminal	84	103
Screw-type terminal	83	102



### Overview

The AS-Interface overvoltage protection module protects downstream AS-Interface devices or individual sections in AS-Interface networks from conducted overvoltages which can be caused by switching operations and remote lightning strikes.

The location of the overvoltage protection module forms within the lightning protection zone concept the transition from zone 1 to 2/3. Direct lightning strikes must be coped with using additional protective measures at the transitions from lightning protection zone 0A to 1.

With the AS-Interface overvoltage protection module it is now also possible to integrate AS-Interface in the overall lightning protection concept of a plant or machine.

The module has the same type of construction, connection and degree of protection (IP67) as the AS-Interface user modules. It is a passive module without AS-i IC and as such does not need its own address on the AS-Interface network.

Connection to an AS-Interface system is effected through the FK-E or PG-E coupling module. Through use of the EEMS interface, the AS-Interface cable and the auxiliary voltage cable can be protected from overvoltage.

Overvoltages are discharged through a ground cable with a green/yellow oil-proof outer sheath. This cable is fixed in the

module and must be connected with low resistance to the system's ground.

### Rated discharge current $I_{sn}$

The rated discharge current is the peak value of a surge current with waveform 8/20 microseconds, for which the overvoltage protection module is rated in accordance with a specific test program.

With waveform 8/20, 100% of the value is achieved after 8 microseconds and 50% after 20 microseconds.

### Protection level $U_p$

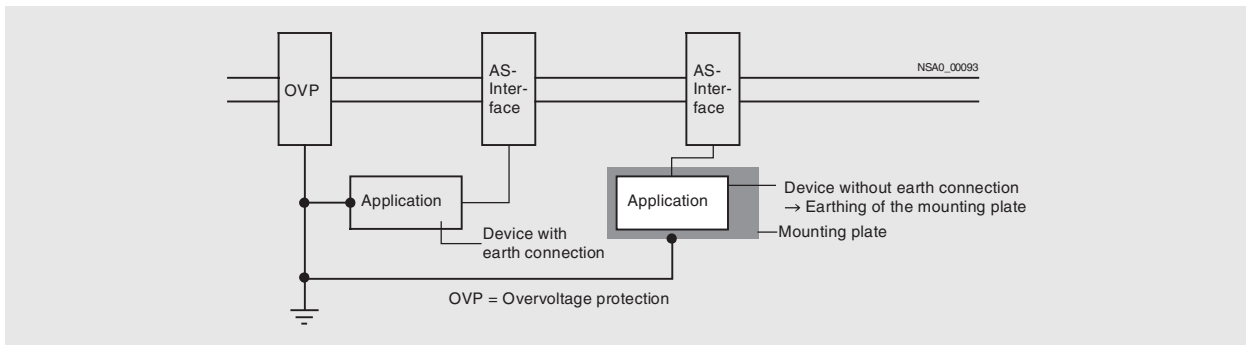
The protection level of an overvoltage protection module is the highest momentary value of the voltage at the terminals, established in individual tests.

The protection level characterizes the capability of an overvoltage protection module to limit overvoltages to a residual level.

### Accessories

An FK-E or PG-E coupling module is required for connection of the AS-Interface cable and the auxiliary power supply cable.

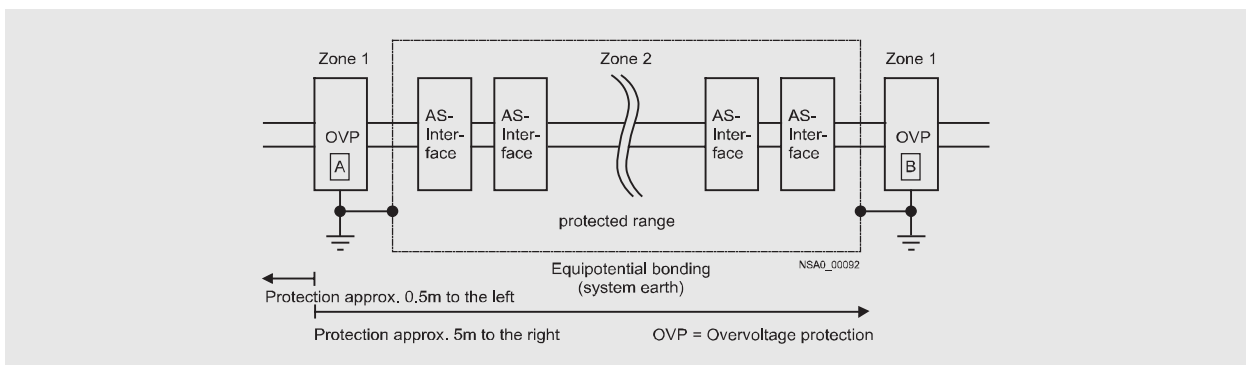
### Configuration guidelines



The grounding of protection modules and the units to be protected must be effected through a shared grounding point

(equipotential bonding). If insulated devices are protected, their mounts must be included in the grounding points.

### Sample application



# AS-Interface Slaves

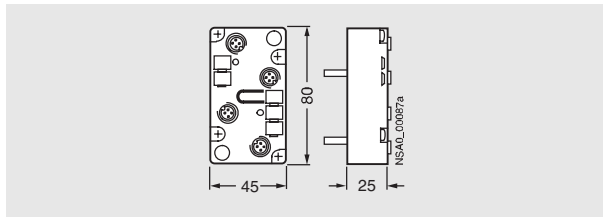
## Modules with special functions Overvoltage protection modules

2

### Technical specifications

Overvoltage protection module 3RK1 901-1GA00		
	For AS-Interface	For AUX Power
<b>Overvoltage protection</b>		
<ul style="list-style-type: none"> <li>Rated discharge current <math>I_{sn}</math> of wave form 8/20                             <ul style="list-style-type: none"> <li>Core-PE in kA</li> <li>Core-core in kA</li> </ul> </li> <li>Protection level <math>U_b</math> at <math>I_{sn}</math> <ul style="list-style-type: none"> <li>Core-PE in kV</li> <li>Core-core in V</li> </ul> </li> <li>Protection level <math>U_b</math> at 1 kV / <math>\mu</math>s                             <ul style="list-style-type: none"> <li>Core-PE in V</li> <li>Core-core in V</li> </ul> </li> </ul>	10 0.5  $\leq 1.8$ $\leq 100$  $\leq 700$ $\leq 50$	10 0.5  $\leq 1.8$ $\leq 70$  $\leq 600$ $\leq 40$
<b>Mechanical specifications</b>		
<ul style="list-style-type: none"> <li>Degree of protection (with coupling module)</li> <li>Dimensions (H x W x D) in mm</li> </ul>	IP67 80 x 45 x 25	
<b>Temperature range</b>		
<ul style="list-style-type: none"> <li>Ambient temperature in °C</li> <li>Storage temperature in °C</li> </ul>	-25 ... +85 -40 ... +85	

### Dimensional drawings



### Overview

Every LOGO! can now be connected to the AS-Interface system



Using the AS-Interface connection for LOGO!, an intelligent slave can be integrated in the AS-Interface system. With the modular interface it becomes possible to integrate the different basic devices in the system according to their functionality. Similarly, functionalities can be quickly and easily adapted to new requirements by exchanging the basic device.

The interface module provides four inputs and four outputs on the system. These I/Os do not actually exist in hardware terms, however, but are only virtually present through the interface on the bus.

### Technical specifications

Supply voltage in V	24 V DC	
Inputs/outputs	4 / 4 (virtual inputs / outputs)	
Bus connection	AS-Interface according to specification	
Ambient temperature in °C	0 ... +55	
Degree of protection	IP20	
Installation	Onto standard mounting rail	
Dimensions (W x H x D) in mm	36 x 90 x 58	
Indications of the LEDs	LED	Status
	Green	OK
	Red	No data traffic
	Flashes red/yellow	Zero address

# AS-Interface Power Supply Units

## AS-Interface power supplies, IP65

2

### Overview



AS-Interface power supplies are an essential and functionally important part of an AS-Interface network. They supply the electronics of the network (AS-Interface modules and AS-Interface masters) and the connected sensor technology. Furthermore, the integrated data decoupling of AS-Interface power supplies ensures the separation of data and energy, thus enabling AS-Interface to transmit data and power on a single line.

AS-Interface enables the direct connection of sensors and actuators in the field to the higher-level control system. This is made possible by the various I/O modules with a high degree of protection. To uphold this approach as far as possible there are AS-Interface masters and of course power supplies in IP65.

The spectrum of AS-Interface power supplies includes units with 24 V DC as well as 230 V AC input voltage.

### Technical specifications

	AS-Interface power supplies, IP65	
	Rated input voltage 230 V AC 3RX9 311-0AA00	Rated input voltage 24 V DC 6EP1 632-1AL01
<b>Output current in A</b>	2.4	2.4
<b>Rated input voltage in V</b>	230 AC	24 DC
<b>Input</b>		
• Input voltage rated value $U_e$ Rated in V	230 AC	24 DC
• Range changeover	Changeover switch (internal)	--
• Input voltage range in V	195 ... 253	20.4 ... 28.8 DC
• Overvoltage strength	EN 61000-4-1	35 V DC, for max. 500 ms
• Mains buffering at $I_e$ Rated in ms	> 20	> 10
• Line frequency rated value I-range in Hz	50/60/47 ... 63	--
• Input current rated value $I_e$ Rated in A	< 0.5	3.6
• Installed input fuse in A	T 2 (not accessible)	T 6.3 (not accessible)
<b>Output</b>		
• Controlled floating direct voltage in accordance with AS-Interface specification	Yes	Yes
• Output voltage rated value $U_a$ Rated in V	30 DC (AS-Interface)	30 DC (AS-Interface)
• Total tolerance	29.5 ... 31.6 V DC	29.5 ... 31.6 V DC
• Residual ripple in mVss	< 300	< 300
• Switching peaks in mVss	< 50	< 50
• Status display	Green LED	Green LED
• Output current rated value $I_a$ Rated in A	2.4 (powerboost 2.8)	2.4
<b>Efficiency/power loss</b>		
• Efficiency at $U_a$ Rated, $I_a$ Rated in %	Approx. 85	> 81
• Power loss at $U_a$ Rated, $I_a$ Rated in W	Approx. 10	< 17
<b>Protective and monitoring functions</b>		
• Output overvoltage protection	No	--
• Current limitation in A	> 2.8	Approx. 2.9 and higher
• Short-circuit protection	Yes	Constant current approx. 2.9 A
<b>Safety</b>		
• Electrical isolation primary/secondary	Yes (SELV according to EN 60950)	Yes (SELV according to EN 60950)
• Safety class	Class I according to IEC 536	Class I according to IEC 536
• Degree of protection	IP65	IP65
• Approvals	CE, UL, CSA (available soon)	CE, UL, shipbuilding
<b>EMC</b>		
• Emitted interference	EN 50081-1	EN 50081-1, EN 55022 Cl. B
• Interference immunity	EN 50082-2	EN 50082-2

# AS-Interface Power Supply Units

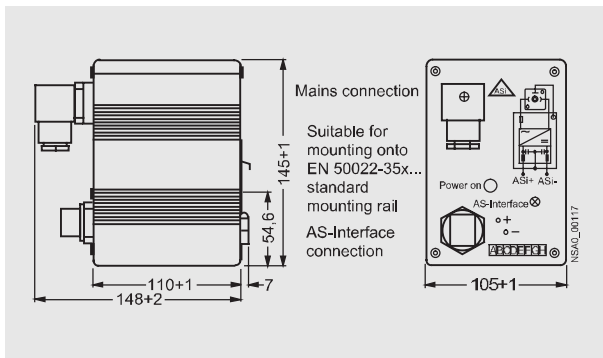
## AS-Interface power supplies, IP65

2

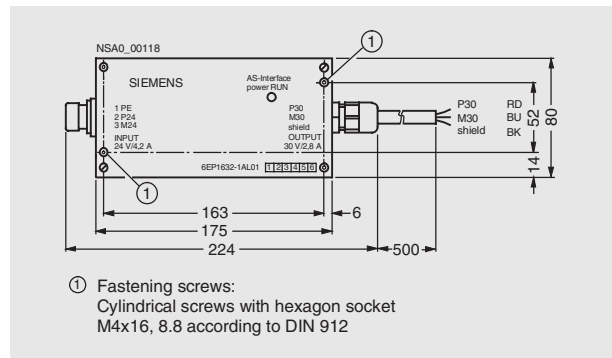
	AS-Interface power supplies, IP65	
	Rated input voltage 230 V AC 3RX9 311-0AA00	Rated input voltage 24 V DC 6EP1 632-1AL01
<b>Operating data</b>		
• Ambient temperature range in °C	-45 ... +55	-25 ... +55
• Transport and storage temperature range in °C	-45 ... +60	-25 ... +85
• Humidity class	Max. 80 % rel. humidity	Climate class 3K3 according to EN 60721, without condensation
<b>Mechanical construction</b>		
• Input connections	Amphenol connector power socket	Circular connector 0.5 ... 2.5 mm <sup>2</sup> 1)
• Output connections AS-i +	AS-i+/AS-i: Using yellow AS-Interface cable	500 mm three-conductor cable AWG 14
• Output connections AS-i -	Cable adapter FK	500 mm three-conductor cable AWG 14
• Output connections ground	--	500 mm three-conductor cable AWG 14
<b>Dimensions (W x H x D) in mm</b>	105 x 155 x 117	224 x 80 x 57
<b>Installation</b>	Fixing on standard mounting rail EN 50022-35 x 7.5	Wall mounting, any mounting position
<b>Accessories</b>	--	6-pole connector for input voltage (6ESS 760-2CA11) and AS-Interface PG coupling module (3RG9 220-0AA00) must be ordered separately

1) Mating piece is not included in the scope of supply (see Accessories).

### Dimensional drawings



3RX9 311-0AA00



6EP1 632-1AL01

# AS-Interface Power Supply Units

## AS-Interface power supplies, IP20

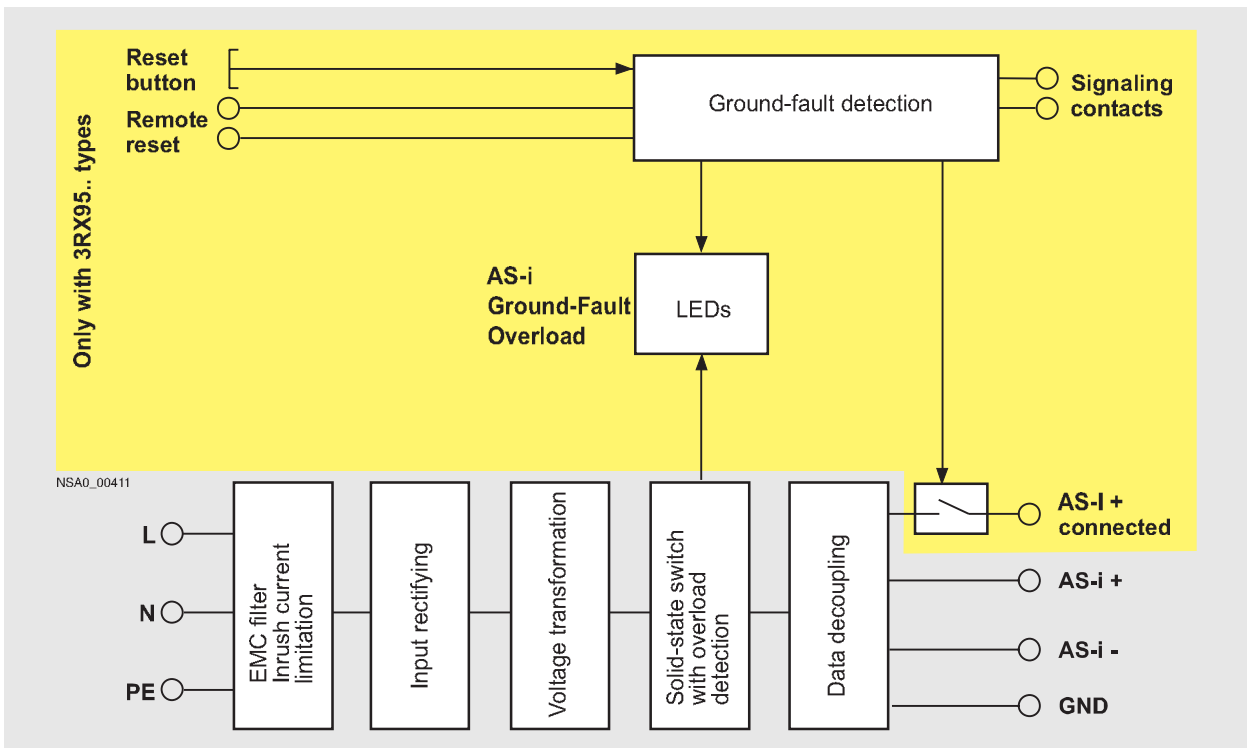
2

### Overview



AS-Interface power supplies are an integral part of an AS-Interface network. They supply the electronics of the network (AS-Interface modules and AS-Interface masters) and the connected sensor technology. Furthermore, the integrated data decoupling of AS-Interface power supplies ensures the separation of data and energy, thus enabling AS-Interface to transmit data and power on a single line.

### Design



Basic design of the AS-Interface power supplies

AS-Interface power supplies are primary-controlled direct voltage supply units. The primary-switched mode regulators generate a controlled direct voltage of 30 V DC with high stability and low residual ripple.

Data and power are always transmitted simultaneously over the AS-Interface 2-conductor cable. AS-Interface power supplies must therefore not only ensure the power supply of the AS-Interface network, but also that of the data link.

Standard power supplies are not suitable for this purpose. For this reason, standard power supply units must not be used to supply an AS-Interface network. AS-Interface power supplies supply the electronics of the network (AS-Interface masters, AS-Interface modules) and all connected sensors. Graded power supply units with 2.4 to 8 A output current are available,

depending on the power requirements of the respective AS-Interface network.

As shown in the graphics, the new generation of AS-Interface power supplies (3RX95...) is available in IP20 with integrated ground-fault and overload detection.

### Function

Features of the new power supply generation 3RX9 5..:

- **Compact dimensions**

With just 50/70/120 mm widths, the new devices are the most compact AS-Interface power supplies yet with an extremely high power density. The small footprint of these devices can be fully utilized as a further device can be mounted on the DIN rail directly next to the power supply unit. There is therefore no need for gaps between devices (as is often the case with other compact power supply units).

- **Higher rating**

The new devices have an output current of 3/5/8 A.

- **Integrated ground-fault detection**

Ground-fault detection to EN 60204-1 comes as standard with AS-Interface. The new generation of AS-Interface power supplies are all equipped with integrated ground-fault detection, which reliably detects and reports any ground faults.

Furthermore, by setting up additional contacts, users can specify whether the AS-Interface voltage should be switched off immediately in the event of a ground fault, thus preventing unintentional startup of a machine. This prevents damage to the system in the event of a fault.

- **Integrated overload detection**

An output overload is detected and reported over a diagnostic LED.

- **Diagnostics memory**

Any ground faults or overloads on the output side are stored in a diagnostics memory until the device is reset. These events are indicated by the flashing of the respective LED. This facilitates fault diagnostics on an AS-Interface network as a service technician can immediately see where any faults in the system are coming from (even after the fault has occurred).

- **Remote reset and remote indication**

The recognized ground fault can be reported to a central control system over established contacts and evaluated. The stored diagnostics can be reset locally over a reset button. It can also be reset by a control system over a reset input.

- **Diagnostic LEDs**

Three different colored LEDs indicate the status of the AS-Interface power supply locally at the supply unit.

- **Ultra-wide input range for 8 A version**

The ultra-wide input range of 120 to 500 V of the 8-A version means that the supply units can be used in virtually any network worldwide. In addition, this version dispenses with the need for a neutral conductor as the device can be connected directly between 2 phases of a network.

- **Removable terminal blocks with spring-loaded connections**

Each power supply unit has three terminal blocks; one block each for the input side, the output side and the information terminal respectively. These can be removed and enable fast replacement of the supply unit in the event of a fault. The spring-load terminals also enable fast and permanently stable mounting of cable conductors.

### Technical specifications

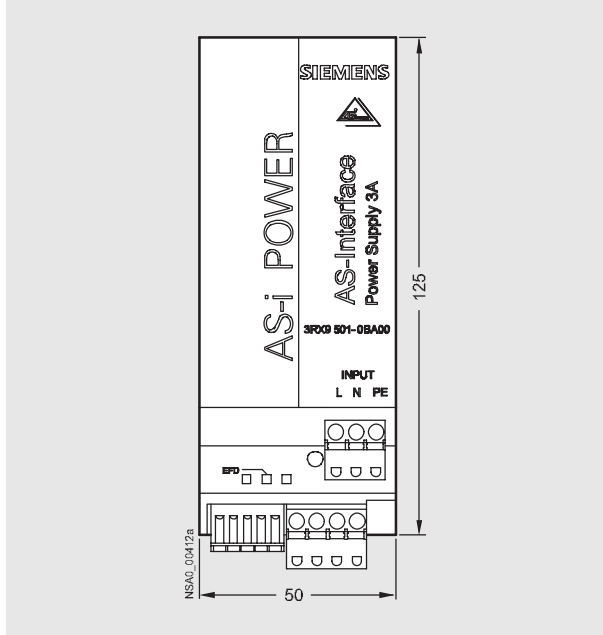
	AS-Interface Power Supply		
	Single output IP20		
	Output current 3 A 3RX9 501-0BA00	Output current 5 A 3RX9 502-0BA00	Output current 8 A 3RX9 503-0BA00
<b>Input data</b>			
• Primary voltage $U_i$ in V	120 / 230 AC	120 / 230 AC	120 / 230 ... 500 AC
• Operational voltage range in V	85 ... 132 / 176 ... 253	85 ... 132 / 176 ... 253	85 ... 132 / 176 ... 550
• Mains frequency range in Hz	47 ... 63	47 ... 63	47 ... 63
• Mains buffering at $I_a$ Rated in ms	> 20	> 20	> 20
• Rated primary current in A	1.6 / 0.9	2.7 / 1.5	4.4 / 2.4
• Back-up protection in the main supply line recommended (IEC 898) in A	6 Characteristic C	6 Characteristic C	10 Characteristic C
<b>Output data</b>			
• Rated output voltage $U_a$ Rated in V	30 DC	30 DC	30 DC
• Residual ripple / spikes	< 50 mV <sub>pp</sub> (10 ... 500 kHz) < 300 mV <sub>pp</sub> (0 ... 10 kHz)	< 50 mV <sub>pp</sub> (10 ... 500 kHz) < 300 mV <sub>pp</sub> (0 ... 10 kHz)	< 50 mV <sub>pp</sub> (10 ... 500 kHz) < 300 mV <sub>pp</sub> (0 ... 10 kHz)
• Rated output current $I_a$ Rated in A	3	5	8
• Making-current limitation in A	Typ. 3.5	Typ. 5.5	Typ. 8.5
• Efficiency at full load in %	Typ. 84	Typ. 87	Typ. 87
<b>Ambient conditions</b>			
• Storage/transport temperature in °C	-25 ... +80	-25 ... +80	-25 ... +80
• Ambient operating temperature in °C	-10 ... +70	-10 ... +70	-10 ... +70
• Degree of protection	IP20	IP20	IP20
• Degree of pollution	2	2	2
• Humidity class	Climate class DIN 50010, relative air humidity max. 100 %, without condensation		
• EMC emitted interference class B	IEC 61000-6-3	IEC 61000-6-3	IEC 61000-6-3
• EMC interference immunity	EN 61000-6-2, EN 61000-4-2/-3/-4/-5/-6/-11		

# AS-Interface Power Supply Units

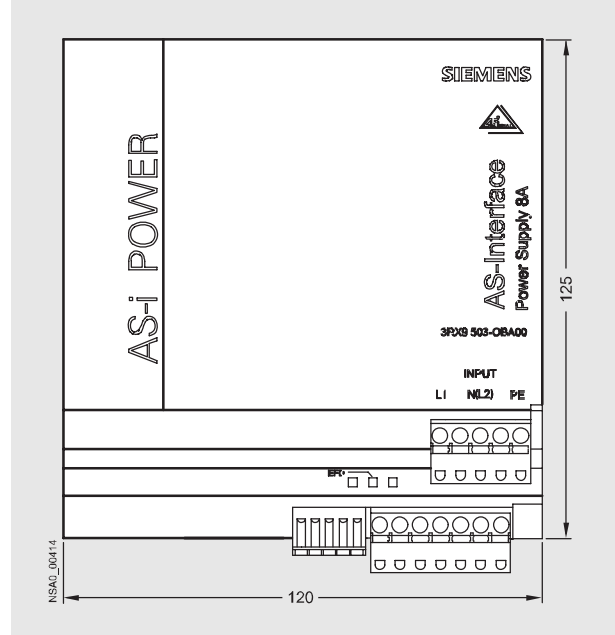
## AS-Interface power supplies, IP20

2

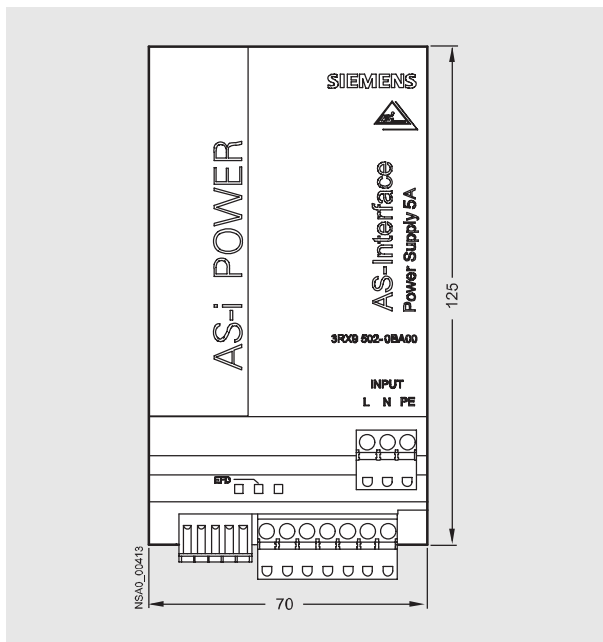
### Dimensional drawings



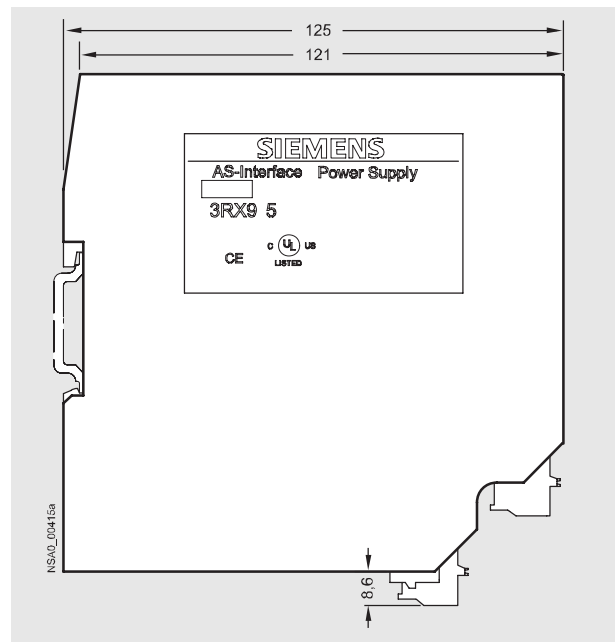
Front view 3RX9 501-0BA00



Front view 3RX9 503-0BA00



Front view 3RX9 502-0BA00



Side view 3RX9 501-0BA00 / 3RX9 502-0BA00 / 3RX9 503-0BA00



### More information

#### Conversion table

Previous type Order No.	Version	New type Number	Order No.	Version
3RX9 307-0AA00	Single output IP20 2.4 A	1	3RX9 501-0BA00	Single output IP20 with ground-fault detection 3 A
3RX9 310-0AA00	Single output IP20 with ground-fault detection 2.4 A	1	3RX9 501-0BA00	Single output IP20 with ground-fault detection 3 A
3RX9 307-1AA00	Single output IP20 4 A	1	3RX9 502-0BA00	Single output IP20 with ground-fault detection 5 A
6EP1 354-1AL01	Single output IP20 7 A	1	3RX9 503-0BA00	Single output IP20 with ground-fault detection 8 A
3RX9 305-1AA00	Dual output IP20 4 A / 4 A	2	3RX9 502-0BA00	Single output IP20 with ground-fault detection 5 A
3RX9 306-1AA00	Combi output IP20 4 A (AS-i) / 5 A (24 V)	1	3RX9 502-0BA00	Single output IP20 with ground-fault detection 5 A
		1	6EP1 333-2AA01	SITOP 24 V IP20 5 A

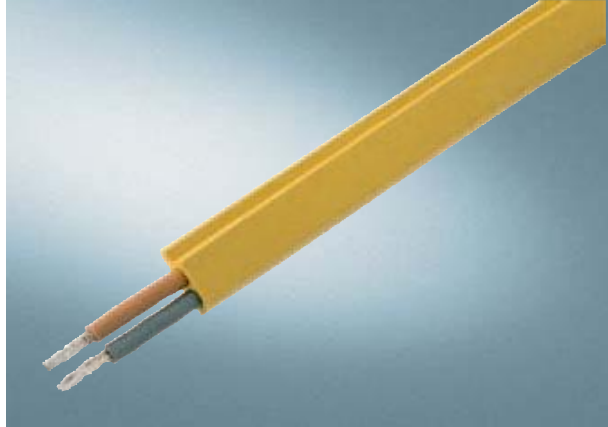
*Note: The following versions will presumably be available until 12/2005: 3RX9 305-1AA00, 3RX9 306-1AA00, 3RX9 307-0AA00, 3RX9 307-1AA00, 3RX9 310-0AA00 and 4FD5 213-0AA 10-1A.*

# AS-Interface Transmission Media

## AS-Interface shaped cables

2

### Overview



The actuator-sensor interface – the networking system used for the lowest field area – is characterized by very easy mounting

and installation. A new connection technique was developed specially for AS-Interface.

The stations are connected using the AS-Interface cable. This two-conductor cable has a trapezoidal shape, thus ruling out polarity reversal.

Connection is effected by the insulation piercing method. In other words, contact pins pierce the shaped AS-Interface cable and make reliable contact with the two conductors. Cutting to length and stripping are superfluous. Consequently, AS-Interface stations (e.g. I/O modules, intelligent devices) can be connected in the shortest possible time and exchanging devices is quick.

To enable use in the most varied ambient conditions (e.g. in an oily environment), the AS-Interface cable is available in different materials (rubber, TPE, PUR).

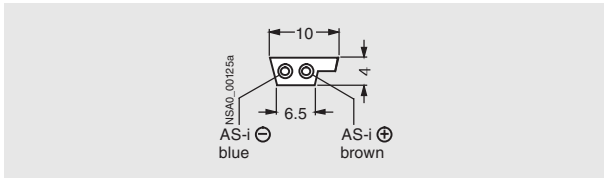
For special applications it is also possible to use a standard round cable. With AS-Interface, data and power for the sensors (e.g. proximity switches BERO) and actuators (e.g. indicator lights) are transmitted over the yellow AS-Interface cable.

The black cable must be used for actuators with a 24 V DC supply (e.g. solenoid valves) and a high power requirement.

### Technical specifications

	AS-Interface Shaped Cables			
	EPDM (rubber)	TPE (special PVC compound)	TPE special version according to UL Class 2	PUR (polyurethane)
<b>Application temperature range</b>				
• Stationary in °C	-40 ... +85	-40 ... +105	-30 ... +90	-50 ... +90
• Moved in °C	-25 ... +85	-30 ... +105	-20 ... +90	-50 ... +90
<b>Core colors</b>	Brown, blue	Brown, blue	Brown, blue	Brown, blue
<b>Flexibility</b>	Very good	Good	Good	Good
<b>Fire behavior</b>	Flammable	Flame-retardant according to IEC 60332-1 VDE 0482 T. 265-2-1 UL 1581 sec. 1061 cable flame UL 1581 sec. 1060 CSA FT1	Flame-retardant according to IEC 60332-1 VDE 0482 T. 265-2-1 UL 1581 sec. 1061 cable flame UL 1685 CSA FT4	Flame-retardant according to IEC 60332-1 VDE 0482 T. 265-2-1
<b>Without halogens (PVC-free)</b>	Yes	No	No	Yes
<b>Without silicone precipitation</b>	Yes	Yes	Yes	Yes
<b>Ozone and weather resistant</b>	Conditionally resistant	Resistant	Resistant	Resistant
<b>Oil resistance</b>	Conditionally resistant	Resistant	Resistant	Resistant
<b>Smallest permissible bending radii according to DIN VDE 0298, Part 300, in mm</b>				
• Fixed	12	12	12	12
• Freely movable	24	24	24	24
<b>Bending behavior according to DIN VDE 0472, Part 603</b>	No break after 30000 reverse bending cycles	No break after 30000 reverse bending cycles	No break after 30000 reverse bending cycles	No break after 30000 reverse bending cycles
<b>UL approval</b>	No	UL 758 AWM	UL 758 AWM UL 13 Class 2 UL 444 CMG	No
<b>CSA approval</b>	No	C22.2 No. 210.2 AWM	C22.2 No. 214-02	No
<b>Monitored expertise (VDE)</b>	No	No	No	VDE Reg. No.9971 300 V/500 V Stationary: -40 ... +70 °C Transport: -25 ... +70 °C Moved: -15 ... +70 °C  Approved for marine and offshore use up to 300 V/500 V: Germanischer Lloyd Lloyds Register of Shipping ABS Europe LTD Bureau Veritas Det Norske Veritas

### Dimensional drawings



## System Components and Accessories

### Extension plug

### Overview



With the extension plug / extension plug plus it is possible to double the cable length possible in an AS-Interface segment from 100 to 200 m.

The extension plug / extension plug plus is a passive component which is connected to that point of the AS-Interface network that is furthest away from the power supply. It has an M12 connector for quick connection to the AS-Interface M12 feeder with degree of protection IP67.

Only one power supply unit is needed to supply power to the slaves on the up to 200 m long segment.

The extension plug / extension plug plus has integrated under-voltage detection for monitoring the AS-Interface voltage in order to be sure that the necessary voltage still exists at the end of the bus cable. Undervoltage is signaled on the extension plug by means of a diagnostics LED. The extension plug plus is equipped with an AS-Interface slave and communicates this diagnostics information directly to the AS-Interface master.

### Design

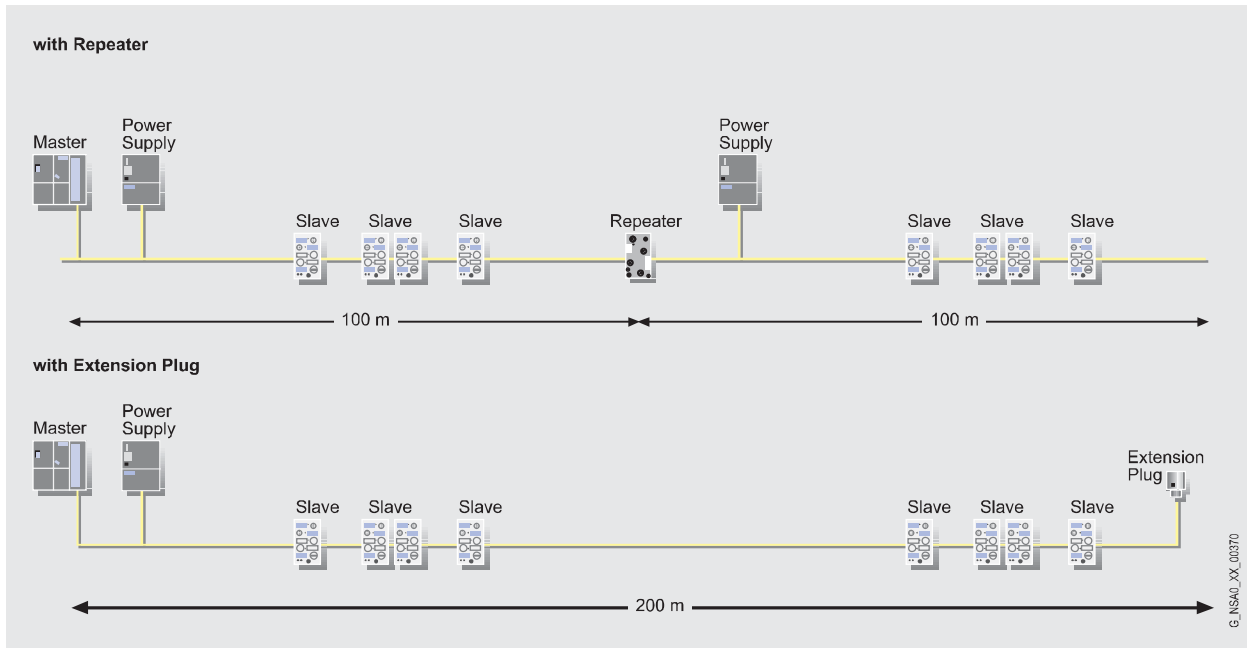
To construct an AS-Interface segment with a cable length of more than 100 m and up to a maximum of 200 m, the extension plug / extension plug plus is installed at that point of network which is furthest from the AS-Interface power supply unit. This point does not have to be localized exactly; it suffices to connect the extension plug / extension plug plus in its vicinity (approx.  $\pm 10$  m).

As with all AS-Interface networks, any network structure (line, tree, star) is possible when using the extension plug / extension plug plus. Only one extension plug / extension plug plus is required per 200-m segment even with a tree or star structure. As a passive network component the extension plug does not need an AS-Interface address. The extension plug plus has an integral AS-Interface A/B slave for the diagnostics message and thus requires an AS-Interface address. For addressing purposes, the extension plug Plus is simply plugged on the 3RK1 904-2AB01 addressing unit.

# AS-Interface System Components and Accessories

## Extension plug

2



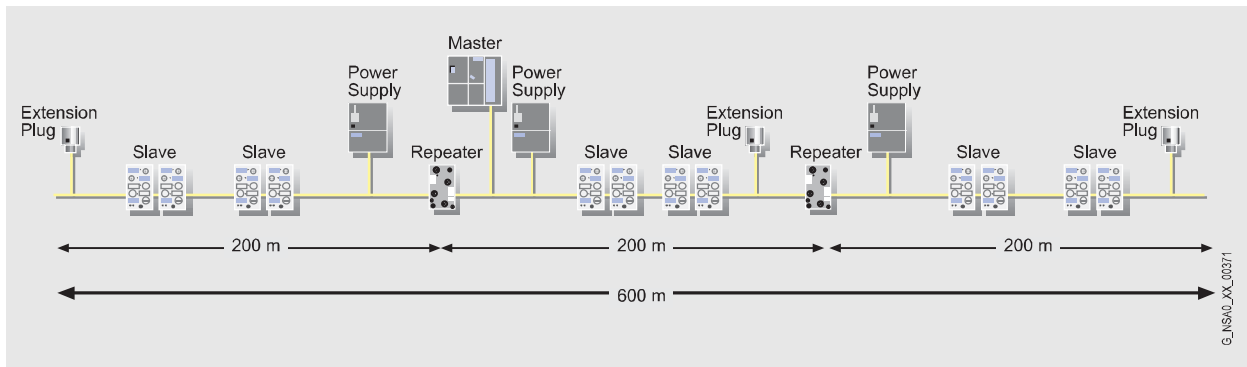
Topology of an AS-Interface network with a size of 200 m

The extension plug / extension plug plus is connected using an M12 plug-in connector and most easily realized with the help of the AS-Interface M12 branch 3RX9 801-0AA00 to IP67 degree of protection.

Depending on the size of an AS-Interface segment and the power consumption (the power consumption varies with the number of stations connected), it is important to make sure that the voltage drop along the AS-Interface cable does not become excessive. To guarantee that even the remotest slave is still supplied with the necessary minimum voltage, the extension plug has a voltage monitor. With the extension plug, any undershooting of the minimum voltage in accordance with the AS-Interface specification is clearly indicated by flashing of a green LED; a correct AS-Interface voltage is signaled by steady illumination of the green LED. The undervoltage detection has a delay for the LED indication in order to recognize also short-time

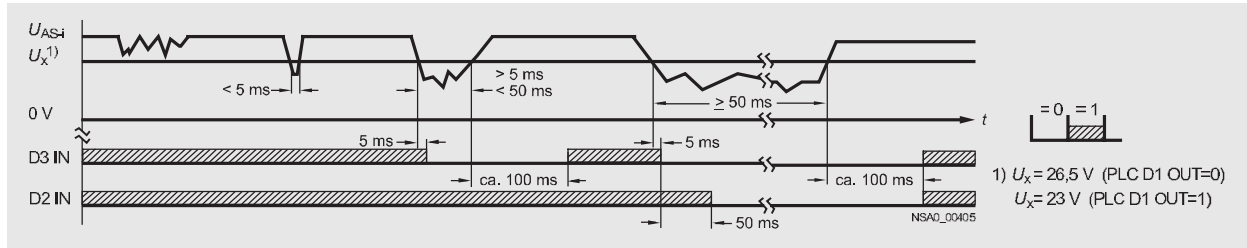
voltage dips of the type which occur, for example, when actuators are switched. The extension plug plus is equipped with an AS-Interface slave. Instead of the diagnostics LED, the extension plug plus communicates the diagnostics information directly to the AS-Interface master. Two different voltage values can be set as threshold value. Using two diagnostics bits it is possible to distinguish between brief and lengthy voltage drops.

For particularly large AS-Interface networks the maximum possible cable length can be increased further by using repeaters. Please note that when a repeater and an extension plug / extension plug plus are used together, the series connection of repeaters is not possible. Hence the maximum possible distance from the master to a slave is 400 m and the absolute maximum cable length is 600 m. The parallel connection of repeaters for a star-shaped configuration with segments up to 200 m long respectively is possible.



Maximum network size with repeaters and extension plug (master at center of network)

### Function



Transmission of the diagnostic message with the extension plug plus

### Technical specifications

	Extension plug 3RK1 901-1MX00	Extension plug plus 3RK1 901-1MX01
<b>Operational voltage according to AS-Interface specification in V</b>	26.5 ... 31.6	26.5 ... 31.6
<b>Polarity reversal protection U AS-Interface</b>	Yes	Yes
<b>AS-Interface certificate</b>	Requested	Requested
<b>Degree of protection</b>	IP67	IP67
<b>Ambient temperature in °C</b>	-25 ... +85	-25 ... +85
<b>Status indicator U AS-Interface</b>		
• LED On: U AS-Interface in V	26.5 ... 31.6	None
• LED flashes: U AS-Interface in V	10 ... 26.5	None
<b>Power supply</b>	From AS-Interface	From AS-Interface
<b>Total current input in mA</b>	≤ 10	≤ 15
<b>Slave type</b>	No slave integrated	A/B slave
<b>I/O configuration</b>	--	B
<b>ID/ID2 code</b>	--	I/O
<b>Assignment of data bits</b>		
• OUT1 (D0)	--	Not required
• OUT2 (D1)	--	D1 = 0: Switching threshold 26.5 V D1 = 1: Switching threshold 23 V
• IN3 (D2)	--	D2 = 0: Undervoltage > 50 ms D2 = 1: No undervoltage
• IN4 (D3)	--	D3 = 0: Undervoltage > 5 ms D3 = 1: No undervoltage
<b>Connection to AS-Interface</b>	Using M12 plug	Using M12 plug
<b>Pin assignment</b>		
• PIN1	U AS-Interface +	U AS-Interface +
• PIN3	U AS-Interface -	U AS-Interface -

# AS-Interface System Components and Accessories

## Addressing units

2

### Overview



To be able to participate in data exchange with the master, all stations have to be addressed before the AS-Interface network is configured. This can be done

- Offline by means of an addressing unit or
- Online using the master of the AS-Interface system.

The addresses themselves are the values 1 to 31 (or 1A to 31A and 1B to 31B for the extended AS-Interface Specification 2.1). A new slave that has not yet been addressed has the address 0. It is recognized accordingly by the master as a new slave that has not yet been addressed and as such is not yet included in the normal communication.

The address can be assigned at random, i.e. it makes not difference whatsoever if the slave with address 21 begins or if the first slave is actually issued with address 1.

### Function

- Reading out the slave address 0 to 31, A/B
- Reading out the I/O and ID codes of the slaves
- Standard and extended ID Code1 and ID Code2
- Standard and extended addressing mode according to AS-Interface Version 2.1
- Programming of the ID Code 1
- Function testing of slaves: reading inputs and writing outputs from digital or analog slaves
- AS-Interface test: Measurement of voltage (measuring range 0 to 35 V) and current consumption (measuring range 0 to 100 mA) of the AS-Interface bus
- Storage: Complete system configurations can be stored (profiles of all slaves, also with extension according to AS-Interface Specification 2.1)
- Detection of complete system complements

### Technical specifications

AS-Interface addressing and diagnostics unit 3RK1 904-2AB01	
<b>Power supply</b>	The standard power supply is provided by 4 batteries according to IEC LR6 (NEDA 15), which guarantee that the unit can perform at least 2500 device addressings For a longer battery life the unit is switched off automatically approx. 1 minute after the last operation
<b>Ambient conditions</b>	<ul style="list-style-type: none"> <li>• Working temperature range in °C: 0 ... +55</li> <li>• Storage temperature range in °C: -20 ... +55 (without batteries)</li> <li>• Relative humidity in %: Max. 75, condensation not permitted</li> <li>• Altitude above sea-level in m: Up to 2000</li> <li>• Location: Only in indoor rooms</li> </ul>
<b>Mechanical design</b>	<ul style="list-style-type: none"> <li>• Degree of protection: IP40</li> <li>• Dimensions in mm: 84 x 195 x 35</li> <li>• Connection: Using M12 socket: <ul style="list-style-type: none"> <li>• Pin1: ASI+</li> <li>• Pin3: ASI-/ GND</li> <li>• Pin2/4/5: IR addressing</li> </ul> </li> </ul>

# AS-Interface System Components and Accessories

## AS-Interface analyzers

### Overview



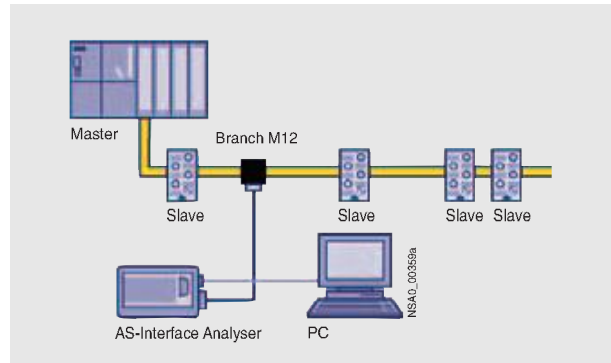
The AS-Interface analyzer is used to test AS-Interface networks. It enables systematic troubleshooting and permanent monitoring.

Installation errors, e.g. loose contacts or EMC interference under extreme loads, can be revealed by this device.

Thanks to the easy-to-use software the user can assess the quality of complete networks even if he lacks detailed specialist knowledge of AS-Interface. In addition it is an easy matter with the AS-Interface analyzer to create test logs from the records produced, thus providing documentation for start-ups and service assignments.

For advanced AS-Interface users there are trigger functions for detailed diagnostics.

### Connection



The AS-Interface analyzer follows the communication on the AS-Interface network as a passive station. The unit is supplied simultaneously from the AS-Interface cable.

The analyzer interprets the physical signals on the AS-Interface network and records the communication.

The data thus obtained are transferred through an RS 232 interface to a PC such as a notebook, for evaluation with the supplied diagnostics software.

### Technical specifications

AS-Interface analyzers 3RK1 904-3AB01	
<b>Interfaces</b>	<ul style="list-style-type: none"> <li>AS-Interface</li> <li>RS 232 for connection to a PC</li> <li>Trigger input (24 V)</li> <li>Trigger output (TTL)</li> </ul>
<b>Displays / LEDs</b>	<ul style="list-style-type: none"> <li>Supply voltage OK (power)</li> <li>RS 232 interface in operation</li> <li>Test mode</li> </ul>
<b>Statistics mode</b>	Online view or long-term measurement up to 14 days (without PC) or one year (with PC)
<b>Trace mode</b>	Message frame memory for 256000 AS-Interface message frames
<b>Rated operational current in mA</b>	Approx. 70 from AS-Interface
<b>Rated insulation voltage in V</b>	> 500
<b>EMC</b>	According to EN 50081-2, EN 61000-6-2
<b>Ambient temperature in °C</b>	0 ... +55
<b>Storage temperature in °C</b>	-25 ... +70
<b>Requirements</b>	IBM compatible PC 80486 and higher
<b>Operating system</b>	Windows 95/98, Windows ME, Windows NT4, Windows 2000, Windows XP

# PROFIBUS System Overview

## Process or field communication

2

### Overview

#### Communication functions

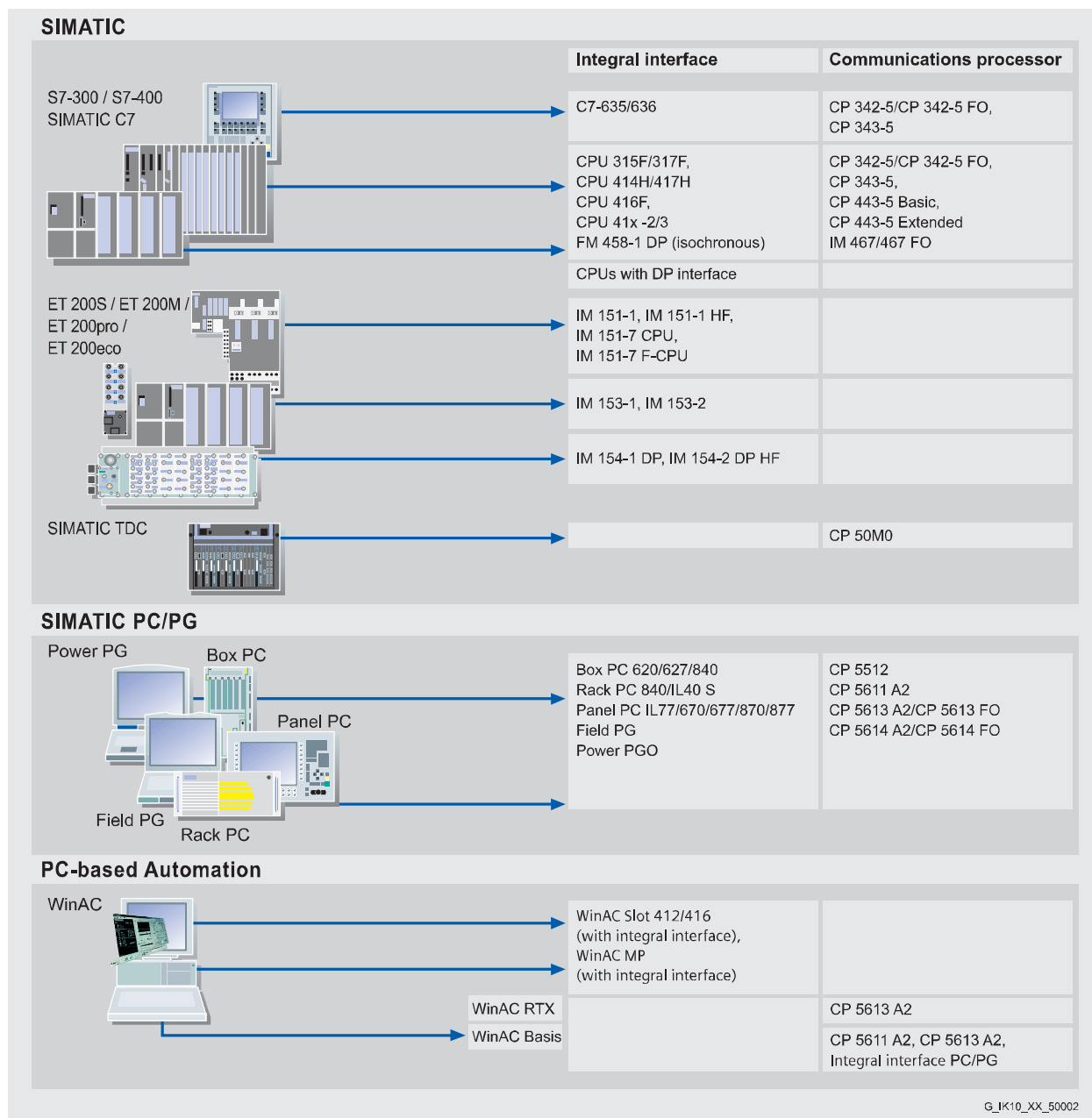
The process or field communication (PROFIBUS DP, PROFIBUS PA) is used to link field device to an automation, HMI or I&C system.

The link can be established through integrated interfaces on the CPU or using interface modules (IMs) and communications processors (CPs).

With today's powerful automation systems it is often more effective to link several PROFIBUS DP lines to one automation system not only in order to increase the number of connectable I/O stations but also to be able to handle individual production areas independently of others (segmentation).

PROFIBUS is standardized according to IEC 61158/EN 50170. It is an efficient, open and robust fieldbus system with short response times and the following protocols:

- PROFIBUS DP (Distributed Peripherals) is used to connect distributed peripherals, e.g. SIMATIC ET 200 with very fast response times according to the IEC 61158/EN 50170 standard.
- PROFIBUS PA (Process Automation) expands PROFIBUS DP with inherently safe transmission according to the international standard IEC 61158-2.



PROFIBUS DP masters



# PROFIBUS System Overview

## Process or field communication

2

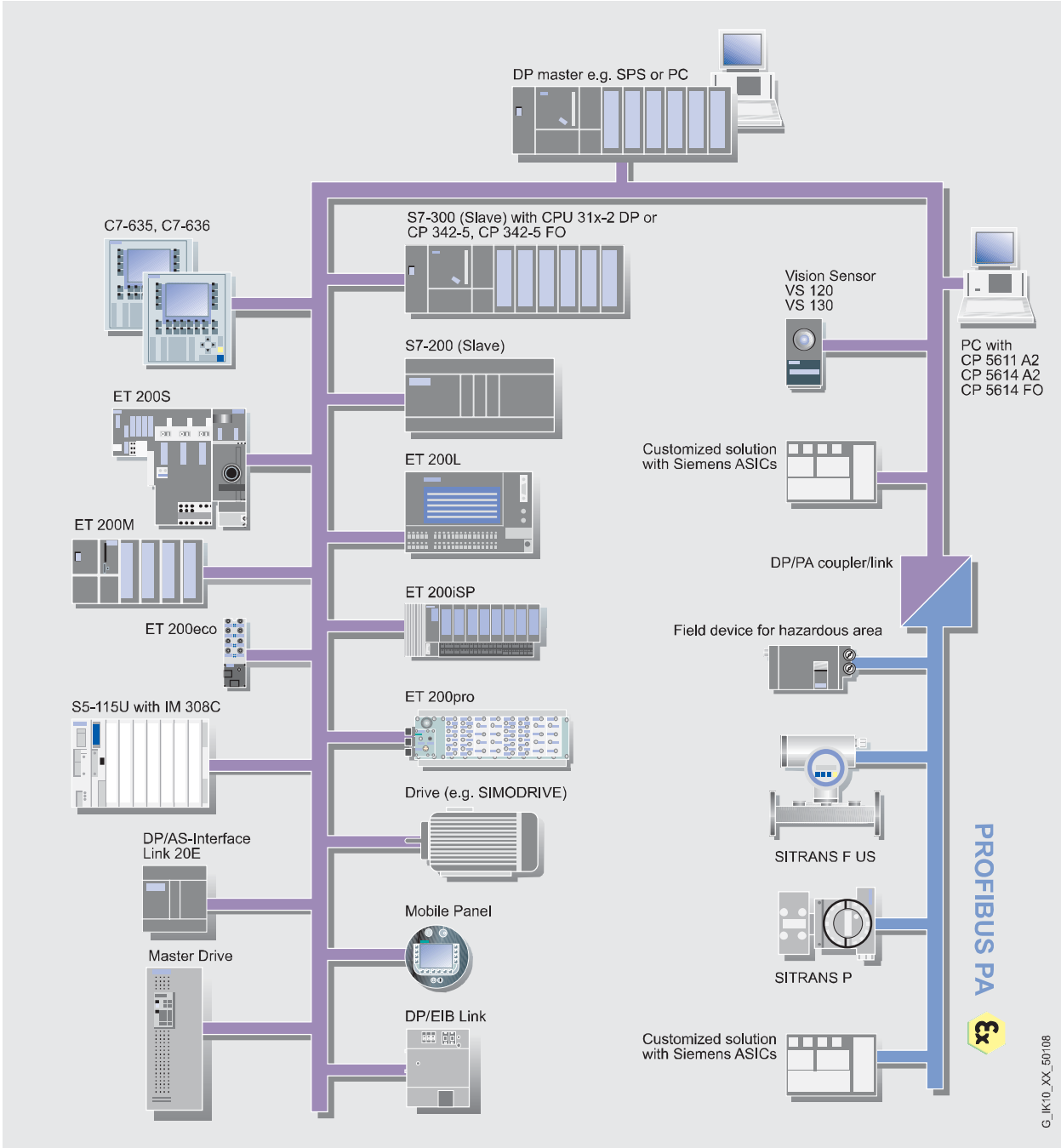
PROFIBUS DP/PA is used to connect field devices such as distributed I/O stations or drives to automation systems such as SIMATIC S7 or PCs.

PROFIBUS DP/PA is selected when I/O stations on a machine or in a plant (e.g. the field level) are widely distributed and can be spatially grouped (>16 inputs/outputs) to form a station (e.g. ET 200).

In this case the actuators/sensors are connected to field devices, which are supplied with output data according to the

master/slave principle and send the input data to the controller or the PC.

Powerful tools such as STEP 7 and COM PROFIBUS are available to configure and parameterize the I/O stations. With these tools, tests and start-ups are possible from every connection using PROFIBUS DP.



PROFIBUS DP slaves

G\_IK10\_XX\_50108

# PROFIBUS System Overview

## Process or field communication

### DP device types

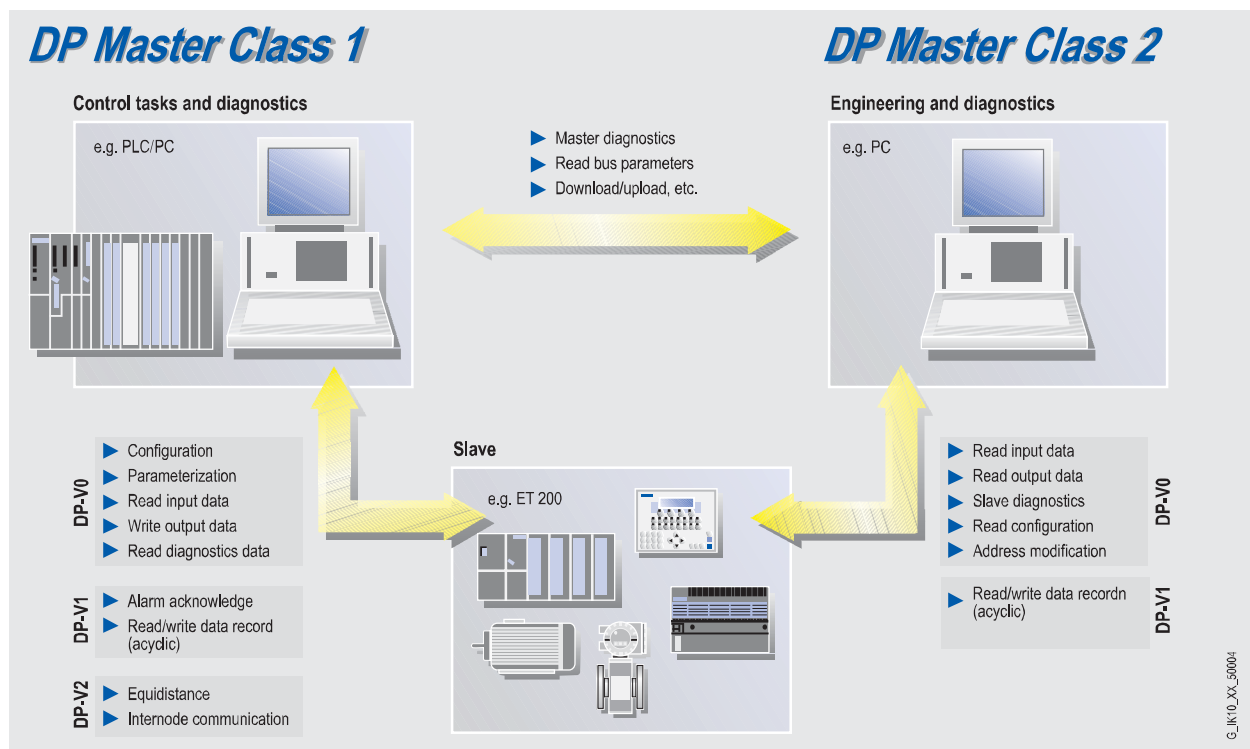
PROFIBUS DP differentiates between two different classes of master and various DP functionalities:

- **DP master class 1**  
The DP master class 1 is the central component of PROFIBUS DP. In a fixed, continuously recurring message cycle the central controller or PC exchanges information with distributed stations (DP slaves).
- **DP master class 2**  
Devices of this type (programming, configuring or operating devices) are used during start-up, for configuring the DP system or for operating the plant while it is running (diagnostics). A DP master class 2 is able, for example, to read the input data, output data, diagnostics data and configuration data of slaves.
- **DP slave**  
A DP slave is an I/O station which reads in input information and sends out output information to the other peripherals. The amount of input and output information varies from device to device but is limited to a maximum 244 bytes per device. The functional scope of DP masters class 1 and 2 and of DP slaves can vary. A communications processor can be accordingly efficient and versatile.
- **DP-V0**  
The DP master functions (DP-V0) are: Configuring, parameterizing, cyclic reading of input data and writing of outputs, and reading of diagnostics data.
- **DP-V1**  
The additional DP function expansions (DP-V 1) enable acyclic read and write functions and alarm acknowledgment in parallel with the cyclic data traffic. These expanded DP functions also include acyclic access to the parameters and

measured values of a slave (e.g. field devices of the process automation, intelligent operating and monitoring devices). Slaves of this type must be supplied with comprehensive parameter data during start-up and while running. The acyclically transmitted data (e.g. parameterizing data) are changed only rarely compared to the cyclic measured values and are transmitted with low priority in parallel with the fast cyclic transfer of useful data. Alarm acknowledgment on the master provides for the assured transmission of alarms from DP slaves.

- **DP-V2**  
The DP master functions (DP-V2) are: cycle synchronization and cross data traffic between DP slaves.
- **Cycle synchronization**  
Cycle synchronization is realized through the use of an equidistant cycle signal on the bus system. This cyclic, equidistant cycle is sent as a global control message frame from the master to all stations. Master and slaves can thus synchronize their applications on this signal. For typical drive applications it is necessary for the jitter of the cycle signal to be smaller than 1  $\mu$ s.
- **Cross data traffic between DP slaves**  
The publisher/subscriber model is used to implement the cross traffic between slaves. Slaves which are declared to be publishers make available their input data (equivalent to a reply message frame to their own master) to other slaves, the subscribers, for them to read as well. The cross traffic communication takes place cyclically.

## Integration



DP master classes

### Function

Hardware	PROFIBUS-DP		PG/OP	S7 Communication				S5-K <sup>1)</sup>	PROFIBUS-FMS			Time of day						
	Master Class 1 in the standard system	Master Class 2 DP slave		Put/Get client	Put/Get server	BSEND/BRECV	USEND/URECV		H communication	Read	Write	Info. / Report	Sender	Relay	receiver			
<b>SIMATIC S5</b> CP 5431 FMS/DP IM 308-C	●	●	●				● <sup>2)</sup>	●										
<b>SIMATIC 505</b> 505 FIM 505 RBC CP 5434	●																	
<b>SIMATIC S7-300 SIMATIC C7</b> CP 342-5 CP 343-5	● <sup>3)</sup>	●	●															
<b>SIMATIC S7-400</b> CP 443-5 Basic CP 443-5 Extended IM 467 IM 467 FO			●															

1) S5-compatible communication; refers to SDA (PLC/PLC connection) and SDN services of PROFIBUS Layer 2

2) Additionally SRD services of PROFIBUS Layer 2

3) DP master, DP slave cannot be operated simultaneously

4) Fault-tolerant DP-master and S7 Communication can be operated optionally

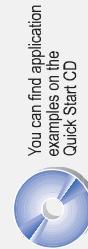
G..K/10..XX..50/00

Communication overview for SIMATIC

# PROFIBUS System Overview

## Communication overview

Hardware	Software	Operating system		PG/OP	OPC <sup>6)</sup>	PROFIBUS DP			S7 communication				PROFIBUS FMS					
		Windows 2000 Pro	Windows XP Pro			Win 2003 Server	Master Klasse 1	Master Klasse 2	DP-Slave	Put/Get Client	Put/Get Server	BSEND/BRECV	USEND/URECV	H communication	Read	Write	Info/Report	
<b>CP 5613 A2</b>	CP with DP-Base 1) 4)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
<b>CP 5613 FO</b>	DP-5613 4)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
<b>CP 5614 A2</b>	S7-5613	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
<b>CP 5614 FO (PCI 32 Bit)</b>	FMS-5613	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
<b>CP 5511 (FCMCIA 16 Bit)</b>	SOFTNET-DP	●	●	●	●	●	●	2)3)	●	●	●	●	●	●	●	●	●	●
<b>CP 5611 (PCI 32 Bit)</b>	SOFTNET-DP Slave	●	●	●	●	●	●	●	●	2)	●	●	●	●	●	●	●	●
	SOFTNET-S7	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	STEP 7	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	SOFTNET-DP	●	●	●	●	●	●	●	●	2)3)	●	●	●	●	●	●	●	●
<b>CP 5512 (CardBus 32 Bit)</b>	SOFTNET-DP Slave	●	●	●	●	●	●	●	●	2)	●	●	●	●	●	●	●	●
	SOFTNET-S7	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	STEP 7	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●



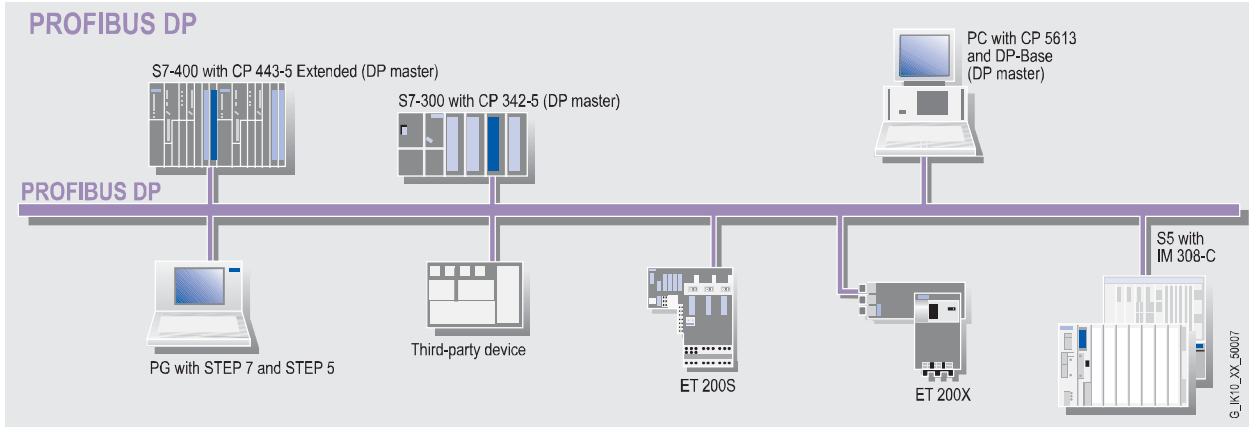
- 1) Included in the scope of supply CP-5613/A2/CP-5613FO/CP-5614 A2/CP-5614 FO
- 2) DP master and DP slave cannot be operated simultaneously
- 3) Master Class 1 and Master Class 2 cannot be operated simultaneously on one CP
- 4) DP-Base and CP-5613 cannot be operated simultaneously
- 5) On CP-5614 only
- 6) Including XML DA interface for data access

You can find more information on the internet.  
<http://www.siemens.com/automation/net/ik-into>  
 a.s. = available soon

Communication overview for PG/PC

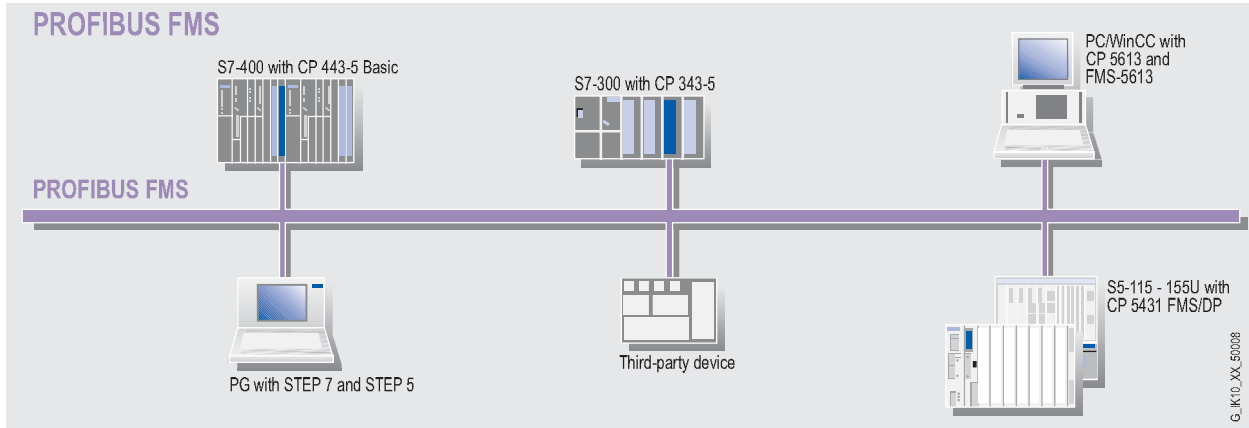
### Integration

#### Configuration example for process or field communication



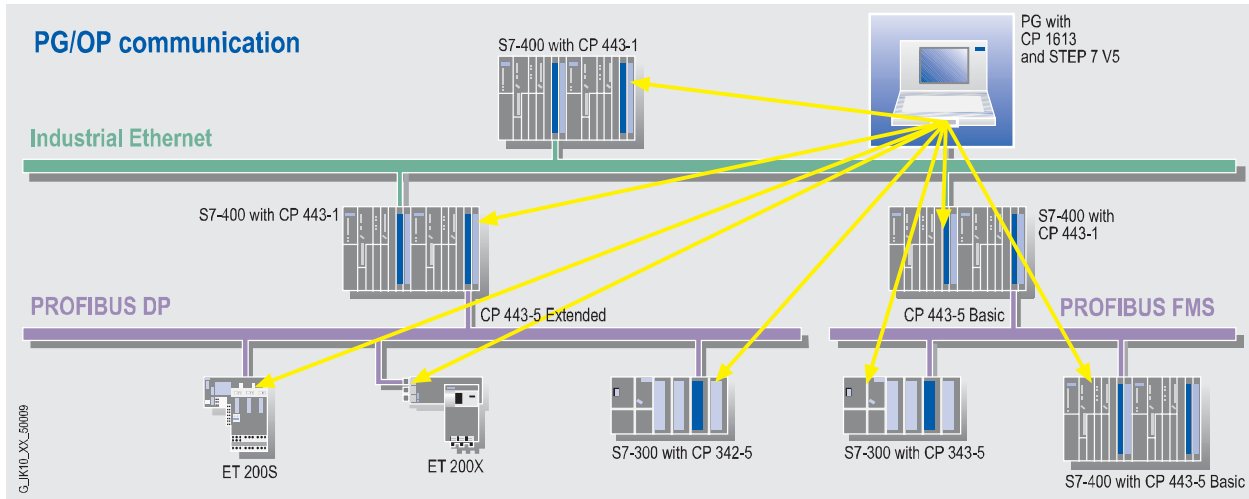
PROFIBUS DP configuration for SIMATIC S5/S7 and PG/PC

#### Configuration example for data communication



PROFIBUS FMS configuration for SIMATIC S5/S7 and PG/PC

#### Configuration example for PG/OP communication



PG/OP communication with S7 routing

# PROFIBUS System Overview

## Technical specifications

2

### Technical specifications

<b>Standard</b>	PROFIBUS according to IEC 61158/EN 50170 Volume 2
<b>Topology</b>	<ul style="list-style-type: none"> <li>• Electrical network</li> <li>• Optical network</li> <li>• Wireless coupling</li> </ul>
<b>Transmission medium</b>	<ul style="list-style-type: none"> <li>• Electrical network</li> <li>• Optical network</li> <li>• Wireless coupling</li> </ul>
<b>Network size</b>	<ul style="list-style-type: none"> <li>• Electrical network</li> <li>• Optical network</li> <li>• Wireless coupling</li> </ul>
<b>Transfer rate</b>	9.6 kbit/s to 12 Mbit/s (adjustable) including 31.25 kbit/s for PROFIBUS PA
<b>Number of stations</b>	Max. 127
<b>Access control</b>	Token passing with lower-level master-slave
<b>Protocols</b>	PROFIBUS DP PG/OP communication S7 communication S5 compatible communication (SEND/RECEIVE) PROFIBUS FMS

### More information

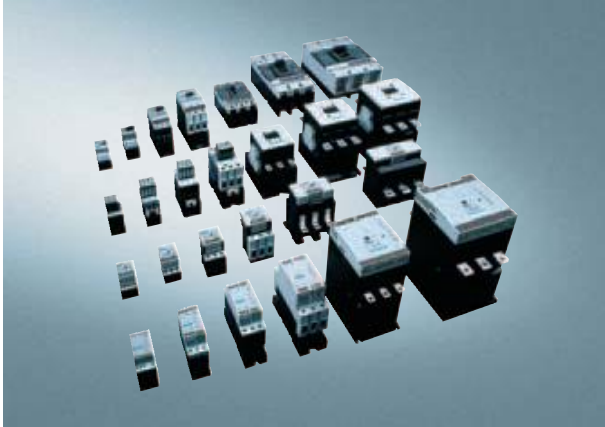
For the SIMATIC NET products referred to above (order numbers 6GK..., 6XV1...) please also note the conditions of application, which can be consulted on the Internet site quoted below.

You can find more information on the Internet at:

<http://www.siemens.com/simatic-net/ik-info>

More information about PROFIBUS can be found in Catalog IK PI, in the chapter *PROFIBUS* according to IEC 61158 / EN 50170.

### Overview



#### ***A perfect team: The SIRIUS modular system for the controlgear cabinet***

Building switchgear cabinets should be quick, easy, flexible and space-saving. But how can all these requirements be met simultaneously? The answer lies in the unique SIRIUS modular

The new 3RB2 solid-state overload relays

system, where you will find everything that you need for switching, protecting and starting motors and industrial systems.

This modular selection of standard components covers the range up to 250 kW / 400 V in just seven sizes which are optimally coordinated, can be combined with ease and use the same accessories. Control technology can be that simple.

Continuous further development and regular innovations ensure that our customers are optimally equipped with SIRIUS and benefit from efficient solutions – today and tomorrow.

All components of the SIRIUS modular system are characterized by a space-saving design and high flexibility. Configuring, installing, wiring and servicing are extremely easy and time-saving to perform.

Regardless of whether you want to build up load feeders with circuit-breakers or overload relays, contactors or soft starters, SIRIUS has the right product for every application.

#### ***SIRIUS stands for innovation***

To be able to meet our customers' requirements tomorrow as well as today we are dedicated to the ongoing development of our product portfolio.



With the newly developed SIRIUS 3RB2 solid-state overload relays for both standard and high-feature requirements it is now possible to provide motor and plant protection over the full range from 0.1 to 630 A. Thanks to the large setting range it is possible, furthermore, to cover this current range with a minimum number of variants, which compared to the "classic" bimetal relays has been reduced by up to 90 %. And this variance can be minimized further by the modular design of the devices for high-feature requirements. With these devices for full motor protection it is possible to transmit warning signals, current values and the like, e.g. for further processing in the PLC.

The SIRIUS 3RB2 solid-state overload relays are coordinated with the other components of the SIRIUS modular system with regards to their electric rating, mechanics and dimensions.

The SIRIUS 3RB2 solid-state overload relays reduce stock and product variance, simplify configuring, mounting and start-up, increase plant availability and enable customized solutions.

# SIRIUS Modular System

## System overview

The new SIRIUS 3RW40 soft starters – for soft starting up to high ratings

2





























Two new types of soft starter in compact SIRIUS design provide the answer for the starting of three-phase asynchronous motors with reduced strain on the load and the network. The new SIRIUS 3RW40 soft starter is used in demanding standard applications. The SIRIUS 3RW44 soft starter is the right choice for high functionality and for difficult starting operations.

For simple to demanding standard applications in which a wye-delta starter has been used up to now, the SIRIUS 3RW40 soft starter provides the best solution for starting applications with zero torque surge. With a power range from 75 to 250 kW (at 400 V) the new SIRIUS 3RW40 soft starters supplement the existing, service-proven product segment of the 3RW30 soft starters with 2-phase control. The use of 2-phase controlled soft starters up to this high power range is unique and was made possible by a new control method which was specially developed by Siemens.

For motor starts with more exacting requirements, which up to now had to be implemented with a frequency converter for example, the SIRIUS 3RW44 soft starter provides the greatest functionality and diagnostics with user-friendly operation. For integration in the process landscape the new 3RW44 high feature soft starter can be retrofitted with an optional PROFIBUS DP module. Thanks to its new torque control the SIRIUS 3RW44 soft starter is a master of difficult starting and ramp-down operations for drives covering a performance range up to 710 kW at 400 V with an inline circuit (up to 1200 kW at 400 V with an inside-delta circuit).



Design

S00	S0	S2	S3	S6	S10	S12
						
SIRIUS 3RV motor starter protectors				SENTRON		
						
SIRIUS 3RT contactors						
						
SIRIUS 3RU/3RB overload relays						
						
SIRIUS 3RW soft starters						

NSA0\_00419a







The seven compact sizes of the modular system

# SIRIUS Modular System

## System overview

2

### More information

	Product	For further information see
	<p><b>Robust and reliable: SIRIUS 3RT contactors</b> Thanks to the extreme robustness and best contact reliability of our contactors, their switching is extremely precise and reliable. At the same time they enable you to build compact control cabinets with a high packing density because the auxiliary switch blocks and coil circuits are inside the contactor's contours. This facilitates expansions and saves a great deal of space in the control cabinet.</p>	<ul style="list-style-type: none"> <li>• A&amp;D Mall: Section <i>Low-Voltage Controls / SIRIUS Industrial Controls / Controls / Contactors and Contactor Assemblies</i></li> <li>• Catalog: LV 1 chapter <i>Controls – Contactors and Contactor Assemblies</i></li> </ul>
	<p><b>Much more than ON/OFF: The SIRIUS 3RV motor starter protectors</b> The SIRIUS 3RV motor starter protectors are compact, current limiting motor starter protectors. They ensure reliable shutdown in the short-circuit case and protect loads and the system from overloads. In addition they are suitable for normal switching duty with loads that have a small number of switching operations as well as for reliable isolation of the equipment from the supply system for maintenance work or modifications.</p>	<ul style="list-style-type: none"> <li>• A&amp;D Mall: Section <i>Low-Voltage Controls / SIRIUS Industrial Controls / Protection Equipment / Motor Starter Protectors up to 100 A</i></li> <li>• Catalog: LV 1 chapter <i>Protection Equipment</i></li> </ul>
	<p><b>Triggering when things get serious: SIRIUS 3RU and 3RB overload relays</b> The overload relays of the SIRIUS family are available in a thermal version as well as in a solid-state version for high-feature applications. They are responsible in the main circuit for the current-dependent overload protection of loads and the other switching and protective devices in the respective load feeder.</p>	<ul style="list-style-type: none"> <li>• A&amp;D Mall: Section <i>Low-Voltage Controls / SIRIUS Industrial Controls / Protection Equipment / Overload Relays</i></li> <li>• Catalog: LV 1 chapter <i>Protection Equipment</i></li> </ul>
	<p><b>Soft starting and ramp-down: SIRIUS 3RW soft starters</b> The 3RW soft starters offer a complete range covering all standard and high-feature motor starting applications. As the result, the advantages of soft starting and ramp-down can be used today in a wide range of applications for realizing optimum machine concepts with greater ease and lower cost.</p>	<ul style="list-style-type: none"> <li>• A&amp;D Mall: Section <i>Low-Voltage Controls / SIRIUS Industrial Controls / Load Feeders, Motor Starters and Soft Starters / 3RW Soft Starters</i></li> <li>• Catalog: LV 1 chapter <i>Load Feeders, Motor Starters and Soft Starters</i></li> </ul>
	<p><b>Everything ready for immediate use: With factory-wired SIRIUS load feeders</b> Load feeders start loads by means of a combination of protective and switching functions. This requires a wide selection of different components in order to be able to realize all starter types. To keep downtimes as short as possible, Siemens offers factory-wired starter solutions.</p>	<ul style="list-style-type: none"> <li>• A&amp;D Mall: Section <i>Low-Voltage Controls / SIRIUS Industrial Controls / Load Feeders, Motor Starters and Soft Starters</i></li> <li>• Catalog: LV 1 section <i>Load Feeders, Motor Starters and Soft Starters</i></li> </ul>
	<p><b>SIRIUS infeed system</b> When you want to supply current to several circuit-breakers in a group or to complete load feeders, all arguments are in favor of using the user-friendly SIRIUS infeed system. Thanks to a terminal block it is also possible to integrate single-pole, two-pole or three-pole components.</p>	<ul style="list-style-type: none"> <li>• A&amp;D Mall: Section <i>Low-Voltage Controls / SIRIUS Industrial Controls / Load Feeders, Motor Starters and Soft Starters / 3RA Fuseless Load Feeders</i></li> <li>• Catalog: LV 1 section <i>Load Feeders, Motor Starters and Soft Starters</i></li> </ul>