Systems

AS-Interface • IO-Link • PROFIBUS

Reference Manual · March 2010

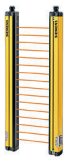
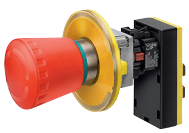
Industrial Controls

SIEMENS

Systems

Introduction

Overview

		Order No.	Page
AS-Interface/ASIsafe			
	ASIsafe enables the integration of safety-oriented components in an AS-Interface network, for example: • EMERGENCY-STOP pushbuttons • Protective door switches • Safety light arrays The simple wiring of AS-Interface, which is a major advantage, is maintained.		
 Safety monitor	**AS-Interface safety monitors** • Key element of ASIsafe • Monitors safe participants and links safe inputs • Ensures safe disconnection • Modular construction according to individual requirements • Available with one or two release circuits with 2-channel configuration • All versions also with removable screw terminals or spring-type terminals • All safety monitors in revised Version 3 with additional options • Filtering out of brief single-channel interruptions in the sensor circuit with the expanded safety monitor Version 3 • Expanded safety monitor with integrated safe slave for controlling a distributed safe AS-i output or for safe coupling a safe signal from one AS-i network to another AS-i network • New configuration software asimon V3 with graphic function diagram presentation Your advantage: Easy to configure safety functions up to Category 4, PL e, SIL 3.	**3RK1**	13
 K45F  S22.5F (SlimLine)	**AS-Interface safety modules** • Complete portfolio of ASIsafe modules - For connection of safety switches with contacts (position switches etc.) as well as solid-state safety sensors (BWS) • Degree of protection IP65/IP67 or IP20 • Very compact dimensions, from 20 mm width • Two or four inputs in Category 2 or one or two inputs in Category 4 / SIL 3 • Four safe inputs or two additional standard outputs available on the module Your advantage: Easy integration of safe signals, be it in the control cabinet or in the field.	**3RK1**	16
 Position switch	**Position switches** • Plastic with degree of protection IP65 and metal with degree of protection IP66/IP67 • ASIsafe Electronics integrated in the enclosure, with low power consumption < 60 mA • Available with separate actuator and tumbler Your advantage: Conventional wiring of safety safety functions required no longer required.	**3SF1**	See "Detecting Device"
	Cable-operated switches • Degree of protection IP65 • Direct connection of cable-operated switches for detection of signals • Metal enclosures	**3SF2**	See "Commanding and Signaling Devices"
 Light curtain and array	**Light curtains/arrays and laser scanners** • Degree of protection IP65 • Connection to AS-Interface either direct or through safe solid-state input module • Up to Category 3 (laser scanners) or Category 4 (light arrays/curtains) Your advantage: Direct connection of active and optical protection for persons to ASIsafe.	**3SF7** **3RG7 84...**	See Catalog FS 10 "Sensor Technology"
 EMERGENCY-STOP for mounting on front plate	**EMERGENCY-STOP pushbuttons** • Degree of protection IP65/IP67 • EMERGENCY-STOP directly on AS-Interface using integrated modules • Metal or plastic version Your advantage: Easy direct connection of service-proven control elements to ASIsafe.	**3SF5**	See "Commanding and Signaling Devices"

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Masters			
	The AS-Interface master connects SIMATIC control systems to AS-Interface. 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.		
 CP 343-2, CP 343-2P for SIMATIC S7-300	**Masters for SIMATIC** • Connection of up to 62 AS-Interface slaves • Integrated analog value transmission • Simple configuration by adopting the actual configuration as the desired configuration at the press of a button • Easy operation in the input/output address range • Monitoring of the supply voltage on the AS-Interface shaped cable	**6GK7**	22
 CP 243-2 for SIMATIC S7-200			
AS-Interface/Routers			
	As an alternative to the CPs, which are plugged directly in the controller it is also possible to use a link as AS-Interface master – at any position beneath the PROFIBUS DP or PROFINET IO.		
 DP/AS-i F-Link	**Routers** • Degree of protection IP20 • PROFIBUS slave or PROFINET IO device and AS-Interface master (single or double master in case of DP/AS-i LINK Advanced and IE/AS-i LINK PN IO) • Connection of up to 62 AS-Interface slaves • Integrated ground-fault monitoring (in case of DP/AS-i LINK Advanced and IE/AS-i LINK PN IO) • User-friendly local diagnostics and local start-up by means of a full graphic display and control keys or through a web interface with a standard browser (in case of DP/AS-i LINK Advanced and IE/AS-i LINK PN IO) • Integrated analog value transmission • Configuring and uploading of AS-Interface configuration in STEP 7 possible • User-friendly selection of AS-Interface slaves • Safety-orientated transition from ASIsafe to PROFIsafe also available as DP/AS-i F-Link Your advantage: Optimum transition to PROFIBUS or PROFINET, integrated in STEP 7.	**6GK1**	25
 IE/AS-i LINK PN IO			
 DP/AS-i LINK Advanced			
 DP/AS-Interface Link 20E			

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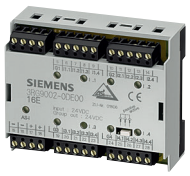
AS-Interface/Slaves			
	Slaves contain the AS-Interface electronics and connection options for sensors and actuators in the field and in the control cabinet. A total of up to 62 slaves can be connected to one bus. The slaves then exchange their data in cyclic mode with a control module (master).		
 K20 digital module	**Field modules/Digital I/O modules IP67 - K60, K45 and K20** • Degree of protection IP65/IP67 • Modules available with up to degree of protection IP68/69K • ATEX-certified modules available for Ex Zone 22 • Connection sockets in M8/M12 • Up to eight inputs and four outputs • A/B technology available • Contacting protected against polarity reversal • Standard rail mounting and wall mounting possible • Mounting of the module on the base plate using just one screw • Diagnostics LEDs Your advantage: Reduction of mounting and start-up times by up to 40 %.	**3RK1, 3RK2**	35, 47, 52
 K45 digital module			
 K60 digital module			
 K60 analog module	**Field modules/Analog I/O modules IP67 - K60** • Degree of protection IP65/IP67 • Detects or transmits analog signals locally • 2/4-channel • Input modules for up to four sensors with current signal, sensors with voltage signal or sensors with thermal resistor • Output modules for current or voltage Your advantage: Easy integration of analog values.	**3RK1**	60
 SlimLine	**Cabinet modules** • Degree of protection IP20 • No M12 plugs required for connection • Up to 16 inputs • Narrow design of the SlimLine modules with width from 22.5 mm • Removable, finger-safe terminal blocks that cannot be mixed up (SlimLine) • Flat design of the flat modules for small control cabinets and confined conditions • Connection with screw-type or spring-type terminals • Standard rail mounting and wall mounting possible • Diagnostics LEDs Your advantage: Modules enable use in cabinets and small local control cabinets.	**3RG9, 3RK1**	65
 F90 module			
 Flat module			

		Order No.	Page
 Counter module	**Modules with special functions/Counter modules** • Degree of protection IP20 • For evaluation of pulses • Connection with screw-type or spring-type terminals Your advantage: Evaluation of pulses which exceed even the clock frequency of AS-Interface.	**3RK1**	86
 Ground-fault detection module	**Modules with special functions/Ground-fault detection modules** • Degree of protection IP20 • Display using LEDs • Two signaling outputs Your advantage: Automatic diagnostics of ground faults on AS-Interface.	**3RK1**	87
 Overvoltage protection module	**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.	**3RK1**	89
 3RA61 compact feeder	**Compact feeders** • 3RA61 direct-on-line starters, 3RA62 reversing starters • Degree of protection IP20 • Up to 15 kW/400 V • Wide setting range • Weld-free • Removable terminals • Optional AS-i add-on module Your advantage: Less space and wiring work needed in the control cabinet, no welding, connection to AS-Interface.	**3RA6**	see Manual SIRIUS Compact starter 3RA6
 Compact starter	**Motor starters/Compact starters (400 V AC)** • Degree of protection IP65/IP67 • Up to 5.5 kW at 400/500 V AC • Electromechanical or solid-state design • Optional with brake contact Your advantage: No local control cabinets required thanks to completely factory-wired load feeder with IP65 protection.	**3RK1**	see Manual AS-Interface Compact starter
 ECOFAST motor starter	**Motor starters/ECOFAST motor starters and soft starters** • Degree of protection IP65/IP67 • Standardized interfaces according to ECOFAST Specification (DESINA-conform) • Mechanical or solid-state soft switching function Your advantage: Less space required in the control cabinet, the starters can be installed near the motor or be plugged on the motor.	**3RK1**	see Manuals ECOFAST
 Motor starter	**Motor starters/Motor starters (24 V DC)** • Degree of protection IP65/IP67 • Direct-on-line starters, double starters or reversing starters • Up to 70 W • Quick stop function Your advantage: Simple motor starter in service-proven module construction for 24 V DC motors.	**3RK1**	see Load Feeders and Motor starters

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 Pushbutton unit	**Pushbutton units and indicator lights** • Modular construction according to individual requirements • Metal and plastic version • Available with standard or A/B slaves and ASIsafe slave • With LEDs Your advantage: Complete 3SF58 operating system with simple AS-Interface connection for your plant.	**3SF58**	See "Commanding and Signaling Devices"
 Signaling column	**Signaling columns** • Many optical and acoustic elements can be combined • Also as A/B slaves according to AS-Interface Specification 2.1 • Up to three signaling elements can be connected using an adapter element • With LEDs or incandescent lamps Your advantage: Signaling columns for monitoring production sequences and for visual or acoustic warnings in emergency situations, with easy AS-Interface connection.	**8WD4**	See "Commanding and Signaling Devices"
 Connection for LOGO!	**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.	**3RK1**	91
AS-Interface/Power supply units	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 energy on one cable.		
 IP20, 3 A  IP20, 8 A	**Power supply units** *Power supply units with safety class IP20:* • With wide performance spectrum from 2.6 to 8 A • UL/CSA approval means the power supplies can be used worldwide The 2.6 A version is approved according to NEC Class 2 • Less space required thanks to compact dimensions • Easy and quick installation • Certified for global use • Integrated ground-fault and overload detection save the need for additional components and makes applications reliable • Diagnostics memory, remote indication and remote reset allow fast detection of faults in the system • Removable terminal blocks reduce downtimes • The ultra-wide input range enables single- and two-phase applications (8 A version) Your advantage: Optimum performance for each application.	**3RX9**	92
AS-Interface/Transmission media	AS-Interface shaped cable for connection of network stations.		
 Shaped cable	**AS-Interface shaped cables** • No polarity reversal thanks to trapezoidal shape • Cables made of optimized material for different operating conditions • Special version according to UL Class 2 available Your advantage: Fast replacement and connection to AS-Interface by piercing method.	**3RX9**	95

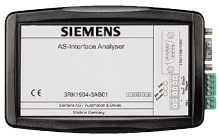
AS-Interface/System components and accessories

Accessories comprise tools for mounting, installation and operating as well as individual components.

Repeater
(6GK1 210-0SA01)

Extension plug

Addressing unit



Analyzer

M12 sealing cap

Cable terminating piece

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Repeaters and extension plugs • Repeaters for extending the AS-Interface cable by 100 m per repeater • Extension plug for the extension of the AS-Interface segment to max. 200 m • A maximum of two repeaters and one extension plug can be installed in series (max. 300 m) • Parallel switching of several repeaters possible (star configuration option) • Maximum size increases (when combined) to more than 600 m • Easy mounting • IP67 module enclosure Your advantage: Lower infrastructure costs, more possibilities of use and greater freedom for plant planning.	**3RK1, 6GK1**	Repeaters: 97 Extension plugs: 98
Addressing units • Addressing all stations of the AS-Interface network (standard and A/B slaves) • Reading out the slave profile (I/O.ID.ID2 and ID1 code) • Setting the ID1 code and temporary setting of the slave parameters (e. g. for testing of analog slaves) • Measurement of AS-Interface voltage • Enables direct setting of outputs and reading in of a slave's inputs • Storage of complete system configurations Your advantage: Easiest way to address and parameterize the slaves.	**3RK1**	101
AS-Interface analyzers • Diagnostics units for completely checking the quality and function of an AS-Interface installation • Transmission of collected data through an RS 232 interface to a PC, evaluation by software • Easy and user-friendly operation • Automatically generated test logs • Advanced trigger functions enable exact analysis • Process data can be monitored online • In addition to digital I/O data it is also possible to view analog values and safety slaves in data mode Your advantage: Preventative testing of an AS-Interface network is possible, recorded logs facilitate remote diagnostics.	**3RK1**	102
Miscellaneous accessories Individual components such as sealing caps, cable adapters, distributors etc.	**3RG7, 3RG9, 3RK1, 3RX9, 6ES7**	103

Introduction

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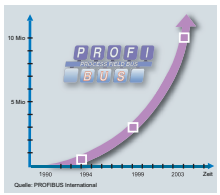
IO-Link			
	The newly developed IO-Link system offers the following advantages for connecting complex (intelligent) sensors/actuators: • Only 2 units required: IO-Link master and IO-Link device • Dynamic changing of sensor/actuator parameters directly by the PLC • Devices can be exchanged during operation without need for re-parameterization • Consistent diagnostic information as far as the sensor/actuator level • Uniform and greatly reduced wiring of different sensors/actuators • Reduction of parameterization tools • Transparent representation of all parameter and diagnostics data • Signals and indicators for preventive maintenance Your advantage: Fast commissioning and flexible maintenance thanks to central data storage, less wiring work because no passive distributors are needed.	**6ES7 138** **3RK5**	105
PROFIBUS			
	• PROFIBUS is an efficient, open and robust bus system which guarantees smooth communication • The system is fully standardized, thus enabling standardized components from different manufacturers to be connected without problem • 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 • Fast local assembly and commissioning using the FastConnect cabling system • Constant monitoring of the network components by means of a simple and effective signaling concept • High protection for your investment because existing systems can be expanded without repercussions • High availability thanks to ring redundance with OLM • Optimum connection of the actuator-sensor level by router to AS-Interface		109

Note:

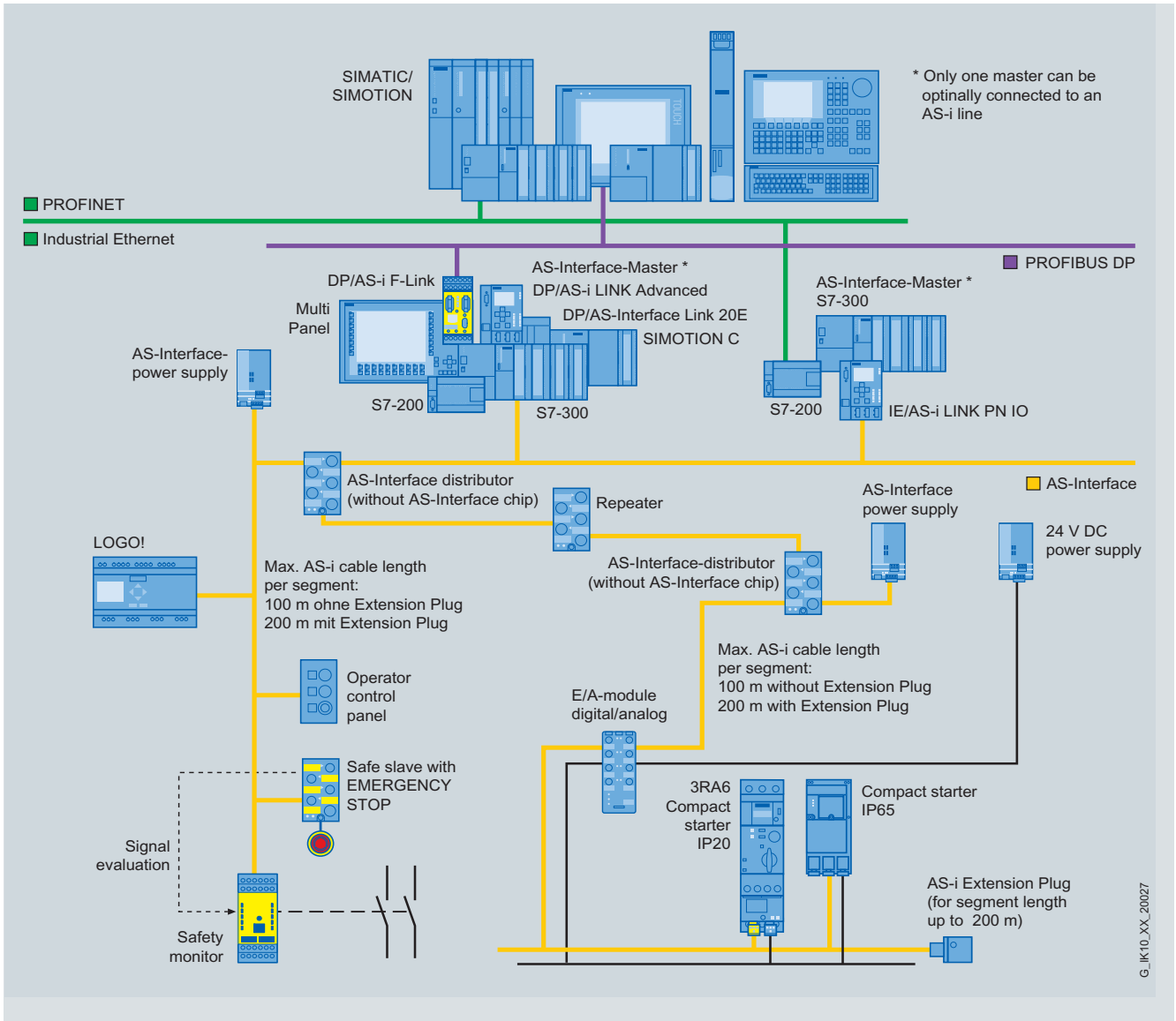
	Screw terminals
	Spring-type terminals
	Combicon connection
	These connections are indicated in the Technical specifications by orange backgrounds.

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 energy 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 version there is not only far less risk of errors but also less effort during maintenance and servicing.



Example of a system configuration

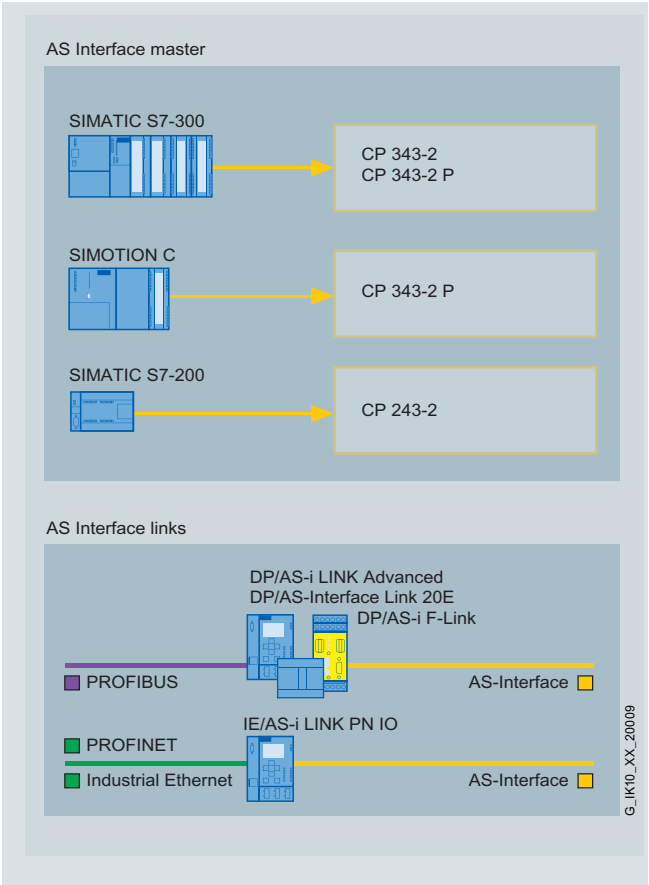
Communication overview

Overview

System components

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

- Master interface modules for central control units such as SIMATIC S7, distributed peripherals
- AS-Interface shaped cables
- Optional network components such as repeaters
- Power supplies for slaves
- Modules for connection of standard sensors/actuators,
- Actuators and sensors with integrated slave ASIC
- Safety modules for transmitting safe data through AS-Interface
- Addressing unit for setting the slave addresses during commissioning.



AS-Interface masters and AS-Interface links (see Routers)

Technical specifications

Standard	EN 50295/IEC 61158
Topology	Line, star or tree structure (same as electrical wiring)
Transmission medium	Unshielded two-conductor cable (2 x 1.5 mm^2) for data and auxiliary power
Connection methods	Contacting of the AS-Interface cable by insulation piercing method
Maximum cable length	100 m without repeater/extension plug; 200 m with extension plug; 300 m with 2 repeaters connected in series; 600 m with extension plug and 2 repeaters connected in series. Longer cable lengths also possible when connecting further repeaters in parallel
Maximum cycle time	5 ms for maximum configuration with standard addresses, 10 ms for maximum configuration with A/B addresses, profile-specific for Spec 3.0 slaves;
Number of stations per AS-Interface line	31 slaves acc. to AS-Interface Spec. V2.0; 62 slaves (A/B technology) acc. to AS-Interface Spec. V2.1 and V3.0, integrated analog value transmission
Number of binary sensors and actuators	Max. 124 DI/124 DO acc. to Spec. V2.0; Max. 248 DI/186 DO acc. to Spec. V2.1; Max. 496 DI/496 DO acc. to Spec. 3.0
Access control	Cyclic polling master slave method, cyclic data transfer by host (PLC, PC)
Error safeguard	Identification and repetition of faulty message frames

More information

Please always observe the general conditions of application and further information for the modules referred to above. These can be consulted at the following Internet site:

http://support.automation.siemens.com/WW/view/en/10805888/130000

AS-Interface system manual

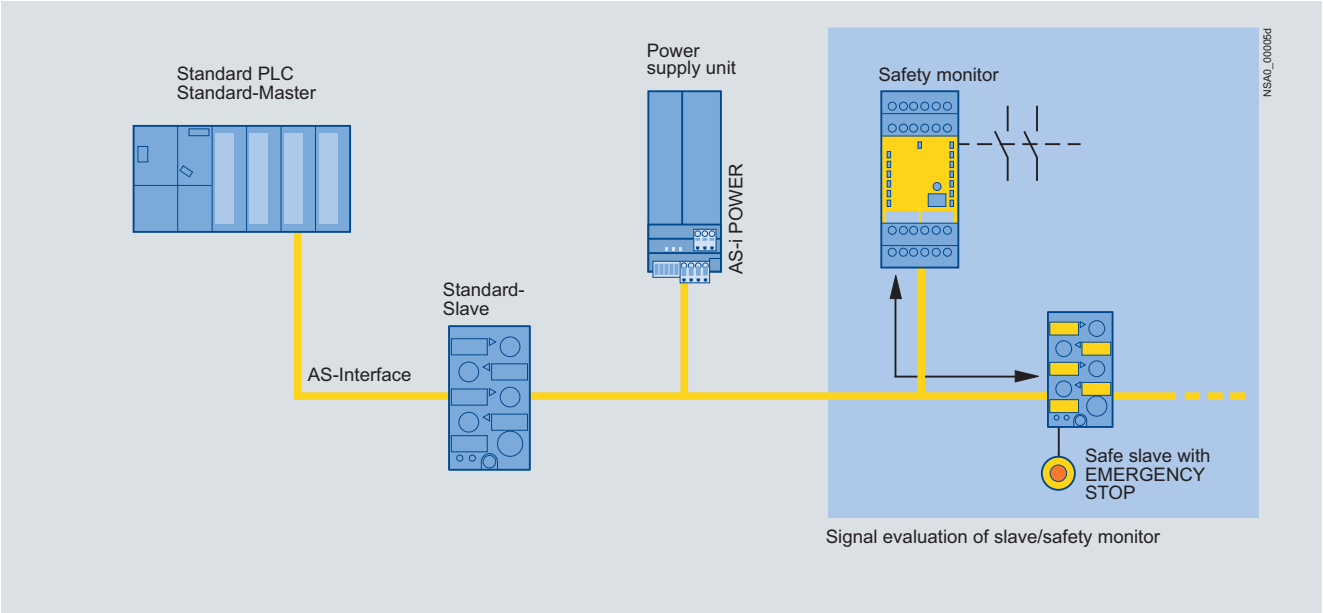
More information about AS-Interface is available in the AS-Interface system manual.

The German-language AS-Interface System Manual can be downloaded free from the Internet at:
http://support.automation.siemens.com/WW/view/de/26250840

The English-language AS-Interface System Manual can be downloaded free from the Internet at:
http://support.automation.siemens.com/WW/view/en/26250840

A print version of the AS-Interface System Manual is also available in both German and English; see LV 1 Chapter "Systems" --> "AS-Interface" -->"System components and accessories" --> "Miscellaneous accessories".

Overview



Secure communication and standard communication on AS-Interface

Safety is included

The ASIsafe concept supports the direct integration of safety-related components, such as emergency-stop switches, protective door switches or safety light arrays, in the AS-Interface network. These are fully compatible with the familiar AS-Interface components (masters, slaves, power supplies, repeaters, etc.) according to IEC 62026/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 procedure for safety-oriented signals is configured for implementing applications up to Category 4 according to EN 954-1, up to PL e according to EN ISO 13849-1 and up to SIL 3 according to IEC 61508.

Software

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

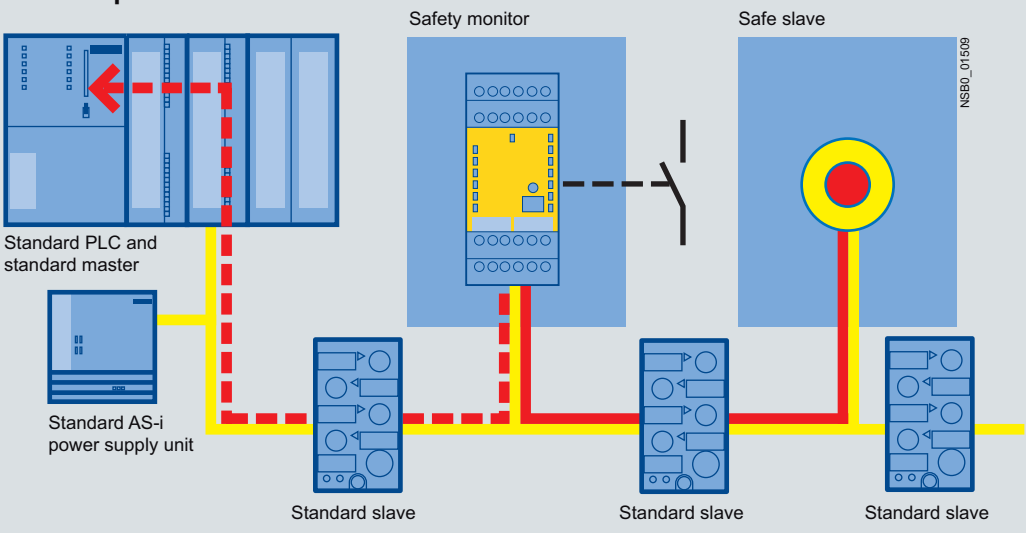
Introduction

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 safety modules and the safety-related sensors with integrated interface.

The components of ASIsafe



Standard PLC and standard AS-i master:
Central installation at the PLC and distributed installation using DP-AS-i Links is possible.

Safety monitor:
The safety monitor evaluates all safe inputs and ensures safe disconnection.

Safe slave:
Safe signals are recorded by the safe slaves.

Standard AS-i slaves:
Standard and safety-oriented slaves can be connected to one bus.

Signal evaluation safe slave/safety monitor
AS-Interface cable
Extended ASIsafe diagnostics (through regular I/O transfer)

Function

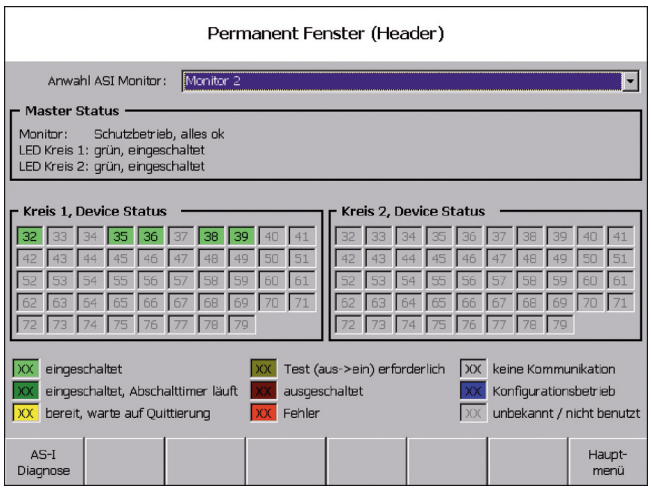
Like the standard stations, the safe stations send their information to the master after master calls. The safety monitor monitors this transmission from the safe stations to the master and switches into the safe state.

The safety monitor is configured with the software "asimon". 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.

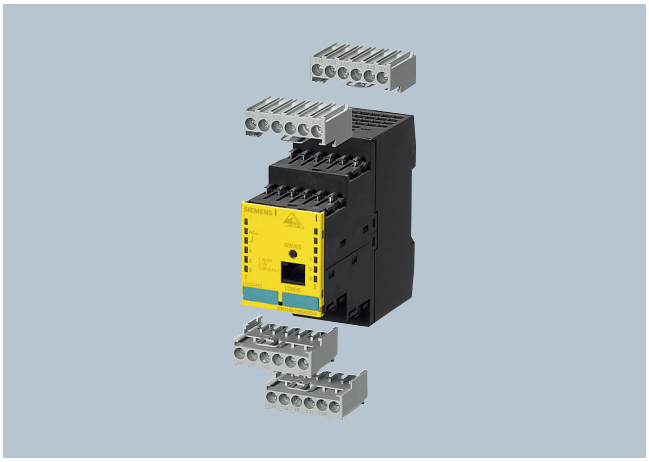
Integration

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.

Integration within TIA is performed using function blocks which are offered on the ASIsafe CD-ROM for S7-200 and S7-300. These function blocks enable detailed diagnostics of all parameterized modules. This requires an AS-i address to be issued to the safety monitor by means of the configuration software. Evaluation is performed by means of function blocks in the PLC. With the help of prefabricated WinCC flexible modules this evaluation can then be visualized system-wide on existing HMI devices (OP/TP 270 and higher).



Overview



Safety monitor with screw terminals (removable terminals)

The safety monitor is the centerpiece of ASIsafe Solution local. It enables safety-orientated responding to signals from the ASIsafe (input) slaves on the same AS-i network and has 1-2 enabling circuits. A safe application is configured using a PC. Various application-specific operating modes can be selected for this. They include, for example, an EMERGENCY-STOP function, door 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 module for STEP 7, which is included on the ASIsafe CD, the full diagnostics spectrum can be processed further in the higher-level PLC.

The AS-Interface safety monitor is currently offered in the latest Version 3 (Firmware V3.x) and is available in three expansion levels.

Both basic/expanded expansion levels are available with one or two-channeled configured enabling circuits.

The expanded safety monitor is also available as a version with integrated safe slave which can be used for the control of a safe AS-i output or for safe coupling of a switch signal on another safety monitor or F-Link.

The safety monitor is used in an AS-Interface bus system to monitor protective devices, e. g. protective doors, EMERGENCY-STOP switches, etc.

The safety monitor can be used up to Category 4 acc. to EN 954-1, to PL e acc. to EN ISO 13849-1 and to SIL 3 acc. to IEC 61508.

The safety characteristics for the maximum service life (T1) of 20 years are:

- PFD: 7.2×10^{-5} (monitor type 1, 2, 3, 4)
  esp. 6.1×10^{-5} (monitor type 6)
- PFH D: 7.2×10^{-5} (all monitor types)

The user must calculate the PFD value of the total loop.

Note:

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

The safety monitor is mounted on the standard mounting rail. Disassembly from the standard mounting rail is quick and easy and requires no tools. With an additional accessory (push-in lugs), the safety monitor can also be screwed on.

Application

The safety monitor acts as a "bus-based safety relay". It provides a user-friendly introduction to safety-orientated communication over fieldbuses thanks to its simple configuration using the graphic PC software asimon. The standard infrastructure of the AS-i network (AS-i master under standard PLC, AS-i power supply unit) can still be used without restriction.

The monitor comes in three expansion levels:

- Basic safety monitor
  with starter set of modules and basic functionality
- Expanded safety monitor with expanded features and functionality
- The expanded safety monitor is also available as a version with integrated safe slave which can be used for the control of a distributed safe AS-i output or for safe coupling of a switch signal on another safety monitor or F-Link.

Basic safety monitor versus expanded safety monitor

	Basic	Expanded
Number of monitoring modules	32	48
Number of OR gates (inputs)	2	6
Number of AND gates (inputs)	--	6
Wildcards for monitoring modules	✓	✓
Deactivating of monitoring modules	✓	✓
Fault release	✓	✓
Diagnostics hold	✓	✓
A/B slaves for acknowledgment	✓	✓
Safe time functions	--	✓
"Button" function	--	✓
Debouncing of contacts	--	✓
Filtering out of brief disconnections	--	✓ (as of Version 3)
Control of safe AS-i output/safe coupling	--	✓ (in version with integrated safe slave)

✓ Available
-- Not available

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.

AS-Interface safety monitors

Features of the basic safety monitor

- Wildcards and deactivating of monitoring modules
  Wildcards are available for the configuration. They are integrated in the configuration and diagnostics and can be easily activated if required. User-friendly 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.
- Diagnostics hold:
  Disconnections can be "frozen" until an acknowledgment comes through a standard slave. This function provides valuable help in the event of short-time causes of disconnection.
- Also from Version 3 upwards:
  The standard output data bits of safe input slaves can be processed for acknowledgment, fault release and other non-safety-oriented signals.

Additional features 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 and
  - Pulse
- "Button" function:
  Additional acknowledgment option for restarting the system using an additional button. The button function can be assigned to any input or output signal of a standard slave 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.
- Also from Version 3 upwards:
  Filtering out of brief single-channel interruptions in the sensor circuit. A tolerance time can be set during which the brief opening of a safety-oriented input contact is ignored in order to increase plant availability.

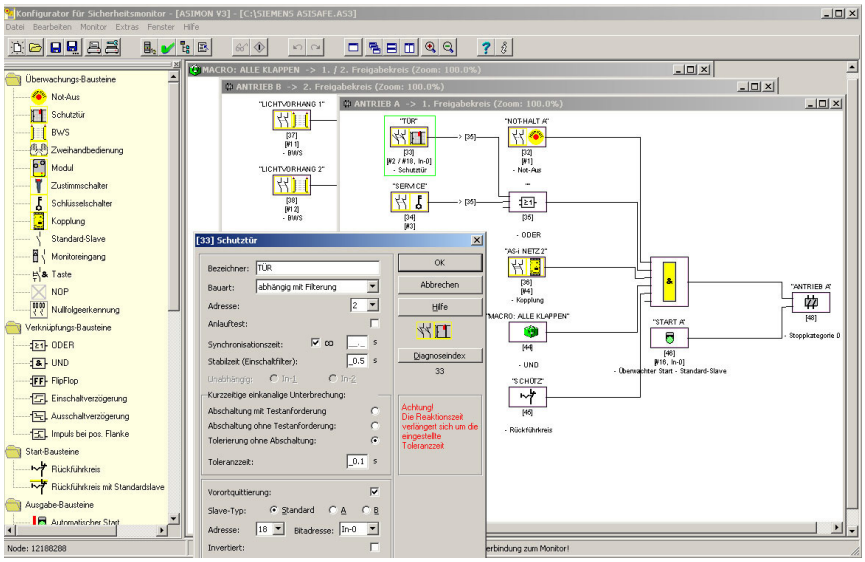
Additional features of the expanded safety monitor with integrated safe slave

This new safety monitor type offers the additional features of the expanded safety monitor plus the following features:

- Filtering out of brief single-channel interruptions in the sensor circuit.
- Actuating a safe distributed actuator (safe output module of e. g. safe valves or motor starters) parallel to the 2nd enabling circuit.
- Alternatively: Use as a "safe coupler" between two ASIsafe networks. A safe input signal on network 1 can thus act on an enabling circuit of network 2. A detour through a hard-wired safe input module on network 2 is not required in this case.

Configuration software asimon V3: new features

- Multi-window system
- Creation of the safety logic in graphic function diagram form, with changeover to former tree presentation possible
- No "preprocessing" of the safety logic
- Management of user-specific modules
- Downward compatibility:
  - Existing asimon V2 projects can be loaded
  - Can also be used on all former versions of the safety monitor
    - with the corresponding scope of functions
- Graphic printout of the safety logic
- Easier system start-up:
  - Teaching the code sequences of safe AS-Interface slaves
  - Manual input of code sequences also possible in addition
  - Selectable number of simulated slaves
- Simpler diagnostics using AS-Interface through assignment of a diagnostics index to the software function block
- Signaling the switching state of the signaling and relay outputs to higher-level PLCs using a simulated AS-Interface slave
- New functions for filtering out brief interruptions and for controlling a safe AS-i output or for safe coupling of two AS-i networks



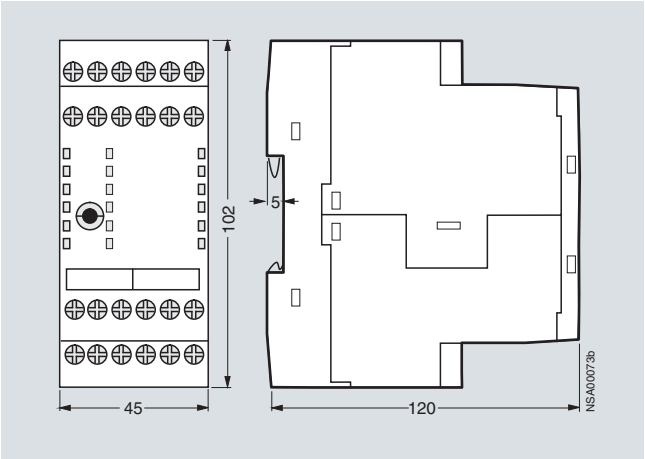
Interface of the configuration software asimon V3

Technical specifications

3RK1 105 safety monitor

Rated operational current		
I_e/AC-12 up to 250 V	A	3
I_e/AC-15		
• 115 V	A	3
• 230 V	A	3
I_e/DC-12 up to 24 V	A	3
I_e/DC-13		
• 24 V	A	1
• 115 V	A	0.1
• 230 V	A	0.05
Response time	ms	≤ 40
Achievable performance level acc. to EN ISO 13849-1		PL e
Achievable SIL (or SILCL) acc. to EN 62061		SIL 3
Failure probability (PFH_D) acc. to EN 62061		
For max. service life (T1) of 20 years		9.1×10^{-9}
Failure probability (PFD) acc. to EN 61062		7.2×10^{-5} (monitor type 1, 2, 3, 4) esp. 6.1×10^{-5} (monitor type 6)
Ambient temperature	°C	0 ... +60
Storage temperature	°C	-40 ... +85

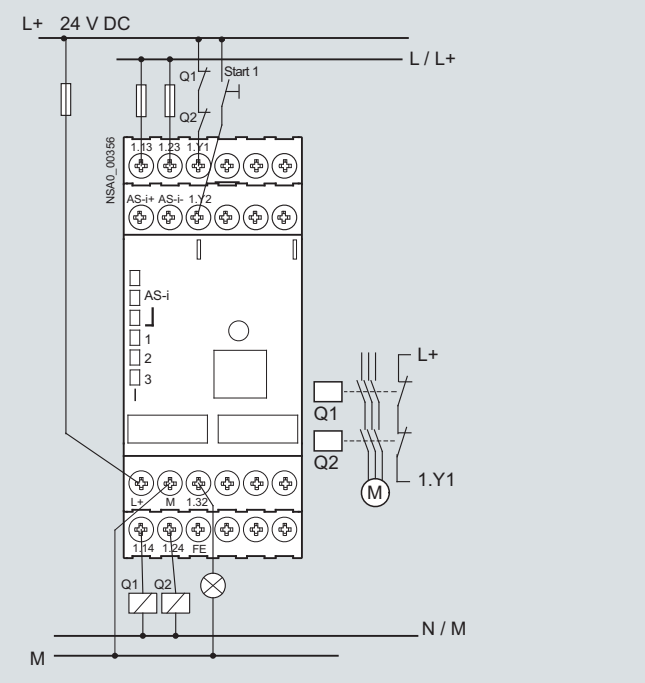
Dimensional drawings



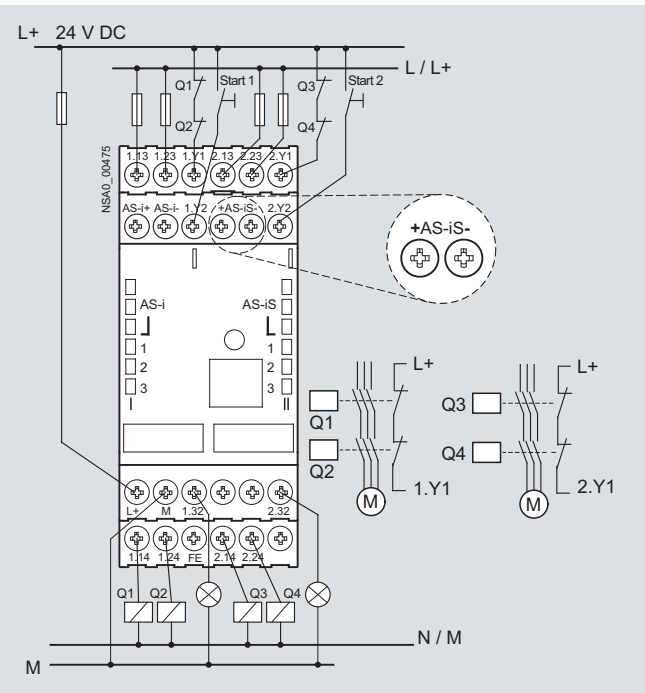
Safety monitor

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.



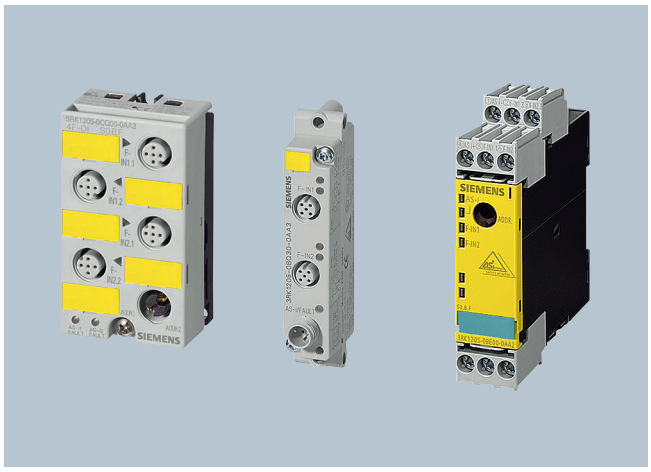
Safety monitor type 1, type 3 – with one enabling circuit



Safety monitor type 2, type 4, type 6 – with two enabling circuits (terminals AS-iS+/AS-iS- only for type 6)

AS-Interface safety modules

Overview



Safety modules for AS-Interface (ASIsafe modules) are available for field use in degree of protection IP67 (K20F and K45F compact modules) and for the control cabinet (S22.5F SlimLine modules) in degree of protection IP20.

A very compact module with an optimum price /performance ratio is thus available for very application.

Following modules are available for selection:

K20F compact safety modules for operation in the field

Being only 20 mm wide, the K20F module is particularly well suited for applications where modules need to be arranged in the most confined space. The K20F modules are connected to the AS-Interface with a round cable with M12 cable box instead of with the AS-Interface flat cable. This enables extremely compact installation. The flexibility of the round cable means that it can also be used on moving machine parts without any problems. The K20 modules are also ideal for such applications as their non-encapsulated design makes them particularly light in weight.

K45F compact safety modules for operation in the field

The platform of the K45F modules covers the following variations:

- Connection of ("mechanical") switches/safety sensors with contacts:
  - K45F 2F-DI: two safety-oriented inputs in operation up to Category 2 according to EN 954-1. If Category 4 is required, a two-channel input is available on the module.
  - K45F 2F-DI/2DO: There are also two standard outputs in addition to the safe inputs. Supplied from the yellow AS-i cable
  - K45F 2F-DI/2DO U_{aux}: same as K45F 2F-DI/2DO, but supplied from the black 24 V DC cable
  - K45F 4F-DI: four safety-oriented inputs in operation up to Category 2, two for Category 4. Extremely compact double slave (uses two full AS-i addresses).
- Connection of solid-state switches/safety sensors (non-contact protective devices, BWS):
  - K45F LS (light sensor): safe input module for connection of solid-state safety sensors with testing semiconductor outputs (OSSD). In particular non-contact protective devices (BWS) such as active, optoelectronic light arrays and light curtains for Type 2 and Type 4 according to IEC/EN 61496. Transmitters as well as receivers are supplied with power from the yellow AS-i cable. Matching sensor cables and optionally a separate transmitter supply module are available as accessories.

S22.5F SlimLine safety modules for operation in control cabinets and local control cabinets

The S22.5F SlimLine safety module has two safety inputs. The safe connection of signals to ASIsafe networks in the control 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.

In addition there are two S22.5F module versions which have two standard outputs in addition to the two safety 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

		K20F compact safety modules	K45F compact safety modules				
		2 inputs, safe	2 inputs, safe	4 inputs, safe	2 inputs, safe	2 inputs, safe	2 inputs, safe, BWS for 1 light curtain
		--	--	--	2 outputs, standard	2 outputs, standard with U_{aux}	
		2 F-DI	2 F-DI	4 F-DI	2 F-DI/2 DO	2 F-DI/2 DO with U_{aux}	2 F-DI (solid-state, LS - light sensor)
		3RK1 205-0BQ30-0AA3	3RK1 205-0BQ00-0AA3	3RK1 205-0CQ00-0AA3	3RK1 405-0BQ20-0AA3	3RK1 405-1BQ20-0AA3	3RK1 205-0BQ21-0AA3 LS type 2 3RK1 205-0BQ24-0AA3 LS type 4
I/O configuration		0			7		0
ID/ID2 code		B/0	B/F		B/F		B/1
PFD value		Makes no notable contribution to the PFD of the overall system, comprised of the AS-Interface bus and safety monitor					
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.5			26.5 ... 31.5		
Total current input	mA	≤ 45		≤ 70	≤ 250	≤ 60	≤ 60
Inputs							
• Sensors		Mechanical switching contact			Mechanical switching contact		Testing semiconductor outputs (OSSD)
• Input current High	mA	I_{peak} ≥ 5			I_{peak} ≥ 5		
Assignment of inputs		• Pin 1 and Pin 2: Connection/switching contact • Pin 3 and Pin 4: Connection/switching contact • Pin 5: Not assigned			• Pin 1 and Pin 2: Connection/switching contact • Pin 3 and Pin 4: Connection/switching contact • Pin 5: Not assigned		• Type 2 receiver: Pin 1/4/7: - Pin 2/3: + Pin 5: CH1 Pin 6: CH2 Pin 8: FE • Type 4 receiver: Pin 1/4 diag Pin 2/3: + Pin 5: CH1 Pin 6: CH2 Pin 7: - Pin 8: FE • Type 2/4, alternative receiver (5-pole): Pin 1: + Pin 2: CH2 Pin 3: - Pin 4: CH1 Pin 5: FE • Type 2/4 transmitter: Pin 1/4: + Pin 3: - Pin 5: FE
Outputs							
• Type of output		--			Solid-state		--
• Current carrying capacity per output DC 12/13 typical	A	--			0.15	0.7	--
• Maximum summation current per module	A	--			0.15	1.4	--
• Socket assignment of outputs		--			• Pin 3: "-" • Pin 4: Output • Pin 5: Not assigned		--
• Short-circuit protection		--			Built-in		--
• Induction protection		--			Built-in		--
• External power supply 24 V DC		--			--	Using black AS-Interface flat cable	--
• Watchdog		--			Built-in		--
Assignment of outputs							
• OUT 1 (D0)		--			Socket 3 - Pin 4		--
• OUT 2 (D1)		--			Socket 4 - Pin 4		--
AS-Interface certificate		Yes			Yes		

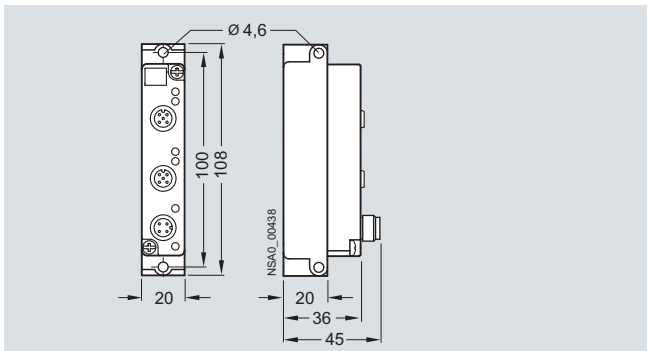
AS-Interface safety modules

		K20F compact safety modules	K45F compact safety modules				
		2 inputs, safe	2 inputs, safe	4 inputs, safe	2 inputs, safe	2 inputs, safe	2 inputs, safe, BWS for 1 light curtain
		--	--	--	2 outputs, standard	2 outputs, standard with U_{aux}	
		2 F-DI	2 F-DI	4 F-DI	2 F-DI/2 DO	2 F-DI/2 DO with U_{aux}	2 F-DI (solid-state, LS - light sensor)
		3RK1 205-0BQ30-0AA3	3RK1 205-0BQ00-0AA3	3RK1 205-0BQ00-0AA3	3RK1 405-0BQ20-0AA3	3RK1 405-1BQ20-0AA3	3RK1 205-0BQ21-0AA3 LS type 2 3RK1 205-0BQ24-0AA3 LS type 4
Approvals		UL, CSA under application	UL, CSA		UL, CSA		
Degree of protection		IP65/67			IP65/67		
Ground terminal		--			--		Pin 5 or 8: Sensor grounding FE: Grounding lug
Ambient temperature	°C	-25 ... +70			-25 ... +70		
Storage temperature	°C	-40 ... +85			-40 ... +85		
Number of I/O sockets		2			4		2 Transmitter to bottom right socket, receiver (8-pole) to top right socket (Siemens 3RG7843/46), receiver (5-pole) to top left socket
Status displays							
• Display of I/Os		Yellow LED			Yellow LED		
• U_{aux}		Not required			Not required	Green LED	Not required
• Display of AS-Interface/ diagnostics		Green/red LED			Green/red LED		
Connection		Using M12 feeder	Using mounting plate for K45 compact module		Using mounting plate for K45 compact module		

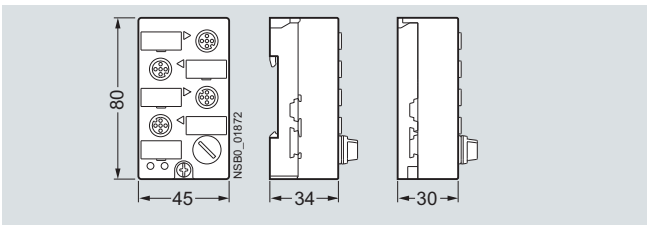
		S22.5F SlimLine safety module, with screw-type or spring-type terminal 2 inputs, safe		
		--	**2 outputs, standard**	**2 outputs, standard with U_{aux}**
		2 F-DI	2 F-DI/2 DO	2 F-DI/2 DO with U_{aux}
• Screw terminals		3RK1 205-0BE00-0AA2	3RK1 405-0BE00-0AA2	3RK1 405-1BE00-0AA2
• Spring-type terminals		3RK1 205-0BG00-0AA2	3RK1 405-0BG00-0AA2	3RK1 405-1BG00-0AA2
I/O configuration		0	7	7
ID/ID2 code		B/F	B/F	B/F
PFD value		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
Operational voltage according to AS-Interface specification	V	26.5 ... 31.5	26.5 ... 31.5	26.5 ... 31.5
Total current input	mA	≤ 45	≤ 250	≤ 60
Inputs				
• Sensors		Mechanical switching contact	Mechanical switching contact	Mechanical switching contact
• Input current Low	mA	Contact open	Contact open	Contact open
• Input current High	mA	Contact closed I_{peak} ≥ 5	Contact closed I_{peak} ≥ 5	Contact closed I_{peak} ≥ 5
Assignment of inputs		• F-IN1.1 and F-IN1.2: Connection of switching contact • F-IN2.1 and F-IN2.2: Connection of switching contact	• F-IN1.1 and F-IN1.2: Connection of switching contact • F-IN2.1 and F-IN2.2: Connection of switching contact	• F-IN1.1 and F-IN1.2: Connection of switching contact • F-IN2.1 and F-IN2.2: Connection of switching contact

		S22.5F SlimLine safety module, with screw-type or spring-type terminal 2 inputs, safe		
		--	2 outputs, standard	2 outputs, standard with U_{aux}
		2 F-DI	2 F-DI/2 DO	2 F-DI/2 DO with U_{aux}
Screw terminals		3RK1 205-0BE00-0AA2	3RK1 405-0BE00-0AA2	3RK1 405-1BE00-0AA2
Spring-type terminals		3RK1 205-0BG00-0AA2	3RK1 405-0BG00-0AA2	3RK1 405-1BG00-0AA2
Outputs				
• Type of output		--	Solid-state	Solid-state
• Current carrying capacity per output DC 12/13 typical	A	--	0.15	0.7
• Maximum summation current per module	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 Schematics/Wiring – SlimLine Safety Module S22.5F	See section Schematics/Wiring – SlimLine Safety Module S22.5F
• Assignment of outputs				
- OUT 1		--	D0	D0
- OUT 2		--	D1	D1
AS-Interface certificate		Yes	Under application	Under application
Approvals		UL, CSA	UL, CSA	UL, CSA
Mechanical specifications				
• Degree of protection		IP20	IP20	IP20
• Shock load (IEC 60068-2-6)	g/ ms	15/11	15/11	15/11
• Vibratory load (IEC 60068-2-27)	Hz Hz Hz	5 ... 500 5 ... 26: 0.75 mm amplitude 26 ... 500: 2 g	5 ... 500 5 ... 26: 0.75 mm amplitude 26 ... 500: 2 g	5 ... 500 5 ... 26: 0.75 mm amplitude 26 ... 500: 2 g
Ground terminal		--	--	--
Ambient temperature	°C	-25 ... +70	-25 ... +70	-25 ... +70
Storage temperature	°C	-40 ... +85	-40 ... +85	-40 ... +85
Number of I/O sockets		--	--	--
Status displays				
• 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
Connection		Using screw terminals or spring-type terminals	Using screw terminals or spring-type terminals	Using screw terminals or spring-type terminals

Dimensional drawings

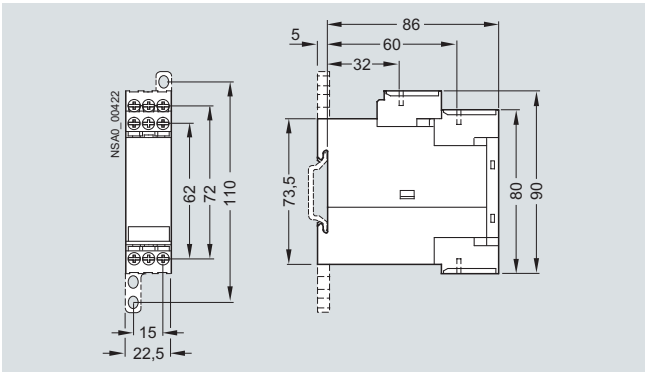


K20 module, two safe inputs, M12 (3RK1 205-0BQ30-0AA3)

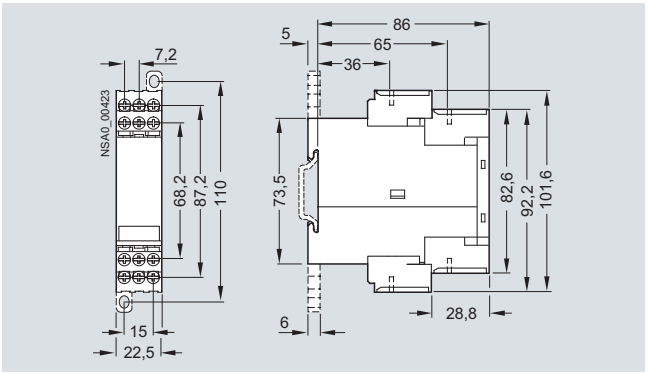


K45F compact safe module:
3RK1 205-0BQ00-0AA3, 3RK1 205-0CQ00-0AA3,
3RK1 405-0BQ20-0AA3, 3RK1 405-1BQ20-0AA3,
3RK1 205-0BQ21-0AA3, 3RK1 205-0BQ24-0AA3

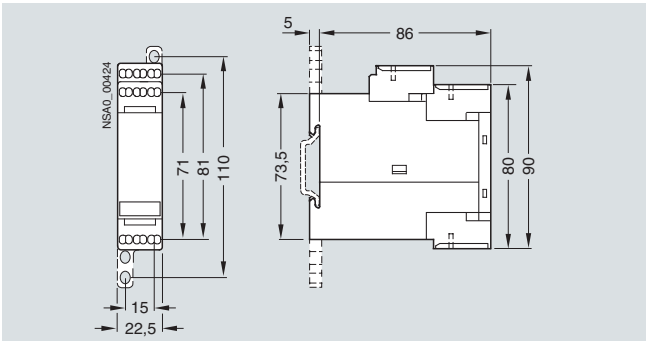
AS-Interface safety modules



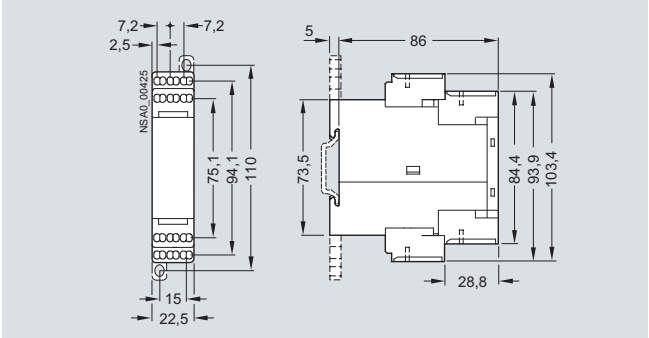
S22.5F SlimLine safety module, 2 F-DI, screw terminals
3RK1 205-0BE00-0AA2



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



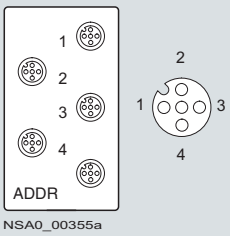
S22.5F SlimLine safety module, 2 F-DI, spring-type terminals
3RK1 205-0BG00-0AA2



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

Schematics

Logical assignments - K45F compact safety module

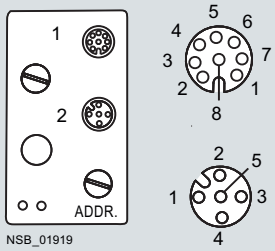


Socket	Assignment / data sheets / function
1	Pin 1 and Pin 2: Influences the bits D0 and D1 = Channel 1 Pin 3 and Pin 4: Influences the bits D2 and D3 = Channel 2 Pin 5 not assigned
2	Pin 1 and Pin 2: Influences the bits D2 and D3 = Channel 2 Pin 5 not assigned
3	Not assigned
4	Not assigned

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 plug 3RK1 901-1AA00 at socket 2.

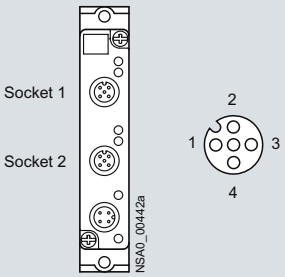
Pin 3 of socket 1 is connected to Pin 1 of socket 2, and Pin 4 of socket 1 is connected to Pin 2 of socket 2. If both pairs of sockets are assigned, the inputs are linked.

Logical assignments - K45F LS compact safety module



Socket	Assignment/data sheets/function
1	Type 2 receiver: Pin 1/4/7: - Pin 2/3: + Pin 5: CH1 Pin 6: CH2 Pin 8: FE Type 4 receiver: Pin 1/4 Diag Pin 2/3: + Pin 5: CH1 Pin 6: CH2 Pin 7: - Pin 8: FE
2	Type 2/4, alternatively receiver (5-pole): Pin 1: + Pin 2: CH2 Pin 3: - Pin 4: CH1 Pin 5: FE Type 2/4 transmitter: Pin 1/4: + Pin 3: - Pin 5: FE

Logical assignments - K20F compact safety module

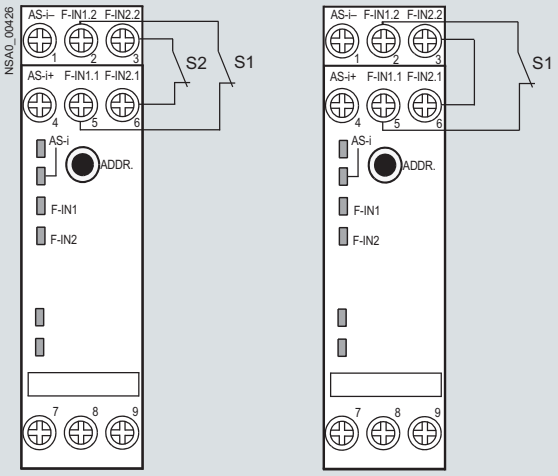


Socket	Assignment / data sheets / function
1	Pin 1 and Pin 2: Influences the bits D0 and D1 = Channel 1 Pin 3 and Pin 4: Influences the bits D2 and D3 = Channel 2 Pin 5 not assigned
2	Pin 1 and Pin 2: Influences the bits D2 and D3 = Channel 2 Pin 3, Pin 4 and Pin 5 not assigned

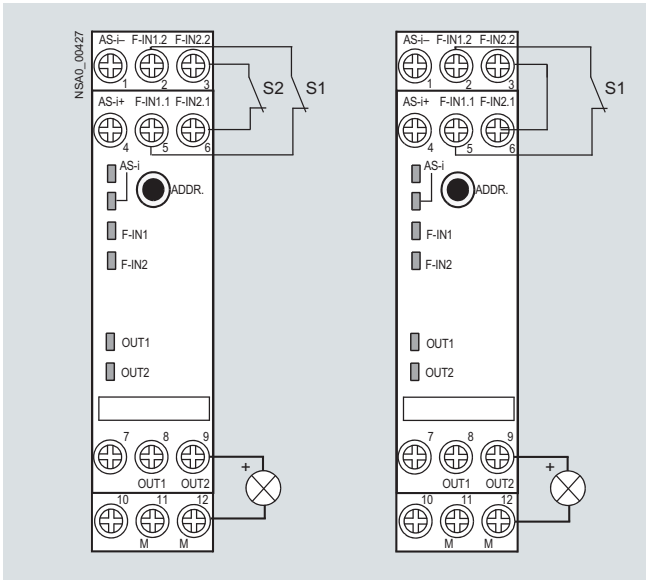
If only a single-channel switch is to be connected to the module, it must be connected to Channel 1. The second channel must be bridged. This is done with the M12 plug 3RK1 901-1AA00 at socket 2.

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.

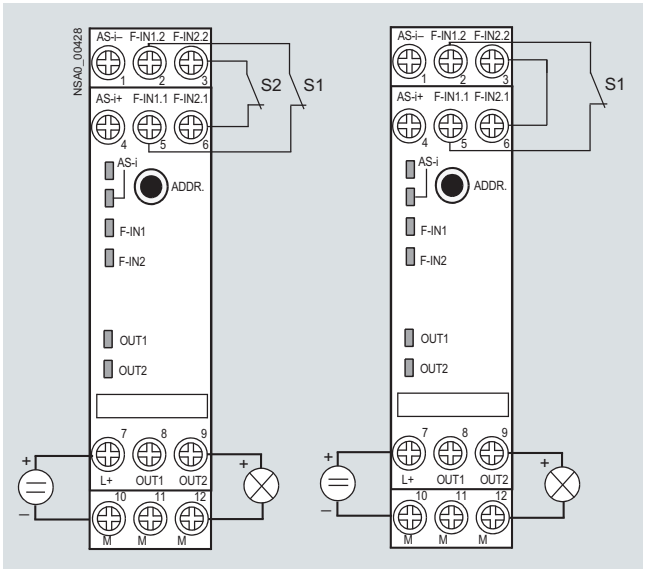
Wiring – S22.5F SlimLine safety module



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



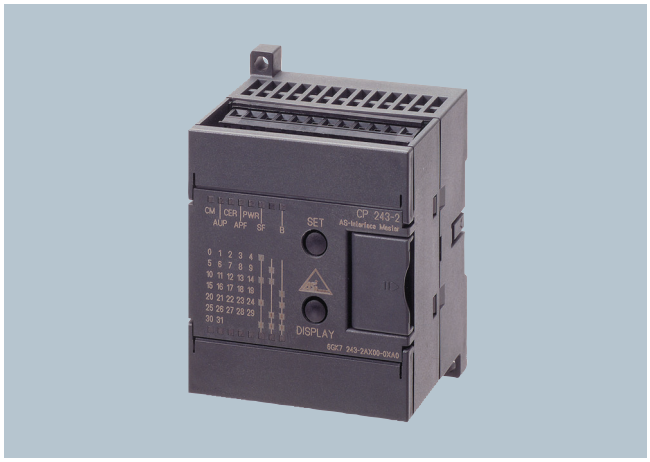
Wiring for S22.5F SlimLine safety module, 2F-DI/2 DO without U_{aux}, Category 2 (right) and Category 3/4 (left)
3RK1 405-0BE00-0AA2 (screw terminals)
3RK1 405-0BG00-0AA2 (spring-type terminals)



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

CP 243-2

Overview



The CP 243-2 is the AS-Interface master for the SIMATIC S7-200. This communications processor (6GK1 243-2AX01-0AX0) supports the extended AS-Interface specification V2.1 and performs the following functions:

- Connection of up to 62 AS-Interface slaves possible
- Integrated analog value transmission (analog profiles 7.3 and 7.4)
- Supports all AS-Interface master functions according to the extended AS-Interface specification V2.1
- Status displays of operating states and indication of the readiness for operation 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 SIMATIC S7-200

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 expanded addressing (A/B).

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 (logic) slots. The operating mode of the CP 243-2 can be set with the status byte and the control byte using the user program.

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

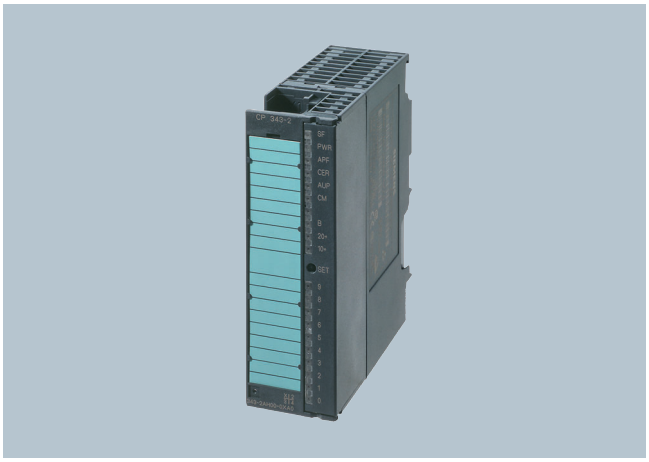
Configuration

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

Technical specifications

AS-Interface specification		V 2.1
Bus cycle time	ms	5 with 31 slaves 10 with 62 slaves
Interfaces		
• Assignment of address area in AG		16 bytes AE/AA, 1 byte DE/DA
• AS-Interface connection		Screw terminals
Power consumption		
• Using backplane bus	mA	Max. 220 at 5 V DC
• From AS-Interface cable	mA	Max. 100
Power loss	W	Approx. 2
Permissible ambient conditions		
• Operating temperature		
- Horizontal installation	°C	0 ... +55
- Vertical installation	°C	0 ... +45
• Transport/storage temperature	°C	- 40 ... +70
• Relative humidity	%	Max. 95 at +25 °C
Structural design		
• Module format		S7-22x expansion module
• Dimensions (W x H x D)	mm	71 x 80 x 62 (H+16 mm with holes for wall mounting)
• Weight	g	250
• Space requirement		1 mounting space

Overview



The CP 343-2 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 possible
- Integrated analog value transmission (all analog profiles)
- Supports all AS-Interface master functions according to the AS-Interface Specification V3.0
- Status displays of operating states and indication of the readiness for operation 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

Design

The CP 343-2 is connected to the S7-300 like an I/O module. 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
- Pushbuttons for switching the master operating mode and for adopting the AS-i slave's existing actual configuration as the target configuration.

Function

The CP 343-2 supports all specified functions of the AS-Interface specification V3.0. This means that up to 62 digital or analog slaves can be operated on the AS-Interface through expanded addressing (A/B). The integrated analog value processing permits easy access to the analog values.

The CP 343-2 occupies 16 bytes each in the I/O address area of the SIMATIC S7-300. The digital I/O data of the standard slaves and A slaves are saved in this area. The digital I/O data of the B slaves and the analog I/O data can be accessed with the S7 system functions for read/write data record. A slaves and B slaves are slaves according to AS-Interface Specification V2.1 and V3.0.

If required, master calls can be performed with the command interface FC ASI_3422, e. g. read/write parameters, read/write configuration.
The FC including a STEP7 sample program can be downloaded from the Internet at
http://support.automation.siemens.com/WW/view/en/5581657.

Configuration

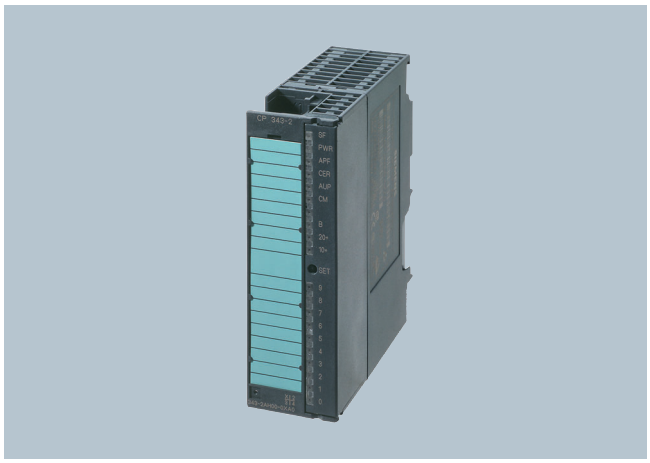
All connected AS-Interface slaves are configured at the press of a button. No further configuration of the CP is required.

Technical specifications

AS-Interface specification		V3.0
Bus cycle time	ms	5 with 31 slaves 10 with 62 slaves
Interfaces		
• Assignment of address area in AG		16 bytes I/O
• AS-Interface connection		S7-300 front connector with terminal connection
Supply voltage	V DC	+5, using backplane bus
Power consumption		
• From backplane bus	mA	Max. 200 at 5 V DC
• From AS-Interface cable	mA	Max. 100
Power loss	W	2
Permissible ambient conditions		
• Operating temperature	°C	0 ... +60
• Transport/storage temperature	°C	-40 ... +70
• Relative humidity, max.	%	95 at +25 °C
Structural design		
• Module format		S7-300 design
• Dimensions (W x H x D)	mm	40 x 125 x 120
• Weight	g	190
• Space requirement		1 mounting space

CP 343-2P

Overview



The CP 343-2P 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:

- **Supports the configuration of the AS-Interface-network with STEP 7 V5.2 and higher**
- Connection of up to 62 AS-Interface slaves possible,
- Integrated analog value transmission (all analog profiles)
- Supports all AS-Interface master functions according to the AS-Interface Specification V3.0
- 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

Design

The CP 343-2P is connected to the S7-300 like an I/O module. 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 readiness for operation of all connected and activated slaves
- Pushbuttons for switching the master operating mode and for adopting the AS-i slave's existing actual configuration as the target configuration.

Function

The CP 343-2P supports all specified functions of the AS-Interface specification V3.0. This means that up to 62 digital or analog slaves can be operated on the AS-Interface through expanded addressing (A/B). The integrated analog value processing permits easy access to the analog values.

The CP 343-2P occupies 16 bytes each in the I/O address area of the SIMATIC S7-300. The digital I/O data of the standard slaves and A slaves are saved in this area. The digital I/O data of the B slaves and the analog I/O data can be accessed with the S7 system functions for read/write data record. A slaves and B slaves are slaves according to AS-Interface Specification V2.1 and V3.0.

If required, master calls can be performed with the command interface FC ASI_3422, e. g. read/write parameters, read/write configuration. The FC including a STEP7 sample program can be downloaded from the Internet at
http://support.automation.siemens.com/WW/view/en/5581657

Configuration

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

The CP 343-2P also supports configuring of the AS-Interface network with STEP 7 V5.2 and higher.Specifying the AS-i configuration in HW-Config facilitates the setting of slave parameters and documentation of the plant. In particular the user-friendly configuring of Siemens AS-Interface slaves using the slave selection dialog is possible. Uploading the ACTUAL configuration of an already configured AS-Interface network is also supported. The saved configuration cannot be overwritten at the press of a button and is therefore tamper-proof.

Technical specifications

AS-Interface specification		V3.0
Bus cycle time	ms	5 with 31 slaves 10 with 62 slaves
Interfaces		
• Assignment of address area in AG		16 bytes I/O
• AS-Interface connection		S7-300 front connector with terminal connection
Supply voltage	V DC	+5, using backplane bus
Power consumption		
• From backplane bus	mA	Max. 200 at 5 V DC
• Using AS-Interface from the AS-Interface shaped cables	mA	Max. 100
Power loss	W	2
Permissible ambient conditions		
• Operating temperature	°C	0 ... +60
• Transport/storage temperature	°C	-40 ... +70
• Relative humidity, max.	%	95 at +25 °C
Structural design		
• Module format		S7-300 design
• Dimensions (W x H x D)	mm	40 x 125 x 120
• Weight	g	190
• Space requirement		1 mounting space
Configuration software		Optional: STEP 7 V5.2 and higher

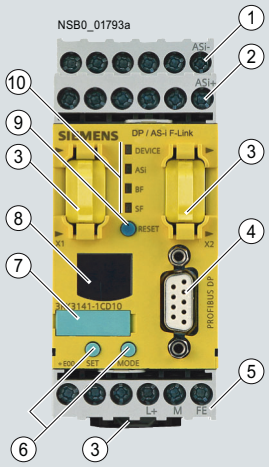
Overview

PN	DP-M	DP-S	ASi-M
		■	■

- Compact, safety-oriented router between PROFIBUS (DP Slave) and AS-Interface
- Monitoring the inputs of safety-oriented digital AS-i slaves (ASIsafe slaves) and forwarding of data through PROFIsafe. No additional safety-oriented components required for the AS-Interface (e. g. safety monitor)
- Connection of up to 62 AS-Interface slaves possible
- Supports all AS-Interface master functions in accordance with AS-Interface specification V3.0
- Accustomed simple transmission of non-safety-oriented input/output data of all AS-i slaves
- Integrated analog value transmission (all analog profiles)
- Direct integration in PROFIBUS networks.
  Optional integration in PROFINET environments through PROFINET/PROFIBUS gateway (IE/PB Link PN IO) or through SIMATIC S7 315/317/319 F PN/DP or S7-416F-3 PN/DP
- Connection to ET 200S with IM-F-CPU using DP master module is possible
- Optimum TIA integration in STEP 7 using Object Manager, integration in non-Siemens engineering tools using PROFIBUS GSD file
- Local diagnostics using LEDs and display with control keys

Design

- Rugged, slim plastic enclosure, degree of protection IP20, for standard rail mounting or wall mounting (with adapter)
- Compact design:
  - Front display for indication of the operating state and readiness for operation of all connected AS-Interface slaves
  - 2 buttons on the front for start-up, call up of diagnostic information
  - 4 LEDs for indication of the operating state of the device, of PROFIBUS DP and the AS-Interface network
  - Front PROFIBUS DP connection with sub D connector
  - Removable terminal blocks for connection of AS-i +/- and supply voltage (over 24 V DC PELV power supply unit)
  - Narrow width (45 mm)
- Operation without fans and batteries
- Fast device replacement in the event of a fault



① Removable terminal block
ASi-: terminal for AS-i -
(blue core of yellow AS-I cable)

② Removable terminal block
ASi+: terminal for AS-i +
(brown core of yellow AS-I cable)

③ Cover for service and system interface
(factory-fitted)

④ PROFIBUS DP interface (D-Sub 9-pole)

⑤ Removable terminal block
L+: 24 V DC
M: Ground to 24 V DC
FE: Functional ground

⑥ SET button: Confirmation
MODE button: Selection

⑦ Labels

⑧ Displays: Two-line, red dot matrix display

⑨ RESET button: Factory default setting
(over coded operation)

⑩ DEVICE LED: Device status
AS-i LED: AS-i voltage/state
BF LED: Bus fault (PROFIBUS DP)
SF LED: Group fault

Front view of DP/AS-i F-Link

DP/AS-i F-Link

Function

Communication principle

The PROFIBUS DP master or the safe control communicates with the AS-Interface slaves over the DP/AS-i F-Link. The AS-Interface process data are mapped into different data ranges for non-safety-oriented input/output data and safety-oriented input data.

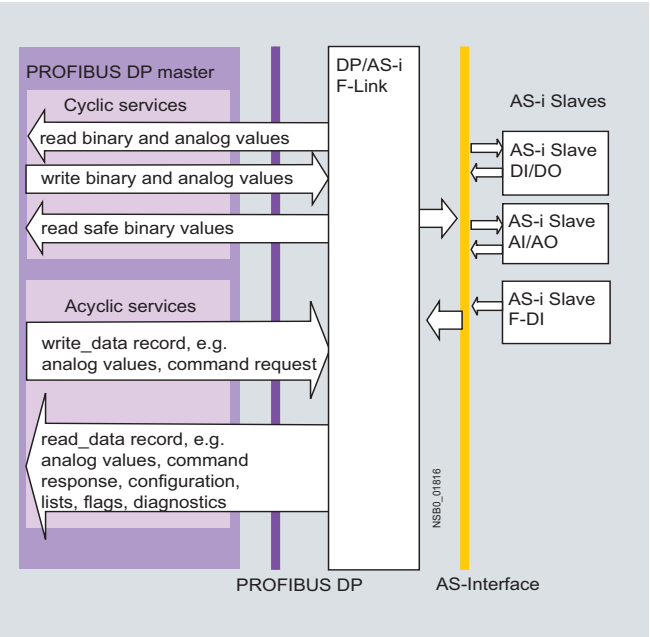
Diagnostics

Extensive diagnostics is possible using the four LEDs, display and control keys or SIMATIC S7. Further details can be found in the manual.

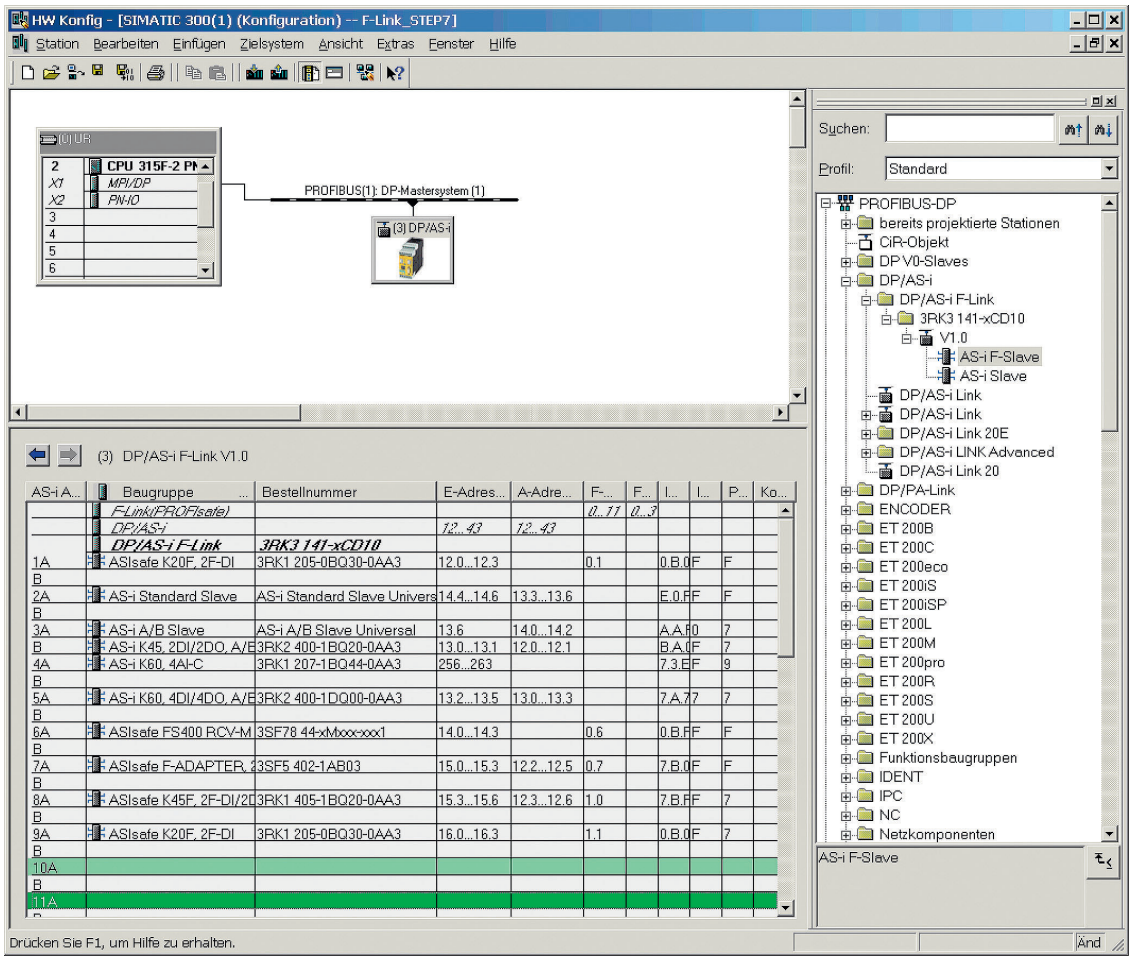
Configuration

The DP/AS-i F-Link can be configured by means of STEP 7 Version V5.4 SP1 and higher. AS-interface slaves from Siemens in particular can be conveniently parameterized via the slave selection dialog. Uploading the actual configuration of an already configured AS-Interface network is also possible.

Alternatively, DP/AS-i F-Link can be integrated in the engineering tool using the PROFIBUS GSD file.

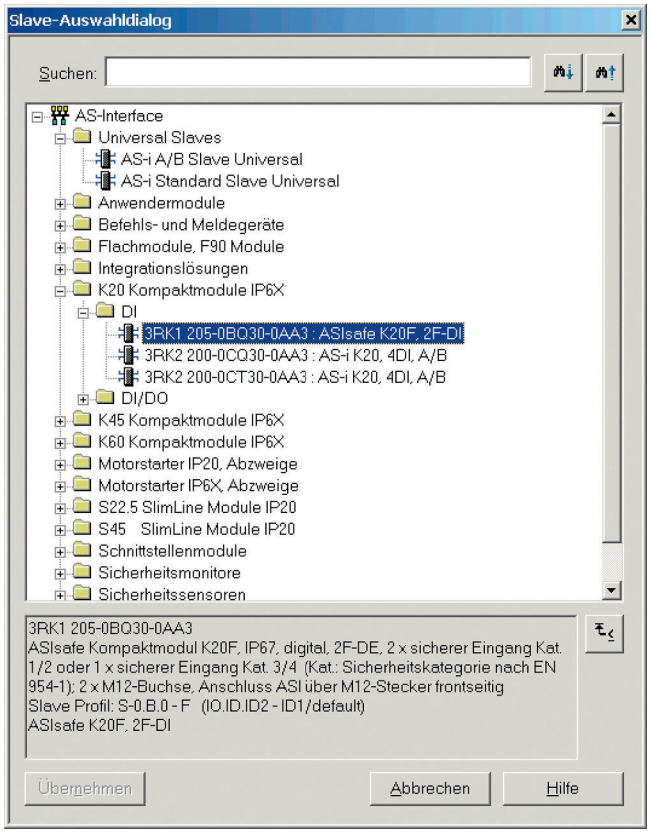


Communication principle for data exchange between PROFIBUS DP master and AS-Interface slaves



Configuration: AS-Interface address table assigned with AS-Interface slaves

Importing the actual configuration for the activation of the AS-Interface slaves is also possible directly on the device - to help in commissioning.



Configuration: Slave selection dialog

Programming

In contrast to the AS-Interface safety monitor, the DP/AS-i F-Link functions solely as a gateway, and does not process its own safety logic.

Programming of the safety function is implemented at the level of the higher-level failsafe PLC, e. g.:

- With Distributed Safety, Version V5.4 SP1 or higher for SIMATIC S7-300F/416F
- With the SAFETY INTEGRATED "SI-Basic" or "SI-COMFORT" NCU Software for SINUMERIK 840D pl/sl
- The safety program and standard program can both access the connected AS-Interface slaves' digital and analog I/O data directly via the CPU's I/O address space.

Technical specifications

Transmission rates per AS-Interface line		
• AS-Interface bus cycle time	ms	5 (for 31 slaves) 10 (for 62 slaves, or acc. to AS-Interface Specification V3.0)
• PROFIBUS transmission rate	Mbit/s	Max. 12
Interfaces		
• AS-Interface connection		Over removable terminal blocks (with screw or spring-type terminals)
• Connection to PROFIBUS		1 x 9-pole Sub D socket
• 24 V DC supply voltage (PELV)		3-pole clamping contacts including functional ground, over removable terminal blocks (with screw or spring-type terminals)
Display		2 lines à 4 characters (red LED dot matrix)
Operation		Over three buttons (Set/Mode/Reset)
Supply voltage		
• From AS-Interface		Acc. to AS-Interface Specification V3.0
• 24 V DC (PELV)	V DC	24, functional ground
Power consumption		
• From 24 V DC	mA	Max. 110
Degree of protection		IP20
Permissible ambient conditions		
• Operating temperature	°C	0 ... +60
• Transport and storage temperature	°C	-40 ... +85
• Relative humidity	%	Max. 95 (at +25 °C)
• Operating altitude	m above sea level	2000
Structural design		
• Mounting		Onto standard mounting rail or wall mounting (with adapter)
• Dimensions (W x H x D)	mm	45 x 104 x 120
• Weight	g	Approx. 300
Supported AS-Interface master profile		M4 (acc. to AS-Interface Specification V3.0)
Configuration of DP/AS-i F-Link and the AS-Interface slaves		Using buttons on the front panel With STEP 7, Version V5.4 SP1 or higher for SIMATIC S7-300F/416F With GSD
Programming of safety functions		With Distributed Safety, Version V5.4 SP1 or higher for SIMATIC S7-300F/416F With the SAFETY INTEGRATED "SI-Basic" or "SI-COMFORT" NCU Software for SINUMERIK 840D pl/sl
Approvals		CE, TÜV, UL AS-Interface certificate

More information

The manual DP/AS-i F-Link can be downloaded free of charge from the Internet at http://support.automation.siemens.com/WW/view/en/24196041.

More presales information can be found at http://www.siemens.com/as-interface/master.

IE/AS-i LINK PN IO

Overview

PN	DP-M	DP-S	ASi-M
■			■

- Compact router between Industrial PROFINET/Industrial Ethernet and AS-Interface
- Single and double AS-Interface master (according to AS-Interface Specification V3.0) for connection of 62 AS-Interface slaves or 124 AS-Interface slaves (for double master)
- Integrated analog value transmission (all analog profiles)
- Integrated ground-fault monitoring for the AS-Interface cable
- User-friendly local diagnostics and start-up by means of a full graphic display and control keys or through a web interface with a standard browser
- Optimum TIA integration via STEP 7
- Integration in non-Siemens engineering tools using PROFINET type file (GSD)
- Vertical integration (standard web interface) through Industrial Ethernet
- Supply voltage from the AS-Interface shaped cable or alternatively with 24 V DC
- Module exchange without entering the connection parameters (IP address etc) using C-PLUG (optional)
- Costs saved by the double AS-Interface master when large volumes of project data are involved

Design

- Compact plastic enclosure in degree of protection IP20 for standard rail mounting
- Compact design;
  - Display in the front panel for detailed indication of the operating state and readiness for operation of all connected and activated AS-Interface slaves
  - 6 pushbuttons for commissioning and testing the AS-Interface line directly on the IE/AS-i LINK PN IO
  - LED indication of the operating state of PROFINET IO and AS-Interface
  - Integrated 2-port switch (RJ45 socket) for connection to Industrial Ethernet supports the line topology with an external switch
  - User-friendly start-up, diagnostics and testing of IE/AS-i LINK PN IO through a web interface using a standard browser
  - Supply voltage from the AS-Interface shaped cable or alternatively with 24 V DC
  - Small mounting depth thanks to recessed plug mounting
- Simple mounting on standard mounting rail
- Operation without fans and batteries
- Fast replacement of devices in case of fault; Using the optional C-PLUG exchange medium (not included in scope of supply) means that absolutely no manual setting on the replacement device is required during replacement.

Function

The IE/AS-i LINK PN IO enables a PROFINET IO controller to cyclically access the I/O data of all the slaves of a lower-level AS-Interface segment. According to the extended AS-Interface specification V3.0, up to 62 slaves, each with 4 digital inputs and 4 digital outputs as well as analog slaves, can be connected per AS-Interface line. Also supported are the expanded slave types with higher I/O data volume according to AS-i Specification V3.0.

IE/AS-i LINK PN IO occupies, in maximum configuration, 62 bytes of input data and 62 bytes of output data in the IO controller in which the digital I/O data of the connected AS-Interface slaves (standard and O/I slaves) of an AS-i line are stored. The double master occupies twice the number of bytes. The required I/O address space can be adjusted to the number of slaves. Integrated evaluation of analog signals is equally as simple as access to digital values, as the analog process data are also located directly in the CPU's I/O address space.

PROFINET IO controllers are able in addition to initiate AS-Interface master calls (e. g. to write parameters, change addresses, read diagnostic values) through the acyclic PROFINET services.

Using an operating display in AS-Interface Link it is possible to fully commission the lower-level AS-i line. The IE/AS-i LINK PN IO is equipped with two Ethernet ports, which are connected via an internal switch. It is additionally possible to use the integrated web servers via the Ethernet, thus further increasing the ease of use already described. Even firmware updates are easily possible using this method of access.

The optional C-PLUG supports module exchange without entering the connection parameters (IP address etc.), keeping downtimes to a minimum in the event of a fault.

Diagnostics

Extensive diagnostics is possible using the display and control keys, web interface or STEP 7, for example:

- Operating state of link
- Status of link as PROFINET IO device
- Diagnostics of the AS-Interface network
- Message frame statistics
- Standard diagnostics pages in the web interface for quick access to diagnostics via Ethernet using standard browsers.

Configuration

STEP 7 V5.4 or higher is required for configuring the full functional scope of the IE/AS-i LINK PN IO.

Uploading the AS-Interface configuration into STEP 7

is also possible during STEP 7 configuration from V5.4 SP2 upwards. In addition, AS-i slaves from Siemens can conveniently be configured at this stage in HW Config (slave selection dialog).

Alternatively, the IE/AS-i LINK IO can be integrated using the PROFINET type file (GSD) in the engineering tool (e.g. STEP 7 versions below V5.4 SP2 or engineering tools from non-Siemens manufacturers).

Technical specifications

Transmission rates per AS-i line		
• AS-Interface bus cycle time	ms	5 with 31 slaves; 10 with 62 slaves
Ethernet transmission rate	Mbit/s	10/100, autosensing
Interfaces		
• AS-Interface connection		
- With single master		1 x 4-pole screw terminals (removable)
- With double master (2 AS-i lines)		2 x 4-pole screw terminals (removable)
• Connection to Ethernet		2 x RJ45 socket (switchports)
• Optional: 24 V DC supply voltage		3-pole screw terminals (removable) including connection of functional ground for integrated ground-fault monitoring
• Slot for exchange medium		C-PLUG
Display		128 x 64 pixel with background lighting
Keys		Membrane keyboard (6 keys)
Supply voltage		
• From AS-Interface cable (AS-i line 1)		Acc. to AS-Interface Specification EN 50295
• Optional	V DC	24 V, functional ground
Power consumption		
• From AS-Interface shaped cable	mA	Max. 250
Load capacity		
• Power loss	W	7.5
Degree of protection		IP20
Permissible ambient conditions		
• Operating temperature		
- Horizontal mounting	°C	0 ... +60
- Vertical mounting	°C	0 ... +45
• Transport and storage temperature	°C	-30 ... +70
• Relative humidity	%	Max. 95 at +25 °C
• Operating altitude	m	3000 above sea level
Structural design		
• Mounting		On standard mounting rail
• Dimensions (W x H x D)	mm	90 x 132 x 88.5
• Weight	g	About 380
Supported AS-Interface master profile		M4 (acc. to AS-Interface Specification V3.0)
Configuring the AS-Interface		Using pushbuttons on the front panel, with STEP 7 version V5.4 SP2 and higher, through web interface

DP/AS-i LINK Advanced

Overview

PN	DP-M	DP-S	ASI-M
		■	■

- Compact router between PROFIBUS (DP Slave) and AS-Interface
- Single and double AS-Interface master (according to AS-Interface specification V3.0) for connection of 62 AS-Interface slaves or 124 AS-Interface slaves (for double master)
- Integrated analog value transmission (all analog profiles)
- Integrated ground-fault monitoring for the AS-Interface cable
- User-friendly local diagnostics and start-up by means of a full graphic display and control keys or through a web interface with a standard browser
- Optimum TIA integration using STEP 7
- Integration in non-Siemens engineering tools using PROFINET type file (GSD)
- Vertical integration (standard web interface) through Industrial Ethernet
- Supply voltage from the AS-Interface shaped cable or alternatively with 24 V DC (optional)
- Module exchange without entering the connection parameters (PROFIBUS address etc.) using C-PLUG (optional)

Design

- Robust plastic enclosure with degree of protection IP20
- Compact design;
  - Display in the front panel for detailed indication of the operating state and readiness for operation of all connected and activated AS-Interface slaves
  - 6 pushbuttons for starting up and testing the AS-Interface line directly on the DP/AS-i LINK Advanced
  - LED indication of the operating state of PROFIBUS DP and AS-Interface
  - Integrated Ethernet port (RJ45 socket) for user-friendly start-up, diagnostics and testing of DP/AS-i LINK Advanced through a web interface using a standard browser
  - Supply voltage from the AS-Interface cable or alternatively with 24 V DC
  - Small mounting depth thanks to recessed plug mounting
- Simple mounting on standard mounting rail
- Operation without fans and batteries
- Fast replacement of devices in case of fault; Using the optional C-PLUG exchange medium (not included in scope of supply) means that absolutely no manual setting on the replacement device is required during replacement.

Function

The DP/AS-i LINK Advanced enables a PROFIBUS DP master to cyclically access the I/O data of all the slaves of a lower-level AS-Interface segment. According to the extended AS-Interface specification V3.0, up to 62 slaves, each with 4 digital inputs and 4 digital outputs as well as analog slaves, can be connected per AS-Interface line. Also supported are the expanded slave types with higher I/O data volume according to AS-i Specification V3.0.

The DP/AS-i LINK Advanced occupies as standard 32 bytes of input data and 32 bytes of output data, in which the digital I/O data of the connected AS-Interface slaves (standard and A/B slaves) of an AS-i line are stored. The double master occupies twice the number of bytes. The size of the input/output image can be compressed so that only the I/O address space actually required is occupied in the DP master's system. Integrated evaluation of analog signals is equally as simple as access to digital values, as the analog process data are also located directly in the CPU's I/O address space.

PROFIBUS DP V1 masters are able in addition to initiate AS-Interface master calls (e. g. to write parameters, change addresses, read diagnostic values) through the acyclic PROFIBUS services.

Using an operating display in AS-i Link it is possible to fully commission the lower-level AS-Interface line. DP/AS-i LINK

Advanced is equipped with an additional Ethernet port which enables use of the integrated web server and further increases the previously described user-friendliness of the operating display. Even firmware updates are easily possible using this method of access.

The optional C-PLUG supports module exchange without entering the connection parameters (PROFIBUS address etc.), keeping downtimes to a minimum in the event of a fault.

Diagnostics

Extensive diagnostics is possible using LEDs, the display and control keys, web interface or STEP 7, for example:

- Operating state of link
- Status of link as PROFIBUS DP slave
- Diagnostics of the AS-Interface network
- Message frame statistics
- Standard diagnostics pages in the web interface for quick access to diagnostics via Ethernet using standard browsers.

Configuration

DP/AS-i LINK Advanced can be configured either by means of STEP 7 version V5.4 and higher or simply by adopting the AS-Interface actual configuration on the display.

Uploading the AS-Interface configuration into STEP 7

is also possible during STEP 7 configuration from V5.4 upwards. In addition, AS-i slaves from Siemens can conveniently be configured at this stage in HW Config (slave selection dialog).

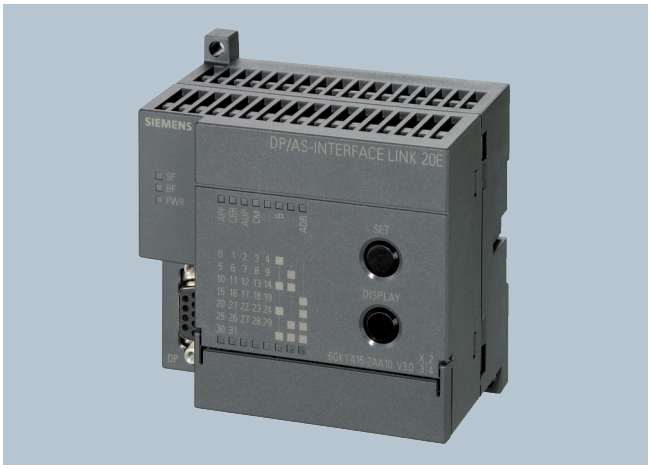
Alternatively, the IE/AS-i LINK IO can be integrated using the PROFINET type file (GSD) in the engineering tool (e.g. STEP 7 versions below V5.4 or engineering tools from non-Siemens manufacturers).

Technical specifications

Transmission rates per AS-Interface line		
• AS-Interface bus cycle time	ms	5 with 31 slaves; 10 with 62 slaves
• PROFIBUS transmission rate	Mbit/s	Max. 12
• Ethernet transmission rate	Mbit/s	10/100, autosensing
Interfaces		
• AS-Interface connection		
- With single master		1 x 4-pole screw terminals (removable)
- With double master (2 AS-i lines)		2 x 4-pole screw terminals (removable)
• Connection to PROFIBUS		1 x 9-pole Sub D socket
• Connection to Ethernet		1 x RJ45
• Optional: 24 V DC supply voltage		3-pole screw terminals (removable) including connection of functional ground for integrated ground-fault monitoring
• Slot for exchange medium		C-PLUG
Display		128 x 64 pixel with background lighting
Keys		Membrane keyboard (6 keys)
Supply voltage		
• From AS-Interface cable (AS-i line 1)		Acc. to AS-Interface Specification EN 50295
• Optional	V DC	24, functional ground
Power consumption		
• From AS-Interface cable	mA	Max. 250
Load capacity		
• 5 V DC at PROFIBUS connection	mA	Max. 70
• Power loss	W	7.5
Degree of protection		IP20
Permissible ambient conditions		
• Operating temperature		
- Horizontal mounting	°C	0 ... +60
- Vertical mounting	°C	0 ... +45
• Transport and storage temperature	°C	-30 ... +70
• Relative humidity	%	Max. 95 at +25 °C
• Operating altitude	m	3000 above sea level
Structural design		
• Mounting		On standard mounting rail
• Dimensions (W x H x D)	mm	90 x 132 x 88.5
• Weight	g	About 380
Supported AS-Interface master profile		M4 (acc. to AS-Interface Specification V3.0)
Configuring the AS-Interface		Using pushbuttons on the front panel, with STEP 7 version V5.4 and higher, through web interface

DP/AS-Interface Link 20E

Overview



PN	DP-M	DP-S	ASI-M
		■	■

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 possible
- Integrated analog value transmission (all analog profiles)
- Supports all AS-Interface master functions in accordance with AS-Interface specification V3.0
- 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 readiness for operation 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 cable.

Function

DP/AS-Interface Link 20E enables a DP master to access all the slaves of an AS-Interface network. According to the extended specification V3.0, up to 62 slaves, each with 4 digital inputs and 4 digital outputs as well as analog slaves, can be connected.

The 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 digital I/O data of the connected AS-Interface slaves (standard and A/B slaves) are occupied. The size of the input/output image can be compressed so that only the I/O address space actually required is occupied in the DP master's system.

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

Configuration

The DP/AS-Interface Link 20E can be configured using STEP7

from version V5.1 SP2 upwards or simply by adopting the AS-Interface actual configuration using the SET pushbutton on the front plate.

Uploading the AS-Interface configuration into STEP 7 is also possible during STEP 7 configuration from V5.2 upwards.

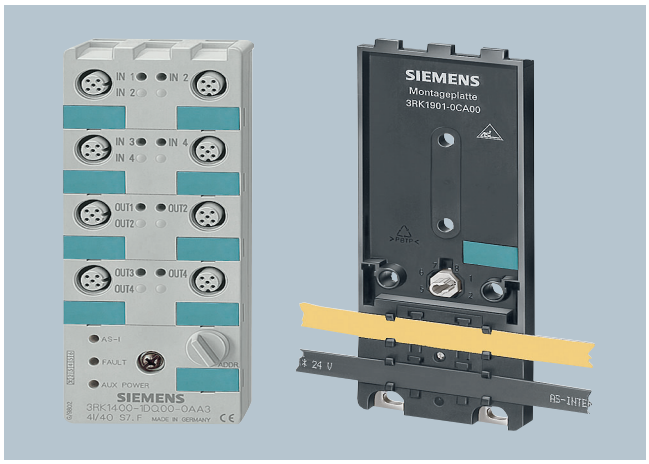
In addition, AS-i slaves from Siemens can conveniently be configured at this stage in HW Config (slave selection dialog).

Alternatively, the DP/AS-Interface Link 20E can be integrated using the PROFIBUS type file (GSD) in the engineering tool (e.g. for STEP 7 versions lower than V5.1 or engineering tools from non-Siemens manufacturers).

Technical specifications

AS-Interface bus cycle time	ms	5 with 31 slaves 10 with 62 slaves
PROFIBUS transmission rate	Mbit/s	Max. 12
Supported AS-Interface master profile		M4 (acc. to AS-Interface Specification V3.0)
Configuring the AS-Interface		Using pushbuttons on the front panel or with STEP 7 V5.1 SP2
Interfaces		
• AS-Interface connection		Screw terminals
• Connection to PROFIBUS		9-pole Sub D socket
Supply voltage		
• From AS-Interface cable		Acc. to AS-Interface Specification EN 50 295
Power consumption		
• From AS-Interface cable	mA	Max. 200
Load capacity		
5 V DC at PROFIBUS connection	mA	Max. 90
Power loss	W	4.5
Mounting		Standard mounting rail or direct mounting
Degree of protection		IP20
Permissible ambient conditions		
• Operating temperature		
- Horizontal mounting	°C	0 ... +60
- Vertical mounting	°C	0 ... +45
• Transport and storage temperature	°C	-40 ... +70
• Relative humidity	%	Max. 95 at +25 °C
Structural design		
• Module format		Similar to S7-200 module
• Dimensions (W x H x D)	mm	90 x 80 x 60
• Weight	g	About 200

Overview



K60

K20

K45

Three coordinated series of AS-Interface compact modules with digital and analog compact modules and a high degree of protection are available for operation in the field:

- Series K60 (digital and analog)
- Series K45 (digital)
- Series K20 (digital)

All compact modules are characterized by particularly simple handling. The K60 and K45 modules are mounted with a mounting plate. The mounting plate is used to receive the AS-Interface flat cables and enables mounting on a wall or standard mounting rail.

The K20 modules are directly mounted without a mounting plate and connected to the AS-Interface using a round cable.

Overview of digital compact modules

The following table provides an overview of the important features of the digital compact modules. For exact details, see the section "Technical specifications" in the chapter on the respective product.

Version	K60	K45	K20
8 inputs/2 outputs	✓	--	--
8 inputs	✓	--	--
4 inputs/4 outputs	✓	✓	✓
4 inputs/3 outputs	✓	--	--
4 inputs/2 outputs	✓	--	--
4 inputs	✓	✓	✓
2 inputs/2 outputs	--	✓	✓
4 outputs	✓	✓	✓
3 outputs	--	✓	--
AS-Interface connection	Flat cable/round cable	Flat cable	Round cable
I/O connection method	M12	M12/M8	M12/M8
Pin assignment	Standard/Y-II/Y	Standard/Y	Standard/Y
Degree of protection	IP65/IP67/IP68/IP69K	IP65/IP67	IP65/IP67
ATEX 3D (Zone 22)	✓	--	--
Extended address mode	✓	✓	✓

✓ Available
-- Not available

I/O modules for operation in the field
Introduction

Function

The I/O modules have a large status display:

- With yellow LEDs for the switching state of the inputs and outputs
- With two LEDs or one dual LED (two-color LED) for AS-i communication (depending on the design)
- With one green LED for the auxiliary voltage U_{AUX}

The status of a module is indicated by LEDs using continuous or blinklight. This enables diagnostics at a glance. The following tables provide an overview of the LED status displays of the I/O modules.

LED status displays for K60 compact modules

AS-i	FAULT	Possible cause	Possible remedy
Green	Off	Normal operation; AS-Interface communication OK	--
Green	Red	No AS-i communication: • Master deactivated or offline • Slave not configured in master • Wrong slave type connected • Slave has wrong address	Ensure AS-i communication: • Activate master or put it online • Reconfigure master • Connect correct module • Check slave address and correct if necessary
Green	Red flashing	Overload of sensor supply (slave is in RESET state and switches off completely)	Disconnect sensor cables from input sockets, install sensors with lower total current input, check sensors and cables
Green flashing	Red	Slave has address 0 (as-delivered state)	Address issued is not equal to 0
Green flashing (alternating flashing)	Red flashing	Overload of outputs (slave switches off all outputs)	Disconnect actuator cables from output sockets, check actuators and cables
Off	Off	No AS-i voltage, AS-i voltage with reversed polarity, AS-i voltage too low	Switch on AS-i voltage, connect correctly, measure AS-i voltage (approx. 30 V DC)

Note: The status "overload of outputs" (green flashing/red flashing, alternating) is not displayed by all modules.

Additional arrangement for K60 analog modules

AS-i	FAULT	Possible cause	Possible remedy
Green flashing (alternating flashing)	Red flashing	No analog data exchange (triple traffic) on AS-i	Use AS-i master according to AS-i Spec. 2.1 or higher
		AS-i master waits for analog output data from PLC (only for analog output modules)	Set CPU to RUN, send data record with analog output data to AS-i master (CP 343-2, CP 343-2P, Link 20E)
		Overload of sensor supply (only for analog input modules)	Disconnect sensor cables from input sockets, install sensors with lower total current input, check sensors and cables

LED status displays for K45 / K20 compact modules

AS-i/FAULT	Possible cause	Possible remedy
Green	Normal operation; AS-Interface communication OK	--
Red	No AS-i communication: • Master deactivated or offline • Slave not configured in master • Wrong slave type connected • Slave has wrong address	Ensure AS-i communication: • Activate master or put it online • Reconfigure master • Connect correct module • Check slave address and correct if necessary
Red flashing	Overload of sensor supply (slave is in RESET state and switches off completely)	Disconnect sensor cables from input sockets, install sensors with lower total current input, check sensors and cables
Yellow-red flashing	Slave has address 0 (as-delivered state)	Address issued is not equal to 0
Green-red flashing	Overload of outputs (slave switches off all outputs)	Disconnect actuator cables from output sockets, check actuators and cables
Off	No AS-i voltage, AS-i voltage with reversed polarity, AS-i voltage too low	Switch on AS-i voltage, connect correctly, measure AS-i voltage (approx. 30 V DC)

Note: The status "overload of outputs" (green flashing/red flashing, alternating) is not displayed by all modules.

Additional LED status display for AUX POWER on modules with auxiliary voltage

AUX POWER	Possible cause	Possible remedy
Green	Normal operation; AS-Interface communication OK	--
Off	No auxiliary voltage Auxiliary voltage with reversed polarity Auxiliary voltage too low	Switch on 24 V DC auxiliary voltage, connect correctly, measure auxiliary voltage (approx. 24 V DC)

Overview

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

Assembly of the K60 modules is performed with a mounting plate which accommodates the AS-Interface shaped cables. Two different mounting plates are offered for:

- Wall mounting
- Standard rail mounting

Addressing of the K60 modules is performed using an addressing socket integrated in the compact module. The addresses can also be assigned after installed.

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 plugs.

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 with a four digital inputs and outputs according to AS-Interface specification 3.0

The new AS-i specification 3.0 adds a number of completely new features to the AS-Interface bus system. The extended address mode (A/B addresses) enables the connection of up to 62 slaves on one AS-i network. With the extended address mode according to specification 3.0, four outputs are now possible even with A/B slaves (instead of only three outputs possible up to now with specification 2.1). Hence with full expansion of an AS-i network, there are now 248 inputs as well as 248 outputs available on one AS-i system. Modules with four inputs and four outputs as A/B slaves according to specification 3.0 are also available as K60 compact modules.

Please note that these modules can be used only with a new master according to AS-i specification 3.0 (e. g.the new DP/AS-i LINK Advanced or IE/AS-i LINK PN IO) and that the cycle times for the outputs can extend to max. 20 ms.

K60 data couplers

An AS-Interface data coupler has been added to the K60 compact module range. Integrated in this module are two AS-Interface slaves which are connected to two different AS-i networks. Each of the two integrated slaves has four virtual inputs and four virtual outputs. The bidirectional data transmission of 4 data bits between two AS-i networks is thus possible in a simple and cost-effective manner. The data coupler need its own address in each AS-i network.

Each AS-i network works with a different cycle time depending on the number of stations. Hence two AS-i networks are not necessarily synchronous. For this reason the AS-i data coupler can be used to transmit only standard data and no safe data.

K60 compact modules for use in hazardous areas (ATEX)

Two versions of the K60 modules are available for operation 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 protective 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 module 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 sealing 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).

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

Technical specifications

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

Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6
Input circuit		PNP
Inputs		
• Sensors		2- and 3-conductors
• Switching level High	V	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 6
Outputs		
• 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
AS-Interface certificate		Yes (or requested for in case of new units)
Approvals		UL, CSA, shipbuilding (or requested for in case of new units)
Degree of protection		IP67
Ground terminal		Pin 5 of each M12 socket is connected to the grounding wrist strap in the mounting plate using a pin
Ambient temperature	°C	-25 ... +85
Storage temperature	°C	-40 ... +85
Status displays		
• Display of I/Os		Yellow LED
• Display of U_{aux}		Green LED
• Display of AS-Interface/diagnostics		Green/red LED
Mounting		Using mounting plate for K60 compact module

Note:

All K60 compact modules are delivered with high-grade steel screws/sockets.

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), safety class III.

		8 inputs/2 outputs	**8 inputs**	**8 inputs**	**8 inputs**
		2 ampere	**--**	**--**	**--**
		A/B slave	Standard slave	A/B slave	A/B slave
		Special assignment	Y-II assignment	Y-II assignment	Y-II assignment
		3RK2 400-1HQ00-0AA3	3RK1 200-0DQ00-0AA3	3RK2 200-0DQ00-0AA3	3RK2 200-1DQ00-1AA3
Total current input	mA	≤ 300	≤ 270	≤ 270	≤ 45
Short-circuit and overload resistant sensor supply		Yes	Yes	Yes	Yes
Sensor power supply		Using AS-Interface	Using AS-Interface	Using AS-Interface	Using U_{aux}
Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200	200	2000
Socket assignment of inputs		Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal
Outputs					
• Current carrying capacity per output DC 12/13 typical	A	2	--	--	--
• Maximum summation current per module	A	4	--	--	--
• Socket assignment of outputs		Pin 3: "-" Pin 4: Output Pin 5: Ground terminal	--	--	--
Slave type		A/B slave	Standard slave	A/B slave	A/B slave
I/O configuration		0 (addr. 1)/7 (addr. 2)	0	0	0
ID/ID2 code		I/O (addr. 1 and 2)	1/F	I/O	I/O
Assignment of data bits					
• Socket 1		Pin 4: IN1 (D0) (addr. 1) Pin 2: IN2 (D1) (addr. 1)	Pin 4: IN1 (D0) (addr. 1) Pin 2: IN2 (D1) (addr. 1)	Pin 4: IN1 (D0) (addr. 1) Pin 2: IN2 (D1) (addr. 1)	Pin 4: IN1 (D0) (addr. 1) Pin 2: IN2 (D1) (addr. 1)
• Socket 2		Pin 4: IN2 (D1) (addr. 1)	Pin 4: IN2 (D1) (addr. 1)	Pin 4: IN2 (D1) (addr. 1)	Pin 4: IN2 (D1) (addr. 1)
• Socket 3		Pin 4: IN3 (D2) (addr. 1) Pin 2: IN4 (D3) (addr. 1)	Pin 4: IN3 (D2) (addr. 1) Pin 2: IN4 (D3) (addr. 1)	Pin 4: IN3 (D2) (addr. 1) Pin 2: IN4 (D3) (addr. 1)	Pin 4: IN3 (D2) (addr. 1) Pin 2: IN4 (D3) (addr. 1)
• Socket 4		Pin 4: IN4 (D3) (addr. 1)	Pin 4: IN4 (D3) (addr. 1)	Pin 4: IN4 (D3) (addr. 1)	Pin 4: IN4 (D3) (addr. 1)
• Socket 5		Pin 4: IN1 (D0) (addr. 2) Pin 2: IN2 (D1) (addr. 2)	Pin 4: IN1 (D0) (addr. 2) Pin 2: IN2 (D1) (addr. 2)	Pin 4: IN1 (D0) (addr. 2) Pin 2: IN2 (D1) (addr. 2)	Pin 4: IN1 (D0) (addr. 2) Pin 2: IN2 (D1) (addr. 2)
• Socket 6		Pin 4: IN2 (D1) (addr. 2)	Pin 4: IN2 (D1) (addr. 2)	Pin 4: IN2 (D1) (addr. 2)	Pin 4: IN2 (D1) (addr. 2)
• Socket 7		Pin 4: OUT1 (D0) (addr. 2) Pin 2: IN3 (D2) (addr. 2)	Pin 4: IN3 (D2) (addr. 2) Pin 2: IN4 (D3) (addr. 2)	Pin 4: IN3 (D2) (addr. 2) Pin 2: IN4 (D3) (addr. 2)	Pin 4: IN3 (D2) (addr. 2) Pin 2: IN4 (D3) (addr. 2)
• Socket 8		Pin 4: OUT2 (D1) (addr. 2) Pin 2: IN4 (D3) (addr. 2)	Pin 4: IN4 (D3) (addr. 2)	Pin 4: IN4 (D3) (addr. 2)	Pin 4: IN4 (D3) (addr. 2)
Number of I/O sockets		8	8	8	8
Special features for the addressing		Module requires two addresses	Module requires two addresses	Module requires two addresses	Module requires two addresses

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

		4 inputs/4 outputs		
		2 ampere	**2 ampere**	**1 ampere**
		Standard slave	Standard slave	Standard slave
		Y-II assignment	Standard assignment	Y-II assignment
		3RK1 400-1DQ00–0AA3	3RK1 400-1CQ00-0AA3	3RK1 400-1DQ01-0AA3
Total current input	mA	≤ 270	≤ 270	≤ 270
Short-circuit and overload resistant sensor supply		Yes	Yes	Yes
Sensor power supply		Using AS-Interface	Using AS-Interface	Using AS-Interface
Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200	200
Socket assignment of inputs		Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Data input I Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal
Outputs				
• Current carrying capacity per output DC 12/13 typical	A	2	2	1
• Maximum summation current per module	A	4	4	4
• Socket assignment of outputs		Pin 3: "-" Pin 2/4: Output Pin 5: Ground terminal	Pin 3: "-" Pin 4: Output Pin 5: Ground terminal	Pin 3: "-" Pin 2/4: Output Pin 5: Ground terminal
Slave type		Standard slave	Standard slave	Standard slave
I/O configuration		7	7	7
ID/ID2 code		F/F	0/F	F/F
Assignment of data bits				
• Socket 1		Pin 4: IN1 (D0) Pin 2: IN2 (D1)	Pin 2/4: IN1 (D0)	Pin 4: IN1 (D0) Pin 2: IN2 (D1)
• Socket 2		Pin 4: IN2 (D1)	Pin 2/4: IN2 (D1)	Pin 4: IN2 (D1)
• Socket 3		Pin 4: IN3 (D2) Pin 2: IN4 (D3)	Pin 2/4: IN3 (D2)	Pin 4: IN3 (D2) Pin 2: IN4 (D3)
• Socket 4		Pin 4: IN4 (D3)	Pin 2/4: IN4 (D3)	Pin 4: IN4 (D3)
• Socket 5		Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)	Pin 4: OUT1 (D0)	Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)
• Socket 6		Pin 4: OUT2 (D1)	Pin 4: OUT2 (D1)	Pin 4: OUT2 (D1)
• Socket 7		Pin 4: OUT3 (D2) Pin 2: OUT4 (D3)	Pin 4: OUT3 (D2)	Pin 4: OUT3 (D2) Pin 2: OUT4 (D3)
• Socket 8		Pin 4: OUT4 (D3)	Pin 4: OUT4 (D3)	Pin 4: OUT4 (D3)
Number of I/O sockets		8	8	8

		4 inputs/4 outputs	**4 inputs/4 outputs**	**4 inputs/4 outputs**	**4 inputs/3 outputs**	**4 inputs/2 outputs**
		1 ampere	2 ampere	2 ampere	2 ampere	2 ampere
		Standard slave	A/B slave (Spec. 3.0)	A/B slave (Spec. 3.0)	A/B slave	Standard slave
		Standard assignment	Y-II assignment	Y-II assignment	Y-II assignment	Y-II assignment
		3RK1 400-1DQ03–0AA3	3RK2 400-1DQ00-0AA3	3RK2 400-1DQ00–1AA3	3RK2 400-1FQ03–0AA3	3RK1 400-1MQ00-0AA3
Total current input	mA	≤ 270	≤ 270	≤ 60	≤ 270	≤ 270
Short-circuit and overload resistant sensor supply		Yes	Yes	Yes	Yes	Yes
Sensor power supply		Using AS-Interface	Using AS-Interface	Using U_{aux}	Using AS-Interface	Using AS-Interface
Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200	1000	200	200
Socket assignment of inputs		Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal				
Outputs						
• Current carrying capacity per output DC 12/13 typical	A	1	2	2	2	2
• Maximum summation current per module	A	4	4	4	4	4
• Socket assignment of outputs		Pin 3: "-" Pin2/4: Output Pin 5: Ground terminal				
Slave type		Standard slave	A/B slave (Spec. 3.0)	A/B slave (Spec. 3.0)	A/B slave	Standard slave
I/O configuration		7	7	7	7	7
ID/ID2 code		0/F	A/7	A/7	A/2	F/F
Assignment of data bits						
• Socket 1		Pin 2/4: IN1 (D0)	Pin 4: IN1 (D0) Pin 2: IN2 (D1)	Pin 4: IN1 (D0) Pin 2: IN2 (D1)	Pin 4: IN1 (D0) Pin 2: IN2 (D1)	Pin 4: IN1 (D0) Pin 2: IN2 (D1)
• Socket 2		Pin 2/4: IN2 (D1)	Pin 4: IN2 (D1)	Pin 4: IN2 (D1)	Pin 4: IN2 (D1)	Pin 4: IN2 (D1)
• Socket 3		Pin 2/4: IN3 (D2)	Pin 4: IN3 (D2) Pin 2: IN4 (D3)	Pin 4: IN3 (D2) Pin 2: IN4 (D3)	Pin 4: IN3 (D2) Pin 2: IN4 (D3)	Pin 4: IN3 (D2) Pin 2: IN4 (D3)
• Socket 4		Pin 2/4: IN4 (D3)	Pin 4: IN4 (D3)	Pin 4: IN4 (D3)	Pin 4: IN4 (D3)	Pin 4: IN4 (D3)
• Socket 5		Pin 4: OUT1 (D0)	Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)	Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)	Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)	Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)
• Socket 6		Pin 4: OUT2 (D1)	Pin 4: OUT2 (D1)	Pin 4: OUT2 (D1)	Pin 4: OUT2 (D1)	Pin 4: OUT2 (D1)
• Socket 7		Pin 4: OUT3 (D2)	Pin 4: OUT3 (D2) Pin 2: OUT4 (D3)	Pin 4: OUT3 (D2) Pin 2: OUT4 (D3)	Pin 4: OUT3 (D2)	Not assigned (closed)
• Socket 8		Pin 4: OUT4 (D3)	Pin 4: OUT4 (D3)	Pin 4: OUT4 (D3)	Not assigned (closed)	Not assigned (closed)
Number of I/O sockets		8	8	8	7	6
Special master requirements			A master acc. to AS-Interface Specification 3.0 is required for this module	A master acc. to AS-Interface Specification 3.0 is required for this module		

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

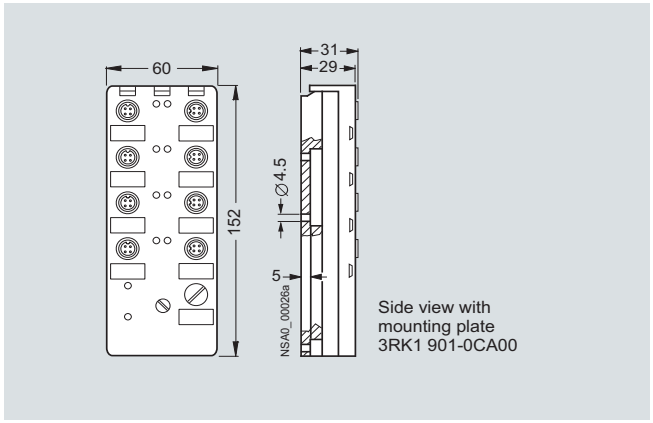
		4 inputs	2 x 2 inputs/ 2 x 2 outputs	4 outputs	Data coupler 4 inputs/4 outputs
		--	1 ampere	2 ampere	--
		Standard slave	Standard slave	Standard slave	Standard slave
		Y-II assignment	Y-II assignment	Y-II assignment	--
		3RK1 200-0CQ00-0AA3	3RK1 400-1DQ02-0AA3	3RK1 100-1CQ00-0AA3	3RK1 408-8SQ00-0AA3
Total current input	mA	≤ 270	≤ 270	≤ 270	≤ 70
Short-circuit and overload resistant sensor supply		Yes	Yes	Yes	--
Sensor power supply		Using AS-Interface	Using AS-Interface	Using AS-Interface	--
Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200	--	--
Socket assignment of inputs		Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal	--	--
Outputs					
• Current carrying capacity per output DC 12/13 typical	A	--	1	2	--
• Maximum summation current per module	A	--	4	4	--
• Socket assignment of outputs		--	Pin 3: "-" Pin 2/4: Output Pin 5: Ground terminal	Pin 3: "-" Pin 2/4: Output Pin 5: Ground terminal	--
Slave type		Standard slave	Standard slave	Standard slave	Standard slave
I/O configuration		0	7	8	7
ID/ID2 code		1/F	F/F	1/F	F/F
Assignment of data bits					
• Socket 1		Pin 4: IN1 (D0) Pin 2: IN2 (D1)	Pin 4: IN1 (D0) Pin 2: IN2 (D1)	--	D0out AS-i 1 = D0in AS-i 2
• Socket 2		Pin 4: IN2 (D1)	Not assigned (closed)	--	D0out AS-i 2 = D0in AS-i 1
• Socket 3		Pin 4: IN3 (D2) Pin 2: IN4 (D3)	Pin 4: IN3 (D2) Pin 2: IN4 (D3)	--	D1out AS-i 1 = D1in AS-i 2
• Socket 4		Pin 4: IN4 (D3)	Not assigned (closed)	--	D1out AS-i 2 = D1in AS-i 1
• Socket 5		Not assigned (closed)	Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)	Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)	D2out AS-i 1 = D2in AS-i 2
• Socket 6		Not assigned (closed)	Not assigned (closed)	Pin 4: OUT2 (D1)	D2out AS-i 2 = D2in AS-i 1
• Socket 7		Not assigned (closed)	Pin 4: OUT3 (D2) Pin 2: OUT4 (D3)	Pin 4: OUT3 (D2) Pin 2: OUT4 (D3)	D3out AS-i 1 = D3in AS-i 2
• Socket 8		Not assigned (closed)	Not assigned (closed)	Pin 4: OUT4 (D3)	D3out AS-i 2 = D3in AS-i 1
Number of I/O sockets		4	4	4	0
Special features for the addressing		--	--	--	Module requires two addresses

		4 inputs/4 outputs	**4 inputs**
		Version ATEX (Ex) II 3D X	Version ATEX (Ex) II 3D X
		2 ampere	--
		Standard slave	Standard slave
		Y-II assignment	Y-II assignment
		3RK1 400-1DQ05-0AA3	3RK1 200-0CQ05-0AA3
Total current input	mA	≤ 270	≤ 270
Short-circuit and overload resistant sensor supply		Yes	Yes
Sensor power supply		Using AS-Interface	Using AS-Interface
Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200
Socket assignment of inputs		Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Data input II Pin 3: Sensor supply L- Pin 4: Data input I Pin 5: Ground terminal
Outputs			
• Current carrying capacity per output DC 12/13 typical	A	2	--
• Maximum summation current per module	A	4	--
• Socket assignment of outputs		Pin 3: „-" Pin 2/4: Output Pin 5: Ground terminal	--
Slave type		Standard slave	Standard slave
I/O configuration		7	0
ID/ID2 code		F/F	1/F
Assignment of data bits			
• Socket 1		Pin 4: IN1 (D0) Pin 2: IN2 (D1)	Pin 4: IN1 (D0) Pin 2: IN2 (D1)
• Socket 2		Pin 4: IN2 (D1)	Pin 4: IN2 (D1)
• Socket 3		Pin 4: IN3 (D2) Pin 2: IN4 (D3)	Pin 4: IN3 (D2) Pin 2: IN4 (D3)
• Socket 4		Pin 4: IN4 (D3)	Pin 4: IN4 (D3)
• Socket 5		Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)	Not assigned (closed)
• Socket 6		Pin 4: OUT2 (D1)	Not assigned (closed)
• Socket 7		Pin 4: OUT3 (D2) Pin 2: OUT4 (D3)	Not assigned (closed)
• Socket 8		Pin 4: OUT4 (D3)	Not assigned (closed)
Number of I/O sockets		8	4
Prescribed use		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	
Designations		Ⓔx II 3D Ex tD A22 IP65X T75°C	Ⓔx II 3D Ex tD A22 IP65X T60°C
Limiting conditions for safe operation		• Suitable protective measures must be taken to protect the module from mechanical damage. • All M12 plug-in 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 Franz Binder GmbH + Co. elektrische Bauelemente KG, Rötelstrasse 27, 74172 Neckarsulm, Germany Tel. +49 (0) 7132/325-0, Fax +49 (0) 7132/325-150, http://www.binder-connector.com, Article No. 16-0977-000 • All the M12 sockets which are not assigned must be closed with 3RK1 901-1KA01 sealing caps (tamper-proof version) such that they cannot be released by hand. • Addressing the module using the 3RK1 904-2AB01 addressing unit is only permitted outside the Ex-Zone 22. • 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. • If an additional supply (AUX POWER) is required, it must comply with VDE 0106 (PELV), safety class III.	
Installation and commissioning		• The devices are approved for an ambient temperature of -25 to +85 °C. • 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. • It is assumed that personnel are familiar with the assignment of classes to the permitted hazardous zones. • The plug-in connectors and AS-Interface cables must not be connected or disconnected when live. • The units require no maintenance. • No modifications or repairs are allowed to be carried out on the units. • All the above points must be observed in the event of replacement. • See also Regulations for Installation EN 60079-14 / EN 50281-1-2.	

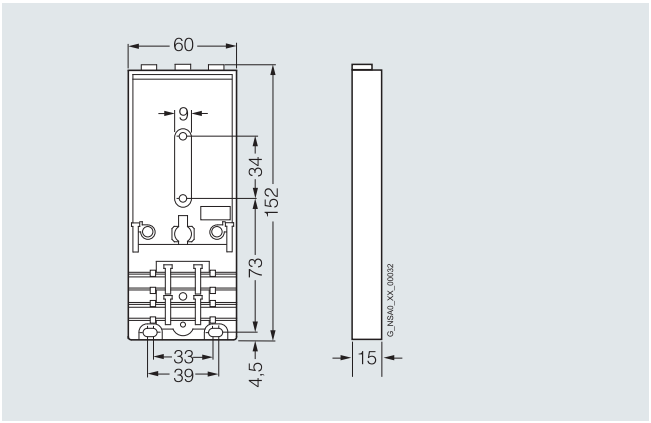
I/O modules for operation in the field
Digital I/O modules, IP67 - K60

		K60 mounting plates	
		For wall mounting	**For standard rail mounting**
		3RK1 901-0CA00	3RK1 901-0CB01
Ambient temperature	°C	-40 ... +85	-40 ... +85
Degree of protection		IP67 with screw-mounted K60 compact module	IP67 with screw-mounted K60 compact module
Connection methods		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
Mounting		• Wall mounting • On profile system (corresponding sliding blocks required) • Hole spacing compatible with K45 mounting plate for wall mounting	• Standard rail mounting • For the previous 3RK1 901-0CB00 version of the standard rail mounting it is also possible to order the standard mounting rail adapter separately as a spare part: 3RX1 660-0B. This adapter is not required for the new 3RK1 901-0CB01 version.
Additional seals		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).

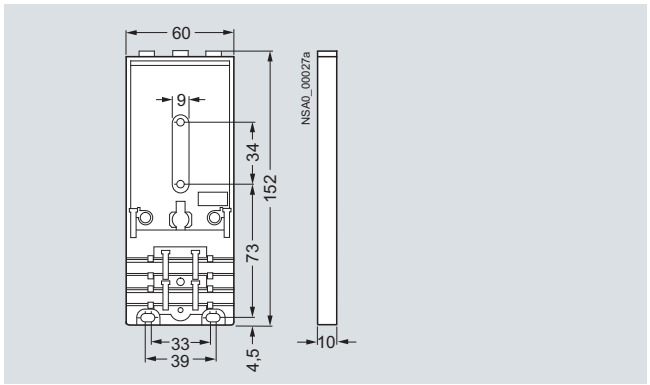
Dimensional drawings



I/O module



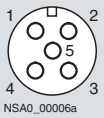
3RK1 901-0CB01 mounting plate for standard rail mounting



3RK1 901-0CA00 mounting plate for wall mounting

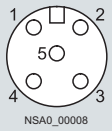
Schematics

Terminal assignment for input (M12 socket)



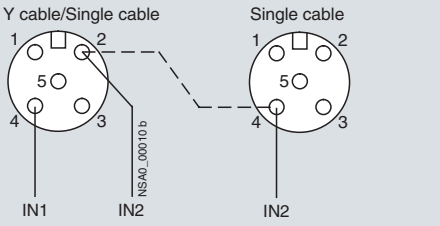
Pin 1: Supply L+
Pin 2: Input signal (bridged with Pin 4)
Pin 3: Supply L–
Pin 4: Input signal (bridged with Pin 2)
Pin 5: Ground terminal

Standard assignment



Pin 1: Supply L+
Pin 2: Input signal 2
Pin 3: Supply L–
Pin 4: Input signal 1
Pin 5: Not assigned

Y assignment



Left column (plan view)

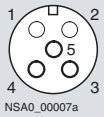
Pin 1: Supply L+
Pin 2: Input signal 2
Pin 3: Supply L–
Pin 4: Input signal 1
Pin 5: Ground terminal

Right column (plan view)

Pin 1: Supply L+
Pin 2: Not assigned
Pin 3: Supply L–
Pin 4: Input signal 2
Pin 5: Ground terminal

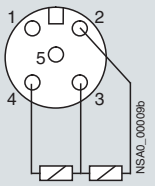
Y-II assignment

Terminal assignment for output (M12 socket)



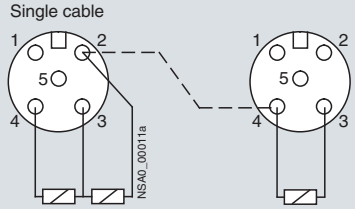
Pin 1: Not assigned
Pin 2: Not assigned
Pin 3: Supply L–
Pin 4: Outpunt signal
Pin 5: Ground terminal

Standard assignment



Pin 1: Not assigned
Pin 2: Output signal 2
Pin 3: Supply L–
Pin 4: Output signal 1
Pin 5: Not assigned

Y assignment



Left column (plan view)

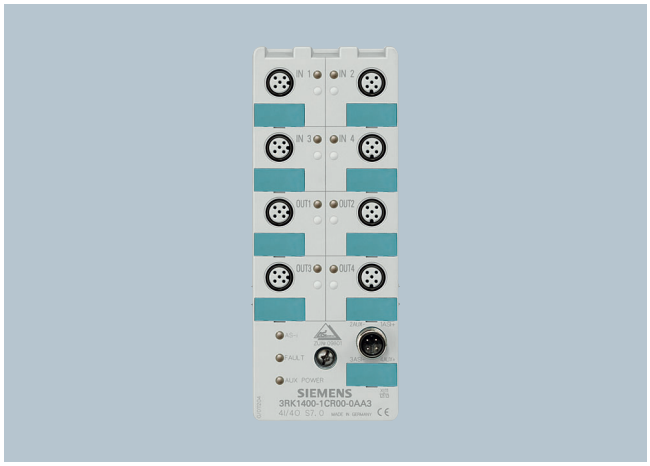
Pin 1: Not assigned
Pin 2: Output signal 2
Pin 3: Supply L–
Pin 4: Output signal 1
Pin 5: Ground terminal

Right column (plan view)

Pin 1: Not assigned
Pin 2: Not assigned
Pin 3: Supply L–
Pin 4: Output signal 2
Pin 5: Ground terminal

Y-II assignment

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 degree of protection IP68/IP69K.

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 voltage supply are routed in this case in a shared round cable.

Degree of protection IP68 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. For IP68 test conditions, see section 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.

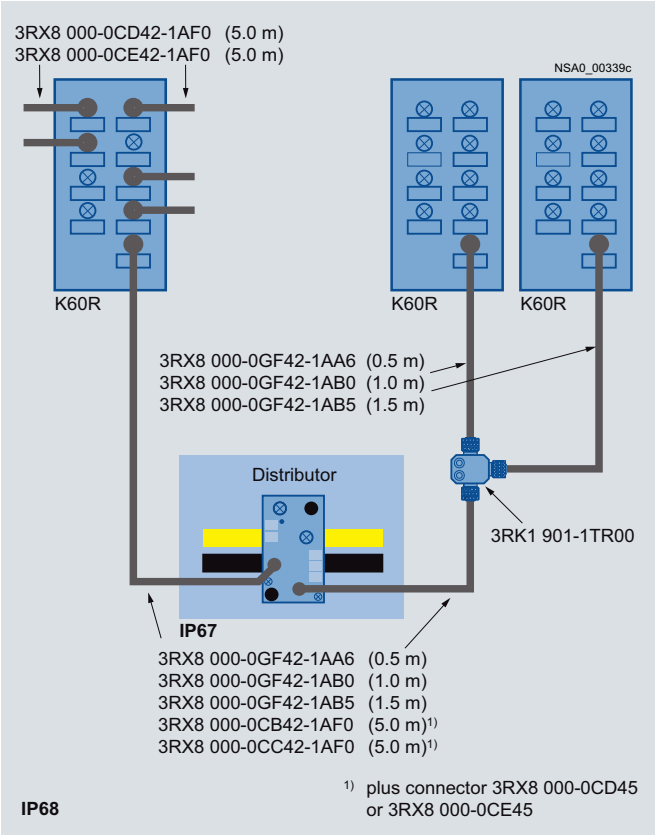
Mounting

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 cable.

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 an AS-Interface M12 feeder (3RK1 901-1NR..). 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 plugs 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 distributor 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 distributor. 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 degree of protection IP68.

Please note the following boundary conditions:

- The configuration guidelines for AS-Interface 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 mm². For connection of the K60R modules, the aforementioned M12 connecting cables 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.
- For round cable connections with shared AS-i and U_{aux} in a single cable, the following maximum lengths apply:
  - Per spur line from feeder to module: maximum 5 m
  - Total of all round cable segments in an AS-Interface network: maximum 20 m

Tests IP68/IP69K

K60R modules were tested with the following tests:

- Stricter test than IP67:
  min 90 m in 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

		4 inputs/4 outputs IP68/IP69K Standard assignment 3RK1 400-1CR00-0AA3
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6
Total current input	mA	≤ 270
Input circuit		PNP
Inputs		
• Sensor supply using AS-Interface		Short-circuit and overload resistant
• Sensors		2- and 3-conductors
• Voltage range	V	20 ... 30
• Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200
• Switching level High	V	≥ 10
• Input current Low/High	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 terminal
Outputs		
• Type of output		Solid-state
• Current carrying capacity per output DC 12/13 typical	A	2
• Maximum summation current per module	A	4
• Socket assignment of outputs		Pin 3: "-" Pin 4: Output Pin 5: Ground terminal
• 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
Slave type		Standard slave
I/O configuration		7
ID/ID2 code		0/F

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

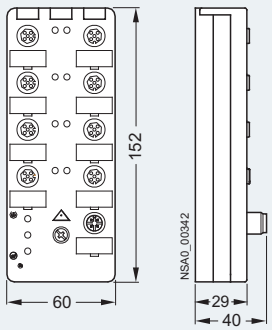
		4 inputs/4 outputs IP68/IP69K Standard assignment 3RK1 400-1CR00-0AA3
Assignment of data bits		
• Socket 1		Pin 2/4: IN1 (D0)
• Socket 2		Pin 2/4: IN2 (D1)
• Socket 3		Pin 2/4: IN3 (D2)
• Socket 4		Pin 2/4: IN4 (D3)
• Socket 5		Pin 4: OUT1 (D0)
• Socket 6		Pin 4: OUT2 (D1)
• Socket 7		Pin 4: OUT3 (D2)
• Socket 8		Pin 4: OUT4 (D3)
AS-Interface certificate		Yes
Degree of protection		IP68/IP69K with 3RK1 901-0CA00 IP68 mounting plate test conditions see section "Overview" --> "Tests IP68/IP69K" 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 sealing caps.
Ground terminal		Pin 5 of each M12 socket is connected to the grounding wrist strap in the mounting plate using a pin
Ambient temperature	°C	-25 ... +85
Storage temperature	°C	-40 ... +85
Number of I/O sockets		8
Status displays		
• Display of I/Os		Yellow LED
• Display of U_{aux}		Green LED
• Display of AS-Interface/diagnostics		Green/red LED
Mounting		Using mounting plate for K60 compact module

Note:

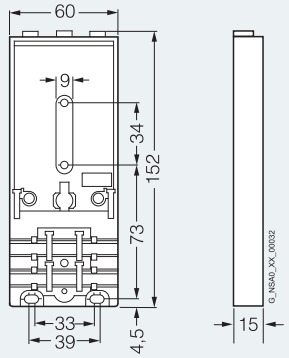
All K60 compact modules are delivered with high-grade steel screws/sockets.

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), safety class III.

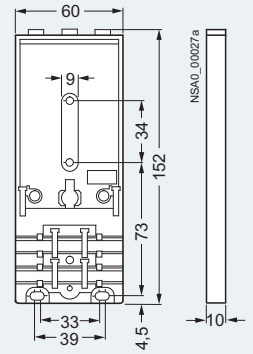
Dimensional drawings



I/O module



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



3RK1 901-0CA00 mounting plate for wall mounting

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 range.

The acclaimed advantages of the existing K60 compact modules are fully emulated by the far smaller K45 modules. Their footprint is 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 mounting plate for wall mounting has a hole arrangement 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 mounting plate for standard rail mounting has a hole arrangement that is identical to that of the user modules.

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.

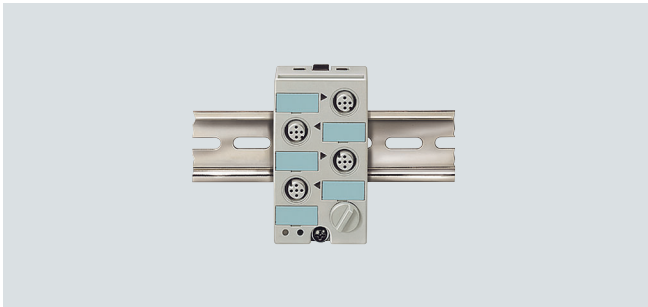
Sensors/actuators are connected using M12 sockets. The 4I module can be ordered optionally with M8 connection sockets.

Design

Mounting

- Place the AS-Interface flat cables (yellow or yellow and black) in the corresponding cable routing 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 scope of supply) 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 sealing caps in order to guarantee the quoted degree of protection.

Technical specifications

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

Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6
Reverse polarity protection *U* AS-Interface		Built-in
Input circuit		PNP
Inputs		
• Sensor supply using AS-Interface		Short-circuit and overload resistant
• Sensors		2- and 3-conductors
• Voltage range	V	20 ... 30[1)]
• Switching level High	V	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 6
Outputs		
• 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
AS-Interface certificate		Yes (or requested for in case of new units)
Approvals		UL, CSA, shipbuilding (or requested for in case of new units)
Degree of protection		IP67 (IP65 with M8 snap-action connection)
Ground terminal		Using Pin 5 of the M12 sockets and outgoing unit using 2.8-mm flat connector (no ground terminal with M8 sockets)
Ambient temperature	°C	-25 ... +85
Storage temperature	°C	-40 ... +85
Status displays		
• Display of I/Os		Yellow LED
• Display of U_{aux}		Green LED
• Display of AS-Interface/diagnostics		Green/red dual LED
Mounting		Using mounting plate for K45 compact module

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

Note:

All K45 compact modules are delivered with high-grade steel screws/sockets.

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), safety class III.

		4 inputs Standard slave Standard assignment		
		M12	M8 screw terminal	M8 snap-action terminal
		3RK1 200-0CQ20-0AA3	3RK1 200-0CT20-0AA3	3RK1 200-0CU20-0AA3
Total current input	mA	≤ 270	≤ 270	≤ 270
Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200	200
Socket assignment of inputs		Pin 1: Sensor supply L+ Pin 3: Sensor supply L- Pin 2/4: Data input Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 3: Sensor supply L- Pin 4: Data input	Pin 1: Sensor supply L+ Pin 3: Sensor supply L- Pin 4: Data input
Slave type		Standard slave	Standard slave	Standard slave
I/O configuration		0	0	0
ID/ID2 code		0/F	0/F	0/F
Assignment of data bits				
• Socket 1		Pin 4/2: IN1 (D0)	Pin 4: IN1 (D0)	Pin 4: IN1 (D0)
• Socket 2		Pin 4/2: IN2 (D1)	Pin 4: IN2 (D1)	Pin 4: IN2 (D1)
• Socket 3		Pin 4/2: IN3 (D2)	Pin 4: IN3 (D2)	Pin 4: IN3 (D2)
• Socket 4		Pin 4/2: IN4 (D3)	Pin 4: IN4 (D3)	Pin 4: IN4 (D3)
Number of I/O sockets		4	4	4

		4 inputs A/B slave Standard assignment		
		M12	M8 screw terminal	M8 screw terminal
		3RK2 200-0CQ20-0AA3	3RK2 200-0CT20-0AA3	3RK2 200-0CU20-0AA3
Total current input	mA	≤ 270	≤ 270	≤ 270
Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200	200
Socket assignment of inputs		Pin 1: Sensor supply L+ Pin 3: Sensor supply L- Pin 4/2: Data input Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 3: Sensor supply L- Pin 4: Data input	Pin 1: Sensor supply L+ Pin 3: Sensor supply L- Pin 4: Data input
Slave type		A/B slave	A/B slave	A/B slave
I/O configuration		0	0	0
ID/ID2 code		A/0	A/0	A/0
Assignment of data bits				
• Socket 1		Pin 4/2: IN1 (D0)	Pin 4: IN1 (D0)	Pin 4: IN1 (D0)
• Socket 2		Pin 4/2: IN2 (D1)	Pin 4: IN2 (D1)	Pin 4: IN2 (D1)
• Socket 3		Pin 4/2: IN3 (D2)	Pin 4: IN3 (D2)	Pin 4: IN3 (D2)
• Socket 4		Pin 4/2: IN4 (D3)	Pin 4: IN4 (D3)	Pin 4: IN4 (D3)
Number of I/O sockets		4	4	4

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

		2x2 inputs -- A/B slave Y assignment M12 3RK2 200-0CQ22-0AA3	**2 inputs/2 outputs** Current carrying capacity of outputs: 2 A[1] Standard slave Standard assignment M12 3RK1 400-1BQ20-0AA3	**2 x (1 input/1 output)** Current carrying capacity of outputs: 0.2 A Standard slave Y assignment M12 3RK1 400-0GQ20-0AA3	**4 x (1 input/1 output)** Current carrying capacity of outputs: 0.2 A A/B slave (Spec 3.0) Y assignment M12 3RK2 400-0GQ20-0AA3
Total current input	mA	≤ 270	≤ 270	≤ 270	≤ 270
Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200	200[2]	200[2]
Reverse polarity protection U_{aux}		Does not apply	By coding	U_{aux} not required	U_{aux} not required
Socket assignment of inputs		Pin 1: Sensor supply L+ Pin 3: Sensor supply L- Pin 4/2: Data input Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Data input Pin 3: Sensor supply L- Pin 4: Data input Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Output Pin 3: Sensor supply L- Pin 4: Data input Pin 5: Ground terminal	Pin 1: Sensor supply L+ Pin 2: Output Pin 3: Sensor supply L- Pin 4: Data input Pin 5: Ground terminal
Outputs					
• Current carrying capacity per output DC 12/13 typical	A	--	2[1]	0.2[2]	0.2[2]
• Maximum summation current per module	A	--	3	0.2[2]	0.2[2]
Slave type		A/B slave	Standard slave	Standard slave	A/B slave (Spec 3.0)
I/O configuration		0	3	3	7
ID/ID2 code		A/0	0/F	F/F	A/7
Assignment of data bits					
• Socket 1		Pin 4: IN1 (D0) Pin 2: IN2 (D1)	Pin 4/2: IN1 (D0)	Pin 4: IN1 (D0) Pin 2: OUT3 (D2)	Pin 4: IN1 (D0) Pin 2: OUT1 (D0)
• Socket 2		--	Pin 4/2: IN2 (D1)	--	Pin 4: IN2 (D1) Pin 2: OUT2 (D1)
• Socket 3		--	Pin 4: OUT3 (D2)	--	Pin 4: IN3 (D2) Pin 2: OUT3 (D2)
• Socket 4		Pin 4: IN3 (D2) Pin 2: IN4 (D3)	Pin 4: OUT4 (D3)	Pin 4: IN2 (D1) Pin 2: OUT4 (D3)	Pin 4: IN4 (D3) Pin 2: OUT4 (D3)
Number of I/O sockets		2	4	2	4

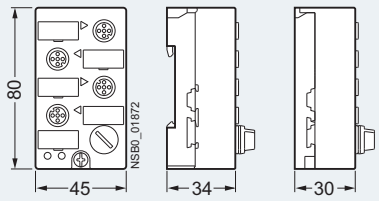
[1] The typical current carrying capacity per output increases with version "E12" from 1.5 to 2 A (available since approx. 07/2003).

[2] Summation current for all inputs and outputs max. 200 mA.

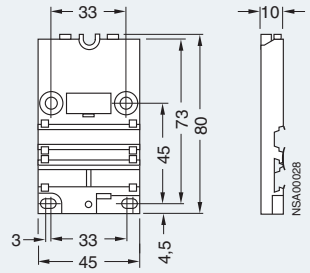
		4 outputs Current carrying capacity of outputs: 1 A Standard slave Standard assignment M12 3RK1 100-1CQ20-0AA3	**3 outputs** Current carrying capacity of outputs: 1 A A/B slave Standard assignment M12 3RK2 100-1EQ20-0AA3	**2 outputs/2 inputs** Current carrying capacity of outputs: 2 A A/B slave Standard assignment M12 3RK2 400-1BQ20-0AA3
Total current input	mA	≤ 45	≤ 45	≤ 270
Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200	200
Reverse polarity protection U_{aux}		By coding	By coding	By coding
Socket assignment of inputs		--	--	Pin 1: Sensor supply L+ Pin 2: Data input Pin 3: Sensor supply L Pin 4: Data input Pin 5: Ground terminal
Outputs				
• Current carrying capacity per output DC 12/13 typical	A	1	1	2
• Maximum summation current per module	A	3	3	3
Slave type		Standard slave	A/B slave	A/B slave
I/O configuration		8	8	B
ID/ID2 code		0/F	A/0	A/0
Assignment of data bits				
• Socket 1		Pin 4: OUT1 (D0)	Pin 4: OUT1 (D0)	Pin 4/2: IN3 (D2)
• Socket 2		Pin 4: OUT2 (D1)	Pin 4: OUT2 (D1)	Pin 4/2: IN4 (D3)
• Socket 3		Pin 4: OUT3 (D2)	Pin 4: OUT3 (D2)	Pin 4: OUT1 (D0)
• Socket 4		Pin 4: OUT4 (D3)	Not available	Pin 4: OUT2 (D1)
Number of I/O sockets		4	3	4

		K45 mounting plates	
		For wall mounting	**For standard rail mounting**
		3RK1 901-2EA00	3RK1 901-2DA00
Ambient temperature	**°C**	-40 ... +85	-40 ... +85
Degree of protection		IP67 with screw-mounted K45 compact module	IP67 with screw-mounted K45 compact module
Connection methods		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
Mounting		• Wall mounting • On profile system (corresponding sliding blocks required) • Hole spacing compatible with K60 mounting plate	• Standard rail mounting/wall mounting • On profile system (corresponding sliding blocks required) • Hole spacing compatible with FK/FK-E coupling module (user module)
Cable entry		Insertion of AS-Interface cable, yellow and black, possible from any direction	Insertion of AS-Interface cable, yellow and black, possible from any direction

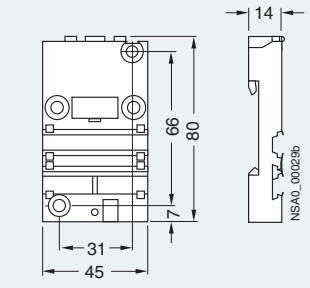
Dimensional drawings



I/O module



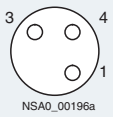
3RK1 901-2EA00
Mounting plate for wall mounting
Arrangement and drilled holes identical to that of the K60 compact module



3RK1 901-2DA00
Mounting plate for standard rail mounting
Arrangement and drilled holes identical to that of the user module

Schematics

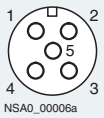
Terminal assignment for input (M8 socket)



Pin 1: Supply L+
Pin 4: Supply L–
Pin 4: Input signal

Standard assignment

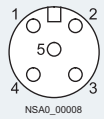
Terminal assignment for input (M12 socket)



Pin 1: Supply L+
Pin 2: Input signal (bridged with Pin 4)
Pin 3: Supply L–
Pin 4: Input signal (bridged with Pin 2)
Pin 5: Ground terminal

Standard assignment

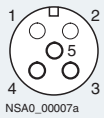
Terminal assignment for input (M12 socket)



Pin 1: Supply L+
Pin 2: Input signal 2
Pin 3: Supply L–
Pin 4: Input signal 1
Pin 5: Not assigned

Y assignment

Terminal assignment for output (M12 socket)



Pin 1: Not assigned
Pin 2: Not assigned
Pin 3: Supply L–
Pin 4: Outpunt signal
Pin 5: Ground terminal

Standard assignment

I/O modules for operation in the field
Digital I/O modules, IP67 - K20

Overview

Use in tight spaces

The K20 compact module range rounds off the AS-Interface compact modules with a particularly slim design and a width of a mere 20 mm. Thanks to its extremely compact dimensions, these modules are particularly suited for handling machine applications in the field of production engineering where modules need to be arranged in the smallest of spaces.

Robotics is yet another application area. Instead of the AS-Interface flat cable, the K20 modules are connected to AS-Interface over 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. This enables extremely compact installation.

The flexibility of the round cable means that it can also be used on moving machine parts without any problems. The K20 modules are also ideal for such applications as their non-encapsulated design makes them particularly light in weight.

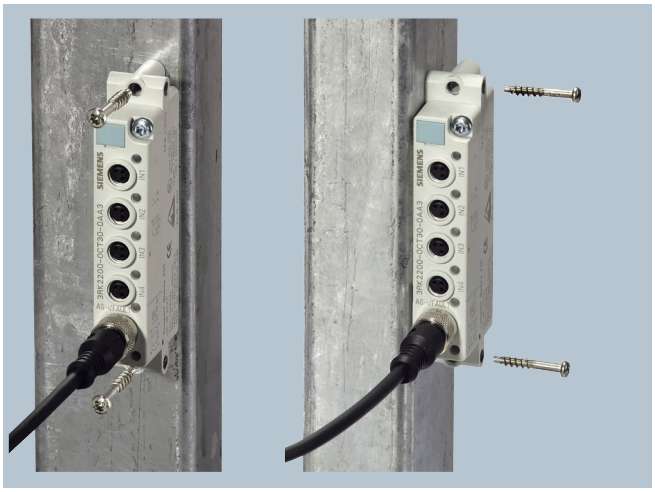
In applications with tow chains, many users rely on placing the AS-Interface bus cable in a round cable. In this case, the K20 modules support direct connection to the round cable. No flat to round cable adapter is required.

The K20 compact module range includes standard AS-Interface modules, as well as an ASIsafe version for the connection of failsafe sensors, such as EMERGENCY-STOP pushbuttons or protective door monitoring. All standard AS-Interface K20 modules support, as far as technically possible, the expanded address mode (A/B addresses) according to AS-Interface specification 2.1, which enables connection of 62 stations to an AS-Interface network. The K20 module with four inputs and four outputs works in expanded address mode according to AS-Interface specification 3.0 which, for the first time, supports four outputs with an A/B slave, thus enabling 248 inputs and 248 outputs in a fully expanded AS-Interface network.

For particularly space-saving dimensions, the sensors and actuators are connected over M8 plug-in connectors. Alternatively, M12 connectors with Y assignment can be used.

Design

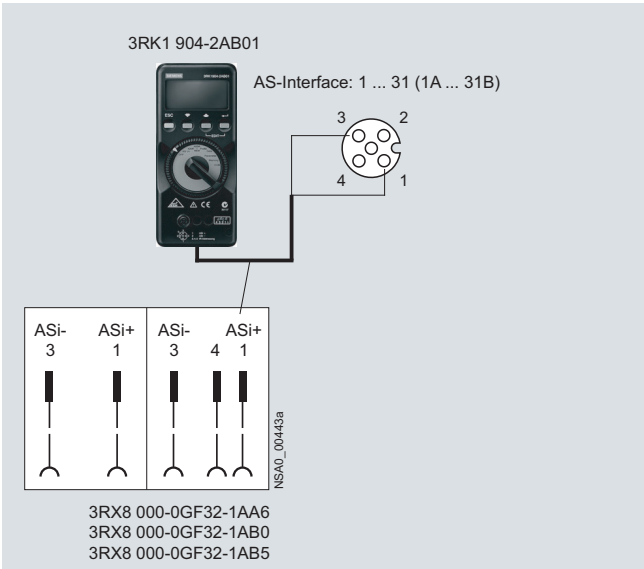
Mounting



Mounting the K20 modules: On front (see left) or on side (see right)

The K20 modules are mounted with two screws. No mounting plate is required. The modules can be mounted either on the front or the side. This flexibility allows users to place them where they will be best protected and save the most space, e. g. on standard mounting rails.

Addressing



Addressing the K20 modules

Addressing the K20 modules is performed using the same socket as for the bus connection. The module is connected to the 3RK1 904-2AB01 addressing unit using a standard M12 connecting cable (2- or 3-pole), 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 for connecting to the addressing unit. When the addressing operation is completed, the addressing cable is removed again and the module connected to the bus cable. Never use a 4-pole or 5-pole connecting cable for the addressing.

All K20 modules (except ASIsafe versions) support, as far as technically possible, the extended address mode and can be addressed with an A or B address. Up to 62 slaves can be connected accordingly to one AS-Interface network. The version with four inputs and four outputs (3RK2 400-1CT30-0AA3) works according to the new AS-Interface specification 3.0. With specification 3.0 even A/B slaves can have four outputs (instead of only three possible up to now with specification 2.1). Please note, however, that these modules can be used only with a new master according to AS-Interface Specification 3.0 (e. g. the new DP/AS-i LINK Advanced) and that the cycle times for the outputs can extend to max. 20 ms.

Connection

AS-Interface M12 feeders and distributor, closed

AS-Interface M12 feeders and distributor, open

A new series of AS-Interface distributors and M12 feeders is available for easy connection of the K20 modules to the AS-Interface flat cable:

AS-Interface distributors

Like the AS-Interface 3RK1 901-1NN00 standard distributor, the new AS-Interface 3RK1 901-1NN10 compact distributor enables the AS-Interface flat cable to be distributed to several lines. The compact distributor can be used for a current carrying capacity up to 6 A. It is characterized by particularly simple handling:

- Insert the cable
- Swing shut and
- Secure in the closed position with only one captive screw.

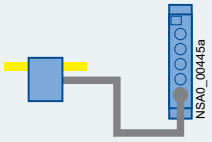
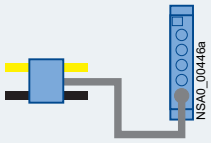
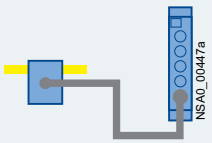
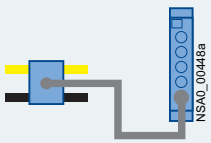
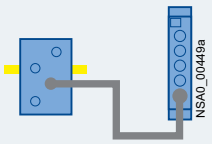
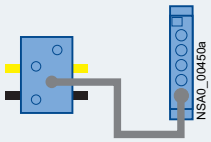
No additional seals are required for the compact distributor. The AS-Interface flat cable must always be routed through the compact distributor, i. e. you must never terminate it in the compact distributor. For higher currents or for when one of the two flat cables has to be terminated in the distributor, use the standard distributor.

AS-Interface M12 feeders

AS-Interface M12 feeders are available in the same design as the compact distributor. These versions are required for transition from the AS-Interface flat cable to a round cable. The spectrum covers AS-Interface M12 feeders with various cable lengths (1 and 2 m) and distinguishes between M12 feeders for AS-i/U_{aux} for connecting I/O modules and M12 feeders for AS-Interface without U_{aux} for connecting modules with inputs. These AS-Interface M12 feeders are just as easy to use as the AS-Interface compact distributor. The flat cable must always be routed through the M12 distributors, i. e. you must never terminate it in the M12 distributors. For cases requiring the AS-Interface flat cable to be terminated in the M12 feeder, use the standard M12 feeder (3RX9 801-0AA00) or the quadruple M12 feeder (3RK1 901-1NR00).

I/O modules for operation in the field
Digital I/O modules, IP67 - K20

The various options for connecting the K20 modules to the AS-Interface bus cable and the 24 V DC auxiliary voltage are presented in the following table:

	Digital I/O modules, IP67 – K20	
	AS-i without U_{aux}	**AS-i / U_{aux}**
	4DI, M8 3RK2 200-0CT30-0AA3 4DI, M12 3RK2 200-0CQ30-0AA3 2FDI, M12 3RK1 205-0BQ30-0AA3	2DI/2DO, M8 3RK2 400-1BT30-0AA3 2DI/2DO, M12 3RK2 400-1BQ30-0AA3 4DI/4DO, M8 3RK1 400-1CT30-0AA3 3RK2 400-1CT30-0AA3
K20 modules • Plus M12 feeder with integrally extruded cable	 M12 feeder: 3RK1 901-1NR11 (1 m) or 3RK1 901-1NR12 (2 m)	 M12 feeder: 3RK1 901-1NR21 (1 m) or 3RK1 901-1NR22 (2 m)
K20 modules • Plus M12 feeder with socket • Plus separate M12 cable	 M12 feeder: 3RX9 801-0AA00 3RK1 901-1NR10 M12 cable: 3RX8 000-0GF42-1AA6 (0.6 m) 3RX8 000-0GF42-1AB0 (1.0 m) 3RX8 000-0GF42-1AB5 (1.5 m)	 M12 feeder: 3RK1 901-1NR20 M12 cable: 3RX8 000-0GF42-1AA6 (0.6 m) 3RX8 000-0GF42-1AB0 (1.0 m) 3RX8 000-0GF42-1AB5 (1.5 m)
K20 modules • Plus quadruple M12 feeder • Plus separate M12 cable	 M12 feeder: 3RK1 901-1NR00 M12 cable: 3RX8 000-0GF42-1AA6 (0.6 m) 3RX8 000-0GF42-1AB0 (1.0 m) 3RX8 000-0GF42-1AB5 (1.5 m)	 M12 feeder: 3RK1 901-1NR00 M12 cable: 3RX8 000-0GF42-1AA6 (0.6 m) 3RX8 000-0GF42-1AB0 (1.0 m) 3RX8 000-0GF42-1AB5 (1.5 m)

To connect the feeder and the K20 module over distances > 2 m 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, angled: 3RX8 000-0CE45) and connected to the feeder.

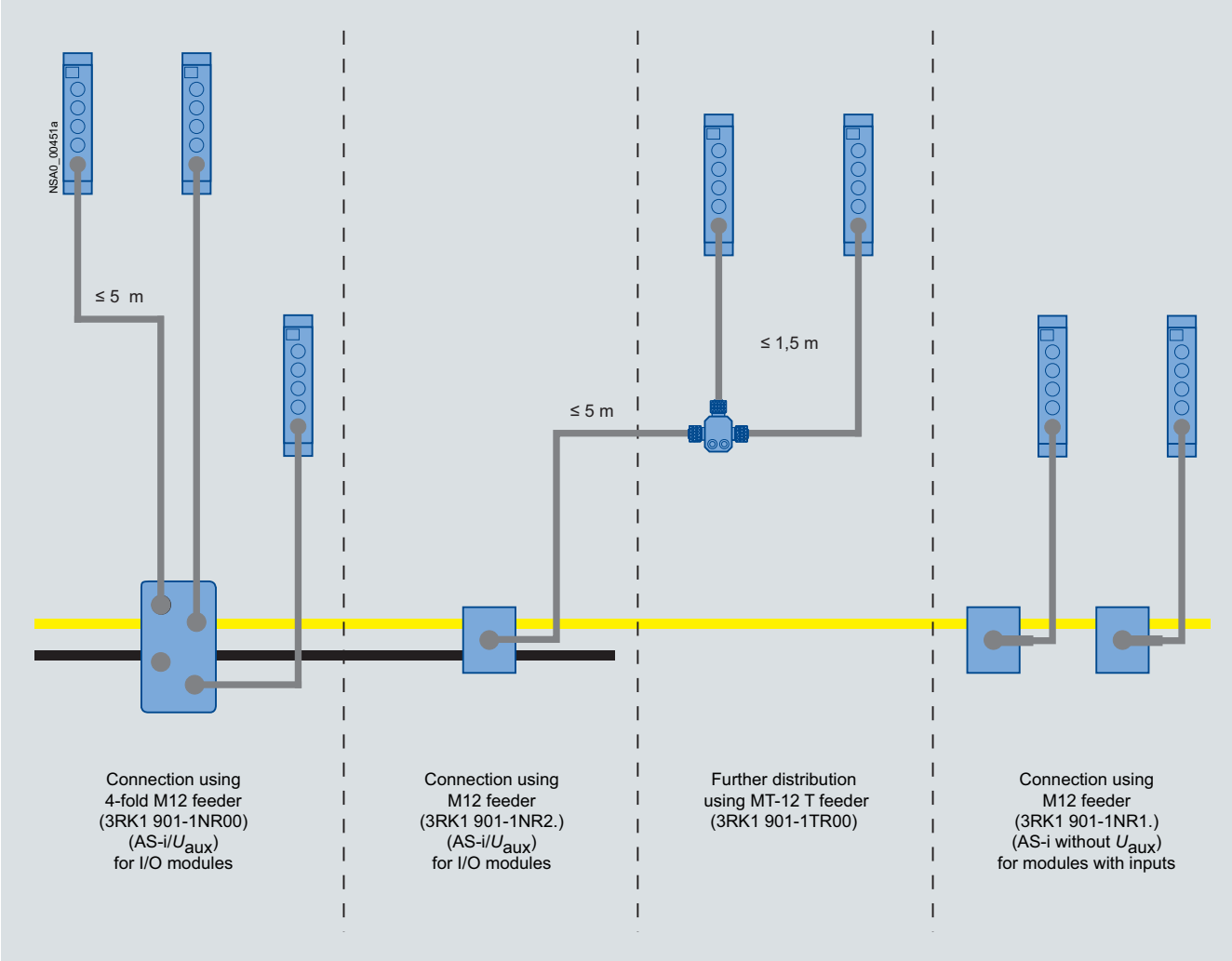
This cable is available in two versions:

- 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 K20 module to one spur line, the spur line can be split again using a T distributor (3RK1 901-1TR00).

Please note the following boundary conditions:

- The configuration guidelines for AS-Interface 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^2. For connection of the K20 modules, the aforementioned M12 connecting cables 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.
- For round cable connections with shared AS-i and U_{aux} in a single cable, the following maximum lengths apply:
  - Per spur line from feeder to module: maximum 5 m
  - Total of all round cable segments in an AS-Interface network: maximum 20 m



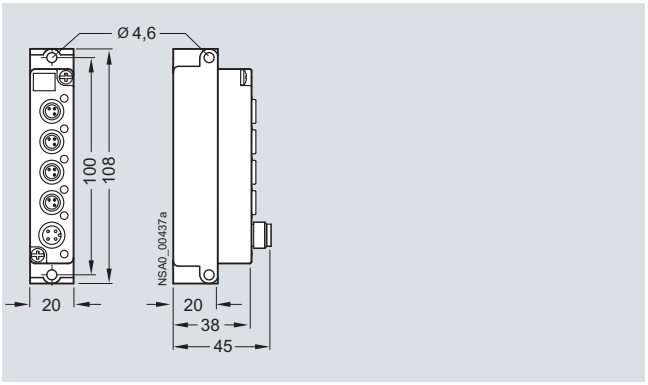
Connection examples for K20 modules

Technical specifications

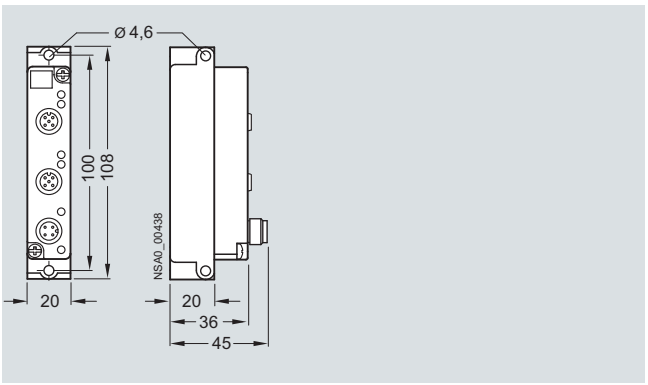
		Digital I/O module, IP67 – K20			
		4 inputs	**4 inputs**	**2 inputs/2 outputs**	**4 outputs**
		M8	M12	M8	M8
		Standard assignment	Y assignment	Standard assignment	Standard assignment
		3RK2 200-0CT30-0AA3	3RK2 200-0CQ30-0AA3	3RK2 400-1BT30-0AA3	3RK2 100-1CT30-0AA3
Slave type		A/B slave	A/B slave	A/B slave	A/B slave
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6
Total current input	mA	≤ 270	≤ 270	≤ 270	≤ 60
Input circuit		PNP	PNP	PNP	--
Inputs					
• Sensor supply using AS-Interface		Short-circuit and overload resistant	Short-circuit and overload resistant	Short-circuit and overload resistant	--
• Sensors		2- and 3-conductors	2- and 3-conductors	2- and 3-conductors	--
• Voltage range	V	16.5... 30	16.5 ... 30	16.5 ... 30	--
• Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	200	200	150	--
• Current carrying capacity for all inputs (T_u ≤ 55 °C)	mA	150	150	70	--
• Switching level High	V	≥ 10	≥ 10	≥ 10	--
• Input current Low/High	mA	≤ 1.5/≥ 6	≤ 1.5/≥ 6	≤ 1.5/≥ 6	--
• Socket assignment of inputs					--
- Pin 1		Sensor supply L+	Sensor supply L+	Sensor supply L+	--
- Pin 2		--	Data input 2	--	--
- Pin 3		Sensor supply L-	Sensor supply L-	Sensor supply L-	--
- Pin 4		Data input	Data input 1	Data input	--
- Pin 5		--	Not assigned	--	--
Outputs					
• Type of output		--	--	Solid-state	Solid-state
• Current carrying capacity per output DC 12/13 typical	A	--	--	1	1
• Maximum summation current per module	A	--	--	1	1
• Socket assignment of outputs		--	--	Pin 3: "-" Pin 4: Output	Pin 3: "-" Pin 4: Output
• Short-circuit protection		--	--	Built-in	Built-in
• Induction protection		--	--	Built-in	Built-in
• External power supply 24 V DC		--	--	Shared round cable connection with AS-Interface connection through M12 female connector	
• Watchdog		--	--	Built-in	Built-in
I/O configuration		0	0	B	7
ID/ID2 code		A/0	A/2	A/0	A/7
Assignment of data bits					
• Socket 1		Pin 4: IN1 (D0)	Pin 4: IN1 (D0) Pin 2: IN2 (D1)	Pin 4: IN3 (D2)	Pin 4: OUT1 (D0)
• Socket 2		Pin 4: IN2 (D1)	Pin 4: IN3 (D2) Pin 2: IN4 (D3)	Pin 4: IN4 (D3)	Pin 4: OUT2 (D1)
• Socket 3		Pin 4: IN3 (D2)	Not available	Pin 4: OUT1 (D0)	Pin 4: OUT3 (D2)
• Socket 4		Pin 4: IN4 (D3)	Not available	Pin 4: OUT2 (D1)	Pin 4: OUT4 (D3)
• Socket 5		Not available	Not available	Not available	Not available
• Socket 6		Not available	Not available	Not available	Not available
• Socket 7		Not available	Not available	Not available	Not available
• Socket 8		Not available	Not available	Not available	Not available
AS-Interface certificate		Yes	Yes	Yes	Yes
Approvals		UL/CSA	UL/CSA	UL/CSA	UL/CSA
Degree of protection		IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67
Ground terminal		Not available	Not available	Not available	Not available
Ambient temperature	°C	-25 ... +70	-25 ... +70	-25 ... +70	-25 ... +70
Storage temperature	°C	-40 ... +85	-40 ... +85	-40 ... +85	-40 ... +85
Number of I/O sockets		4	2	4	4
Status displays					
• Display of I/Os		Yellow LED	Yellow LED	Yellow LED	Yellow LED
• Display of U_{aux}		Not required	Not required	Green LED	Green LED
• Display of AS-Interface/diagnostics		Green/red LED	Green/red LED	Green/red LED	Green/red LED
Additional supply		--	--	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), safety class III.	

		Digital I/O module, IP67 – K20			
		2 inputs/2 outputs	**4 inputs/4 outputs**	**4 inputs/4 outputs**	**2 inputs, safe**
		M12	M8	M8	M12
		Y assignment	Standard assignment	Standard assignment	Y-II assignment
		3RK2 400-1BQ30-0AA3	3RK1 400-1CT30-0AA3	3RK2 400-1CT30-0AA3	3RK1 205-0BQ30-0AA3
Slave type		A/B slave	Standard slave	A/B slave (specification 3.0)	Standard slave
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6
Total current input	mA	≤ 270	≤ 270	≤ 270	≤ 45
Input circuit		PNP	PNP	PNP	For mechanical switching contacts
Inputs					
• Sensor supply using AS-Interface		Short-circuit and overload resistant	Short-circuit and overload resistant	Short-circuit and overload resistant	Not applicable
• Sensors		2- and 3-conductors	2- and 3-conductors	2- and 3-conductors	Mechanical switching contact
• Voltage range	V	16.5 ... 30	16.5 ... 30	16.5 ... 30	Not applicable
• Current carrying capacity for all inputs (T_u ≤ 40 °C)	mA	150	200	200	Not applicable
• Current carrying capacity for all inputs (T_u ≤ 55 °C)	mA	70	150	150	Not applicable
• Switching level High	V	≥ 10	≥ 10	≥ 10	Not applicable
• Input current Low/High	mA	≤ 1.5/≥ 6	≤ 1.5/≥ 6	≤ 1.5/≥ 6	-- / I_{peak} ≥ 5
• Socket assignment of inputs		Pin 1: Sensor supply L+ Pin 2: Data input 2 Pin 3: Sensor supply L- Pin 4: Data input 1 Pin 5: Not assigned	Pin 1: Sensor supply L+ Pin 3: Sensor supply L- Pin 4: Data input	Pin 1: Sensor supply L+ Pin 3: Sensor supply L- Pin 4: Data input	Pin 1/2: F-IN1 Pin 3/4: F-IN2 Pin 5: Not assigned
Outputs					
• Type of output		Solid-state	Solid-state	Solid-state	--
• Current carrying capacity per output DC 12/13 typical	A	1	1	1	--
• Maximum summation current per module	A	1	2 at T = 40 °C	2 at T = 40 °C	--
• Socket assignment of outputs		Pin 2: Output 2 Pin 3: "-" Pin 4: Output 1	Pin 3: "-" Pin 4: Output	Pin 3: "-" Pin 4: Output	--
• Short-circuit protection		Built-in	Built-in	Built-in	--
• Induction protection		Built-in	Built-in	Built-in	--
• External power supply 24 V DC		Shared round cable connection with AS-Interface connection through M12 female connector			--
• Watchdog		Built-in	Built-in	Built-in	--
I/O configuration		B	7	7	0
ID/ID2 code		A/2	0/E	A/7	B/0
Assignment of data bits					
• Socket 1		Pin 4: IN3 (D2) Pin 2: IN4 (D3)	Pin 4: IN1 (D0)	Pin 4: IN1 (D0)	Pin 1/2: F-IN1 Pin 3/4: F-IN2 Pin 5: Not assigned
• Socket 2		Pin 4: OUT1 (D0) Pin 2: OUT2 (D1)	Pin 4: IN2 (D1)	Pin 4: IN2 (D1)	Pin 1/2: F-IN2 Pin 3/4: Not assigned Pin 5: Not assigned
• Socket 3		Not available	Pin 4: IN3 (D2)	Pin 4: IN3 (D2)	Not available
• Socket 4		Not available	Pin 4: IN4 (D3)	Pin 4: IN4 (D3)	Not available
• Socket 5		Not available	Pin 4: OUT1 (D0)	Pin 4: OUT1 (D0)	Not available
• Socket 6		Not available	Pin 4: OUT2 (D1)	Pin 4: OUT2 (D1)	Not available
• Socket 7		Not available	Pin 4: OUT3 (D2)	Pin 4: OUT3 (D2)	Not available
• Socket 8		Not available	Pin 4: OUT4 (D3)	Pin 4: OUT4 (D3)	Not available
AS-Interface certificate		Yes	Yes	Yes	Yes
Approvals		UL/CSA	UL/CSA	UL/CSA	UL/CSA
Degree of protection		IP65/IP67	IP65/IP67	IP65/IP67	IP65/IP67
Ground terminal		Not available	Not available	Not available	Not available
Ambient temperature	°C	-25 ... +70	-25 ... +70	-25 ... +70	-25 ... +70
Storage temperature	°C	-40 ... +85	-40 ... +85	-40 ... +85	-40 ... +85
Number of I/O sockets		2	8	8	2
Status displays					
• Display of I/Os		Yellow LED	Yellow LED	Yellow LED	Yellow LED
• Display of U_{aux}		Green LED	Green LED	Green LED	Not required
• Display of AS-Interface/diagnostics		Green/red LED	Green/red LED	Green/red LED	Green/red LED
Additional supply		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), safety class III.			--
Special master requirements		--	--	A master according to AS-Interface specification 3.0 is required for this module	--

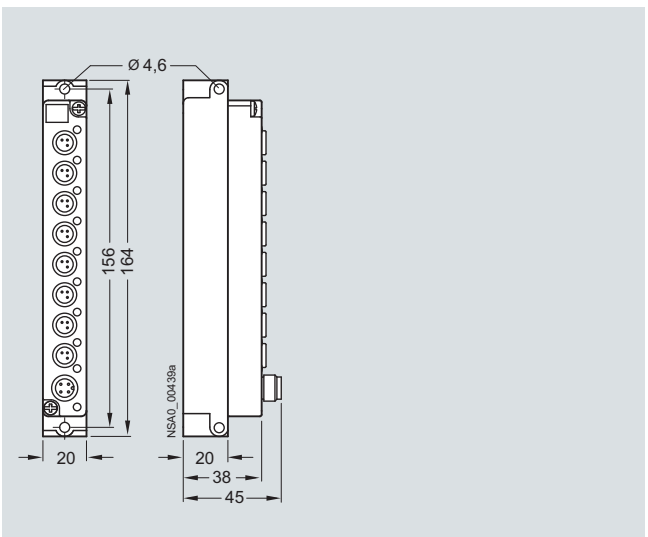
Dimensional drawings



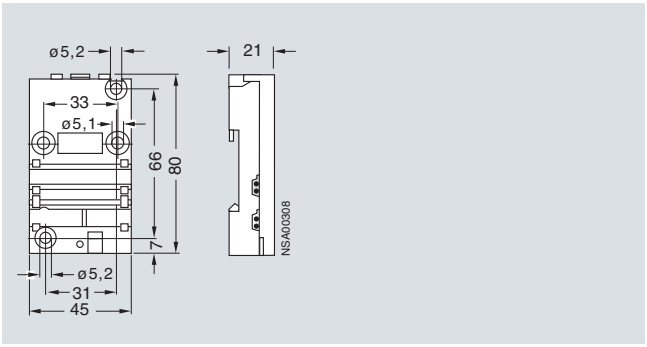
K20 module, four inputs, M8 (3RK2 200-0CT30-0AA3)
K20 module, two inputs/two outputs,
M8 (3RK2 400-1BT30-0AA3)



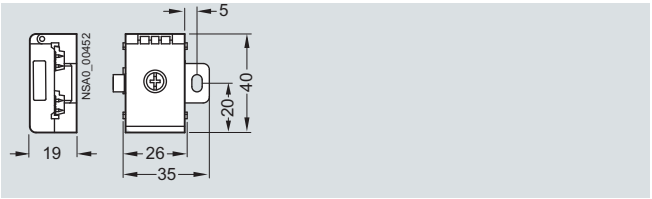
K20 module, four inputs, M12 (3RK2 200-0CQ30-0AA3)
K20 module, two inputs/two outputs,
M12 (3RK2 400-1BQ30-0AA3)
K20 module, two safety inputs, M12 (3RK1 205-0BQ30-0AA3)



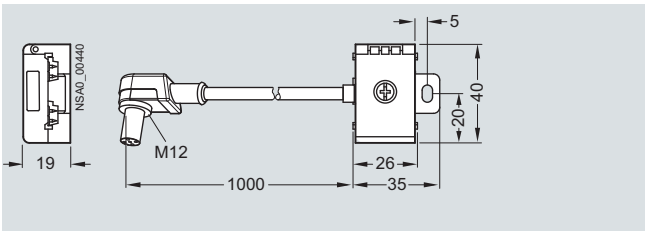
K20 module, four inputs/four outputs, M8 (3RK. 400-1CT30-0AA3)



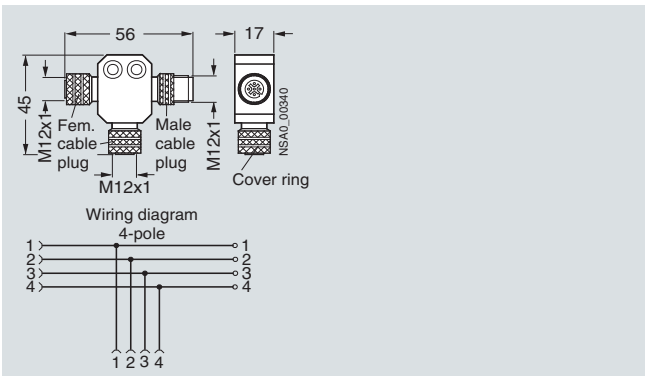
AS-Interface standard distributor, for AS-Interface flat cable
(3RK1 901-1NN00)



AS-Interface compact distributor, for AS-Interface flat cable
(3RK1 901-1NN10)



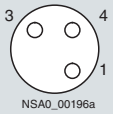
AS-Interface M12 feeder, AS-i/U_{aux}, M12 cable box, 1 m cable length
(3RK1 901-1NR21)



M12-T distributor (3RK1 901-1TR00)

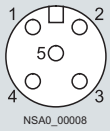
Schematics

Inputs



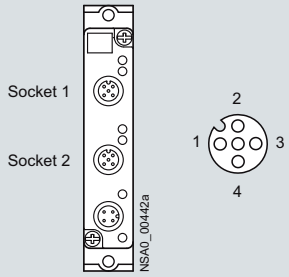
Pin 1: Supply L+
Pin 4: Supply L–
Pin 4: Input signal

Terminal assignment for input, M8 socket, standard assignment



Pin 1: Supply L+
Pin 2: Input signal 2
Pin 3: Supply L–
Pin 4: Input signal 1
Pin 5: Not assigned

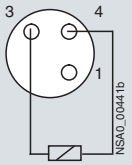
Terminal assignment for input, M12 socket, Y assignment



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 3, Pin 4 and Pin 5 not assigned

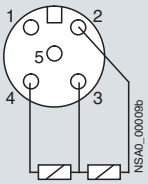
Terminal assignment for safety input, M12 socket, Y-II assignment

Outputs



Pin 1: Not assigned
Pin 4: Supply L–
Pin 4: Output signal

Terminal assignment for output, M8 socket, standard assignment



Pin 1: Not assigned
Pin 2: Output signal 2
Pin 3: Supply L–
Pin 4: Output signal 1
Pin 5: Not assigned

Terminal assignment for output, M12 socket, Y assignment

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

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 or specification 3.0.

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 according to profile 7.3/7.4 are available with two or four input channels. It is possible in addition to convert the two-channel module to using only one input channel, thus enabling very short times before the analog value is available. The conversion is effected by means of a jumper plug at socket 3. The transmission times achieved with analog modules according to Profile 7.A.9 are shorter by half than those achieved with Profile 7.3/7.4. Operation is adjustable in this case, e. g. it is possible to choose with the ID1 Code whether the module is operated with one or two channels.

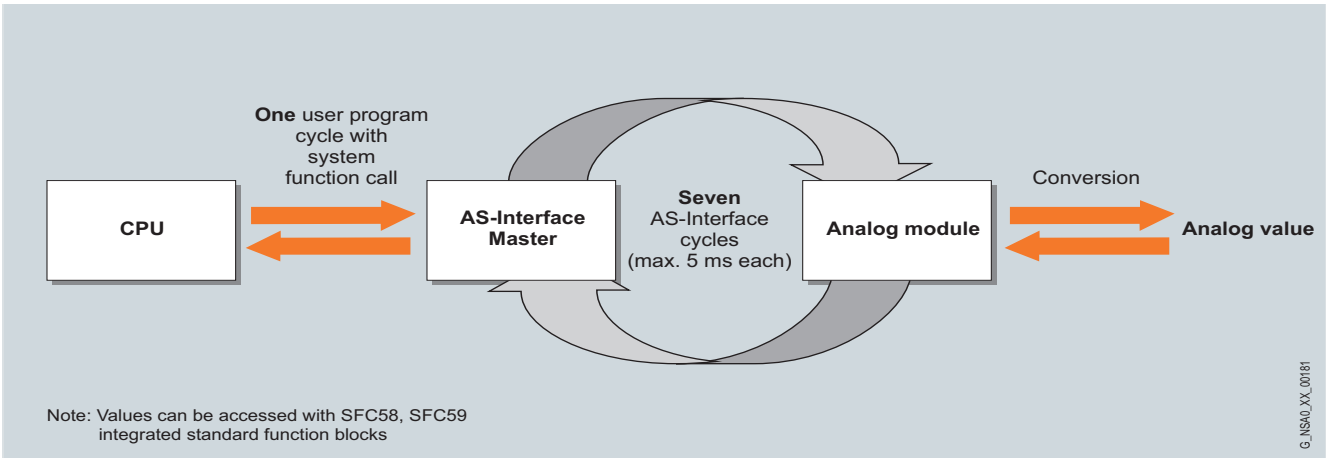
The output modules are configured as two-channel modules as standard.

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.

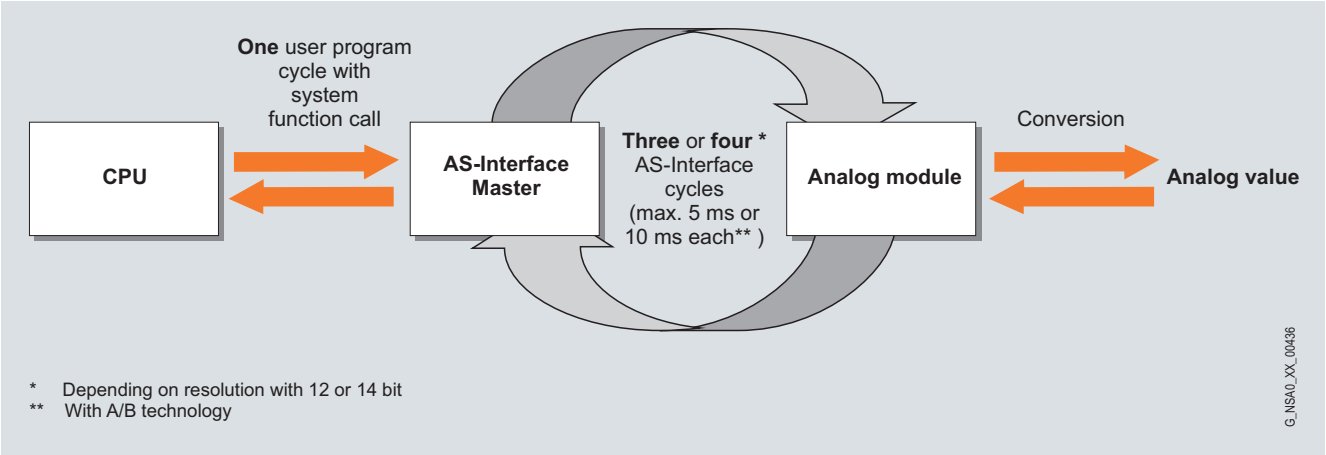
The analog value transmission applies in reverse order for the output modules as well.

In total this results in the following maximum times before the analog value is available with profile 7.3/7.4[1]:

	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.

Data transfer according to analog profile 7.A.9



With analog profile 7.A.9, only three or four AS-Interface cycles are needed for the transmission. This requires the use of a master according to specification 3.0.

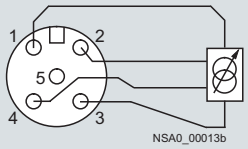
Maximum times before the analog value is available with profile 7.A.9 are offered in the manual with full details according to the mode selected (resolution, number of channels, A/B technology).

Technical specifications

		Analog I/O modules, IP67 - K60	
Slave type		Analog slave	A/B analog slave (Spec. 3.0)
Profile		7.3 D/E	7.A.9
Number format		S7	S7
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6	26.5 ... 31.6
Total current input of the module including connection of sensors/actuators	mA	150	150
Current transfer with connection of two sensors (without U_{aux} infeed)	mA	Max. 46	Max. 46
Additional supply of sensors through U_{aux}	V	24 ... 30	24 ... 30
Current transfer from U_{aux} with connection of two sensors	mA	Max. 500	Max. 500
Current transfer with connection of two current/voltage actuators	mA	Max. 30/max. 24	--
I/O configuration		7	7
ID code		3	A
ID2 code		D/E	9
Approvals		UL, CSA, shipbuilding	UL, CSA, shipbuilding available soon
Degree of protection		IP67 (with inserted cables)	IP67 (with inserted cables)
Ambient temperature	°C	-20 ... +60	-20 ... +60
Storage temperature	°C	-40 ... +85	-40 ... +85
Display of AUX PWR (U_{aux})		Green LED	Green LED
Display of AS-i		Green LED	Green LED
Display of FAULT		Red LED	Red LED
Mounting		Using mounting plate for K60 compact module	Using mounting plate for K60 compact module

Schematics

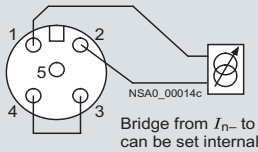
Pin assignment for input module



Pin 1: Supply L+ (DC 24 V)
Pin 2: IN+
Pin 3: Supply M (ground)
Pin 4: IN-
Pin 5: Cable shield / FG (functional ground)

All pin assignments are shown without external sensor supply.

Current input for 4-wire sensor

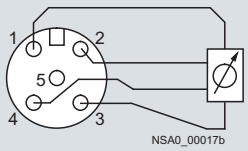


Bridge from I_{n-} to M(3) can be set internally via parameterisation

Pin 1: Supply L+ (DC 24 V)
Pin 2: IN+
Pin 3: Supply M (ground)
Pin 4: IN-
Pin 5: Cable shield / FG (functional ground)

All pin assignments are shown without external sensor supply.

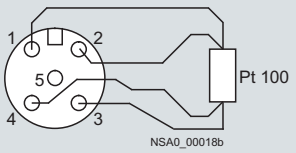
Current input for 2-wire sensor



Pin 1: Supply L+ (DC 24 V)
Pin 2: IN+
Pin 3: Supply M (ground)
Pin 4: IN-
Pin 5: Cable shield / FG (functional ground)

All pin assignments are shown without external sensor supply.

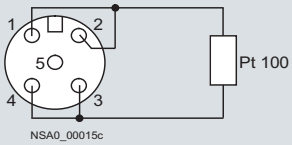
Voltage input for 4-wire sensor



Pin 1: I_{const+}
Pin 2: IN+
Pin 3: I_{const-}
Pin 4: IN-
Pin 5: Cable shield

All pin assignments are shown without external sensor supply.

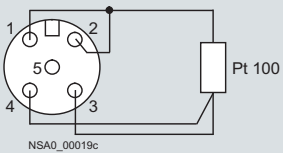
Thermal resistor for 4-wire sensor



Pin 1: I_{const+}
Pin 2: IN+
Pin 3: I_{const-}
Pin 4: IN-
Pin 5: Cable shield

All pin assignments are shown without external sensor supply.

Thermal resistor for 2-wire sensor

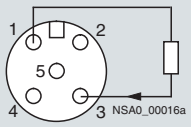


Pin 1: I_{const+}
Pin 2: IN+
Pin 3: I_{const-}
Pin 4: IN-
Pin 5: Cable shield

All pin assignments are shown without external sensor supply.

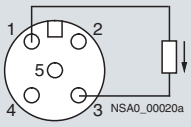
Thermal resistor for 3-wire sensor

Pin assignment for output module



Pin 5: Cable shield
All pin assignments are shown without external sensor supply.

Current output

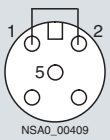


Pin 5: Cable shield
All pin assignments are shown without external sensor supply.

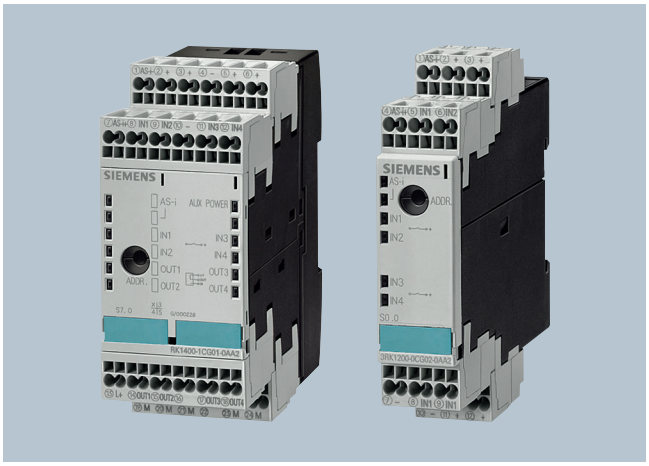
Voltage output

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

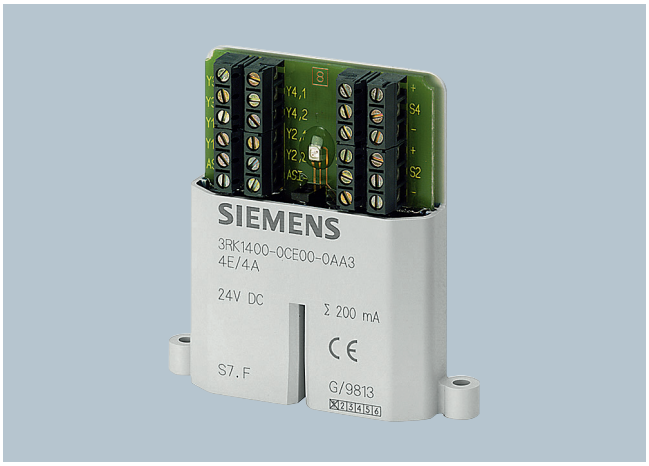
The 3RK1 901-1AA00 input bridge can also be used for this purpose.



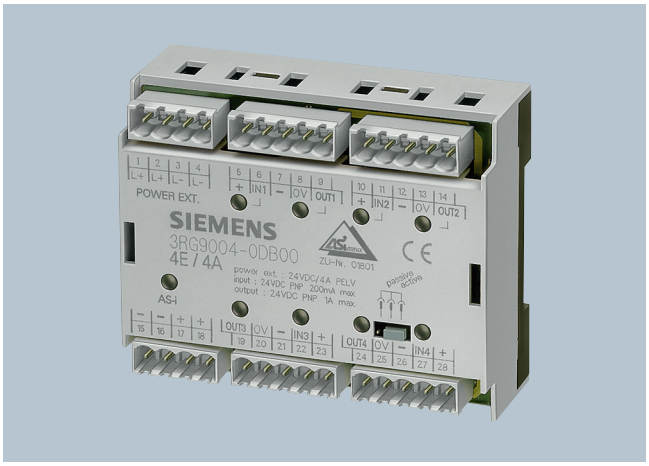
Overview



SlimLine S22.5/S45



Flat module



F90 module

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

- SlimLine S22.5
- SlimLine S45
- F90 module
- 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 base.

Series	Spectrum	Mounting on 35 mm standard mounting rail acc. to EN 60715	Wall mounting using push-in lugs (3RP1 903)	Other possibilities
SlimLine S22.5	• 4I (standard and A/B modules) • 4O • 2I/2O (steady-state/relay outputs) • Counters[1)] • Ground-fault detection modules[1)]	✓	✓	--
SlimLine S45	• 4I/4O (steady-state/relay outputs) • 4I/4O with floating I/Os • 4I/3O (A/B modules) • 4I/4O (A/B modules Spec. 3.0)	✓	✓	--
F90 module	• 4I/4O (screw terminal) • 4I/4O (connection using Combicon connector) • 16I	✓	--	--
Flat modules	• 4I/4O (screw terminal)	--	--	Integrated lugs for screw mounting

1) For more information about these modules see Catalog LV 1 --> Chapter "Systems", section "AS-Interface" --> "Slaves" --> "Modules with Special Functions" in our Mall --> section "Low-Voltage Controls" --> "SIRIUS Industrial Controls" --> "Systems" --> "AS-Interface" --> "Slaves" --> "Modules with Special Functions".

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

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

AS-Interface modules from the SlimLine series have a large status display:

- With yellow LEDs for the switching state of the inputs and outputs
- With two LEDs or one dual LED (two-color LED) for AS-i communication (depending on the design)
- With one green LED for the auxiliary voltage U_{AUX}

The status of a module is indicated by LEDs using continuous or blinklight. This enables diagnostics at a glance. The following tables provide an overview of the LED status displays of the I/O modules.

LED status displays for SlimLine modules

AS-i	FAULT	Possible cause	Possible remedy
Green	Off	Normal operation; AS-Interface communication OK	--
Green	Red	No AS-i communication: • Master deactivated or offline • Slave not configured in master • Wrong slave type connected • Slave has wrong address	Ensure AS-i communication: • Activate master or put it online • Reconfigure master • Connect correct module • Check slave address and correct if necessary
Green	Red flashing	Overload of sensor supply (slave is in RESET state and switches off completely)	Disconnect sensor cables from input sockets, install sensors with lower total current input, check sensors and cables
Green flashing	Red	Slave has address 0 (as-delivered state)	Address issued is not equal to 0
Green flashing (alternating flashing)	Red flashing	Overload of outputs (slave switches off all outputs)	Disconnect actuator cables from output sockets, check actuators and cables
Off	Off	No AS-i voltage, AS-i voltage with reversed polarity, AS-i voltage too low	Switch on AS-i voltage, connect correctly, measure AS-i voltage (approx. 30 V DC)

Note:

The display for LED FAULT is not labeled. It is located directly underneath the AS-i display LED. The status "overload of outputs" (green flashing/red flashing, alternating) is not displayed by all modules.

LED status displays for F90 modules

AS-i/FAULT	Possible cause	Possible remedy
Green	Normal operation; AS-Interface communication OK	--
Red	No AS-i communication: • Master deactivated or offline • Slave not configured in master • Wrong slave type connected • Slave has wrong address	Ensure AS-i communication: • Activate master or put it online • Reconfigure master • Connect correct module • Check slave address and correct if necessary
Red flashing	Overload of sensor supply (slave is in RESET state and switches off completely)	Disconnect sensor cables from input sockets, install sensors with lower total current input, check sensors and cables
Yellow-red flashing	Slave has address 0 (as-delivered state)	Address issued is not equal to 0
Off	No AS-i voltage, AS-i voltage with reversed polarity, AS-i voltage too low	Switch on AS-i voltage, connect correctly, measure AS-i voltage (approx. 30 V DC)

Note:

F90 modules (16I) have no dual LED for AS-i/fault. Only "Green" and "Off" are displayed.

Additional LED status display for AUX POWER on modules with auxiliary voltage

AUX POWER	**Possible cause**	**Possible remedy**
Green	Normal operation; AS-Interface communication OK	--
Off	No auxiliary voltage Auxiliary voltage with reversed polarity Auxiliary voltage too low	Switch on 24 V DC auxiliary voltage, connect correctly, measure auxiliary voltage (approx. 24 V DC)

Note:

Modules without auxiliary voltage connection have no display LED for AUX POWER (e. g. pure input modules, modules with relay outputs). On SlimLine modules with width of 22.5 mm there is no display-LED for AUX POWER.

Overview

SlimLine modules of the S22.5 and S45 series

The AS-Interface series of modules for the "SlimLine" control cabinet with degree of protection IP20 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 or 45 mm.

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

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

With an additional accessory (push-in lugs), 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 design 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
- In our Mall: section "Low-Voltage Controls / SIRIUS Industrial Controls / Systems" --> "AS-Interface" --> "Slaves" --> "Modules with Special Functions"

The new AS-Interface specification 3.0 adds a number of completely new features to AS-Interface bus system. The extended address mode (A/B addresses) enables the connection of up to 62 slaves on one AS-Interface network. With the extended address mode according to specification 3.0, four outputs are now possible for the first time even with A/B slaves (instead of only three outputs possible up to now with specification 2.1). Hence with full expansion of an AS-Interface network, there are now 248 inputs as well as 248 outputs available on one AS-Interface system.

Modules with four inputs and four outputs as A/B slaves according to specification 3.0 are also available as SlimLine modules S45.

Note:

Please note that the modules according to Specification 3.0 can be used only with a new master according to AS-Interface Specification 3.0 (e. g. the new DP/AS-i LINK Advanced or IE/AS-i LINK PN IO) and that the cycle times for the outputs can extend to max. 20 ms.

Design

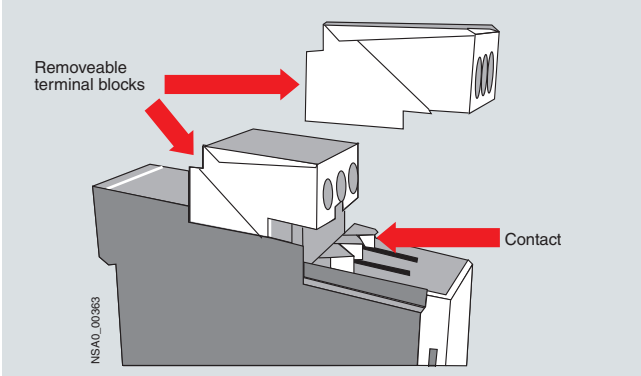
Removable terminals

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:

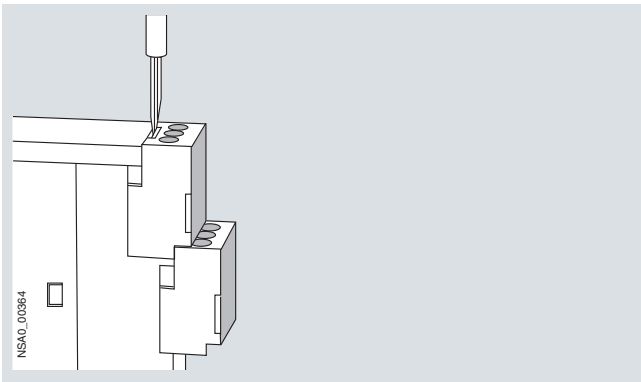
Before the terminal blocks are removed, the unit must be de-energized.

Features



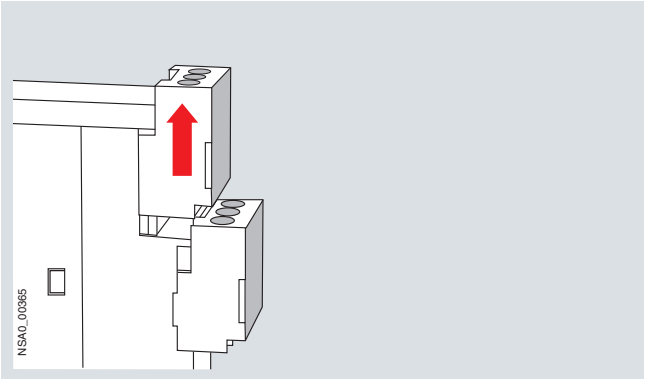
- *Service-proven terminal technology*
  The new design of the removable terminal means that the conductors remain easy to connect. The old conductor cross-sections can still be used.
- *Variable connection methods*
  All modules are available with screw-type and spring-type connections.
- *Coding*
  The coding ensures that the terminal blocks cannot be mixed up (EN 50178).
- *Withdrawal and vibration safety*
  The joint blocks are latched to the enclosure. The terminal blocks can be detached with the help of a 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.
- *Inscription*
  All terminal connections are printed onto the terminal block which allows the unit to be factory-fitted.

Unlocking the removable terminal

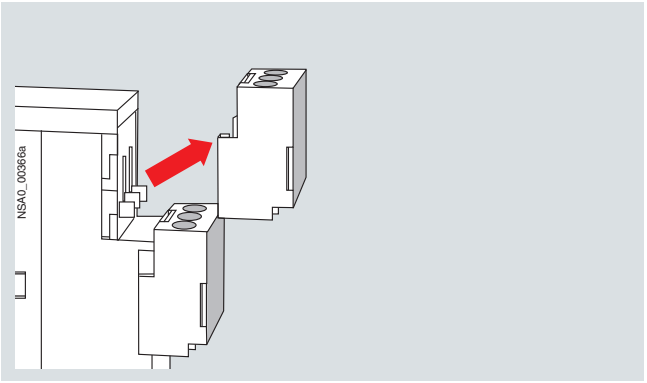


Step 1: release latch with screwdriver

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

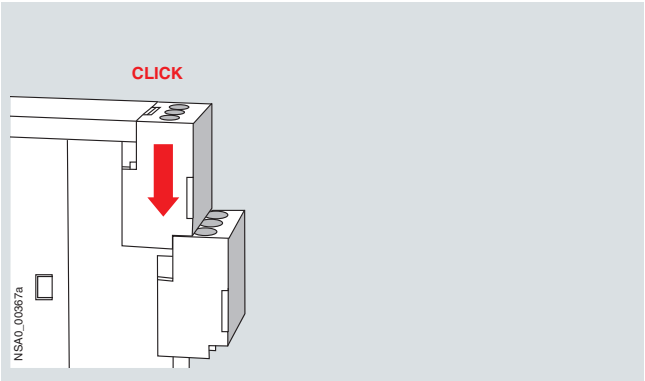


Step 2: pull terminal to the front



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-type connection

Technical specifications

Technical specifications common to all SlimLine modules

Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6
Input circuit		PNP
AS-Interface certificate		Yes (or requested for in case of new units)
Approvals		UL, CSA, shipbuilding (or requested for in case of new units)
Degree of protection		IP20
Ambient temperature	°C	-25 ... +70
Storage temperature	°C	-40 ... +85
Status displays		
• Display of I/Os		Yellow LED
• Display of AS-i		Green LED
• Display of FAULT		Red LED
Note		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), safety class III.

SlimLine S22.5

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

		4 inputs	4 inputs	4 inputs
		Spring-type terminals		
		Standard slave	Standard slave	A/B slave
		2-conductors	2- and 3-conductors	2- and 3-conductors
		3RK1 200-0CG00-0AA2	3RK1 200-0CG02-0AA2	3RK2 200-0CG02-0AA2
Total current input	mA	≤ 50	≤ 270	≤ 270
Inputs				
• Sensor supply		using AS-Interface	using AS-Interface	using AS-Interface
• Sensor current supply Short-circuit and overload resistant		yes	yes	yes
• Voltage range	V	20 ... 30	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply	mA	--	200	200
• Connection of sensors		2-conductor technology	2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High	V	≥ 10	≥ 10	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 5	≤ 1.5/≥ 5	≤ 1.5/≥ 5
I/O configuration		0	0	0
ID/ID2 code		0/F	0/F	A/0
Assignment of data bits				
• Data bit D0		IN1	IN1	IN1
• Data bit D1		IN2	IN2	IN2
• Data bit D2		IN3	IN3	IN3
• Data bit D3		IN4	IN4	IN4
Connection		Spring-type terminal	Spring-type terminal	Spring-type terminal
Conductor cross-sections	mm^2	• 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 cables, 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 cables, 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 cables, solid or stranded: AWG 2 × (24 ...16)
Note		Detachment tool for spring-type terminal: see section "Accessories"		

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

		2 inputs/2 outputs		
		Screw terminals		Spring-type terminals
		Standard slave	Standard slave	Standard slave
		2-conductors	2-conductors	2-conductors
		PNP transistor (2 A)	Relays	PNP transistor (2 A)
		3RK1 400-0BE00-0AA2	3RK1 402-0BE00-0AA2	3RK1 400-0BG00-0AA2
Total current input	mA	≤ 50	≤ 50	≤ 50
Inputs				
• Sensor supply		using AS-Interface	using AS-Interface	using AS-Interface
• Sensor current supply Short-circuit and overload resistant		yes	yes	yes
• Voltage range	V	20 ... 30	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply	mA	--	--	--
• Connection of sensors		2-conductor technology	2-conductor technology	2-conductor technology
• Switching level High	V	≥ 10	≥ 10	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 5	≤ 1.5/≥ 5	≤ 1.5/≥ 5
Outputs				
• Type of output		Transistor (PNP)	Relays	Transistor (PNP)
• Current carrying capacity per output DC 12/13 typical	A	2	--	2
• Maximum summation current per module	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
I/O configuration		3	3	3
ID/ID2 code		0/F	0/F	0/F
Assignment of data bits				
• Data bit D0		IN1	IN1	IN1
• Data bit D1		IN2	IN2	IN2
• Data bit D2		OUT1	OUT1	OUT1
• Data bit D3		OUT2	OUT2	OUT2
Connection		Screw terminals	Screw terminals	Spring-type terminal
Conductor cross-sections	mm^2	--	--	• Solid: 2 × (0.2 5...1.5) • Finely stranded with end sleeve: 2 × (0.25 ...1) • Finely stranded without end sleeve: 2 × (0.25 ...1.5) • AWG cables, solid or stranded: AWG 2 × (24 ...16)
Note		--	--	Detachment tool for spring-type terminal: see section "Accessories"

		2 inputs/2 outputs	4 outputs	4 outputs
		Spring-type terminals		Spring-type terminals
		Standard slave	Standard slave	Standard slave
		2-conductors	--	--
		Relays	PNP transistor (1 A)	PNP transistor (1 A)
		3RK1 402-0BG00-0AA2	3RK1 100-1CE00-0AA2	3RK1 100-1CG00-0AA2
Total current input	mA	≤ 50	≤ 40	≤ 40
Inputs				
• Sensor supply		using AS-Interface	--	--
• Sensor current supply Short-circuit and overload resistant		yes	--	--
• Voltage range	V	20 ... 30	--	--
• Current carrying capacity for sensor supply	mA	--	--	--
• Connection of sensors		2-conductor technology	--	--
• Switching level High	V	≥ 10	--	--
• Input current Low/High	mA	≤ 1.5/≥ 5	--	--
Outputs				
• Type of output		Relay Changeover contact, floating	Solid state (PNP)	Solid state (PNP)
• Current carrying capacity per output DC 12/13 typical	A	--	1	1
• Maximum summation current per module	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 terminals: • Terminal 7: "-" • Terminal 10: M	Using screw 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
I/O configuration		3	8	8
ID/ID2 code		0/F	0/F	0/F
Assignment of data bits				
• Data bit D0		IN1	OUT1	OUT1
• Data bit D1		IN2	OUT2	OUT2
• Data bit D2		OUT1	OUT3	OUT3
• Data bit D3		OUT2	OUT4	OUT4
Connection		Spring-type terminal	Screw terminals	Spring-type terminal
Conductor cross-sections	mm^2	• 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 cables, 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 cables, solid or stranded: AWG 2 × (24 ...16)
Note		Detachment tool for spring-type terminal: see section "Accessories"	--	Detachment tool for spring-type terminal: see section "Accessories"

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

SlimLine S45

		4 inputs/4 outputs		
		Screw terminals		
		Standard slave		
		2- and 3-conductors	2- and 3-conductors	2- and 3-conductors (floating)
		PNP transistor (1 A)	PNP transistor (2 A)	PNP transistor (1 A) floating
		3RK1 400-1CE00-0AA2	3RK1 400-1CE01-0AA2	3RK1 402-3CE01-0AA2
Total current input	mA	≤ 270	≤ 270	≤ 40
Inputs				
• Sensor supply		using AS-Interface	using AS-Interface	using AS-Interface
• Sensor current supply Short-circuit and overload resistant		yes	yes	yes
• Voltage range	V	20 ... 30	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply	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	V	≥ 10	≥ 10	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 5	≤ 1.5/≥ 5	≤ 1.5/≥ 5
Outputs				
• Type of output		Solid-state	Solid-state	Solid-state
• Current carrying capacity per output DC 12/13 typical	A	1	2	1
• Maximum summation current per module	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_s+ - Terminal 19: U_s– • Actuator supply: - Terminal 14: L+ - Terminal 20 to 24: M
• I_{th}		--	--	--
• AC-15		--	--	--
• DC 13, 24 V		--	--	--
• DC 13, 110 V		--	--	--
• DC 13, 230 V		--	--	--
• Watchdog		Built-in	Built-in	Built-in
I/O configuration		7	7	7
ID/ID2 code		0/F	0/F	0/F
Assignment of data bits				
• 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
Connection		Using screw terminals	Using screw terminals	Using screw terminals
Note		--	--	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) safety class III is required for the supply of the input and output circuits.

		4 inputs/4 outputs		
		Screw terminals	Spring-type terminals	Spring-type terminals
		Standard slave	Standard slave	Standard slave
		2- and 3-conductors	2- and 3-conductors	2- and 3-conductors
		Relays	PNP transistor (1 A)	PNP transistor (2 A)
		3RK1 402-3CE00-0AA2	3RK1 400-1CG00-0AA2	3RK1 400-1CG01-0AA2
Total current input	mA	≤ 270	≤ 270	≤ 270
Inputs				
• Sensor supply		using AS-Interface	using AS-Interface	using AS-Interface
• Sensor current supply Short-circuit and overload resistant		yes	yes	yes
• Voltage range	V	20 ... 30	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply	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	V	≥ 10	≥ 10	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 5	≤ 1.5/≥ 5	≤ 1.5/≥ 5
Outputs				
• Type of output		Relays	Solid-state	Solid-state
• Current carrying capacity per output DC 12/13 typical	A	--	1	2
• Maximum summation current per module	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
ID/ID2 code		0/F	0/F	0/F
Assignment of data bits				
• 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
Connection		Using screw terminals	Spring-type terminal	Spring-type terminal
Conductor cross-sections	mm^2	--	• 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 cables, 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 cables, solid or stranded: AWG 2 × (24 ...16)
Note		--	Detachment tool for spring-type terminal: see section "Accessories"	

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

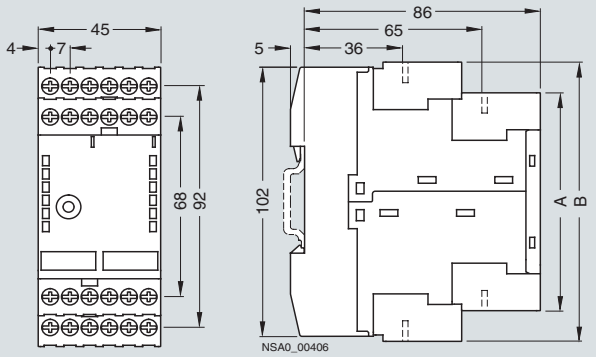
		4 inputs/4 outputs	
		Spring-type terminals	
		Standard slave	
		2- and 3-conductors	
		PNP transistor (1 A)	Relays
		3RK1 402-3CG01-0AA2	3RK1 402-3CG00-0AA2
Total current input	mA	≤ 40	≤ 270
Inputs			
• Sensor supply		using U_{aux}	using AS-Interface
• Sensor current supply Short-circuit and overload resistant		yes	yes
• Voltage range	V	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply	mA	200	200
• Connection of sensors		2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High	V	≥ 10	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 5	≤ 1.5/≥ 5
Outputs			
• Type of output		Solid-state	Relays
• Current carrying capacity per output DC 12/13 typical	A	1	--
• Maximum summation current per module	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_s+ • Terminal 19: U_s– Actuator supply: • Terminal 14: L+ • Terminal 20 to 24: M	Does not apply
• 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
I/O configuration		7	7
ID/ID2 code		0/F	0/F
Assignment of data bits			
• 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
Connection		Spring-type terminal	Spring-type terminal
Conductor cross-sections	mm^2	• 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 cables, 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 cables, solid or stranded: AWG 2 × (24 ...16)
Note 1		Detachment tool for spring-type terminal: see section "Accessories"	
Note 2		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) safety class III is required for the supply of the input and output circuits.	--

		4 inputs/3 outputs	
		Screw terminals	Spring-type terminals
		A/B slave	A/B slave
		2- and 3-conductors	2- and 3-conductors
		PNP transistor (2 A)	PNP transistor (2 A)
		3RK2 400-1FE00-0AA2	3RK2 400-1FG00-0AA2
Total current input	mA	≤ 270	≤ 270
Inputs			
• Sensor supply		using AS-Interface	using AS-Interface
• Sensor current supply Short-circuit and overload resistant		yes	yes
• Voltage range	V	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply	mA	200	200
• Connection of sensors		2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High	V	≥ 10	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 5	≤ 1.5/≥ 5
Outputs			
• Type of output		Solid-state	Solid-state
• Current carrying capacity per output DC 12/13 typical	A	2	2
• Maximum summation current per module	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		• Terminal 13: L24+ • Terminal 19: M24	• Terminal 13: L24+ • Terminal 19: M24
• I_{th}		--	--
• AC-15		--	--
• DC 13, 24 V		--	--
• DC 13, 110 V		--	--
• DC 13, 230 V		--	--
• Watchdog		Built-in	Built-in
I/O configuration		7	7
ID/ID2 code		A/0	A/0
Assignment of data bits			
• 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
Connection		Using screw terminals	Spring-type terminal
Conductor cross-sections	mm^2	--	• 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 cables, solid or stranded: AWG 2 × (24...16)
Note		--	Detachment tool for spring-type terminal: see section "Accessories"

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

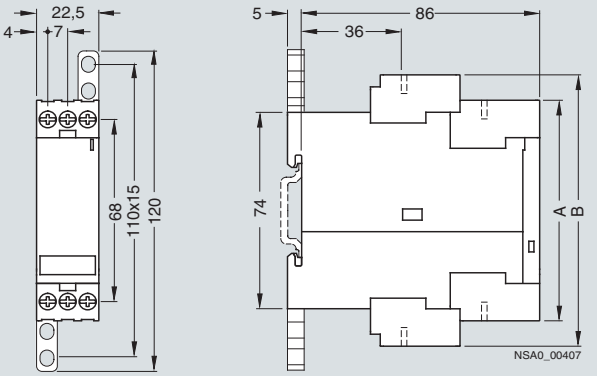
		4 inputs/4 outputs	
		Screw terminals	Spring-type terminals
		A/B (Spec. 3.0)	A/B (Spec. 3.0)
		2- and 3-conductors	2- and 3-conductors
		PNP transistor (2 A)	PNP transistor (2 A)
		3RK2 400-1CE01-0AA2	3RK2 400-1CG01-0AA2
Total current input	mA	≤ 270	≤ 270
Inputs			
• Sensor supply		using AS-Interface	using AS-Interface
• Sensor current supply Short-circuit and overload resistant		yes	yes
• Voltage range	V	20 ... 30	20 ... 30
• Current carrying capacity for sensor supply	mA	200	200
• Connection of sensors		2- and 3-conductor technology	2- and 3-conductor technology
• Switching level High	V	≥ 10	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 5	≤ 1.5/≥ 5
Outputs			
• Type of output		Solid-state	Solid-state
• Current carrying capacity per output DC 12/13 typical	A	2	2
• Maximum summation current per module	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		• Terminal 13: L24+ • Terminal 19: M24	• Terminal 13: L24+ • Terminal 19: M24
• I_{th}		--	--
• AC-15		--	--
• DC 13, 24 V		--	--
• DC 13, 110 V		--	--
• DC 13, 230 V		--	--
• Watchdog		Built-in	Built-in
I/O configuration		7	7
ID/ID2 code		A/7	A/7
Assignment of data bits			
• 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
Connection		Using screw terminals	Spring-type terminal
Conductor cross-sections	mm^2	--	• 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 cables, solid or stranded: AWG 2 × (24...16)
Note		--	Detachment tool for spring-type terminal: see section "Accessories"

Dimensional drawings



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

SlimLine S45

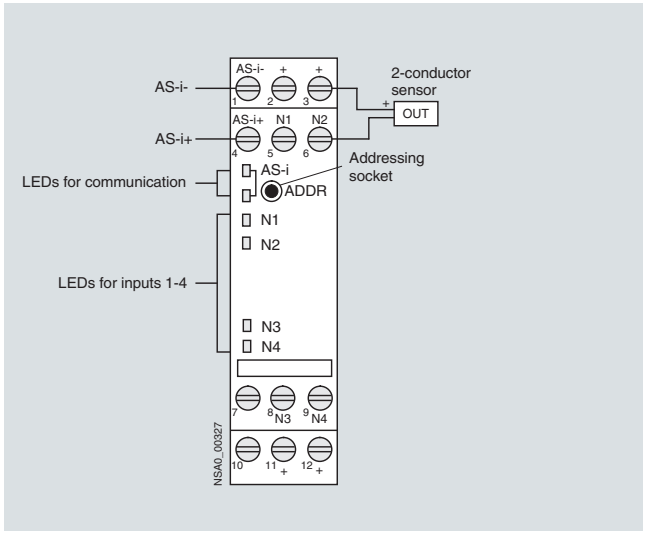


	A	B
Standard terminal		
Spring-type terminal	81,6	101,6
Screw terminal	80	100
Removeable terminal		
Spring-type terminal	84	103
Screw terminal	83	102

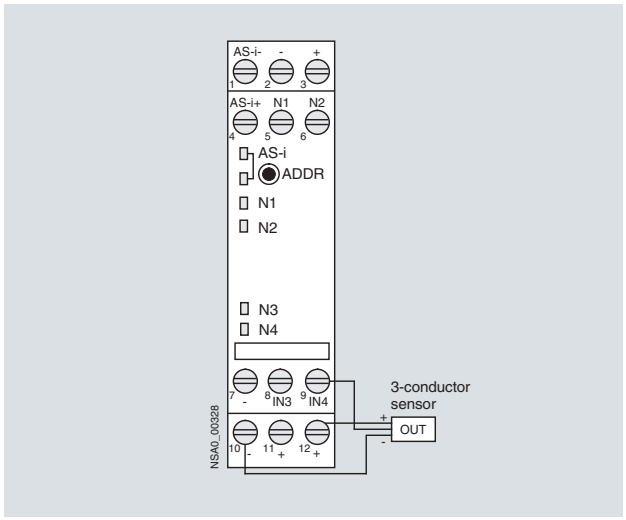
SlimLine S22.5

Schematics

Switching example for SlimLine S22.5

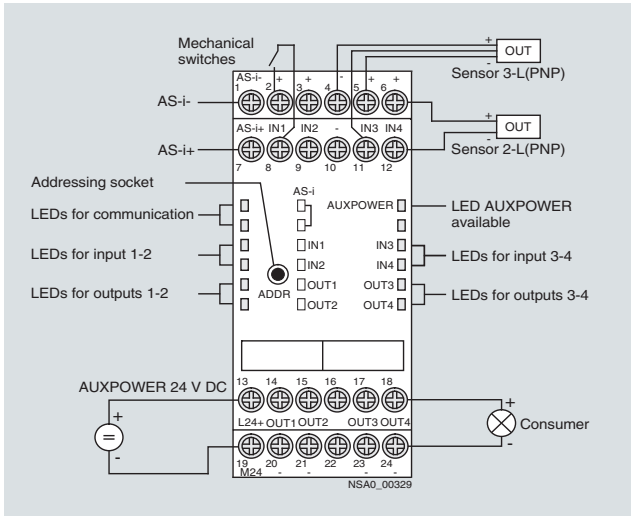


3RK1 200-0CE00-0AA2



3RK1 200-0CE02-0AA2

Switching example for SlimLine S45



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 PAA	PLC PAE	Master AA		Module AA	Module EA	Note
	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~~	E 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:

AA	Output image
EA	Input image
MC	Master call
PAA	Process image of the outputs
PEA	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 x ((6 x 5 ms) + 5 ms + 10 ms) =180 ms

Function blocks

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

- FC 22 for S7-300

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.

Programming examples:

Programming examples for the S7-300 are available from Technical Assistance, Tel. +49 (0)911 895-5900 or the Internet.

More information

You can find further information on the Internet at:

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

Technical specifications

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

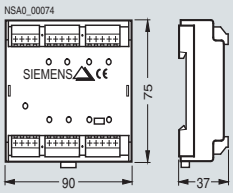
I/O modules for operation in the control cabinet, IP20

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

		16 inputs	
		Screw terminals	**Combicon connectors**
		PNP transistor	PNP transistor
		3RG9 002-0DE00	3RG9 004-0DE00
Slave type		Standard slave	
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6	
Total current input	mA	≤ 70	
Input circuit		PNP	
Inputs			
• Sensor supply		using AS-Interface	
• Sensor current supply Short-circuit and overload resistant		yes	
• Voltage range	V	20 ... 30	
• Connection of sensors		Mechanical contacts	
• Signal 1 U_{in}		20 ... 30 V ≥ 3 mA	
Group signal			
• Current carrying capacity I_{out}	mA	≤ 25	
• Output voltage U_{out}	V	20 ... 30	
Watchdog		Built-in	
I/O configuration		7	
ID/ID2 code		F/F	
Assignment of data bits			
• 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)	
AS-Interface certificate		Yes	
Approvals		UL, CSA, shipbuilding	
Degree of protection		IP20	
Ambient temperature	°C	-25 ... +70	
Storage temperature	°C	-40 ... +85	
Displays of inputs/outputs		Yellow LED	
Connection		Using screw terminals	Using Combicon plug connector
Addressing procedure		Possible using integrated addressing socket	
Note 1		The module has four input groups. Each input group has four inputs and a group signal for the power 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.	
Note 2		Function block required	
Note 3		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), safety class III.	

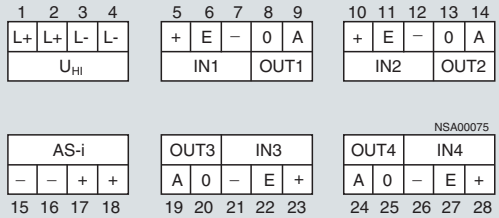
I/O modules for operation in the control cabinet, IP20

Dimensional drawings

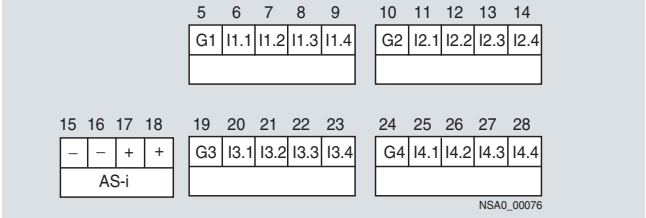


Schematics

Terminal assignment



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



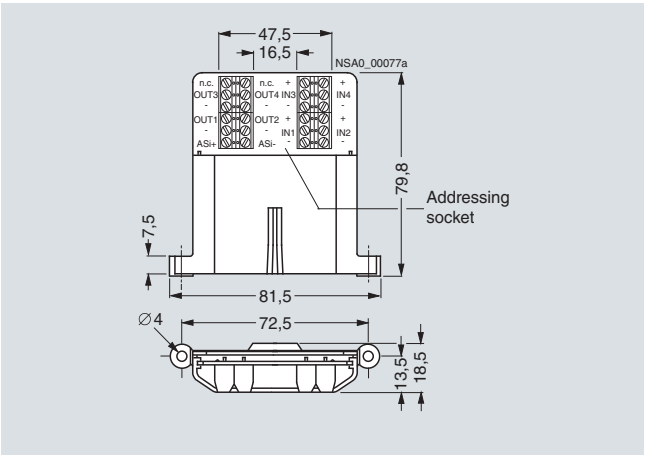
3RG9 002-0DE00
3RG9 004-0DE00

Technical specifications

		Flat modules 4 inputs/4 outputs 200 mA for all I/Os Screw terminals
		3RK1 400-0CE00-0AA3
Slave type		Standard slave
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6
Total current input	mA	≤ 270[1)]
Input circuit		PNP
Inputs		
• Sensor supply using AS-Interface		Short-circuit and overload resistant
• Voltage range	V	20 ... 30
• Current carrying capacity for all inputs	mA	200[1)]
• Connection of sensors		2- and 3-conductor technology
• Switching level High	V	≥ 10
• Input current Low/High	mA	≤ 1.5/≥ 5
Outputs		
• Type of output		Solid-state
• Current carrying capacity (DC 12/DC 13)	mA	200[1)]
• 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)
Watchdog		Built-in
I/O configuration		7
ID/ID2 code		F/F
Assignment of data bits		
• Data bit D0		IN1/OUT1
• Data bit D1		IN2/OUT2
• Data bit D2		IN3/OUT3
• Data bit D3		IN4/OUT4
AS-Interface certificate		Yes
Degree of protection		IP20
Ambient temperature	°C	-25 ... +85
Storage temperature	°C	-40 ... +85
Displays of inputs/outputs		
• AS-i voltage		Green LED
• FAULT		Red LED
Connection		Using screw terminals
Addressing procedure		Using integrated addressing socket

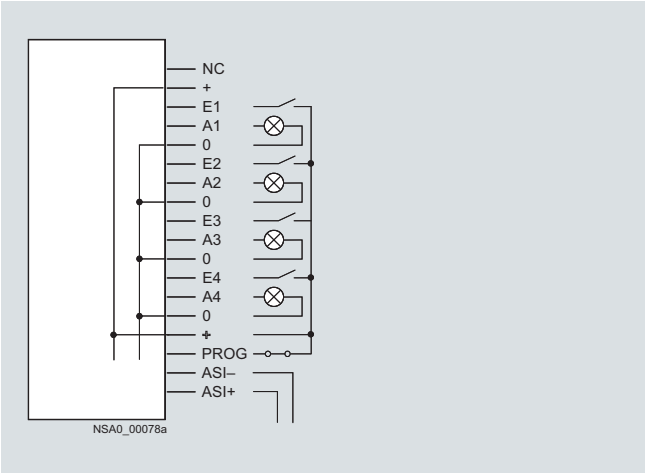
[1)] Summation current for all inputs and outputs max. 200 mA.

Dimensional drawings



Overview

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

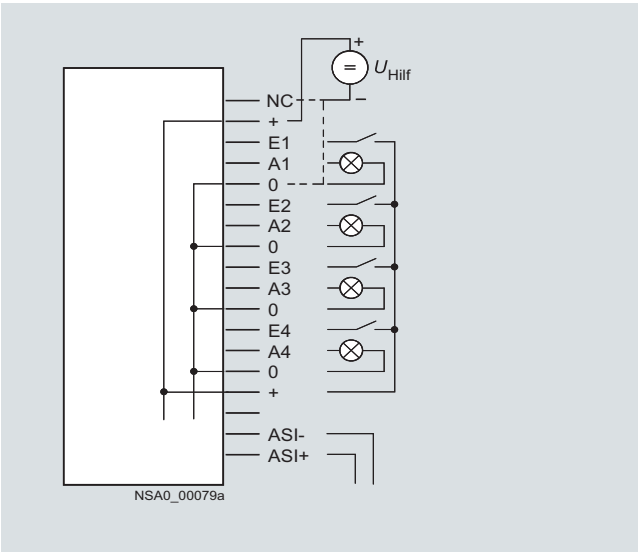


With the 4I/4O module for printed circuit board mounting it is possible for up to four mechanical contacts to be queried or indicator lights to be operated, the necessary energy being provided by the AS-Interface system (yellow AS-Interface cable).

Note:

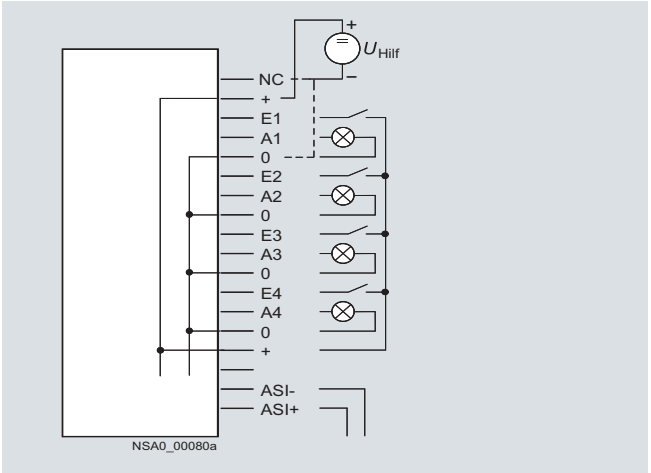
If the switching outputs are overloaded, the module does not respond to invoking by a master.

3RK1 400-0CD01-0AA3 AS-Interface communication 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 energy 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 communication 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.

3RK1 400-1CD00-0AA2, 3RK2 400-1FD00-0AA2 AS-Interface communication module for printed circuit board installation

Connection	Connection pad[1)]
AS-i +	27, 29
AS-i -	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 (not assigned for 3RK2 400-1FD00-0AA2 4I/3O module)
OUT-	7, 8
Not assigned	11, 12, 25, 26

[1)] Pad numbering, see section "Dimensional drawings".

With the 4I/4O or 4I/3O 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.

Up to four indicator lights via the 4I/4O module or up to three indicator lights via the 4I/3O module can also be controlled. The power for short-circuit resistant solid-state switching outputs is provided from an auxiliary voltage (24 V PELV).

Mounting 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 communication module for printed circuit board installation

Connection	Connection pad[1)]
AS-i +	27, 29
AS-i -	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)] 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.

Mounting 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:

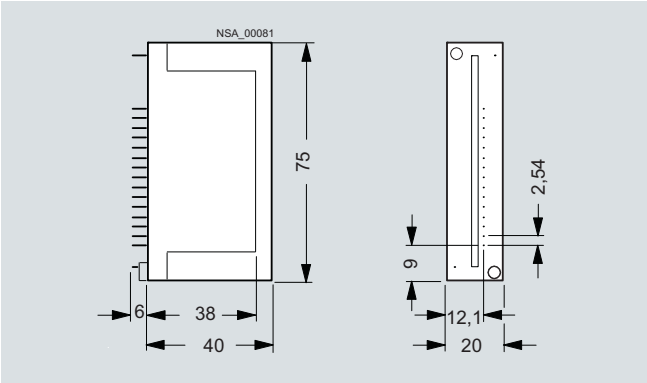
- 180° version for vertical mounting (AMP): Order No. 530843-2
- 90° version for horizontal mounting (AMP): Order No. 650118-1

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

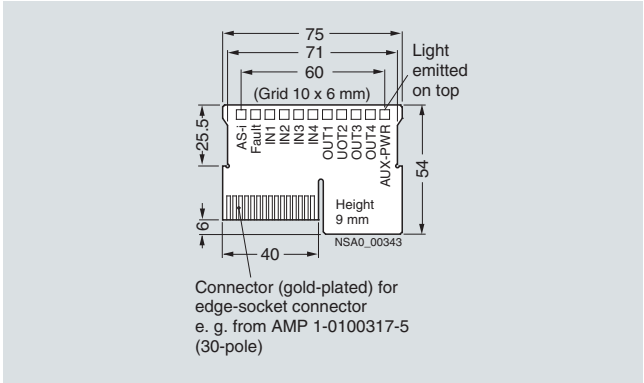
Technical specifications

		4 inputs/ 4 outputs	**4 inputs/ 4 outputs**	**4 inputs/ 4 outputs**	**4 inputs/ 4 outputs**	**4 inputs/ 3 outputs**	**4 inputs**
		3RK1 400-0CD00-0AA3	3RK1 400-0CD01-0AA3	3RG9 005-0SA00	3RK1 400-1CD00-0AA2	3RK2 400-1FD00-0AA2	3RK1 200-0CD00-0AA2
Supply		Supply of I/Os using AS-Interface (max. 200 mA)	Supply of I/Os using external auxiliary voltage (24 V PELV)	Supply of I/Os using external auxiliary voltage (24 V PELV)	Supply of outputs using external auxiliary voltage (24 V PELV)	Supply of outputs using external auxiliary voltage (24 V PELV)	Supply of Inputs using AS-Interface
Version		Printed circuit board with solder pins, protected by enclosure	Printed circuit board with solder pins, protected by enclosure	Printed circuit board with solder pins for horizontal mounting	Printed circuit board with gold-plated direct connector for 30-pole male connector socket for simple installation with direct connector		
Slave type		Standard slave	Standard slave	Standard slave	Standard slave	Standard slave	Standard slave
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6	26.5 ... 31.6
Total current input	mA	≤ 270	≤ 25	≤ 25	≤ 270	≤ 270	≤ 270
Input circuit		PNP	PNP	PNP	PNP	PNP	PNP
Inputs							
• Sensor supply		Using AS-Interface	Using U_{aux}	Using U_{aux}	Using AS-Interface	Using AS-Interface	Using AS-Interface
• Switching voltage	V	20 ... 30	20 ... 30	20 ... 30	20 ... 30	20 ... 30	20 ... 30
• Switching current	mA	≥ 3	≥ 3	≥ 3	--	--	--
Outputs							
• Type of output		Solid-state	Solid-state	Solid-state	Solid-state	Solid-state	--
• Load voltage	V	20 ... 30	19 ... 30	19 ... 30	U_{aux} - 0.8 V	U_{aux} - 0.8 V	--
• Short-circuit protection		Built-in	Built-in	Built-in	Built-in	Built-in	--
• Induction protection		--	--	--	Built-in (freewheel diode)	Built-in (freewheel diode)	--
• External power supply 24 V DC		Using solder pins	Using solder pins	Using solder pins	Using printed circuit board contacts	Using printed circuit board contacts	--
Summation current for all inputs and outputs	mA	200	200	200	200	200	200
I/O configuration		7	7	7	7	7	0
ID/ID2 code		0/F	0/F	0/F	0/F	I/O	0/F
Assignment of data bits							
• Data bit D0		IN1/OUT1	IN1/OUT1	IN1/OUT1	IN1/OUT1	IN1/OUT1	IN1
• Data bit D1		IN2/OUT2	IN2/OUT2	IN2/OUT2	IN2/OUT2	IN2/OUT2	IN2
• Data bit D2		IN3/OUT3	IN3/OUT3	IN3/OUT3	IN3/OUT3	IN3/OUT3	IN3
• Data bit D3		IN4/OUT4	IN4/OUT4	IN4/OUT4	IN4/OUT4	IN4/--	IN4
Approvals		UL, CSA, shipbuilding	UL, CSA, shipbuilding	UL, CSA, shipbuilding	--	--	--
Degree of protection		IP20 enclosure connecting pins IP00	IP20 enclosure connecting pins IP00	IP00	IP00	IP00	IP00
Ambient temperature	°C	-25 ... +70	-25 ... +70	-25 ... +70	-25 ... +70	-25 ... +70	-25 ... +70
Storage temperature	°C	-40 ... +80	-40 ... +80	-40 ... +80	-40 ... +85	-40 ... +85	-40 ... +85
Display		None	None	None	AS-i: Green Fault: Red I/O: Yellow L24+: Green	AS-i: Green Fault: Red I/O: Yellow L24+: Green	AS-i: Green Fault: Red Inputs: Yellow
LED status display		--	--	--	• AS-i: On On Flashes On • Fault: Off On On Flashes • Status: OK No data traffic Zero address Overload (sensor)		

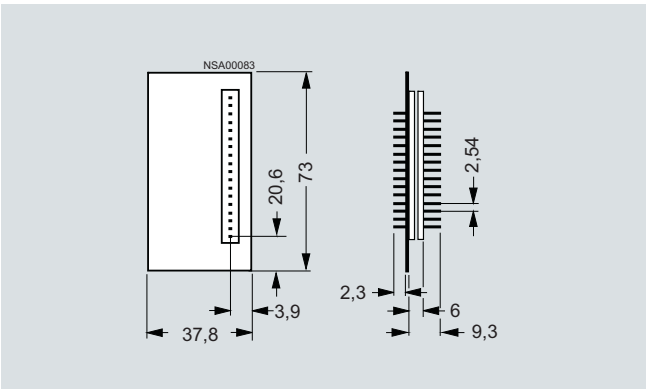
Dimensional drawings



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



3RK2 400-1FD00-0AA2
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



3RG9 005-0SA00

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.

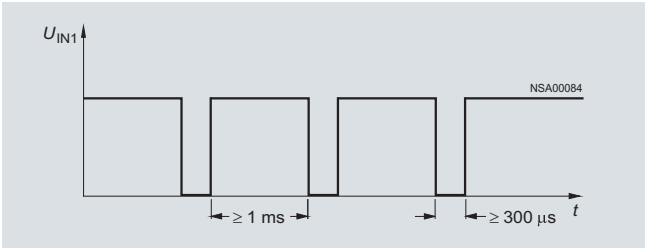
For the values sent to be unambiguous, no more than 15 count values are allowed between two host invocations or AS-Interface master invocations at terminal 8. The maximum permissible transmission frequency is calculated from these times:

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

T_{max} : max. 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 µs and a High for at least 1 ms. This results in a controller-independent maximum frequency of

f_{Cmax} = 1/1.3 ms = 769 Hz for the counter module (see following graphic).



Time criteria for counter module

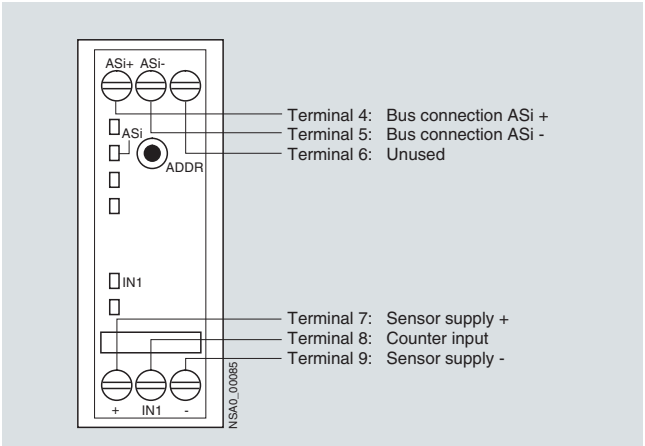
If the time criterion stipulated in the graphic is violated, the count value is rejected.

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.

Programming examples for the S7-300 are available from Technical Assistance, Tel. +49 (0)911 895-5900 or the Internet.



Connection options

Technical specifications

		Counter modules	
		With screw terminal connection	With spring-type terminal
		3RK1 200-0CE03-0AA2	3RK1 200-0CG03-0AA2
Slave type		Standard slave	
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6	
Total current input	mA	≤ 170	
Input			
• Sensor supply using AS-Interface		Short-circuit and overload resistant	
• Assignment		Terminal 7: + Terminal 9 : - Terminal 8 : IN1	
• Voltage range	V	20 ... 30	
• Current carrying capacity	mA	90	
• Switching level Low/High	V	≤ 5/≥ 10	
• Input current Low/High	mA	≤ 2/≥ 10	
I/O configuration		0	
ID code		F	
AS-Interface certificate		Yes	
Approvals		UL, CSA, shipbuilding	
Degree of protection		IP20	
Ambient temperature	°C	-25 ... +70	
Storage temperature	°C	-40 ... +85	
Displays			
• AS-i		LED green on + LED red off = Status OK LED green off + LED red on = no data traffic LED green flashes + LED red on = zero address LED green off + LED red flashes = overload (sensor)	
Conductor cross-sections	mm^2		
• 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 cables, solid or stranded		--	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)."

The AS-Interface ground-fault 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.

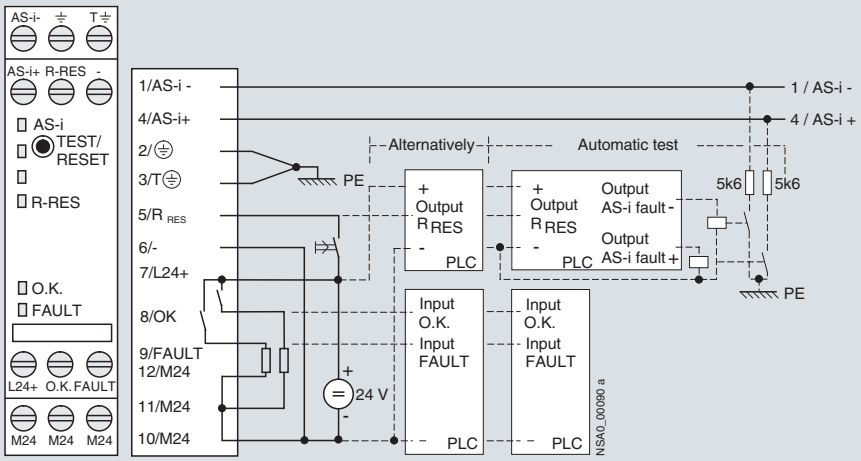
Function

A ground fault is detected by the module, is indicated by an LED and is signaled by two signaling outputs (1st: OK, 2nd: Fault). The ground fault signal is stored in the module. The ground fault must first be eliminated in order to 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 OK
9	Signaling output FAULT (earth fault signaling)
10	External voltage supply for signaling outputs M24
11	Negative connection for signaling output M24
12	Negative connection for signaling output M24

Connection options

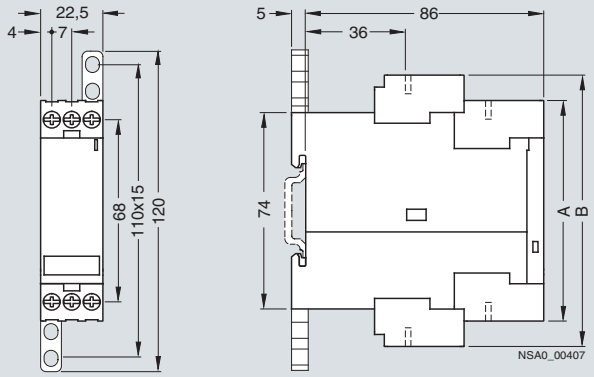
Technical specifications

		Ground-fault detection modules	
		With screw terminal	With spring-type terminal
		3RK1 408-8KE00-0AA2	3RK1 408-8KG00-0AA2
Total current input	mA	≤ 40	
Reverse polarity protection		Built-in	
Ground fault		10 % U_{AS-i} ≤ U_{GND} ≤ 90 % U_{AS-i}	
Low signal range			
• I_{IN}	mA	≤ 1.5	
High signal range			
• U_{IN}	V	≥ 10	
• I_{IN}	mA	≥ 6	
Current carrying capacity[1]			
• DC 12	A	1 (max. 2 per module)	
• DC 13	A	500 (24 V)[2]	
• DC 13	mA	200 (48 V)[2]	
Operating cycles 12 DC		2×10^6	
Rated operational voltage range	V	24 ... 48 DC	
Degree of protection		IP20	
Dimensions (H x W x D)	mm	102 × 22.5 × 92	
Rated temperature	°C	25	
Ambient temperature	°C	-25 ... +70	
Storage temperature	°C	-40 ... +85	
Addressing procedure		The module does not need its own AS-Interface address.	
Connection		Screw terminal	Spring-type terminal
Conductor cross-sections	mm^2		
• 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 cables, solid or stranded		--	AWG 2 × (24 ...16)
Use of repeaters		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
Standard terminal		
Spring-type terminal	81,6	101,6
Screw terminal	80	100
Removeable terminal		
Spring-type terminal	84	103
Screw terminal	83	102

More information

You can find more information on the Internet at:

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

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 design, 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 according to 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

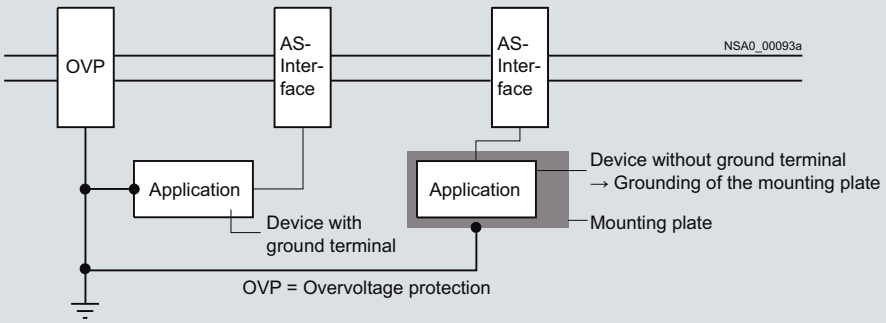
The protection level of an overvoltage protection module is the highest momentary value of the voltage at the terminals, established in individual tests.

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

Accessories

An FK-E (3RG9030-0AA00) or PG-E (3RG9240-0AA00) coupling module is required for connection of the AS-Interface cable and the auxiliary power supply cable.

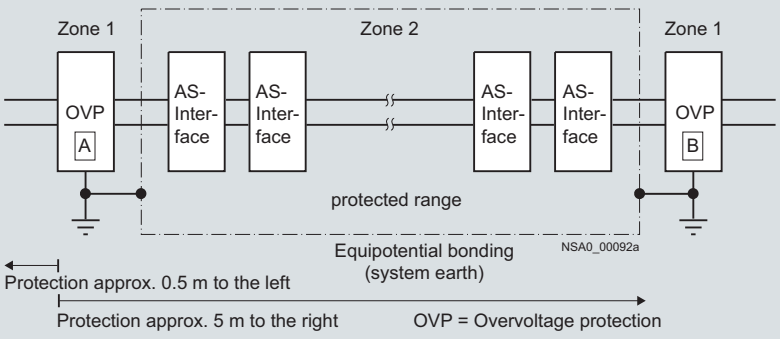
Configuration guidelines



Configuration guidelines for overvoltage protection modules

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

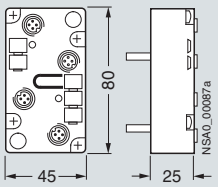


Sample application for overvoltage protection modules

Technical specifications

		Overvoltage protection modules	
		For AS-Interface	For AUX Power
		3RK1 901-1GA00	
Overvoltage protection			
• Rated discharge current I_{sn} of wave form 8/20			
- Core PE	kA	10	10
- Core-core	kA	0.5	0.5
• Protection level U_p at I_{sn}			
- Core PE	kV	≤ 1.8	≤ 1.8
- Core-core	V	≤ 100	≤ 70
• Protection level U_p at 1 kV / µs			
- Core PE	V	≤ 700	≤ 600
- Core-core	V	≤ 50	≤ 40
Mechanical specifications			
• Degree of protection (with coupling module)		IP67	
• Dimensions (H x W x D)	mm	80 × 45 × 25	
Temperature range			
• Ambient temperature	°C	-25 ... +85	
• Storage temperature	°C	-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 units in the system according to their functionality. Similarly, functionalities can be quickly and easily adapted to new requirements by exchanging the basic unit.

The interface module provides four inputs and four outputs on the system. These inputs and outputs are not physical, however, but are only virtually present through the interface on the bus.

Technical specifications

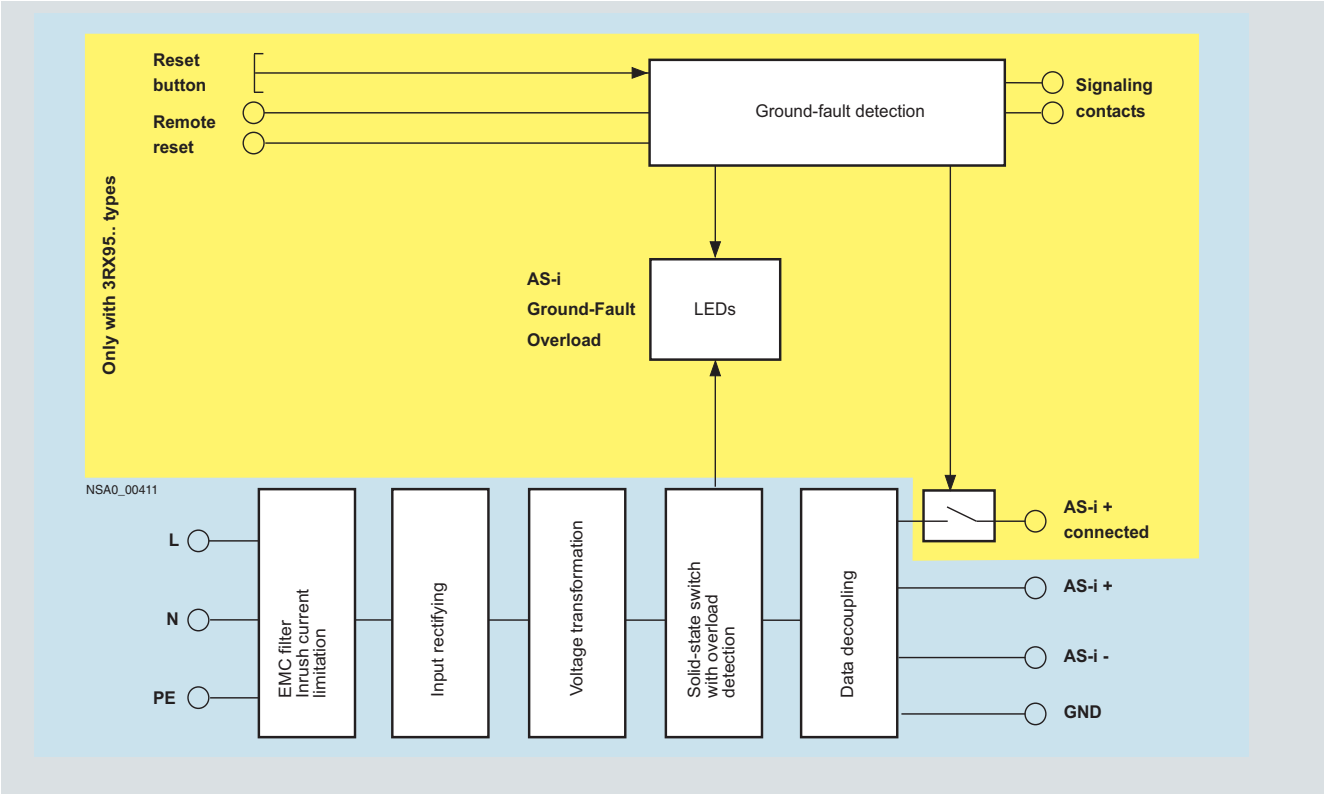
Supply voltage	V	24 DC
Inputs/outputs		4/4 (virtual inputs/outputs)
Bus connection		AS-Interface acc. to specification
Ambient temperature	°C	0 ... +55
Degree of protection		IP20
Mounting		Onto standard mounting rail
Dimensions (W x H x D)	mm	36 x 90 x 58
Indications of the LEDs		
LEDs		Status
• Green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

AS-Interface power supplies, IP20

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 cable.

Design



Basic design of the AS-Interface power supplies

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

Data and energy are always transmitted simultaneously over the AS-Interface 2-wire 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 2.6 to 8 A output current are available, depending on the power requirements of the respective AS-Interface network. The 2.6 A version is approved according to NEC Class 2.

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 3RX9 5... power supply generation:

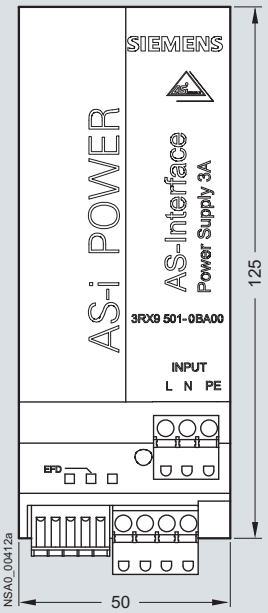
- Compact dimensions
- With widths of 50 / 70 / 120 mm, the new devices are some of the most compact AS-Interface power supplies yet, with an extremely high power density. The small mounting surface of the devices can be fully utilized as other devices can be mounted next to the power supply onto the standard mounting rail. Consequently, no clearances to other devices are required.
- Increased power
  The new devices have an output current of 3 / 5 / 8 A.
- Integrated ground fault detection
  Integrated ground fault detection for AS-Interface is mandatory according to EN 60 204-1. All the AS-Interface power supplies from Siemens have integrated ground fault detection, which reliably detects and reports a ground fault. If required, the AS-Interface voltage can be automatically switched off to prevent any unintended response from the system.
- oIntegrated overload detection
  Any overload on the output side is detected and reported via a diagnostics LED.
- Diagnostics memory
  Both ground faults and overloads on the output side are saved and reported in a diagnostics memory until a reset takes place. This simplifies diagnosing faults in an AS-Interface network, as service technicians can even detect a fault that has already occurred based on the AS-i power supply.
- Remote reset and remote signaling
  A ground fault can be reported and evaluated via the relay contact by a central control and/or indicator. The diagnostics saved can be locally reset using a reset pushbutton. They can also be reset via a reset input of a control or an external pushbutton.
- Diagnostics LEDs
  The status of the AS-Interface power supply can be read off locally using three different colored LEDs on the power supply.
- 2-phase connection / ultra-wide input range for 8 A
  The 8 A version's ultra-wide input range from 120 to 500 V allows it to be used in nearly every network in the world. Additionally, this version dispenses with the need for an N-conductor, as the device can be connected directly between 2 phases in a network.
- Operation with 24 V direct voltage
  The 3 A power supply is also available as a version with a 24 V DC input. This power supply is excellently suited for use in battery-operated systems or systems with an uninterruptible power supply (UPS).
  Removable terminal blocks with spring-loaded technology
  The power supply has three terminal blocks: a block each for the input side, the output side and signal/reset terminals. The terminal blocks are removable and therefore allow the power supply unit to be quickly replaced in case of fault. In addition, the terminals' spring-loaded connection system enables quick and permanently stable installation of the connecting wires.

Technical specifications

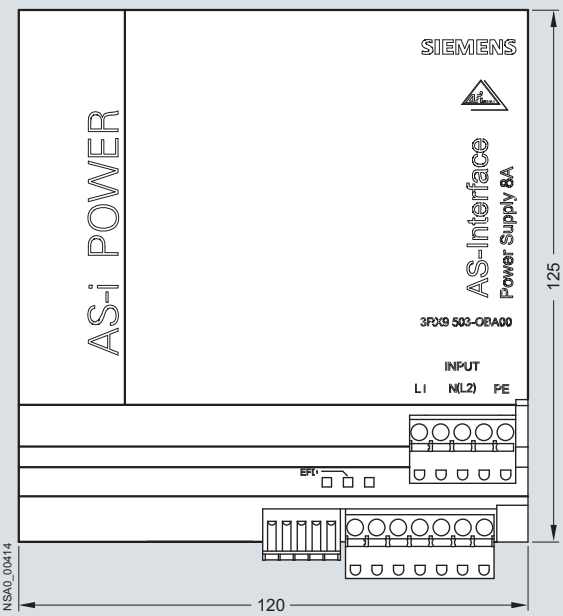
		AS-Interface power supply units				
		Single output IP20				
		Output current 2.6 A Class 2	Output current 3 A	Output current 3 A	Output current 5 A	Output current 8 A
		3RX9 501-2BA00	3RX9 501-0BA00	3RX9 501-1BA00	3RX9 502-0BA00	3RX9 503-0BA00
Input data						
• Primary voltage U_e	V	120/230 AC	120/230 AC	24 DC	120/230 AC	120/230 ... 500 AC
• Operational voltage range	V	85 ... 132/ 176 ... 253 AC	85 ... 132/ 76 ... 253 AC	20 ... 29 DC	85 ... 132/ 76 ... 253 AC	85 ... 132/ 76 ... 550 AC
• Mains frequency range	Hz	47 ... 63	47 ... 63	--	47 ... 63	47 ... 63
• Mains buffering at $I_{a\ rated}$	ms	--	> 20	> 10	> 20	> 20
• Rated primary current	A	1.4/0.8	1.6/0.9	4.5	2.7/1.5	4.4/2.4
Output data						
• Rated output voltage $U_{a\ rated30}$	V	30 DC	30 DC	30 DC	30 DC	30 DC
• Residual ripple/spikes		< 50 mVpp (10 ... 500 kHz) < 300 mVpp (0 ... 10 kHz)	< 50 mVpp (10 ... 500 kHz) < 300 mVpp (0 ... 10 kHz)	< 50 mVpp (10 ... 500 kHz) < 300 mVpp (0 ... 10 kHz)	< 50 mVpp (10 ... 500 kHz) < 300 mVpp (0 ... 10 kHz)	< 50 mVpp (10 ... 500 kHz) < 300 mVpp (0 ... 10 kHz)
• Rated output current $I_{a\ rated}$	A	2.6	3	3	5	8
• Making-current limiting	A	Typ. 3.0	Typ. 3.5	Typ. 3.5	Typ. 5.5	Typ. 8.5
• Degree of efficiency at full load	%	Typ. 84	Typ. 84	Typ. 84	Typ. 87	Typ. 87
Ambient conditions						
• Storage/transport temperature	°C	-25 ... +80	-25 ... +80	-25 ... +80	-25 ... +80	-25 ... +80
• Ambient operating temperature	°C	-10 ... +70	-10 ... +70	-10 ... +70	-10 ... +70	-10 ... +70
• Degree of protection		IP20	IP20	IP20	IP20	IP20
• Degree of pollution		2	2	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				
• EMC interference immunity		EN 61000-6-2, EN 61000-4-2/-3/-4/-5/-6/-11				

AS-Interface power supplies, IP20

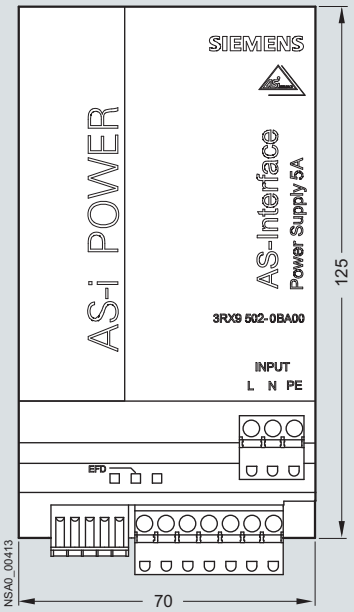
Dimensional drawings



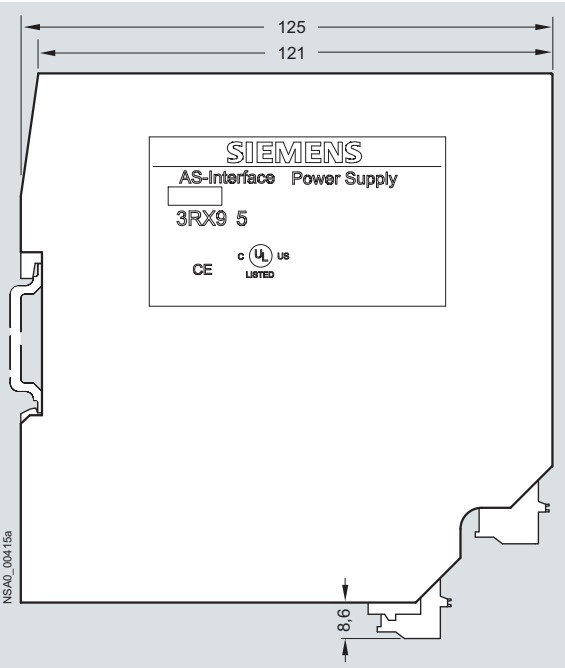
Front view 3RX9 501-0BA00, 3RX9 501-1BA00, 3RX9 501-2BA00



Front view 3RX9 503-0BA00

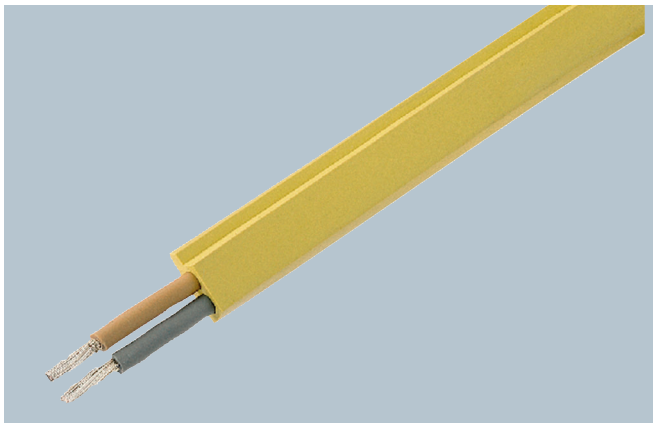


Front view 3RX9 502-0BA00



Side view 3RX9 501-0BA00, 3RX9 501-0BA00, 3RX9 501-2BA00, 3RX9 502-0BA00, 3RX9 503-0BA00

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 method was developed specially for AS-Interface.

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

Connection is effected by the insulation piercing method. In other words, male contacts pierce the shaped AS-Interface cable and make reliable contact with the two wires. 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. BERO proximity switches) 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.

Suitable for operation in tow chains

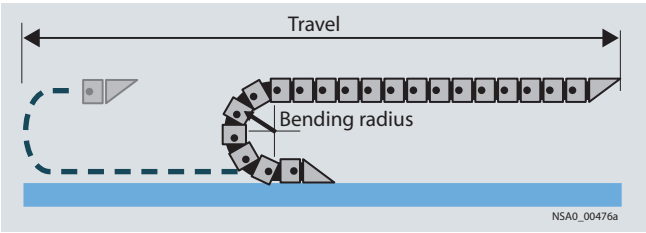
The use of the AS-Interface shaped cables with TPE and PUR outer sheath was checked in a tow chain test with the following conditions:

Chain length	m	6
Travel	m	10
Bending radius	mm	75
Travel speed	m/s	4
Acceleration	m/s^2	4
Number of cycles		10 million
Duration of test		Approx. 3 years (11000 cycles per day)

After termination of the 10 million cycles only slight wear was visible due to the lugs of the tow chain. The cores and core insulation no damage could be detected.

Note:

When using a tow chain the cables must be installed free from tensile forces. On no account may the cables be twisted, but must be routed flat through the tow chain.



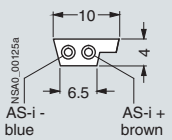
Tow chain

AS-Interface shaped cables

Technical specifications

		AS-Interface shaped cables			
		EPDM (rubber)	TPE (special PVC compound)	TPE special version acc. to UL Class 2	PUR (polyurethane)
Application temperature range					
• Stationary	°C	-40 ... +85	-40 ... +105	-30 ... +90	-50 ... +90
• Moved	°C	-25 ... +85	-30 ... +105	-20 ... +90	-50 ... +90
Core colors		Brown, blue	Brown, blue	Brown, blue	Brown, blue
Flexibility		Very good	Good	Good	Good
Fire behavior		Flammable	Flame-retardant acc. to IEC 60332-1 VDE 0482 T. 265-2-1 UL 1581 sec. 1061 cable flame UL 1581 sec. 1060 CSA FT1	Flame-retardant acc. to IEC 60332-1 VDE 0482 T. 265-2-1 UL 1581 sec. 1061 cable flame UL 1685 CSA FT4	Flame-retardant acc. to IEC 60332-1 VDE 0482 T. 265-2-1
Without halogens (PVC-free)		Yes	No	No	Yes
Without silicone precipitation		Yes	Yes	Yes	Yes
Ozone and weather resistant		Conditionally resistant	Resistant	Resistant	Resistant
Oil resistance		Conditionally resistant	Resistant	Resistant	Resistant
Smallest permissible bending radii acc. to DIN VDE 0298, Part 300	mm				
• Fixed		12	12	12	12
• Freely movable		24	24	24	24
Smallest permissible bending radii acc. to DIN VDE 0298, Part 300	mm				
• Fixed		12	12	12	12
• Freely movable		24	24	24	24
UL approval		No	UL 758 AWM	UL 758 AWM, UL 13 Class 2, UL 444 CMG	No
CSA approval		No	C22.2 No.210.2 AWM	C22.2 No. 214-02	No
Monitored expertise (VDE)		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



Overview

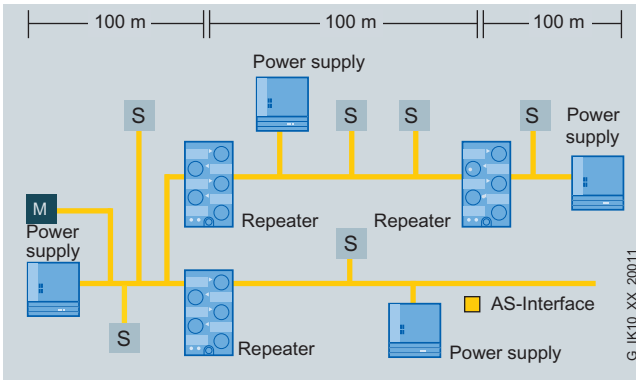
AS-Interface repeater

- The AS-Interface repeater is for extending the AS-Interface line by 100 m per repeater and has the following characteristics:
- Maximum of two repeaters in series can be used
- Connecting multiple repeaters in parallel possible (star configuration possible)
- Maximum size increase of an AS-Interface network to more than 500 m is thus possible
- Easy mounting
- IP67 module enclosure

Design

AS-Interface network with Repeaters

- Slaves can be used on both sides of the repeater
- AS-Interface power supply is required on both sides
- Electrical isolation of the two AS-Interface shaped cable lines
- Installed in K45 module enclosure with mounting plate
- Separate indication of the correct AS-Interface voltage for each side
- Maximum two repeaters in series (max. cable length 300 m)
- Parallel switching of several repeaters possible (star configuration)
- Combination of series and parallel switching possible (max. range 500 m)



Benefits

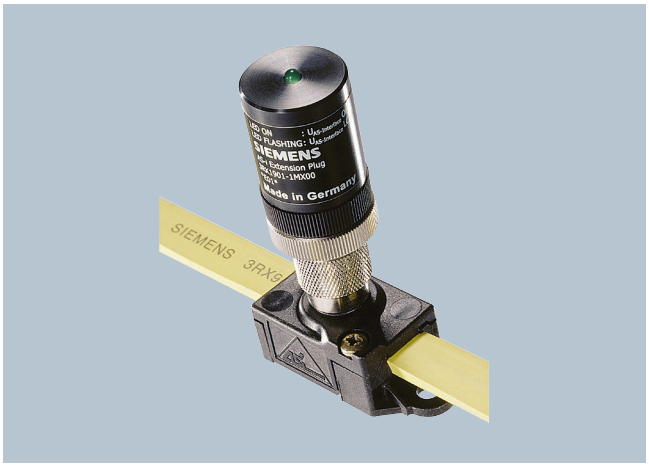
- Further options for use and more freedom when designing systems thanks to the extension of the AS-Interface network.
- Reduced downtimes and service times in case of fault thanks to separate display of the correct AS-Interface voltage for each side.

Area of application

The repeater is used to extend the AS-Interface segment by 100 m, where one AS-Interface voltage supply is located on each side of the repeater's AS-Interface slave.

Extension plugs

Overview



Extension Plug (on feeder M12 AS-Interface)

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 is a passive component, the Extension Plug Plus also contains an I/O slave.

The Extension Plug / Extension Plug Plus is connected to the position in the AS-Interface network that is furthest away from the power supply. It features an M12 plug and can therefore be quickly connected with the AS-Interface M12 feeder, with an IP67 degree of protection.

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 undervoltage 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

Installation in the AS-Interface network

Maximum cable length and installation site

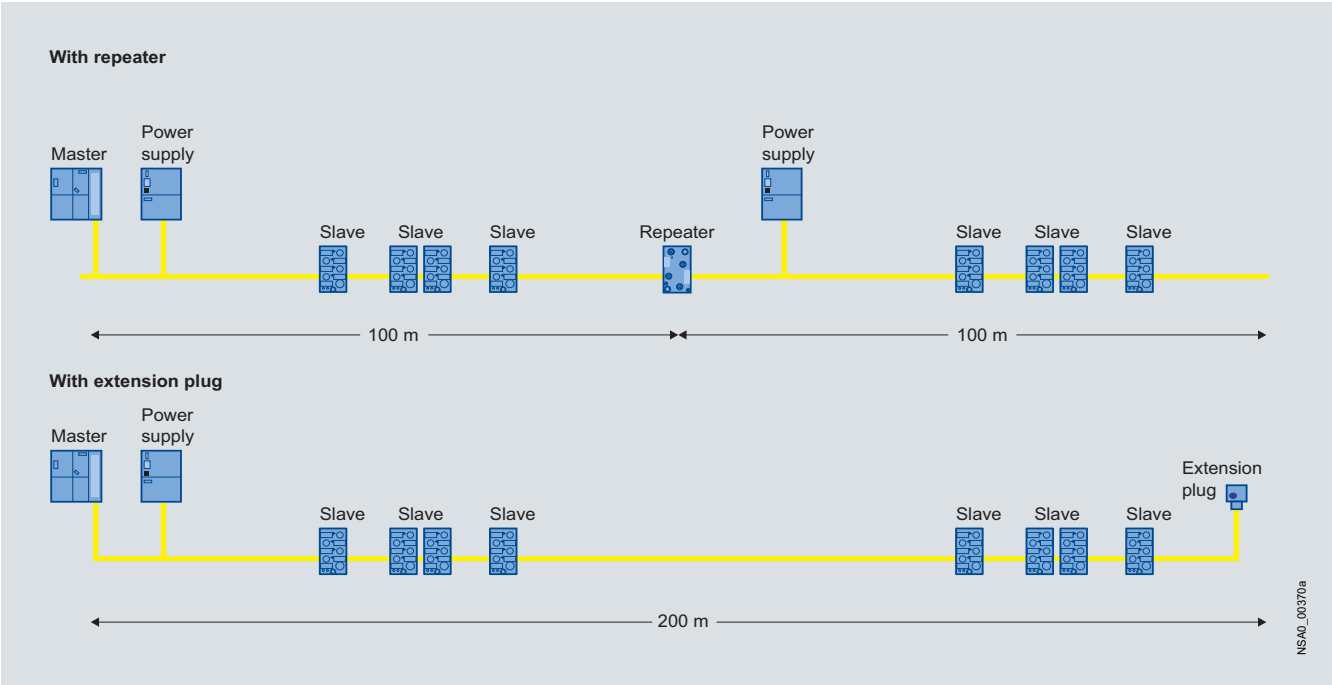
To construct an AS-Interface segment with a cable length of more than 100 m and up to a maximum of 200 m, the extension plug/extension plug plus is installed at that point of the network which is furthest from the AS-Interface power supply unit. This point does not have to be localized exactly; it suffices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

Possible AS-Interface network structure

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.

Addressing

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 diagnostic signal and thus requires an AS-Interface address. For addressing purposes, the extension plug plus is simply plugged on the 3RK1 904-2AB01 addressing unit.



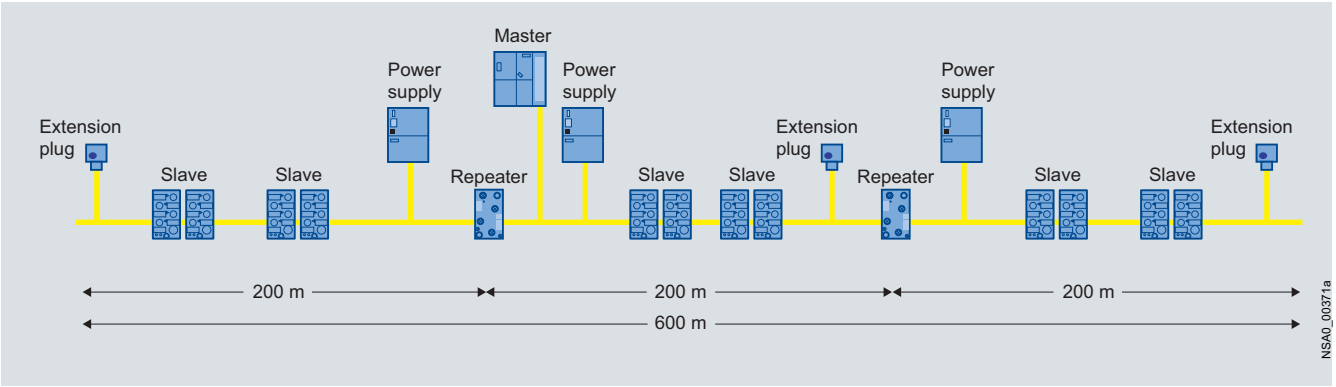
Topology of an AS-Interface network with a size of 200 m

Connection

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

Use of repeaters

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

Voltage monitoring

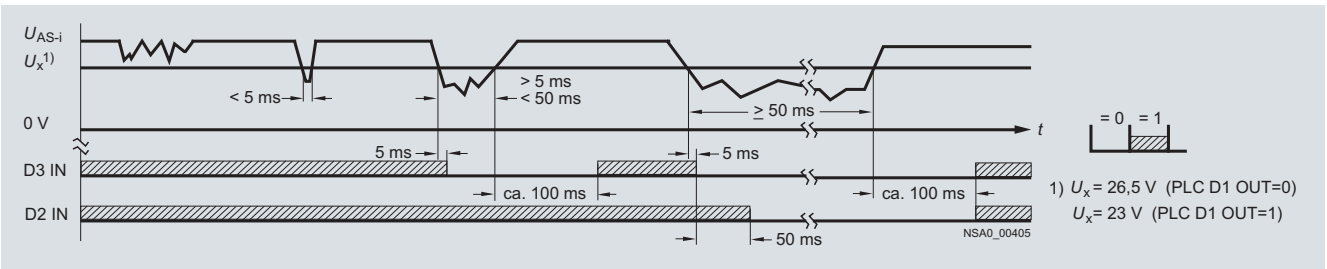
Signal upon undershooting of the minimum voltage

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.

Detection of also short-time voltage dips

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.



Transmission of the diagnostic signal with the extension plug plus

Extension plugs

Technical specifications

		Extension plug 3RK1 901-1MX00	Extension plug plus 3RK1 901-1MX01
Operational voltage acc. to AS-Interface specification	V	26.5 ... 31.6	26.5 ... 31.6
Reverse polarity protection U_{AS-i}		Yes	Yes
AS-Interface certificate		Under application	Under application
Degree of protection		IP67	IP67
Ambient temperature	°C	-25 ... +85	-25 ... +85
Status display U_{AS-i}			
• LED On: U_{AS-i}	V	26.5 ... 31.6	None
• LED flashes: U_{AS-i}	V	10 … 26.5	None
Power supply		From AS-Interface	From AS-Interface
Total current input	mA	≤ 10	≤ 15
Slave type		No slave integrated	A/B slave
I/O configuration		--	B
ID/ID2 code		--	I/O
Assignment of data bits			
• 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
Connection to AS-Interface		Using M12 plug-in connector	Using M12 plug-in connector
Pin assignment			
• Pin 1		U_{AS-i} +	U_{AS-i} +
• Pin 3		U_{AS-i} -	U_{AS-i} -

Overview

To be able to participate in data exchange with the master, every AS-i slave must be assigned an address (not equal to zero) prior to commissioning of the AS-Interface network

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 A/B slaves). 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 can not exchange any I/O data in this state.

The assignment of the addresses is dependent on the position of the slave in the AS-i line. An address must not occur more than once in an AS-i network.

Function

- Reading and creating the slave address 0 to 31, or, 1A to 31A, 1B to 31B
- Saving addresses already assigned, to avoid the same address being assigned more than once
- Reading the slave profile (IO, ID, ID2)
- Reading and creating the ID1 code
- Input/output test when commissioning slaves: Reading input signals and writing outputs for digital and analog slaves
- Measuring the voltage on the AS-Interface line (measuring range 0 to 35 V)
- Displaying the operating current when an AS-i slave is connected directly (measuring range 0 to 100 mA)
- Saving entire network configurations (profiles of all slaves) as addressing help

Technical specifications

		AS-Interface addressing and diagnostics units
		3RK1 904-2AB01
Power supply		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
Ambient conditions		
• Working temperature range	°C	0 ... +55
• Storage temperature range	°C	-20 ... +55 (without batteries)
• Relative air humidity	%	Max. 75, condensation not permitted
• Altitude above sea level	m	Up to 2000
• Location		Only in indoor rooms
Mechanical design		
• Degree of protection		IP40
• Dimensions (W x H x D)	mm	84 x 195 x 35
• Connection		Using M12 socket: • Pin 1: AS-i + • Pin 3: AS-i -/GND • Pin 2/4/5: IR addressing

AS-Interface analyzers

Overview

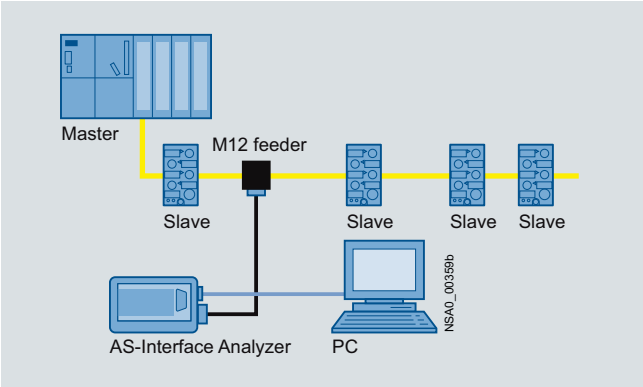
The AS-Interface analyzer is used to test AS-Interface networks. It enables systematic troubleshooting and permanent monitoring.

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
Interfaces		• AS-Interface • RS 232 for connection to a PC • Trigger input (24 V) • Trigger output (TTL)
Displays/LEDs		• Supply voltage OK (power) • RS 232 interface in operation • Test mode
Statistics mode		Online view or long-term measurement up to 14 days (without PC) or one year (with PC)
Trace mode		Message frame memory for 256000 AS-Interface message frames
Rated operational current	mA	Approx. 70 from AS-Interface
Rated insulation voltage	V	> 500
EMC		Acc. to EN 50081-2, EN 61000-6-2
Ambient temperature	°C	0 … +55
Storage temperature	°C	-25 … +70
Requirements		IBM compatible PC 80486 and higher
Operating system		Windows 95/98, Windows ME, Windows NT, Windows 2000, Windows XP, Windows Vista (Home Premium/Business/Ultimate 32)

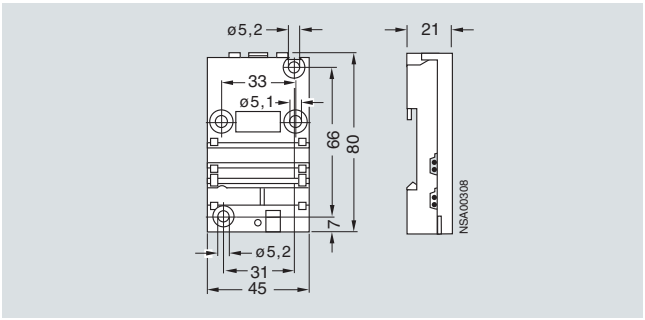
Technical specifications

		AS-Interface M12 feeder						AS-Interface M12 quadruple feeder
		AS-i flat cables			AS-i/U_{aux} flat cables			
		Onto M12 socket	Onto M12 cable box		Onto M12 socket	Onto M12 cable box		Onto quadruple M12 socket
			1 m	2 m		1 m	2 m	
		3RK1 901-1NR10	3RK1 901-1NR11	3RK1 901-1NR12	3RK1 901-1NR20	3RK1 901-1NR21	3RK1 901-1NR22	3RK1 901-1NR00
Operational voltage max.	V	30 DC						
Current carrying capacity total	A	4						
Socket assignment		Pin 1: AS-i + Pin 2: Not assigned Pin 3: AS-i - Pin 4: Not assigned			Pin 1: AS-i + Pin 2: U_{aux} - Pin 3: AS-i - Pin 4: U_{aux} +			
Degree of protection		IP67/IP68/IP69K						IP67
Ambient temperature	°C	–25 ... +75						–25 ... +85
Storage temperature	°C	–25 ... +85						–40 ... +85
Tightening torques for fixing screws	NM	0.8						
Special features of the flat cable		Flat cable must be routed through the M12 feeder						Flat cable can be terminated in the feeder
Connection								Using FKE coupling module (included in scope of supply)

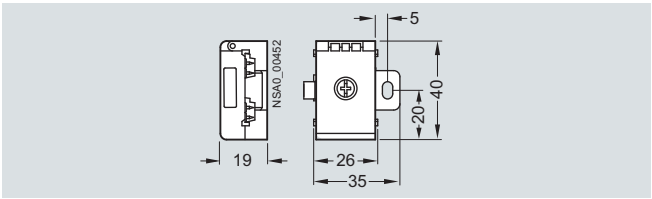
		M12-T distributors
		3RK1 901–1TR00
Voltage range	V	20 ... 30 DC
Current carrying capacity total	A	4 at T = 40 °C
Connection		M12
Degree of protection		IP68
Ambient temperature	°C	-25 ... +85
Storage temperature	°C	-25 ... +85
Number of M12 sockets		1 × M12 plug/2 × M12 box

		Compact distributors	Cable terminating pieces
		3RK1 901-1NN10	3RK1 901-1MN00
Ambient temperature	°C	-25 ... +85	-40 ... +85
Degree of protection		IP67/IP68/IP69K	IP67 with inserted shaped AS-Interface cable
Current carrying capacity total	A	8	--
Mounting		Wall mounting	Cable terminating piece can be fastened, e. g. to a machine, using the integrated eyelet
Special features of the cable end		Cables cannot be terminated in the compact distributor.	

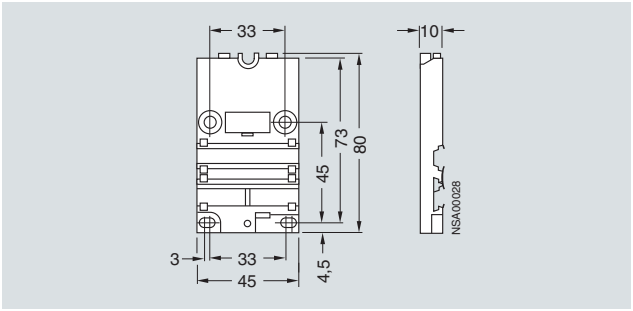
Dimensional drawings



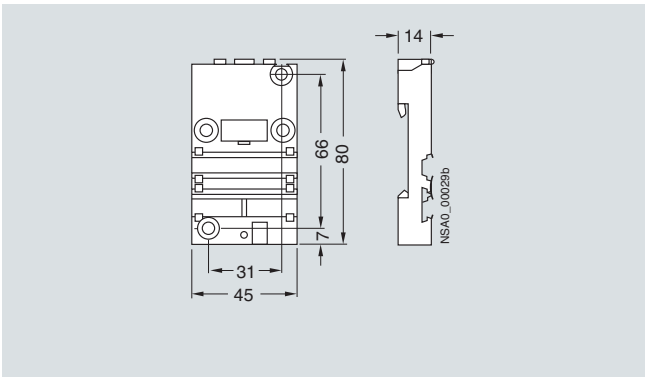
AS-Interface standard distributor, for AS-Interface flat cable
(3RK1 901-1NN00)



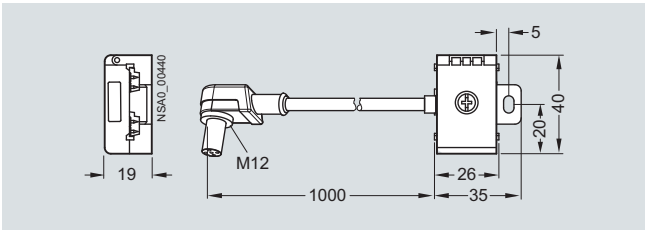
AS-Interface compact distributor, for AS-Interface flat cable
(3RK1 901-1NN10)



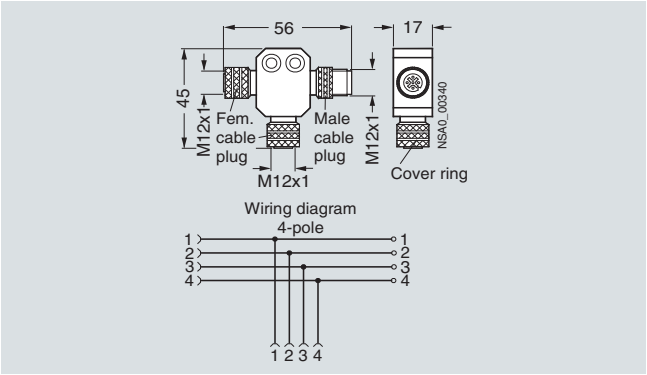
3RK1 901-2EA00 mounting plate for K45 modules, for wall mounting
Arrangement and drilled holes identical to that of the K60 compact module



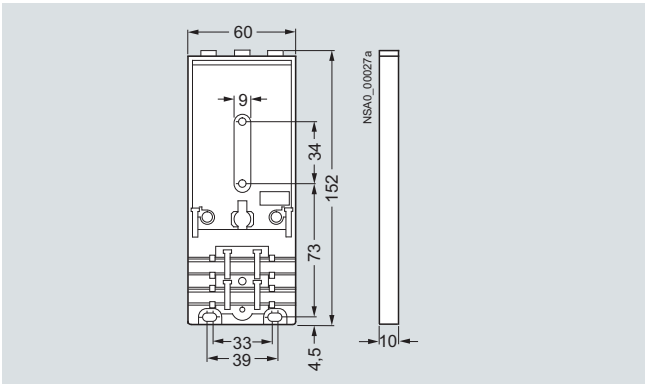
3RK1 901-2DA00 mounting plate for K45 modules, for standard rail mounting
Arrangement and drilled holes identical to that of the user module



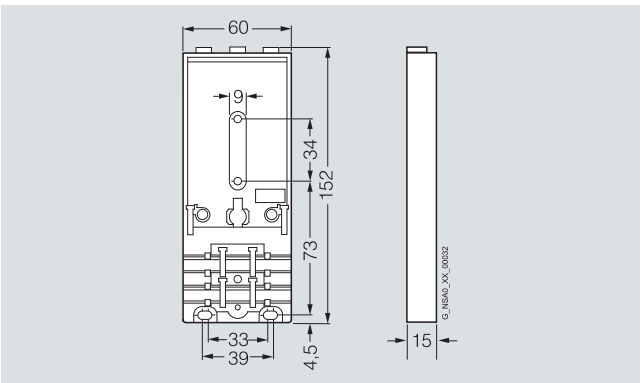
AS-Interface M12 feeder, AS-i/U_{aux}, M12 cable box, 1 m cable length
(3RK1 901-1NR21)



M12-T distributor (3RK1 901-1TR00)

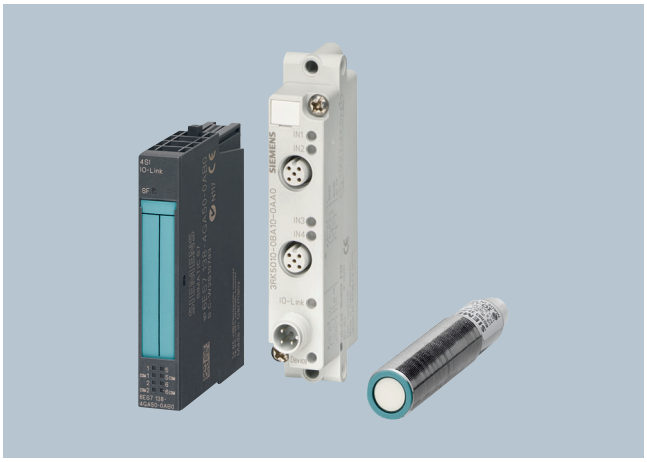


3RK1 901-0CA00 mounting plate for K60 modules, for wall mounting



3RK1 901-0CB01 mounting plate for K60 modules, for standard rail mounting

Overview



IO-Link range

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

Components of an IO-Link system:

Only 2 components are required to use IO-Link:

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

Compatibility of IO-Link

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

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

Expansion through IO-Link I/O modules

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

Analog signals

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

Integration in STEP7

Integration of the device configuration in the STEP7 environment

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

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

Benefits

The IO-Link system offers decisive advantages for connecting complex (intelligent) sensors/actuators:

- Dynamic changing of sensor/actuator parameters directly by the PLC
- Consistent storage of parameters enables devices to be exchanged during operation without need for re-parameterization
- Fast commissioning thanks to central data storage
- Consistent diagnostic information as far as the sensor/actuator level
- Uniform and greatly reduced wiring of different sensors/actuators
- Reduction of parameterization tools
- Integrated communication: Transmission of process data and service data between sensors/actuators and the control system
- Uniform and transparent configuring and programming through use of a parameterization tool integrated in SIMATIC Step 7 (PCT)
- Transparent representation of all parameter and diagnostics data
- Lower configuring and commissioning costs
- Signals and indicators for preventive maintenance

Application

IO-Link is used in two main applications. First, with IO-Link it is easy to connect even complex sensors with very many parameters to the control system. Second, technology based on IO-Link modules is an optimum substitute for passive distributors in connecting binary sensors. In both applications, all the diagnostics data are transmitted to the higher-level control system through IO-Link.

Advantages for users (example)

When a complex pressure sensor is used, numerous parameters (e. g. threshold values, hysteresis values) are set during commissioning for the plant to sun smoothly. These data are sent through IO-Link to the control system and stored there. If this sensor fails and has to be replaced, all that is required is to exchange the sensor itself. The necessary parameters are then called up from the control system and loaded through IO-Link into the sensor. Without IO-Link, the sensor would have to be parameterized anew at great cost of time and effort.

I/O modules

Overview

IO-Link I/O modules

Using IO-Link technology it is also possible to connect standard sensors to IO-Link masters. However, connecting standard sensors directly to the IO-Link master does not exploit the full potential of IO-Link. The solution lies in the technology of the IO-Link modules. The use of this technology represents a more attractive solution in terms of cost than the direct connection of sensors/actuators.

IO-Link I/O modules are a useful addition to ET200S distributed peripherals.

The technology of the IO-Link I/O modules expands IO-Link from a pure point-to-point wiring method in the direction of distributed structures. It must be noted however that the cable length of an IO-Link connection restricts the distance of an IO-Link module from the master to a maximum of 20 m.

The use of passive distributors with accordingly complex and error-prone wiring is no longer necessary.

Transmission of parameter and diagnostic signals

With IO-Link I/O modules it is possible in addition to transmit parameter and diagnostic signals. This enables for example the inputs of modules to be parameterized as NC contacts or NO contacts through IO-Link. An overload or short-circuit in the sensor supply is signaled to the control system through the IO-Link master.

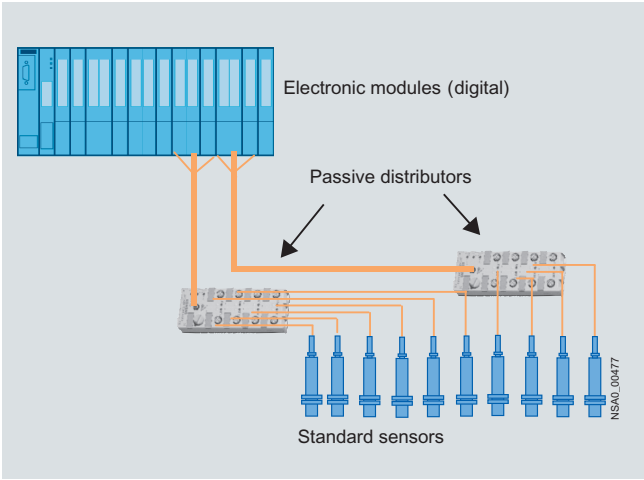
M8 and M12 terminals

M8 and M12 terminals are available for connecting the sensors. Connection to the IO-Link master is made using a standard M12 connecting cable.

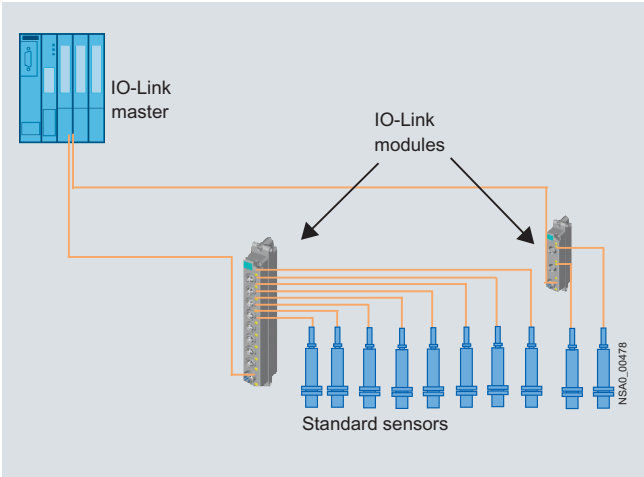
Function

IO-Link I/O modules are used in particular where passive distributors were used up to now for the connection of binary sensors.

Application example: replacement of passive distributors through the use of IO-Link I/O modules



Former technology with passive distributors.



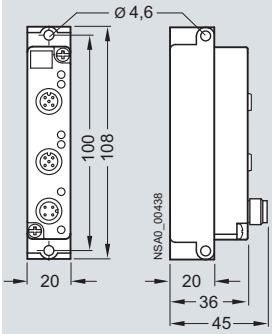
Technology with IO-Link I/O modules

Technical specifications

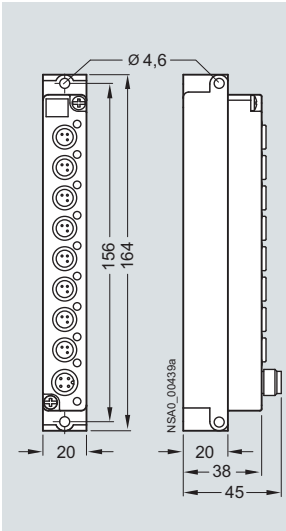
		IO-Link K20 module	
		4 digital inputs	**8 digital inputs**
		M12	M8
		Y assignment	Standard assignment
		3RK5 010-0BA10-0AA0	3RK5 010-0CA00-0AA0
Number of I/O sockets		2	8
IO-Link operating mode		COM 2 (38.4 kBit/s)	COM 2 (38.4 kBit/s)
Supply voltage through IO-Link master		Yes	Yes
Inputs			
• Sensor supply, short-circuit resistant		Yes	Yes
• Current carrying capacity, sensor supply max.	mA	200	400
• Current carrying capacity of sockets 1 ... 4 total max.	mA	200	200
• Current carrying capacity of sockets 5 ... 8 total max.	mA	--	200
• Input current at digital input with signal "1" min.	mA	11	11
• Input current at digital input with signal "0" max.	mA	1.5	1.5
• Input voltage at digital input with signal "1" min.	V	10	10
Socket assignment			
• Socket 1			
- Pin 1		Sensor supply L+	Sensor supply L+
- Pin 2		IN2	--
- Pin 3		Sensor supply L-	Sensor supply L-
- Pin 4		IN1	IN1
- Pin 5		--	--
• Socket 2			
- Pin 1		Sensor supply L+	Sensor supply L+
- Pin 2		IN4	--
- Pin 3		Sensor supply L-	Sensor supply L-
- Pin 4		IN3	IN2
- Pin 5		--	--
• Socket 3			
- Pin 1		--	Sensor supply L+
- Pin 3		--	Sensor supply L-
- Pin 4		--	IN3
• Socket 4			
- Pin 1		--	Sensor supply L+
- Pin 3		--	Sensor supply L-
- Pin 4		--	IN4
• Socket 5			
- Pin 1		--	Sensor supply L+
- Pin 3		--	Sensor supply L-
- Pin 4		--	IN5
• Socket 6			
- Pin 1		--	Sensor supply L+
- Pin 3		--	Sensor supply L-
- Pin 4		--	IN6
• Socket 7			
- Pin 1		--	Sensor supply L+
- Pin 3		--	Sensor supply L-
- Pin 4		--	IN7
• Socket 8			
- Pin 1		--	Sensor supply L+
- Pin 3		--	Sensor supply L-
- Pin 4		--	IN8
Parameters/diagnostics			
• Parameterizable input delay		Adjustable per module (1 ms, 3 ms, 15 ms, 20 ms)	
• Parameterizable inversion of the input signal		Adjustable per input	
• Diagnostic signals through IO-Link		Overload/short-circuit sensor supply	
Status displays			
• IO-Link communication indicator		Green/red dual LED	Green/red dual LED
• IO-Link device indicator		Green/red dual LED	Green/red dual LED
• Inputs/outputs indicator		Green LED per channel	Green LED per channel
Degree of protection		IP67	IP67
Approvals		CE (available) UL/CSA (submitted)	CE (available) UL/CSA (submitted)
Maximum cable length			
• Between master and I/O module	m	20	20
EMC properties			
• Immunity to electromagnetic interference acc. to IEC 60947-1		Environment A (industrial area)	Environment A (industrial area)
• Emitted electromagnetic interference acc. to IEC 60947-1		CISPR11, environment A (industrial area)	
Ambient temperature	°C	-25 ... +70	-25 ... +70
Storage temperature	°C	-40 ... +85	-40 ... +85
Mounting and dimensions			
• Type of mounting		Wall mounting on front or side	
• Dimensions W x H x D	mm	20 x 108 x 45	20 x 164 x 45

I/O modules
IO-Link K20 modules

Dimensional drawings

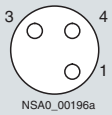


IO-Link K20 I/O module, 4 digital inputs, M12
(3RK5 010-0BA10-0AA0)



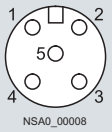
IO-Link K20 I/O module, 8 digital inputs, M8
(3RK5 010-0CA00-0AA0)

Schematics



Pin 1: Supply L+
Pin 4: Supply L–
Pin 4: Input signal

Terminal assignment for input, M8 socket, standard assignment



Pin 1: Supply L+
Pin 2: Input signal 2
Pin 3: Supply L–
Pin 4: Input signal 1
Pin 5: Not assigned

Terminal assignment for input, M12 socket, Y assignment

Overview

Communication functions

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

The connection 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/IEC 61784.

PROFIBUS DP/PA is used to connect field devices such as distributed I/O stations or operating mechanisms 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 to form a station (e. g. ET 200) (>16 inputs/outputs).

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.

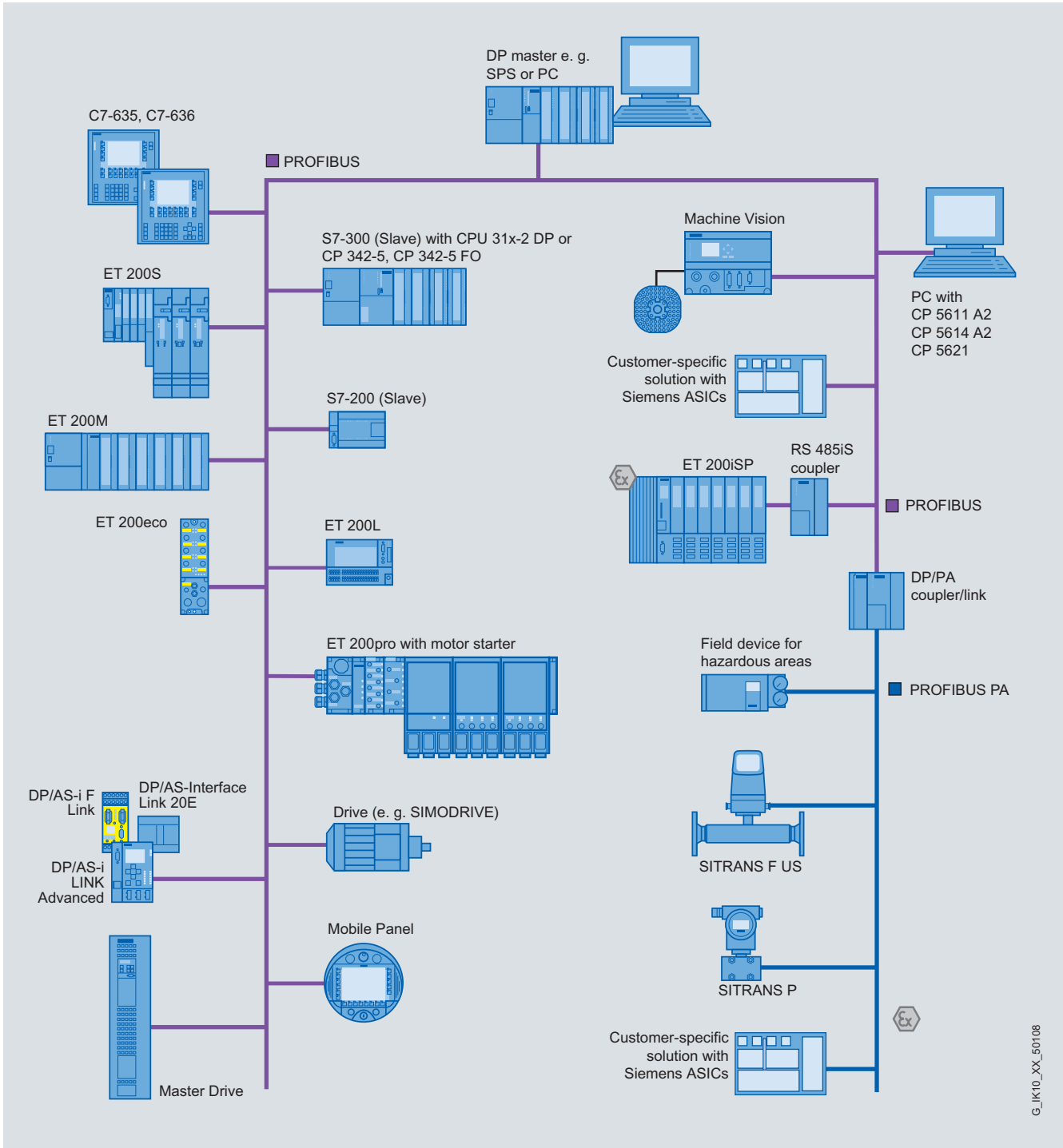
Powerful tools such as STEP 7 and COM PROFIBUS are available to configure and parameterize the I/O stations. With these tools, tests and start-ups are possible from every connection point using PROFIBUS DP.

DP device types

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

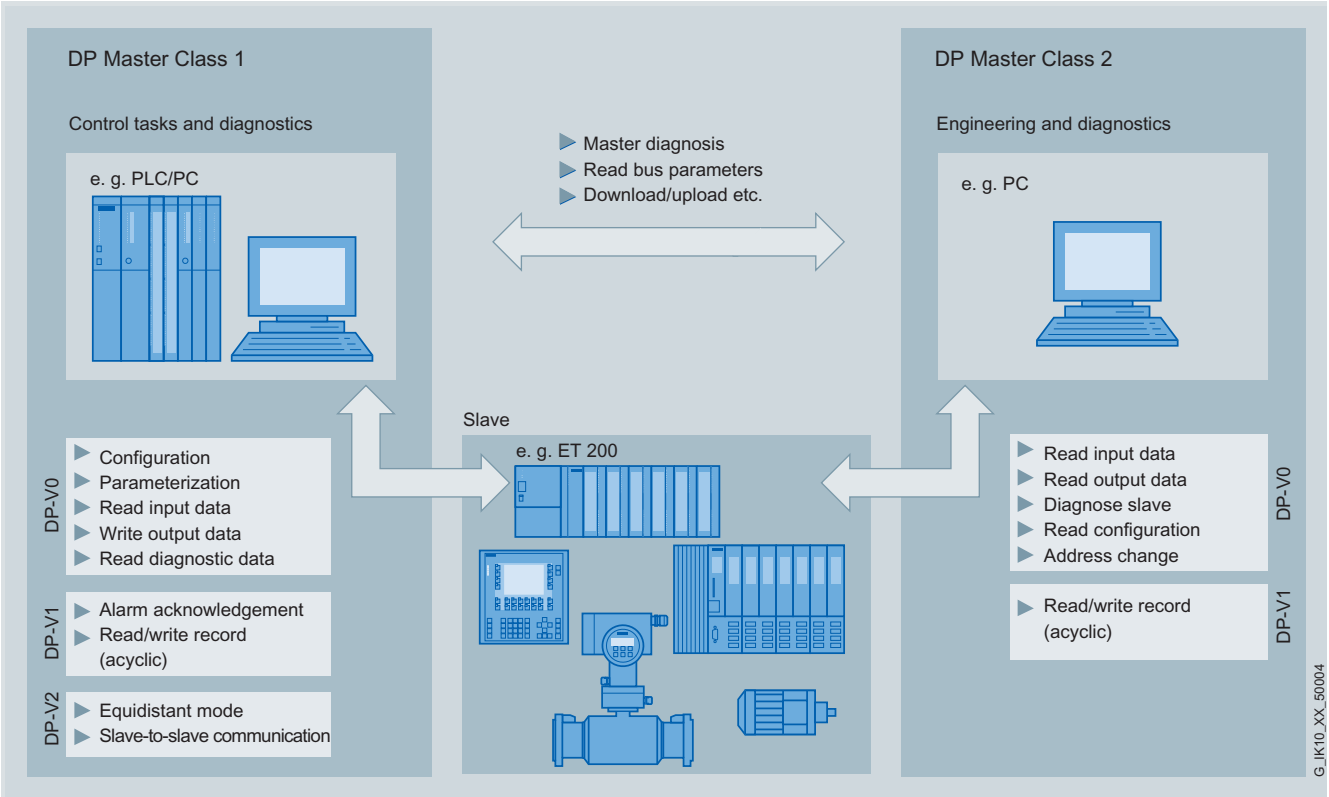
- DP master class 1
  The DP master class 1 is the central component of PROFIBUS DP. In a fixed, continuously recurring message cycle the central controller or PC exchanges information with distributed stations (DP slaves).
- DP master class 2
  Devices of this type (programming, configuring or operating 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 µs.
- 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.

Process or field communication



PROFIBUS DP slaves

Integration



DP master classes

Communication overview

Function

	Hardware	PROFIBUS DP			PROFIBUS FMS			PG/OP	S7 communication		Open communication	Time	
		DP master Class 1	DP master Class 2	DP slave	Read	Write	Info. / Report		Standard system	High-availability communication	Send/Receive 1)	Sending stations	Receiving stations
SIMATIC S7-300	CP 342-5/ CP 342-5 FO	● 2)		● 2)				●	●		●		
	CP 343-5				●	●	●	●	● 3)		●		
SIMATIC S7-400	CP 443-5 Extended	●	●					●	●	●	●	●	●
	CP 443-5 Basic				●	●	●	●	●		●	●	●

1) SDA and SDN services of PROFIBUS Layer 2 (FDL)
2) DP master or DP slave
3) S7 server only

● suitable
not applicable

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Communication overview for SIMATIC

Hardware	Software	Operation system (32 Bit)				OPC 6)	PROFIBUS DP			PROFIBUS FMS			PG/ OP	S7 com-munica-tion	Open com-munic. 8)
		Windows XP Pro	Windows 2003 Server / 2003 R2 Server	Windows Vista Business / Ultimate	other operating systems		DP Master Class 1	DP Master Class 2	DP slave	Read	Write	Info/Report			
CP 5613 A2	CP with DP Base 1) 4)	●	●	●		●	●	●	● 5)				●		●
CP 5613 FO CP 5614 A2 (PCI 32 Bit)	DP-5613 4)	●	●	●		●	●	●					●		●
	S7-5613	●	●	●		●							●		●
	FMS-5613	●	●	●		●				●	●	●	●	●	●
	DK-5613	● 7)	● 7)	● 7)	● 7)		●		● 5)						
CP 5611 A2 (PCI 32 Bit)	SOFTNET-DP	●	●	●		●	● 2)3)	● 2)3)							●
CP 5621 (PCIe x1)	SOFTNET-DP Slave	●	●	●		●			● 2)						
CP 5512 (CardBus 32 Bit)	SOFTNET-S7	●	●	●		●							●	●	●
	STEP 7	●	●	●									●		

You can find more information on the Internet
http://www.siemens.com.simatic-net/ik-info
If you have questions on LINUX projects
please contact I&S
E-mail: it4industry@siemens.com

1) Included in scope of supply of the CP 5613/A2/CP 5613FO/CP 5614 A2
2) DP master and DP slaves cannot be operated simultaneously
3) Master Class 1 and Master Class 2 cannot be operated simultaneously on one CP
4) DP-Base and DP-5613 cannot be operated simultaneously
5) only with CP 5614
6) incl. XML DA interface for data access
7) with porting via DK-5613
8) SEND/RECEIVE based on the FDL interface

on SIMATIC NET-CD Edition 2007

● suitable
not applicable

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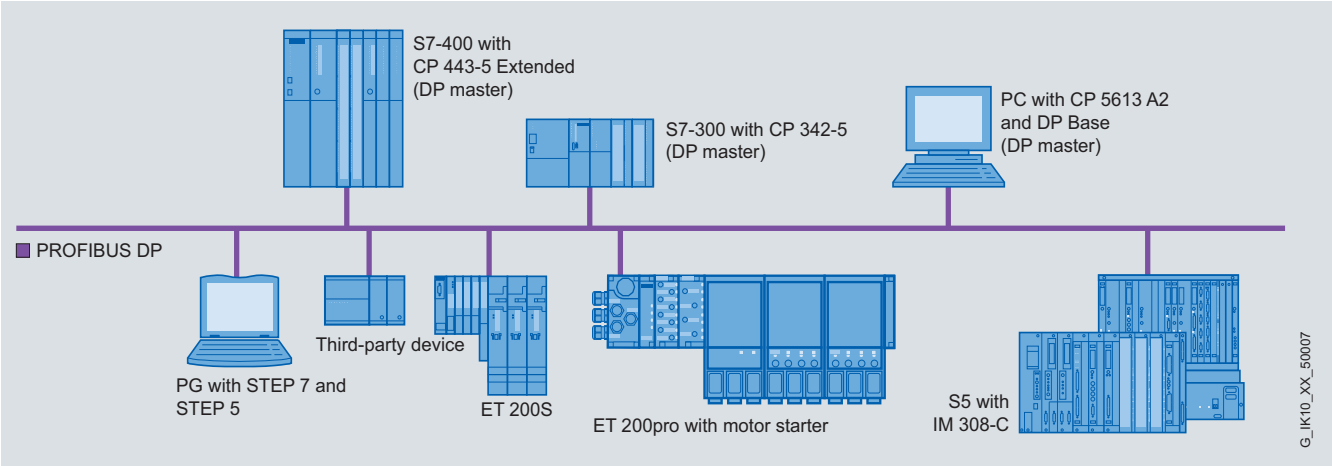
Communication overview for PG/PC

Configuration examples

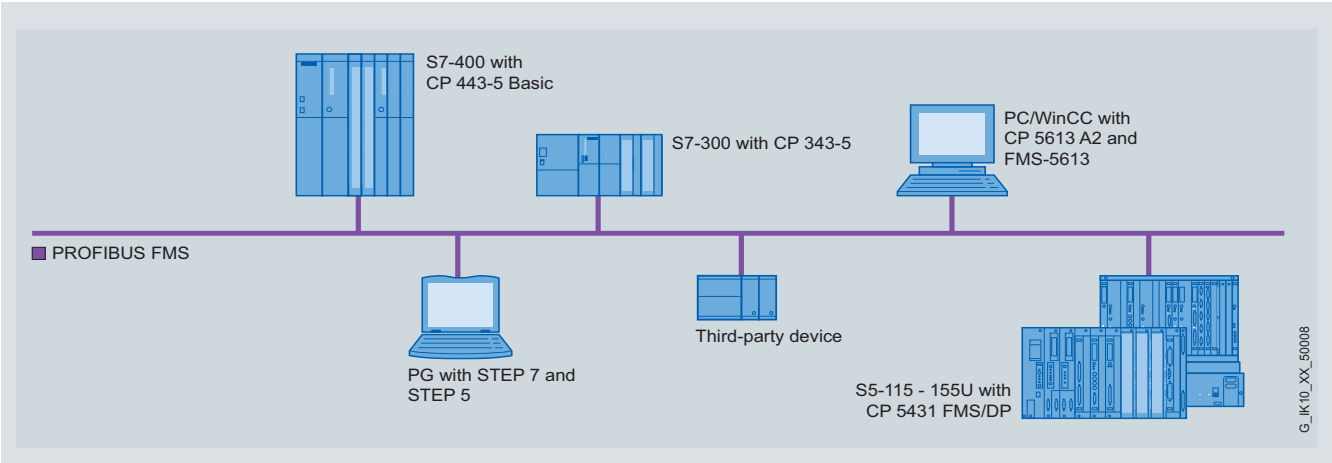
Integration

Configuration example for process or field communication



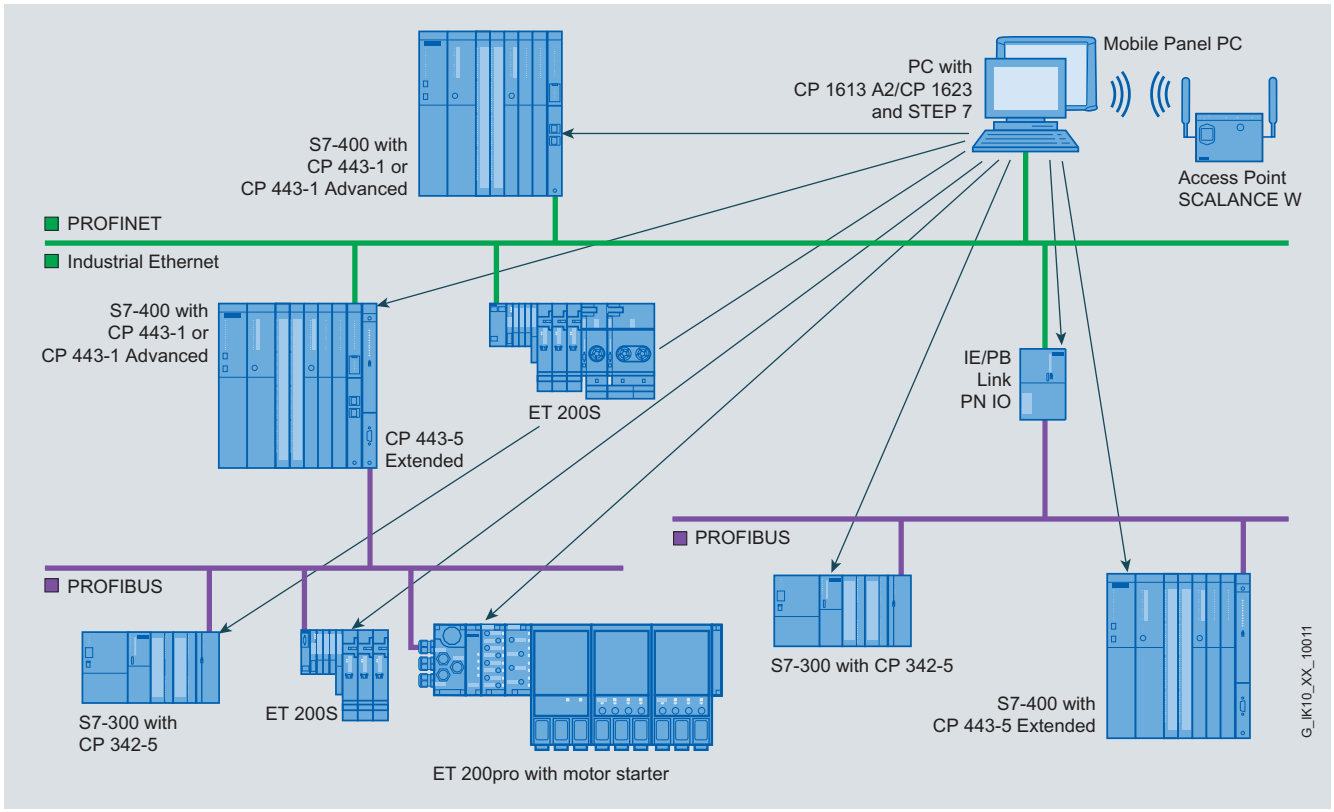
PROFIBUS DP configuration for SIMATIC S5/S7 and PG/PC

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

Technical specifications

Technical specifications

Standard		PROFIBUS acc. to IEC 61158/EN 50170 Volume 2
Topology		
• Electrical network		Bus, tree
• Optical network		Bus, tree, ring
• Wireless coupling		Point-to-point, point-to-multipoint
Transmission medium		
• Electrical network		Shielded two-conductor cable
• Optical network		Optical conductor (glass, PCF and plastic)
• Wireless coupling		Infrared
Network size		
• Electrical network	km	Max. 9.6
• Optical network	km	Max. 90
• Wireless coupling	m	Max. 15
Transmission rate		9.6 kbit/s to 12 Mbit/s (adjustable) including 31.25 kbit/s for PROFIBUS PA
Number of stations		Max. 127
Access control		Token passing with lower-level master-slave
Protocols		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.*

Get more information

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