

"Welcome to the K Controls e-training course designed to deliver useful "Pneumatic Valve Actuation" application information in small instalments."

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## Introduction to Fieldbus

### Fieldbus – a definition

Fieldbus systems and their application to valve automation and associated instrumentation fall into one of three categories.

#### Category 1 (e.g. AS-interface®)

The first is at a relatively simple level where the requirement is to distribute digital I/O (inputs and outputs) to monitor inputs from switches or sensors (level, travel limit, fault alarms etc.) and or control outputs to on/off devices such as solenoid valves or relays. In such applications the requirement for high-speed data transmission is not critical and the need to process significant amounts of data at the node does not exist. Generally the control function is on/off and the speed at which the related equipment operates is far slower than the electronic data transfer rate. Electronic hardware cost is an important factor with local nodes needing to be relatively simple generally with a maximum I/O count of 4. AS-interface® is a typical system in this category.

#### Category 2 (e.g. HART®)

The second category is data acquisition or transmission to and from 4-20mA process instruments such as temperature and flow transmitters or valve positioners where data additional to the process variable is captured in digital form (useful for remote diagnostics or calibration). Digital data is transmitted by superimposing it on top of the 4-20mA analogue signal. HART® from Fisher Rosemount is the leader in this field. (HART® stands for "Highway addressable remote transducer").

#### Category 3 (e.g. PROFIBUS® or FOUNDATION™ fieldbus)

The third category is by far the largest with systems transmitting process control data at high speed to potentially large numbers of nodes. The functionality of the nodes can range from distributing discrete digital and analogue I/O, providing gateways to lower level systems (AS-interface), through to remote processing and local loop control. Systems in this third category are full function fieldbuses capable of handling cyclic data, events and messages. Examples include PROFIBUS® or FOUNDATION™ fieldbus (FF).

The requirements of control valves and on/ off valves differ.

### Control Valves

HART, Profibus or FF can be directly applied to positioners on modulating valves because the benefits of remote calibration and diagnostics on critical control valves could in some cases justify the cost and complexity of having the technology as an integrated part of a control valve assembly.

K Controls designs and manufactures valve networking monitoring and control products:

- Switchboxes
- Control Monitors
- Position Transmitters
- Corrosion resistant
- ATEX certified – gas + dust
- High and low temperatures
- IP68 for submersion
- Low powered solenoids
- Remote I/O compatible
- AS-interface®
- DeviceNet™
- PROFIBUS® PA
- FOUNDATION™ FIELDBUS
- 4-20mA + HART®
- Wireless solutions
- Linear or rotary adaptation

K Controls can also supply your positioner requirements

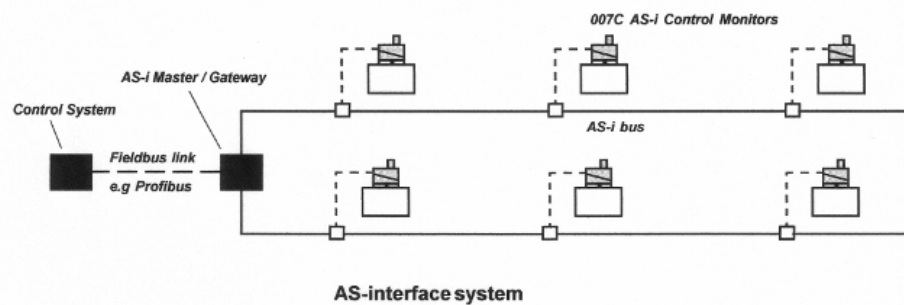
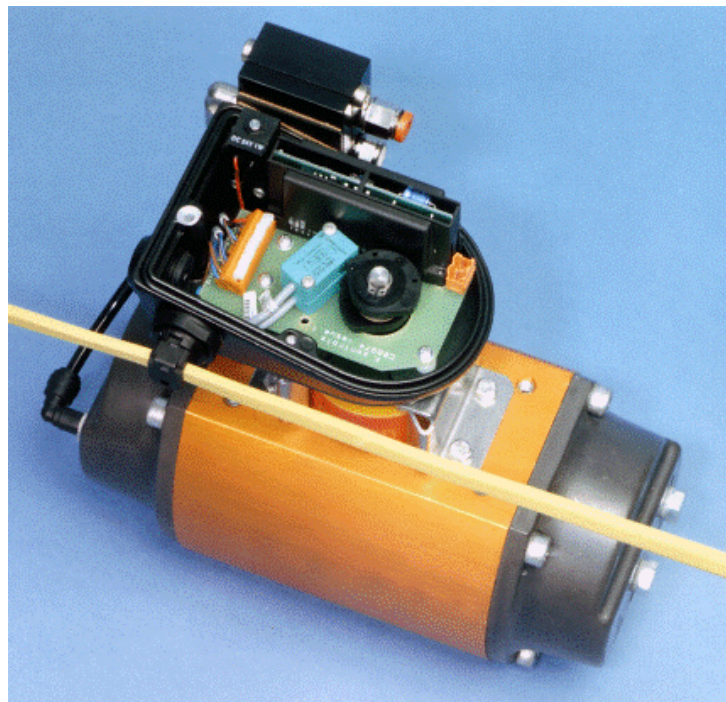
## On / Off Valves

Power constraints and the relatively high cost of the field electronics is limiting the integration of full function fieldbuses (e.g. PROFIBUS® and FOUNDATION™ fieldbus) into switch solenoid units for on/off valves. There are a number of alternative approaches that are being specified:

### AS-interface

PROFIBUS® or FOUNDATION™ fieldbus Gateways can be used to convert fieldbus protocol to AS-interface® which is a more effective solution for on/off valves.

Integrated AS-interface switch / solenoid control monitors can then be connected directly to an AS-interface® using either DIN connectors or a cable piercing connector as shown in this photograph.



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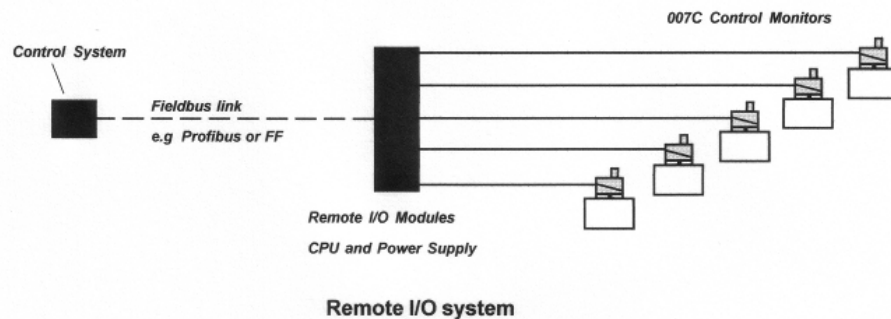
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## Remote I/O Systems

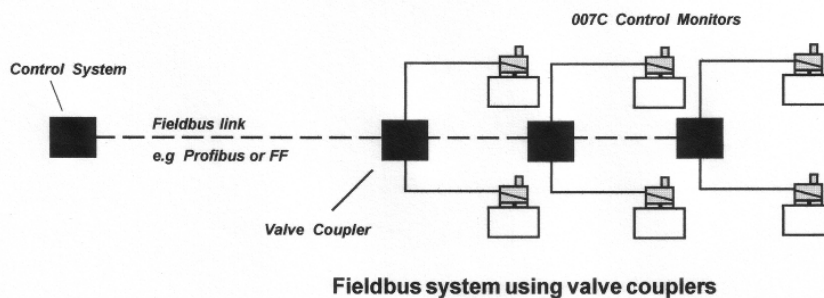
These systems allow hard wired integrated valve actuator control monitors (e.g. the K Controls 007C) to be connected to remote I/O modules situated close to clusters of valves. The remote I/O modules are then connected back to the Distributed Control System (DCS) using a field bus link (e.g. Profibus DP, FF, Modbus or Ethernet). I/O systems can lead to significant reductions in wiring and installation costs but the system is viewed simply as an extension of the Distributed Control System. There are also HART transparent remote I/O systems which allow users access to most of the intelligence built into certain field devices such as temperature transmitters or valve positioners. Redundancy is often built in to the power supply, central processing unit (CPU) and field bus links of these systems. Remote I/O systems are seen by many as less complicated than full function fieldbuses; they usually require minimal staff re-training and can be easy to validate.

On/off field devices (e.g. the K Controls 007C) are suitable for single acting, double acting or “stayput” applications. They can be fitted to rotary or linear valve actuators and are usually wired to the remote I/O module using a single multi-core cable. Special variants for pharmaceutical clean rooms allow the multi-core cable and pneumatic supply line to pass into the field device via a single conduit.



## Valve Couplers

This approach is particularly useful in hazardous areas as intrinsically safe versions are available which can be used in combination with standard certified field devices.





# E-training

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4-20mA + HART®  
Wireless solutions  
Linear or rotary adaptation

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The application of fieldbus in hazardous areas is dealt with in another e-training document.

The implementation of fieldbus technology in the process markets has been slower than in the factory automation markets. Investment cycles are often longer and the problems of software validation and operating in hazardous or hostile environments are taking longer to overcome. However full function fieldbuses are already being integrated into valve positioners and are being utilised by the latest remote I/O systems for on/off and modulating valves. This trend is set to continue. The user can benefit from lower installation costs and the enhanced valve performance information which can then be made available directly to the hierarchy of other factory management networks. These new valve automation techniques will make a positive contribution to the implementation of fully computerised manufacturing systems which aim to improve customer service, reduce costs and increase market share.

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