imtexcontrols

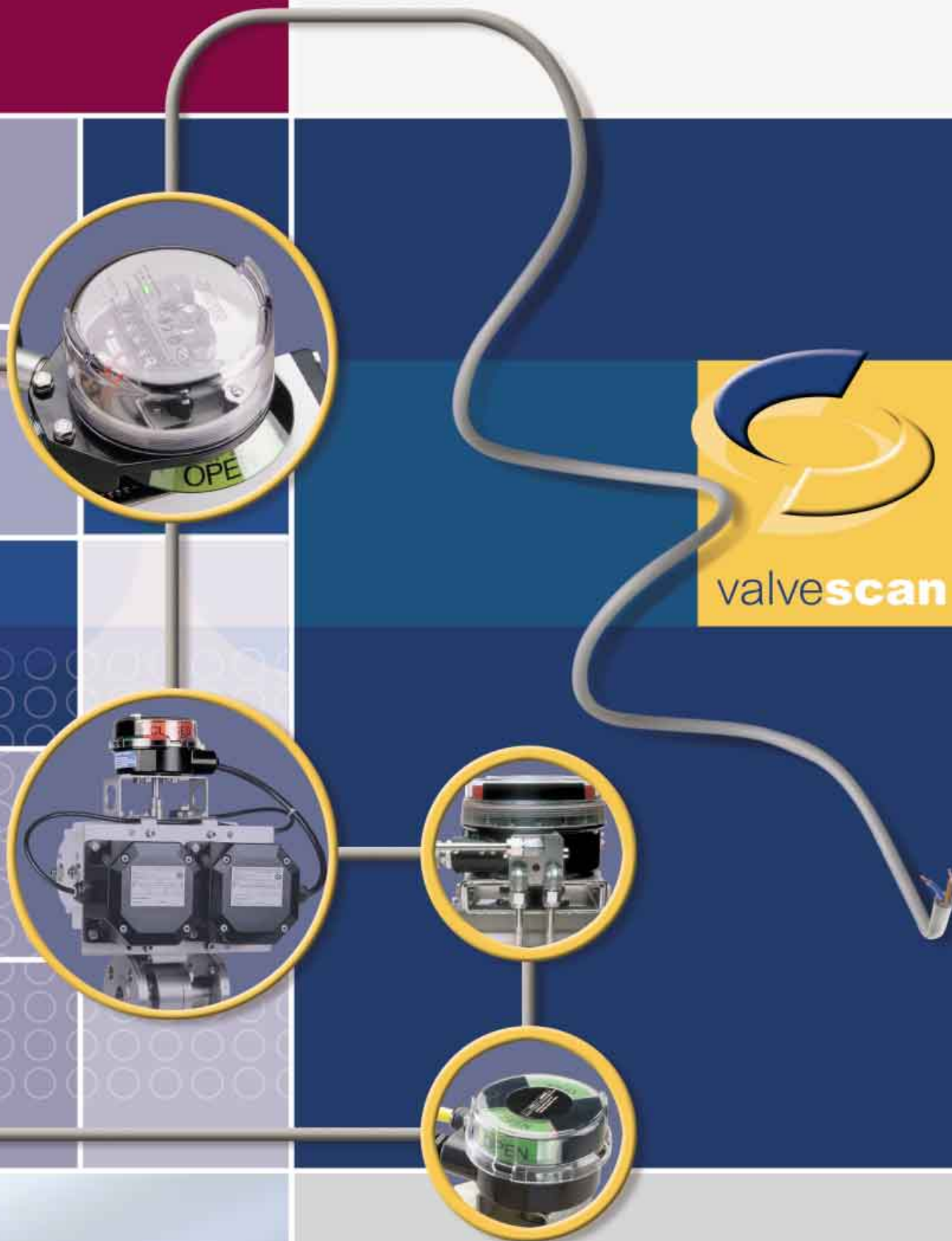## COMMUNICATING WITH VALVES

valvescan

imtex valve**scan** monitoring & control is a manufacturing and marketing company established in 1990 specialising in the supply of advanced valve monitoring and communication systems.

With the increasing implementation of fieldbus networks which form part of the process plant intranet system, process control valves supplied with imtex valve**scan** communication system devices offer many advantages and benefits to process users.

imtex valve**scan** devices incorporate an input/output (I/O) card which integrates with the bus network and can either be used for continuous feedback (0 to 100%) or discrete (on/off) valve applications with the following advantages:

- **Simplified Electrical Wiring**
  Using 2 or 4 wires for all the valves in the valve network eliminates the wiring 'spaghetti' of conventional systems.

- **Reduced Installation Costs**
  By reducing the number of wires used in the valve network, the electrical set-up becomes much simpler and installation time is reduced.

- **Increased System Reliability**
  Using solid-state circuitry and micro-chip technology, maintenance downtime is reduced, system diagnostic functions are enhanced and system reliability is increased.

- **Standard Bus Technology**
  By integrating with the leading bus technology protocols, systems are supported by almost all of the leading manufacturers of process equipment.

Higher Level Bus Networks (Fieldbus)

Field based communication networks are available for interconnecting controllers and complex instruments in the plant environment and are ideally suited for continuous (0 to 100%) or critical duty discrete (on/off) valve applications. In the process industries, Profibus, HART, Foundation Fieldbus and DeviceNet have established a strong base of user support whereas other protocols such as Modbus and Interbus have had traditional support for interconnecting remote I/O.

imtex valve**scan** devices are available to work directly with the following higher level protocols:

- **Profibus PA** - Continuous (0 to 100%) Feedback

- **HART** - Continuous (0 to 100%) Feedback

- **Foundation Fieldbus** - Continuous (0 to 100%) Feedback or Discrete (on/off)

- **DeviceNet** - Discrete (on/off)

Lower Level Bus Networks

A field proven standard such as Actuator – Sensor Interface (AS-i) originally developed for applications which require on-off or "binary" feedback, has proved ideally suited for discrete (on/off) valve applications operating with end of travel limit switches / sensors and solenoid valves. However, with the latest revision of the protocol specification, AS-i is now optimised for use with both binary and analogue (4 to 20mA) control devices and as such is also suited for use with continuous (0 to 100%) valve applications. AS-i was designed to be a lower cost but complementary system to the higher-level bus networks and as such gateways very conveniently to the higher-level bus protocols.

imtex AS-i valve**scan** devices are available to gateway* with the following higher level protocols:

- Profibus DP

- Modbus and Modbus Plus

- LON

- Interbus

- Ethernet (TCP/IP)

- DeviceNet

- CC-Link

- CANopen and CANrho

  Note : Imtex can offer a full range of AS-i gateways as well as power supplies, repeaters and ancillary components

Overview of Main Protocols

Profibus and Foundation Fieldbus

Designed as a digital replacement of the 4 to 20mA standard in the process industries, the Profibus and Foundation Fieldbus protocols are a Local Area Network (LAN) for instruments offering multi-drop capabilities with up to 32 devices per network. The physical wiring for both protocols are fully compatible with intrinsic safety standards and may be used in hazardous as well as general purpose areas.

Benefits

- *Reduction in field wiring costs.*
- *Intrinsic safety wiring option available for further cost reductions in hazardous environments.*
- *Same bus used for continuous and discrete applications.*
- *Control may reside in the field devices freeing up space in central controllers.*
- *Provides greater control functionality and process information.*
- *Standardised function blocks representing control and I/O speed set-up.*
- *Bus lengths up to 1900 metres and spurs up to 120 metres span most process systems.*
- *Supported by over 8% of the World's process instrumentation suppliers.*

DeviceNet

The DeviceNet protocol is based on CAN (Controller Area Network) technology and dramatically reduces costs by integrating up to 64 devices on a 4-wire trunk network. Communication data is carried over two wires with a second pair of wires carrying the power. Both analog and discrete devices may be connected into the DeviceNet protocol.

Benefits

- *More than 30% savings in installation costs over conventional systems.*
- *Capability to handle both analogue and discrete valve and instrument applications.*
- *supplied over the 4-wire bus.*
- *Capability to install up to 64 devices on the same bus network.*
- *Hot insertion of the field devices without dropping power.*
- *Message prioritising to enable fast throughput rate for critical information.*
- *Bus lengths up to 500 metres (dependent on data baud rate).*
- *Technology with proven reliability in millions of mission critical applications.*

HART

HART (Highway Addressable Remote Transducer) is a digital communication protocol which operates on top of a conventional 4 to 20mA analogue current loop signal from a measurement device such as a valve feedback transmitter.

Benefits

- *Allows remote configuration, adjustment and diagnostics of the field device.*
- *Compatible with existing analogue connections on most control systems.*

AS-Interface (AS-i)

AS-i networks up to 62 I/O or 31 analogue modules onto a single pair of wires which delivers both signal and power and is ideally suited for discrete on/off and continuous control applications.

Benefits

- *Ideally suited for batch process duties.*
- *Capability to install up to 62 discrete and 31 analogue devices per network master/gateway.*
- *Simple electronics providing economical and robust performance.*
- *Transfer medium unshielded 2-wire cable for both data and power supply.*
- *Signal transmission has high tolerance to EMI.*
- *Easy to install providing the greatest cost saving with the least complexity.*
- *Highly effective fault correction.*
- *Bus lengths up to 100 metres which can be extended to 500 metres with repeaters.*
- *Free choice of network topology (line, ring, star or tree) allows optimised wiring network.*
- *Variety of gateways available to seamlessly tie into high level bus networks.*

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Bus Networks and Valvescan

Standardised bus networks are able to link intelligent field devices to enterprise systems to offer unparalleled benefits to the process industries. Benefits include dramatic reductions in installation costs, reduced maintenance & commissioning costs and improved process performance. Valvescan, process networking solutions and support services, facilitates the implementation of the plant process bus network.

Optimized Process Bus Architecture

An optimised network may consist of two or three buses which seamlessly and economically link sophisticated process instruments and simple, discrete devices into the process control architecture. **Figure 1** illustrates a fieldbus and sensor bus being directly attached to the process control/enterprise system. Although one higher level bus network may be capable of directly connecting all of the field devices with the control architecture, area classifications, reliability, and economic considerations make the layered approach preferable.

Enterprise Networks

Ethernet with TCP/IP is the de facto standard for linking computer control and business systems together. Field level bus networks are now being plugged into the enterprise
networks by sliding the application protocol from theFieldbus onto the Ethernet network. As a result, the following Ethernet based protocols have emerged at the control system level:

- Profinet - Ethernet with Profibus

- Ethernet IP - Ethernet with ControlNet/DeviceNet

- HSE - Ethernet with Foundation Fieldbus

- Modbus TCP - Ethernet with Modbus

Ethernet with OPC (OLE for Process Control) clients/servers promises to offer universal translation for each of the different protocols' application layers to seamlessly interact with windows-based software.

Figure 1

AS-Interface

Ethernet

Foundation Fieldbus H1

Optimized Process
Bus Architecture

Type of Control	Sensor/Actuator Buses	Device Buses	Full Function Fieldbus	Enterprise Networks
Enterprise Control				• **HSE**
				• EthernetIP
		• **DeviceNet**	• **Foundation Fieldbus H1**	• Modbus TCP
Field Control		• **Modbus**	• WorldFIP	
		• Interbus-S	• ControlNet	
	• **AS-Interface**	• LonWorks		
Discrete Control	• Seriplex	• **Profibus-DP & PA**		

Simple Devices → Complex Devices

Device Functionality/Cost