AS-Interface

Overview and analysis

Stonel AS-Interface networking products are part of the FieldLink line and are fully compliant with AS-Interface bus specifications. AS-Interface networks up to 62 field devices onto a single pair of wires that delivers both signal and power.

Actuator Sensor Interface, or AS-Interface, was developed by a group of sensor manufacturers and introduced into the market in 1994. Since that time, it has become the de facto standard for discrete sensors in process industries throughout the world.
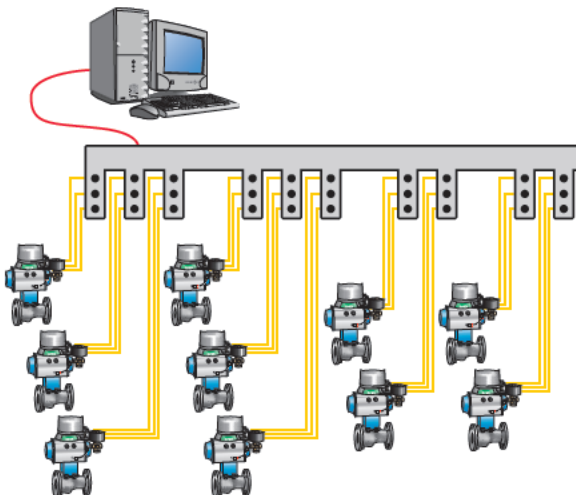
AS-Interface features

- Ideally suited for on/off batch process valves and other discrete applications.
- 62 field devices per network master.
- Simple electronics for economical and robust performance.
- Transfer medium is unshielded two-wire cable for both data and power supply.
- Signal transmission has high tolerance to EMI.
- Easy to install providing the greatest cost savings with the least complexity.
- Free choice of network topology allows optimized wiring network.
- Variety of gateways available to seamlessly tie into high level bus networks.

AS-Interface offers an easy path for network upgrades

AS-Interface gateways may be easily replaced for new upgrades in your plant fieldbus network. For example, you may network your current AS-Interface bus into a Modbus network. However, if you migrate to an Ethernet backbone later, you may install a new gateway and conveniently tie your entire AS-Interface network into the Ethernet network.

AS-Interface is reliable

The AS-Interface Alternating Pulse Modulation (APM) with Manchester II coding and decoding minimizes electromagnetic emissions and is highly tolerant of electromagnetic interference. AS-Interface has a very high level of data integrity and is classified as I3 according to DIN 19244. These networks are robust and perform reliably under the most strenuous environments. AS-Interface networks are recommended for "mission critical" applications.

AS-Interface vs conventional system

AS-Interface is a versatile, low cost alternative to traditional hard wired I/O. It can replace traditional point-to-point wiring with a better, more flexible solution that is easier to install, operate and maintain and easier to re-configure.

Conventional system

Typical batching valve wiring networks attach each of the inputs and outputs (I/O) to a central location resulting in multiple wire runs for each field device. See figure 1. Large expenditures are needed for cabling conduit, installation and I/O points. Space for I/O racks and cabling must be accommodated in order to attach only a few field devices.
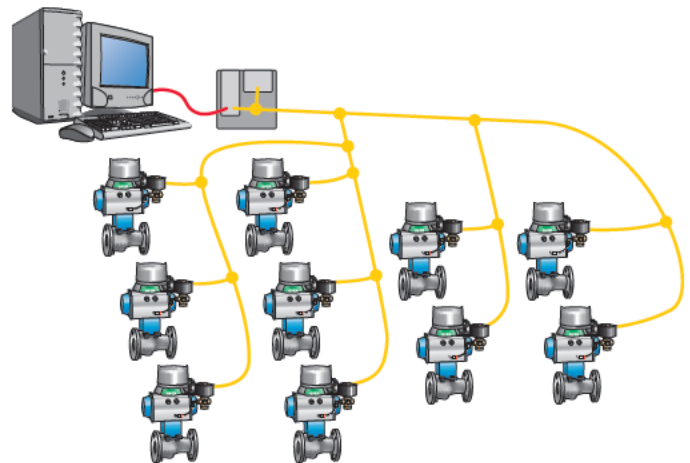
AS-Interface network

A simple gateway interfaces the network into the field communication bus. See figure 2. Data and power are transferred over the two-wire network to each of the AS-Interface compatible field devices.

Each valve communication module contains an AS-Interface ASIC and other electronics to gather open or closed position status and power solenoid or other ancillary devices on or off. Other AS-Interface modules are available to gather inputs and switch power outputs.

Figure 1
Conventional system

Figure 2
AS-Interface network

AS-Interface economic analysis

Using a network with 16 valve communication terminals (VCTs), the following economic analysis may be performed (costs are listed in the amount per automated valve):

Installation cost comparison		
(calculated per field device)	Conventional	AS-Interface
Computer I/O; master/gateway	$70	$65
Conduit, cable tray, wiring and fittings	$1,500	$350
Valve monitor/VCT and pneumatic valve	$510	$610
Switched protected drop connector	NA	$90
Installation and commissioning labor	$700	$300
Power supply	$50	$30
Total installed cost	$2,780	$1,445
Total installation savings $1,335 per automated valve		

There is a net savings of $1,335 per automated valve with AS-Interface communication over the conventional system (52% reduction in installed cost). This savings does not include other cost reductions due to less space consumption for wiring, conduit and I/O racks, as well as greater flexibility in adding field devices or reconfiguring later.

Technical information

Power and data

In an AS-Interface network, data and power are carried over a single two-wire cable that links up to 62 field devices. Each of the field devices may have up to 4 inputs and 4 outputs for a total of 248 binary inputs and outputs per string. Analog inputs and outputs are also available. Stonel AS-Interface I/O modules have 4 inputs and 4 outputs (power output for up to four solenoids or other power consuming accessories).

Transmission media

Two-wire unshielded, untwisted cable, 2 x 1.5 mm^2 (16 AWG) is recommended for data and power in the process environment.

Conductor length

100 meters (328 feet) total length of cabling may be used for each master/gateway. Additional length of 100 meters for each repeater with up to two repeaters in series. Parallel repeaters can be used to construct long networks, provided there are no more than two repeater hops from each device to the master. Total number of field devices must remain at 62 regardless of number of repeaters for each master.

In addition to the repeater, some new devices have been created that allow you to add distance to your AS-i network. The AS-i terminator is a passive device that can be placed near the end of a segment to extend the AS-i network up to 200m without repeaters. The terminator places a specially designed impedance at the end of the AS-i segment which serves to optimize the signal and therefore increase the network length. The tuner is a device that actively looks at the network signal and determines the best impedance level to optimize the signal. It also has diagnostic LED's to show signal level

quality. The tuner can allow networks to extend up to 300m without repeaters and has diagnostic LED's. Please note that it is important that voltage drop be considered when extending networks with these new tools.

Topologies

AS-Interface is capable of supporting any topology. Any combinations of star, ring, tree and linear are possible. Use of a repeater in a ring is not permitted.

AS-Interface system specifications	
Topology	Linear, star, tree or ring
Number field devices	62 per network, maximum
Addressing	AS-i master or handheld
Cabling	Unshielded 2-wire for data and power (30 VDC up to 8 amps) standard round or AS-i flat
Cable length	100 meters per master or 300 meters with two repeaters
Transmission rate	167 kbits/second
Signal coding	Manchester type with alternating pulse modulation
Cycle time	10 msec. maximum with 62 devices
Data per message	4 bit bi-directional
Access procedure	Master/slave
Error detection	1 parity bit + signal quality monitoring

Data integrity

When classifying the bus in terms of data integrity (according to EN608 70-5-4-DIN), the AS-Interface network falls into the highest data integrity class even with a bit error rate of 10-3. Such accuracy is suitable for the transmission of mission critical information.

Standards and user groups

AS-Interface technology has been standardized in EN 50295 and IEC 62026-2. There are over 400 different products available from 50+ vendors. And, as of this writing, there are estimated to be over 12,000,000 installed nodes (field devices) throughout the world.

Stonel AS-Interface gateways

AS-Interface gateways seamlessly interface the AS-Interface network to a higher level fieldbus. For communication, the protocol of the respective fieldbus (Modbus, Profibus, DeviceNet, etc.) will be used. To configure a gateway using an RS485 interface, only a simple RS232C/RS485 converter is needed. In this fashion, the gateway can be operated with a notebook PC via the respective fieldbus interface without need for additional hardware or software.

The operation of all Stonel AS-Interface gateways is identical. Complete configuration and debugging of the network can be accomplished with the included push-buttons, LED and display. Slave addresses can be programmed, faulty AS-Interface field devices can be detected and actual configuration of the AS-Interface network can be stored.

AS-Interface is NOT a competitor to higher-level field buses. AS-Interface is a complementary system to them.

AS-Interface gateways are readily available to the following high level field buses:

- Modbus (RS485)
- Modbus+
- Profibus (DP)
- ProfiNet
- DeviceNet
- Ethernet (TCP/IP)
- Ethernet/IP

Dual channel gateways are available for many of these protocols allowing greater efficiency.

Please contact Valmet for availability since new gateways are becoming available regularly.

Host computer interface

AS-Interface can be easily interfaced with standard PC, PLC and DCS platforms. Variations are as follows:

AS-Interface gateway to higher level protocol
Many PLCs and DCSs have communication cards available that utilize protocols such as Profibus, DeviceNet, Modbus, Modbus+, Ethernet, etc. The appropriate AS-Interface gateway would simply act as a node on the higher level network. See figure 5.

AS-Interface master in DCS/PLC
Many PLCs have AS-Interface scanners available, which enable direct connection without an AS-Interface gateway. See figure 6.

PC
An AS-Interface ISA card may be installed directly into the PC, which acts as the AS-Interface master. Or, a gateway can be used if the PC has the ability to communicate via Modbus, Modbus+, DeviceNet, Profibus, etc.

Figure 5
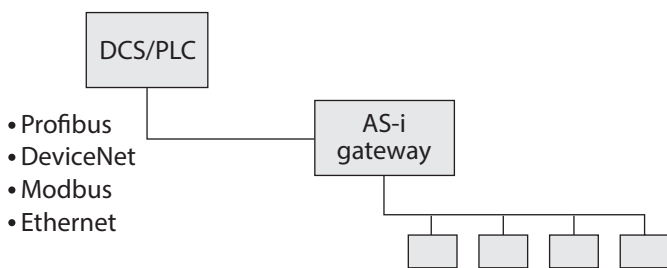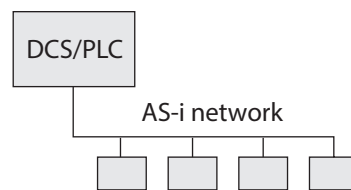AS-Interface gateway to higher level protocol

Figure 6
AS-Interface master in DCS/PLC

Valmet's professionals around the world work close to our customers and are committed to moving our customers' performance forward – every day.

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