AS-Interface
by Bihl+Wiedemann

**Bihl
+ Wiedemann**

THE AS-INTERFACE MASTERS

ASi INTERFACE

About Bihl+Wiedemann

Bihl+Wiedemann GmbH, founded in 1992 by Jochen Bihl and Bernhard Wiedemann, is a highly specialized, internationally operating engineering company based in Mannheim. It is among the leading providers of safety technology and electronic components for automation technology with AS-Interface.

In 1995, Bihl+Wiedemann was the first company to receive a certificate from AS-International for its AS-i master. This master is used as a reference for the certification of AS-i slaves. Other milestones in the history of the Mannheim-based company include the realization of the first AS-i master to comply with specification 3.0, the presentation of the first AS-i master in a stainless steel housing with extended diagnostic functions (2004) and the joining of the AS-Interface safety consortium (2005). Since then, Bihl+Wiedemann has also been among the industry leaders in the area of safety technology with AS-i Safety at Work.

In addition to its headquarters in Mannheim, the company has employees in several European countries. Additional sales partners within Germany and abroad ensure that Bihl+Wiedemann is represented worldwide.

Basic Concept of AS-Interface

AS-Interface is an industrial networking solution for automation systems. It is designed for connecting simple field I/O devices such as binary ON/OFF, analog and safety I/O according to EN 954-1, IEC 61508. Using only a two conductor flat or round cable (AS-i cable, 2 x 1.5 mm, 16 AWG) to connect all slaves to the master using a free topology. This is the main advantage of this system compared to conventional, parallel wiring, where every single signal has to be wired directly to the control system. Data and power are available in the same AS-i cable. Every slave or module has its own address for accessing its data. The slaves can be addressed from 1 to 31 (single slaves), or, with extended addressing, there are 62 slaves available (1A to 31A and 1B to 31B). Single slaves and modules with extended addressing can share the same network.
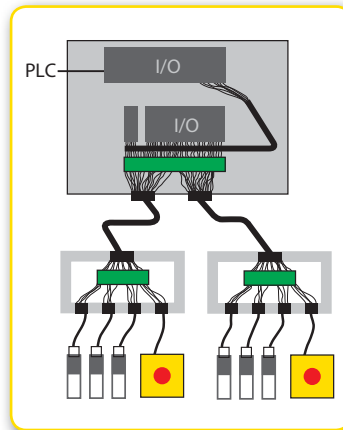

Conventional wiring
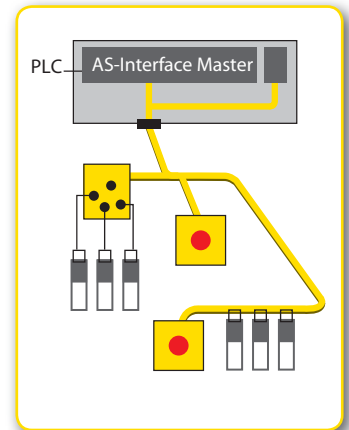
Standard and safety signals in one cable

AS-i Structure

The AS-i Master/Gateway controls the AS-i network and acts as a direct link to the host such as PLC, PC, DCS, etc. A Gateway is an AS-i Master, and simultaneously a slave to higher level network (PROFIBUS, EtherNet/IP, DeviceNet, CANopen, Modbus, etc.). AS-Interface is the lowest level of the automation pyramid intended for Actuator/Sensor networking. It uses bit-wise communication for most common binary field devices (sensor: push button, selector switches, etc.). The level above AS-i is a device level which is an implementation of complex field devices, sensor, and actuator where data exchange occurs mostly byte-wise. Field level is the highest level in the automation hierarchy connecting production facilities at one location and plants at different locations.

AS-i Topology

AS-i supports free topology such as Star, Ring, Linear, Tree and Mesh network (see examples below).
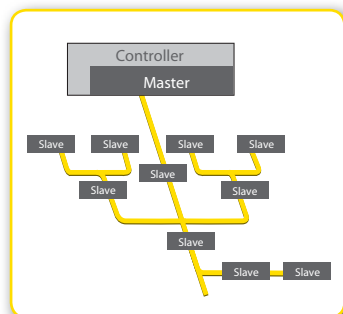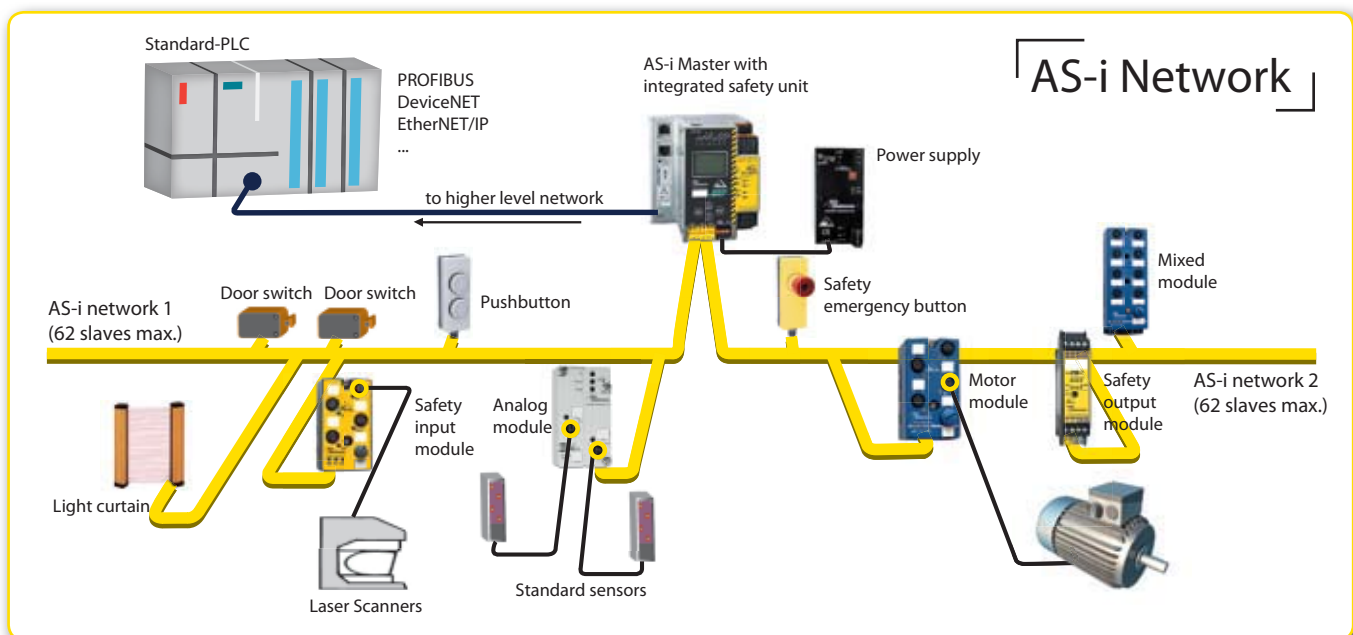

Tree topology
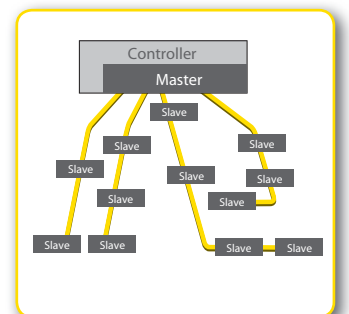
Star topology

Benefits of AS-Interface

- Save hardware by reducing I/O cards, cabinets and wiring
- Simple electronics with robust performance
- Free choice of network topology
- Quick installation, reduce maintenance and shorten testing time, fast commisioning and ability to expand the system
- Fast transmission time (max. 5ms in worst case)
- Avoid wiring errors (no risk of faulty electrical connection)
- High resistance against EMC noise
- Fast error localization because of enhanced diagnostic data
- Reduce cost

Compatibility

AS-i is fully backwards compatible.

This means that a master according to the last specification 3.0 (= M4 profile) can communicate with all existing slaves according to the different specifications 2.0, 2.11 and 3.0. This guarantees a future proof investment.

AS-i Network

Standard-PLC

PROFIBUS DeviceNET EtherNET/IP ...

to higher level network

AS-i Master with integrated safety unit

Power supply

AS-i network 1 (62 slaves max.)

Door switch Door switch Pushbutton

Safety emergency button

Mixed module

Safety input module

Analog module

Motor module

Safety output module

AS-i network 2 (62 slaves max.)

Light curtain

Laser Scanners

Standard sensors

AS-i Characteristics

Medium	Unshielded two conductor flat cable
Signal	Supply power and data in one cable with max. 8 A
Cable Length	100 m (line extension possible using a bus termination, tuners and/or repeater up to 1000 m)
Number of Slaves per Circuit	up to 62
Number of I/O Binary	up to 248 Inputs and 248 Outputs
Number of I/O Analog	up to 124 Inputs or Outputs
Cycle Time	153 µs/slave
Transmission Rate	167 kbits/second
Error Protection	Identification and repetition of faulty frames
Supported Topology	Tree, Star, Ring, Linear, Linear with taps and Mesh
Safety	SIL 3, Category 4, PLe (EN 62061, EN 61508, EN ISO 13849-1, EN 954-1)

Gateways

- 1 Master
- 2 Masters
- 2 Masters, version:
  "1 gateway + 1 power supply
  for 2 AS-i networks"

**Benefits of the 2 Masters, version:
"1 gateway + 1 power supply for 2 AS-i networks":**

- Lower investment, lower installation effort,
  more space in the service cabinet
- Only one connection to each, the power supply and
  the higher level bus
- Separation of power supply and AS-i network possible
- No additional 24 V power supply

AS-i Master / Links / Scanner

AS-i Scanner for Allen-Bradley ControlLogix, CompactLogix and MicroLogix 1500

AS-i Master for PC-based automation

- PCI
- PC2
- PC104
- OEM Module
- M-Module

Safety Gateways / Safety Monitors

Gateways
with integrated Safety Monitor

Safety Monitor

Safety Basic Monitor

- 1 Master
- 2 Masters
- 2 Masters, version:
  "1 gateway + 1 power supply
  for 2 AS-i networks"

- 2 OSSDs
- 4 OSSDs
- Up to 16 OSSDs

- Ideal for small applications
- Stand alone solution
- Expandable over AS-i

Safety Slaves

Safety Inputs

Safety Outputs

- For floating contacts
- For OSSD outputs
- For safety encoders

- Relay outputs
- Electronic outputs
- Mixed Input/Output Modules

Analog Modules

Accessories

Input Slaves

Output Slaves

Specialities

Passive Distributors

- 4 ... 20 mA
- 0 ... 10 V
- Pt100, Pt1000
- Thermocouples

- 0 ... 20 mA
- 0 ... 10 V

- Counter Modules
- Balance Controller
- Mixed Modules

Drive Solutions

AC Motors

DC Motors

- SEW MOVIMOT
- SEW MOVI-SWITCH

- Interroll
- Itoh Denki

- AS-i
- AS-i and 24 V
- Flat cable branch

Diagnostics / Circuit Extensions

Diagnostics / Circuit Extensions

- Analyser
- Bus Termination
- Tuner
- Repeater

AS-i Master with integrated safety unit

Power supply

Bus Termination

Bus Termination

Power supply

Power supply

Bus Termination

Power supply

Power supply

Bus Termination

Bus Termination

Slave

Slave

Slave

Slave

Slave

Repeater

Repeater

Repeater

Repeater

200m 200m 200m 200m 200m

max. 1000m
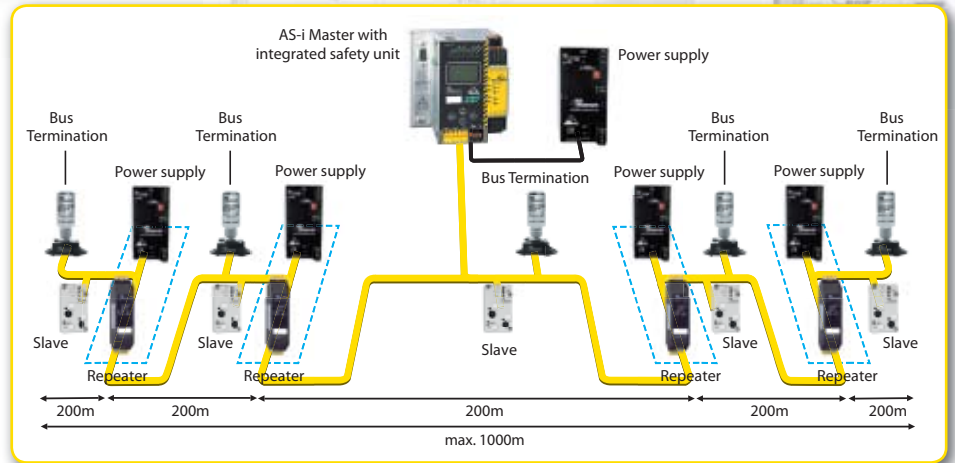
Power Supplies

Power Supplies

- Single Phase
- 3 Phases
- 24 V to AS-i
- 1,8 A, 2 A, 4 A, 8 A
- Decoupling Unit for 2 networks

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