



Introduction to the Actuator Sensor-Interface

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Outline of Presentation



- Introduction to the Actuator-Sensor Interface, AS-i.
- Characteristics and main features of AS-i.
- Connection technology.
- Extensions to the standard V2.1 and V3.0.
- Practical demonstration of the simplicity of AS-i.



AS-interface

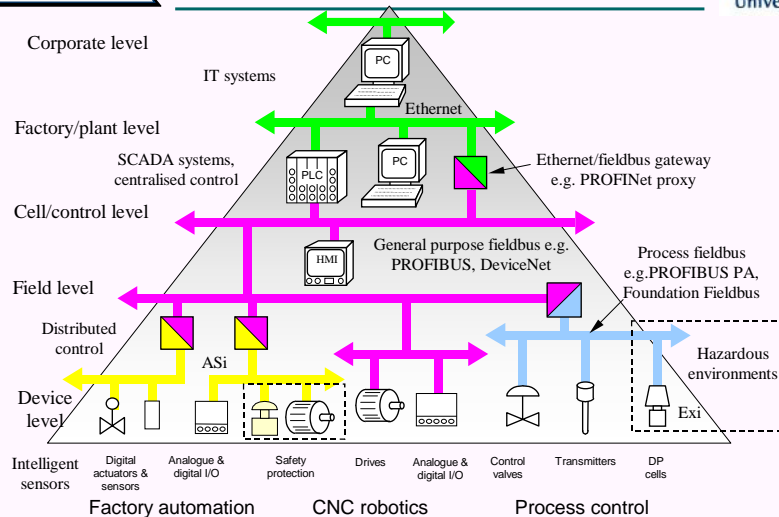


- The Actuator Sensor Interface (AS-i) is widely recognised as the simplest and lowest cost option for networking actuators and sensors in industry.
- Operates at the lowest level in the fieldbus hierarchy
- AS-i is designed primarily for binary (on-off) sensors and actuators although analogue elements are also easily incorporated.
- AS-i is an open, widely-used, vendor-independent standardised solution.
 - ✓ About 15% of the total fieldbus market is AS-i*.
 - ✓ Currently supported by over 100 different manufacturers.
 - ✓ Defined by IEC62026 and EN50295.

* - IMS fieldbus survey 2004

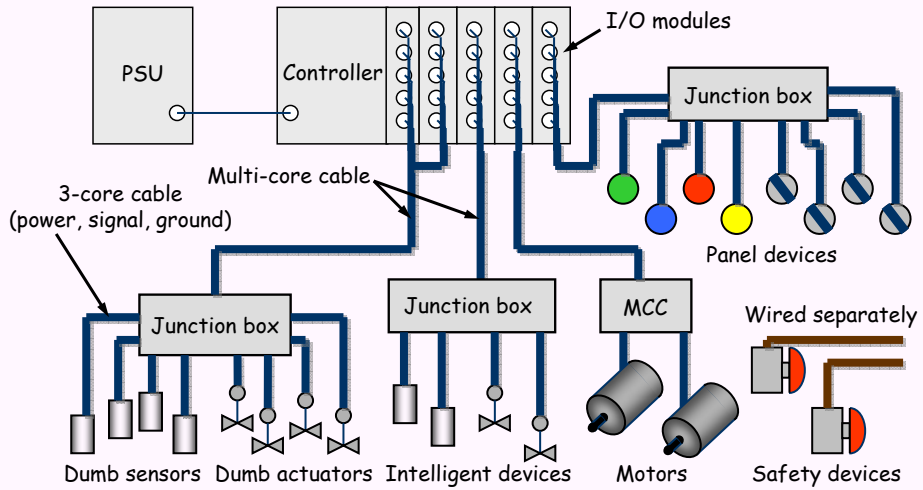


Positioning of AS-i

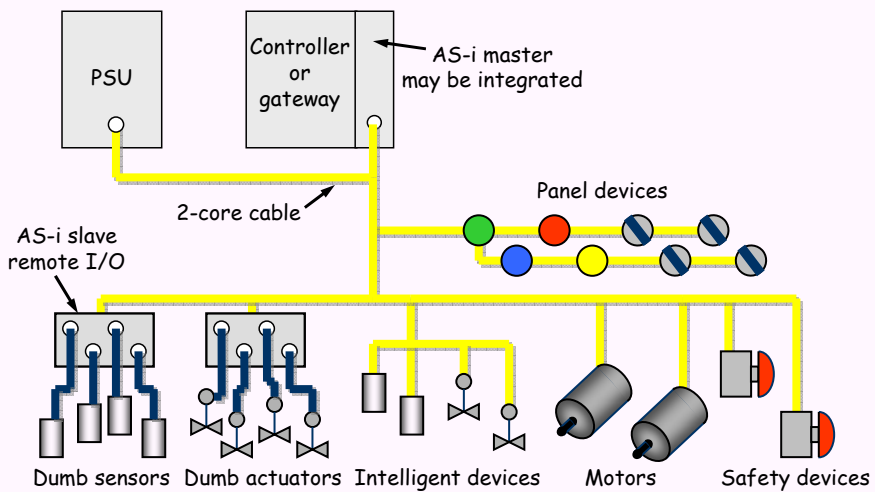




Traditional Wiring



AS-i Wiring





Main Features of AS-i



- In its original form, up to 31 devices can be connected onto the AS-i cable, each with 4 bits of input and four bits of output. This can be achieved with a cycle time of 5ms maximum.
- AS-i uses low-cost, two-core unscreened cable
 - ✓ Up to 100m of 1.5mm² stranded cable
- Power and data are combined on one cable
 - ✓ Nominally 30V at up to 8A over the bus cable.
- Physically and electrically robust
 - ✓ Typically IP67 rated devices and connections
- Simple installation using standardised cable and insulation displacement connection
 - ✓ Special flat profile or round profile cable

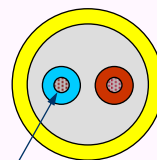
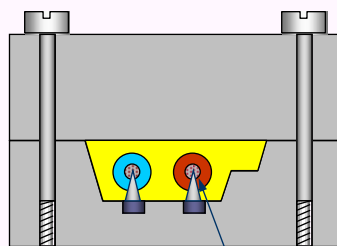


Connection Technology



AS-i flat cable

Round cable



1.5mm² stranded conductor



AS-i Device Capability



- AS-i is extremely low-cost to implement, based on a self-contained chip that incorporates all the circuitry to communicate over the AS-i cable.
- The chip can be embedded :
 - ✓ into an "active I/O module" to which sensors and actuators can be connected, or
 - ✓ Or can be built directly into the sensors or actuators.
- Cost-effective even for the simplest of devices, e.g. proximity switches, panel indicators and switches.
- AS-i is also widely used in functional safety systems (safety protection systems) where high integrity operation and low failure rate is essential.



AS-i V3.0 Extensions



- AS-i has been around in its basic form since 1994.
- Right from the beginning people were trying to extend the basic 4-bit I/O capability using tricks to provide analogue I/O and more extensive data.
- V2.1 extensions were published in 2002, giving:
 - ✓ Double the number of slaves i.e. 62 so-called A/B slaves.
 - ✓ Extended ID codes giving a wider range of defined profiles (sub-profiles)
 - ✓ Simple standardised connection of analogue slaves.
 - ✓ More detailed and better-defined device diagnostics.



AS-i V3.0 Extensions



- V3.0 of the AS-i specification was released in September 2004; the main features include:
 - ✓ Introduction of "combined" transactions, where extended/complex data can be exchanged.
 - ✓ Rationalisation of previously defined profiles for analogue devices (Type 1 transaction).
 - ✓ Serial communication and "combi" devices (Type 2 transaction)
 - ✓ 4I/4O and 8I/8O devices with A/B addressing (Type 3 transaction)
 - ✓ Analogue I/O with A/B addressing (Type 4 transaction)
 - ✓ Introduction of high-speed analogue I/O (Type 5 transaction)



Compatibility



- V2.1 and V3.0 are fully compatible with the original AS-i specification and devices can be mixed in the same network.
- However, to use the new features, you will require master and slave devices that support the extensions.
- New slaves can still be used with an old master but the new functions will not be available on that slave. Likewise, an old specification slave will operate without problems on a modern system.



AS-i Safety at Work



- Safety protection systems are an essential part of modern machine control.
- Concerned with the protection of people, environment, and livelihood - i.e. accident avoidance!
- Not to be confused with explosion prevention (intrinsically safe systems)
- Examples of safety protection systems include:
 - ✓ Emergency stop systems
 - ✓ Protective door and guard switches
 - ✓ Safety light barriers/grids
 - ✓ Machinery interlocking



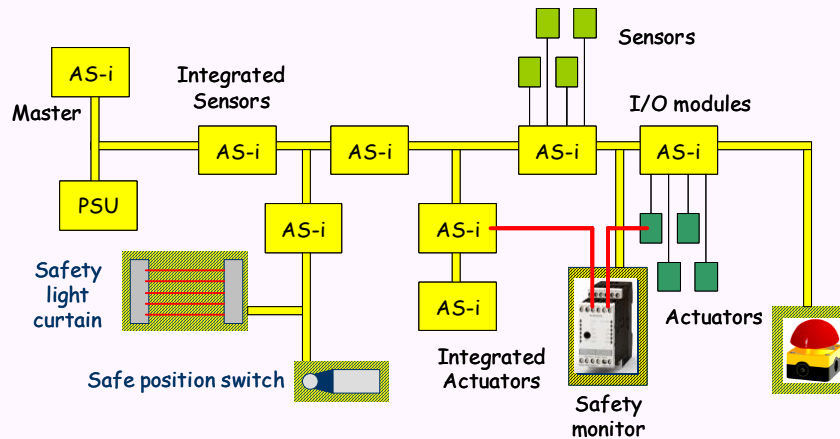
AS-i Safety at Work



- AS-i safe systems are based on the same basic operation and telegrams as traditional AS-i.
- Safety devices can operate over the same network as normal control signals - Mixed operation.
- Special "safe slaves" are required to provide the required safety functionality.
- A standard AS-i master can be used with these safe slaves; the safety function is provided by a "safety monitor".



AS-i Safety at Work



AS-i Safety at Work



- Special "safe slaves" are required to provide the required functionality.
- A standard master is used with these safe slaves; the safety function is provided by a "safety monitor".
- The special "Safety Monitor" provides the safe shutdown or stop functionality.
- There is no need for special failsafe PLC or special safe master!
- Diagnostics are provided via the standard master/standard PLC.



Practical Demonstration



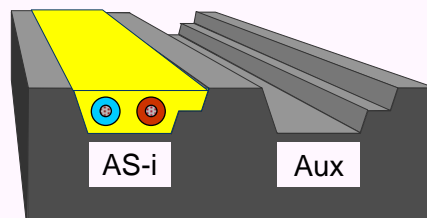
- In order to illustrate the ease with which an AS-i network can be constructed you will build a network now!
- The AS-i profiled yellow cable is connected at one end to a Bihl+Wiedemann master station which will control the network.
- You will connect various slave devices along the cable.
- We will then configure the system and exercise the slaves.



Practical Demonstration



- Many devices are simply clamped to the cable.
 - ✓ However you must make sure that the cable is in the correct slot; i.e. AS-i, NOT Auxiliary power!

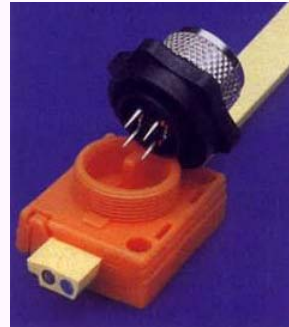




Practical Demonstration



- Some devices have M12 connection these need to be connected via an M12 adaptor.



- ✓ Make sure that the cable is the correct way round so that the mechanical step matches the cable.
- ✓ Clamp the device onto the cable tightly using the screwdriver provided.



Contact details



- A printable copy of this presentation can be downloaded from:

www.VerwerTraining.com

- Contact:

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Questions?