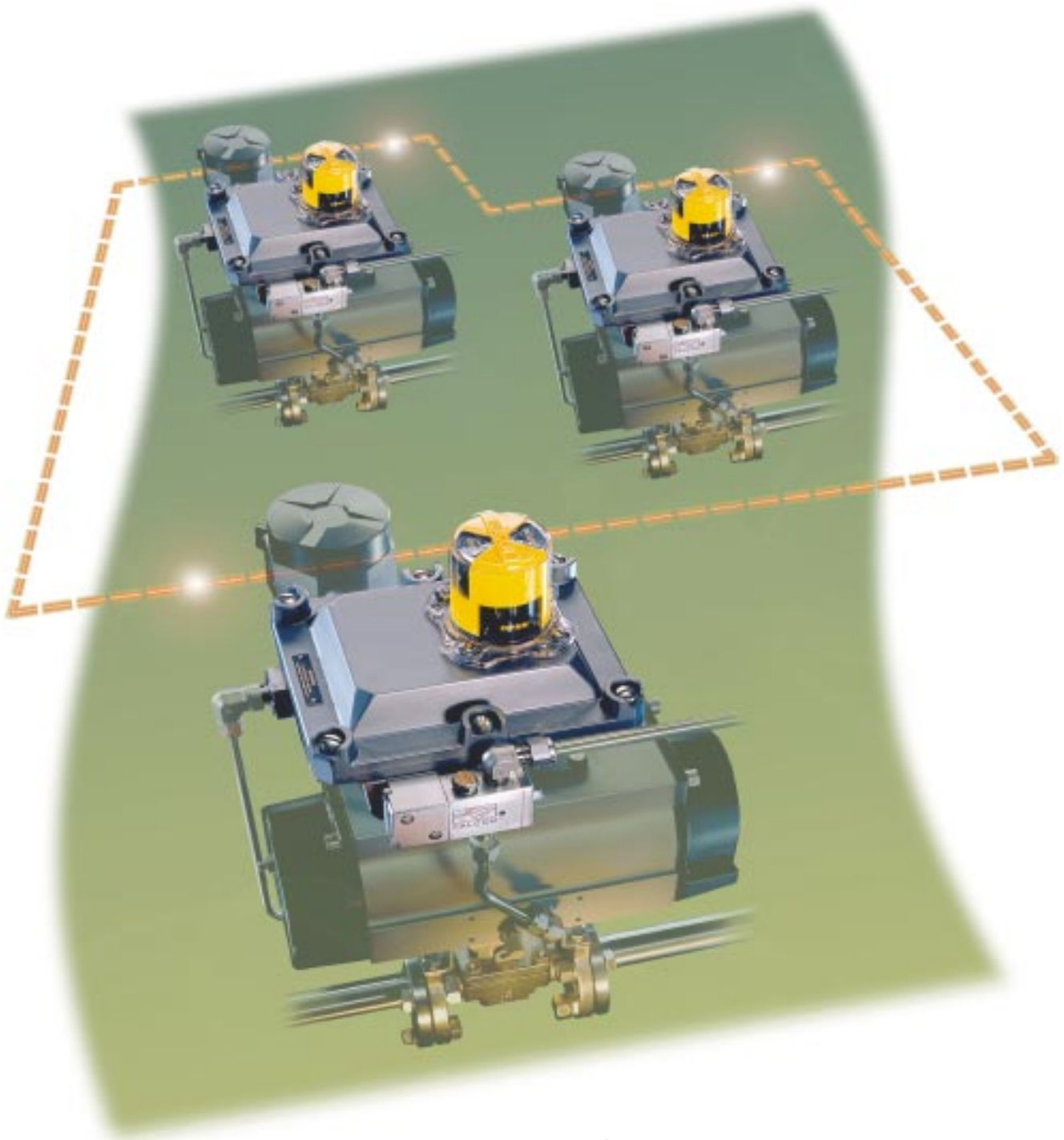




NETWORK SYSTEMS FOR VALVE AUTOMATION

ModBus[®], DeviceNet[®], AS-interface[®]
Profibus[®], Foundation Fieldbus[®]



WESTLOCK
Network Systems Group



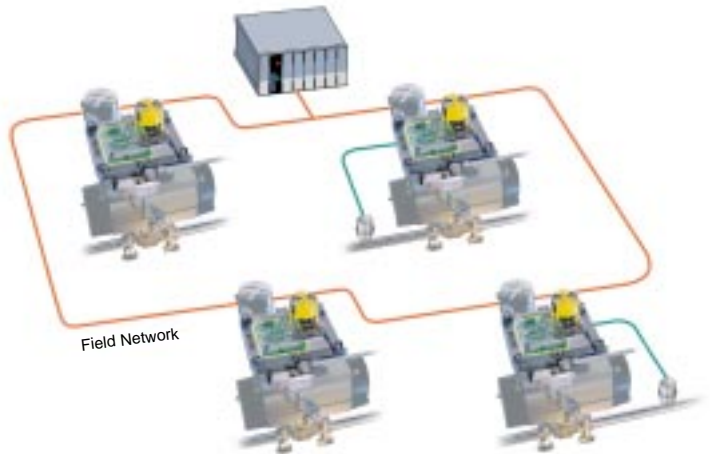
Network Systems for Valve Automation



Network Monitor (resin enclosure)

Intellis® is a family of industrial control field Network Monitors which use embedded control systems to automate valves and link field I/O to the host PLC or DCS. Network Monitors are standard Westlock Control Monitors with the addition of a network I/O module. Each Network Monitor houses two hermetically sealed position sensors for valve position monitoring, a low power solenoid valve for actuation control, and a network interface module for communication via the ModBus®, DeviceNet®, Profibus, Foundation Fieldbus or AS-interface® protocol.

By switching from a conventional hardwired I/O system to an Intellis® network, immediate cost savings are realized through the elimination of hundreds of dedicated wires and their associated costs.



The Network Module

Depending upon the network standard selected (ModBus®, DeviceNet®, AS-interface®, Profibus®, Foundation Fieldbus®, a dedicated network module is integrated within the enclosure of each Network Monitor. The on-board network module is available in two configurations. Network module (A) is capable of communicating and controlling 4 inputs and two outputs. Network module (B) will communicate with and control up to six inputs and two outputs depending on the protocol.

NETWORK CARD A	
INPUT 1:	Valve Position Sensor (open)
INPUT 2:	Valve Position Sensor (closed)
INPUT 3:	External Device
INPUT 4:	External Device
OUTPUT 1:	Solenoid Valve (actuation control)
OUTPUT 2:	Dual Coil or External

NETWORK CARD B ¹	
INPUT 1:	Valve Position Sensor (open)
INPUT 2:	Valve Position Sensor (closed)
INPUT 3:	External Device ²
INPUT 4:	External Device ²
INPUT 5:	External Device ²
INPUT 6:	External Device ²
OUTPUT 1:	Solenoid Valve (actuation control)
OUTPUT 2:	Dual Coil Application or External Device

¹AS-interface: 4 inputs/4 output

²Optically isolated

Standard Network Protocols

The acceptability of standard network protocols such as ModBus®, DeviceNet® and AS-interface® has made it possible to effectively integrate process control components into a network. ModBus, DeviceNet, AS-interface, Profibus and Foundation Fieldbus have emerged as de facto standards for interfacing discrete devices. They have proven themselves to be extremely reliable, simple to understand and consistently cost effective. The integration of these five major network standards with various manufacturers of PLC's and DCS systems is readily accomplished through the implementation of off-the shelf gateway interfaces.

Network Protocol Overview

	ModBus® The ModBus® protocol has been placed in the public domain, operates over a serial interface and is supported by almost every PLC, DCS, and operator interface (OI) company.	ModBus Direct ModBus Direct devices can be connected to almost every PLC, DCS with a ModBus port without any interface. Any 4/20 mA devices can be put into the network using an analog I/O module attached to the ModBus direct port.	DeviceNet® Allen-Bradley is the originator of the DeviceNet® protocol. DeviceNet is an open device network standard based upon proven Controller Area Network (CAN) technology.	AS-interface® Ver. 2.1 The AS-Interface® protocol was developed by a consortium of major European companies. Designed specifically for use in low level automated systems, any Profibus, ModBus, DeviceNet or Interbus PLC may be accessed through a gateway interface.
Physical Media	Twisted pair for communications, two wires for power	Twisted pair for communications two wires for power	Twisted pair for communications and power	Two wire cable (communications & power)
Maximum Distance	3000 ft.	3000 ft.	1600 ft.	300 ft. 900 ft. with repeater
Maximum Network Monitors per System	100/network 10 networks/system	32/network 1/system	63/network 2 networks/system	62/network 1 network/system
Maximum I/O Points per System	800/network 8000/system	256/network plus optional 4/20 mA analog I/O 256/system	504/network plus optional 4/20 mA analog I/O 1008/system	434/network 434/system
Current Consumption Per Network Monitor	60 mA + 20-25 mA/coil	60 mA + 20-25 mA/coil	80 mA + 20-25 mA/coil	20 mA + 20-25 mA/coil
Interface Capability	All PLC's & DCS w/ModBus Port	All PLC's & DCS w/ModBus, Port	Allen-Bradley, Omron, GE, Siemens	All PLC's & DCS w/ModBus, DeviceNet, ProfiBus Port
Communications Method	Master/slave with cyclic polling	Master/slave with cyclic polling	Master/slave multimaster, peer-to-peer	Master/slave with cyclic polling
Error Checking	CRC check	CDC check	CRC check	Control sum, parity
Network Topology	Closed loop bus	Daisy Chain/Zero drop	Trunkline/dropline with branching	Bus, tree, star
Transmission Speed	9.6 kbps	9.6kps, 19.2kps	125 kbps, 250 kbps, 250 kbps	167 kbps
Redundancy	Yes	No	No	No
Valves Specific Diagnostics	Yes	Yes	Yes	No

Standard Network Protocols cont.

The acceptability of standard network protocols such as ModBus®, DeviceNet® and AS-interface® has made it possible to effectively integrate process control components into a serial network. ModBus, DeviceNet, AS-interface, Profibus and Foundation Fieldbus have emerged as de facto standards for interfacing discrete devices. They have proven themselves to be extremely reliable, simple to understand and consistently cost effective. The integration of these three major network standards with various manufacturers of PLC's and DCS systems is readily accomplished through the implementation of off-the shelf gateway interfaces.

Network Protocol Overview

	Foundation Fieldbus® The initial specification for Foundation Fieldbus, drafted in 1987, was a joint effort of the IEC and the ISA to create an international fieldbus standard.	Profibus® Started as a joint Fieldbus project in 1987 between several companies (Siemens, Klockner-Moeller, Bosch and 10 other manufacturers). The Profibus User Organization (PNO) was founded in 1989 and has a membership of over 1000 companies.
Physical Media	Twisted pair for communications, and power.	Twisted pair for communications, two wires for power.
Maximum Distance	1900m, including spurs	1200m
Maximum Network Monitors per System	6/segment if bus powered & IS 12/segment if bus powered & non-IS 32/segment if neither bus powered nor IS	32/segment. 125/system using repeaters
Maximum I/O Points per System	48 discrete 24 analog	1134 / system
Current Consumption Per Network Monitor	25mA max.	120 mA
Interface Capability	All PLC's & DCS supporting the FF protocol	All PLC's & DCS supporting the Profibus protocol
Communications Method	Peer to peer	Peer to peer and cyclic Master/slave
Error Checking	Manchester encoding	CRC
Network Topology	Daisy Chain, trunk/drop (spurs), branching drop (spurs), point to point	Linear, stubs to be avoided (if unavoidable stubs must be ≤0.3m), no branches.
Transmission Speed	31.25 kbps	9.6, 19.2, 93.75, 187.5, 500, 1500, 12000 kbps
Redundancy	Yes	No
Valves Specific Diagnostics	Yes	Yes

Intellis® System Overview

ModBus® • DeviceNet® • AS-interface® • Profibus® • Foundation Fieldbus®

Field Network

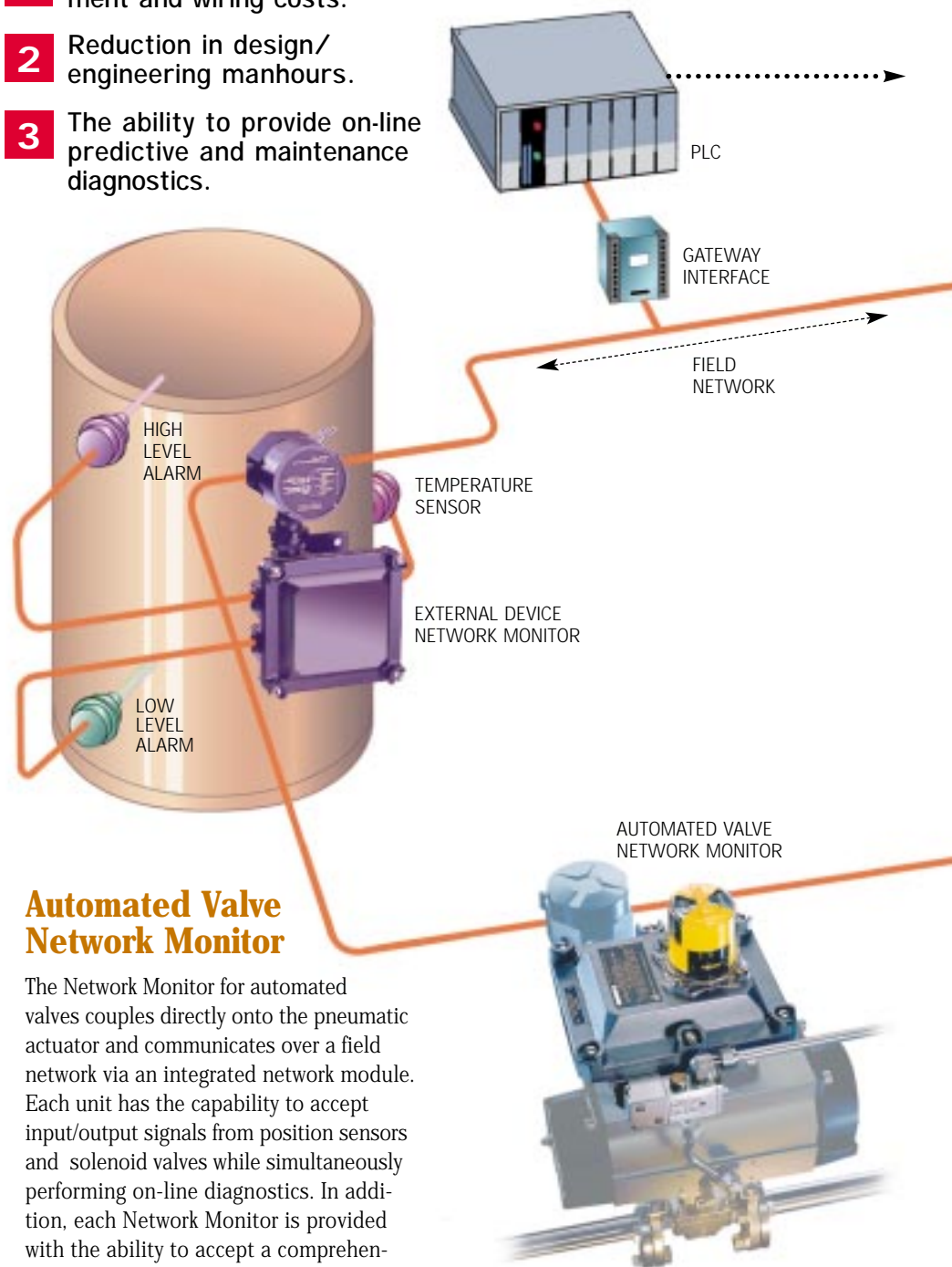
A field communications network is comprised of a specific number of Network Monitors interconnected by a common communications protocol. Network Monitors may be placed on the field network in any physical order. Each Monitor is assigned a unique address and accepts input/output signals from valve position sensors, solenoids, and external devices.

Communications with a PLC, DCS or host computer is accomplished by a gateway interface or scanner card having specific compatibility with the primary control network.

External Device Network Monitor

Network Monitors are available for control or monitoring of non-valve related devices (sensors, alarms, actuators, indicating lights, etc.) Integrated network modules, have as standard, protective diodes and optical isolation and are housed in a General Purpose, Division 2 Nonincendive or Explosionproof enclosures with a 16 point terminal block for simplification of wiring. Depending on the protocol each stand-alone Network Monitor is capable of accepting six external devices.

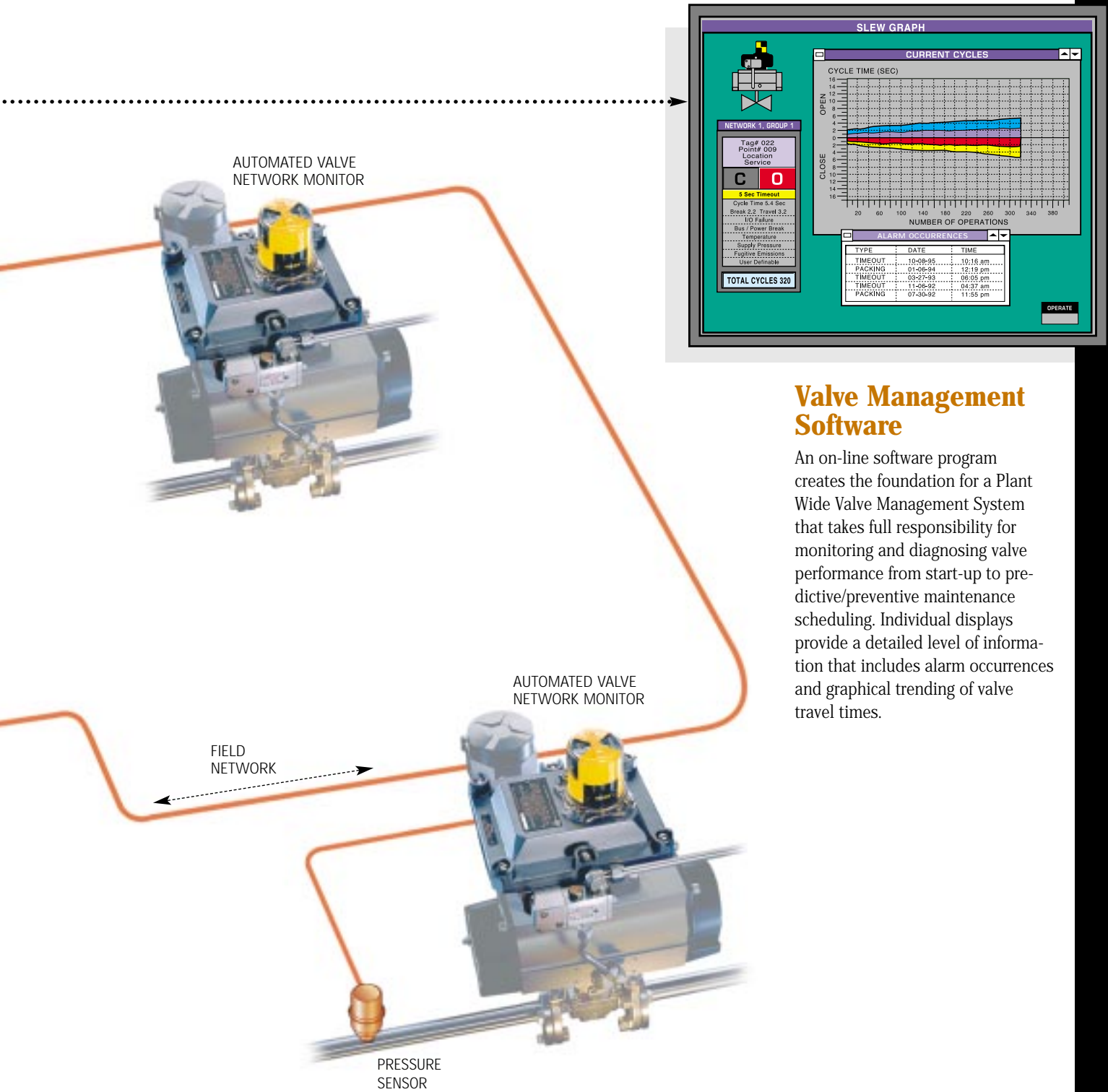
- 1** A major reduction in equipment and wiring costs.
- 2** Reduction in design/engineering manhours.
- 3** The ability to provide on-line predictive and maintenance diagnostics.



Automated Valve Network Monitor

The Network Monitor for automated valves couples directly onto the pneumatic actuator and communicates over a field network via an integrated network module. Each unit has the capability to accept input/output signals from position sensors and solenoid valves while simultaneously performing on-line diagnostics. In addition, each Network Monitor is provided with the ability to accept a comprehensive range of external field devices for control or alarm purposes.

Intellis® System Overview



Valve Management Software

An on-line software program creates the foundation for a Plant Wide Valve Management System that takes full responsibility for monitoring and diagnosing valve performance from start-up to predictive/preventive maintenance scheduling. Individual displays provide a detailed level of information that includes alarm occurrences and graphical trending of valve travel times.

System Support

Conformance Testing

Prior to integration within the Westlock Network Monitor, each network card is subjected to a rigid functionality test and then undergoes a specified period of component "burn-in". After assurance of network card integrity, a communications network, identical to the network specified for a project, is replicated in-house and conformance tested before shipment to the field.

A fully operational communications network with protocol specific network cards and PLC or Host network interface gateways is assembled and then required to satisfactorily operate around-the-clock. A custom software program monitors commands and response, recording any deviations or failure within the system.



Field Confirmation

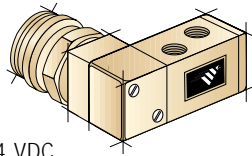
The integrity of every network is confirmed in the field through the utilization of a diagnostic and programming tool. The hand-held service unit will fully check all device functionality.

Personnel Training

Plant personnel, responsible for maintenance and on-going operations, receive in-depth training on field networks, interface devices, hardware components, configuration tools and predictive diagnostic software specifically related to each individual system.



TECHNICAL SPECIFICATIONS & ORDERING GUIDE



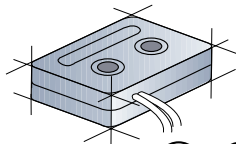
SOLENOID VALVES

Falcon low power solenoid valves operate at 24 VDC, 20 mA, 0.5 watts. The low power feature (20 mA) allows for a major reduction in power supply requirements. When utilizing the AS-interface protocol, power and communications may be transmitted on the same two wire cable.



VALVE POSITION SENSORS

Utilized for full open/close position detection and predictive diagnostic functions, each proximity sensor is hermetically sealed against the intrusion of explosive gases, moisture, and corrosion.



AREA CLASSIFICATIONS

<p>Model 7579, 7679, 7779 Aluminum Nema 4, 4x, 7, 9 Class I, Groups C & D Class II, Groups E, F & G, Div. 1 & 2 Class I, Groups A & B, Div. 2</p>	<p>Model 7544, 7644, 7744 Engineered Resin Nema 4, 4x, Nonincendive Class I, Groups A, B, C & D Class II, Groups F & G Division 2 only</p>
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ORDERING GUIDE (FALCON® SOLENOID)

COILS	CV	Body	3-Way	4-Way
FSO 24 VDC 0.5 watts NEMA 4, 4x, Nonincendive Class I, Groups A, B, C, D Class II, Grps. F, G, Div. 2	.3 Cv	Brass	2100	2500
		Alum.	3100	3500
		303 S.S.	4100	4500
		316 S.S.	5100	5500
		Delrin	6100	6500
XSO 24 VDC 0.5 watts NEMA 4, 4x, 7, 9 Class I, Groups C, D Class II, Groups E, F, G Div. 1 & 2	.5 Cv	Brass	2200	2600
		Alum.	3200	3600
		303 SS	4200	4600
		316 S.S.	5200	5600
		Delrin	6200	6600
	1.2 Cv	Brass	2300	2700
		Alum.	3300	3700
		303 S.S.	4300	4700
		316 S.S.	5300	5700
		Delrin	6300	6700
	3.5 Cv	Alum.	3400	3800
		Delrin	6400	6800

NOTE: For dual coil applications, please consult factory.
 For Manual Override suffix part number with **MO**

ORDERING GUIDE

Network Protocol	Enclosure	Network Card	Beacon	3-Way Beacon	Solenoid	Pefipheral Interface Devices
ProfiBus 72* Foundation Fieldbus 73* ModBus Direct 74 ModBus 75 DeviceNet 76 AS-interface 77	Aluminum 79ME Aluminum w/ Junction Housing 79XE Engineered Resin 44R Engineered Resin w/ Junction Housing 44X	Card A 2 Inputs 1 Output A Card B 6 Inputs 2 Outputs** B	STANDARD BY (Black & Yellow) ANSI YELLOW AY (Inherently Hazardous) ANSI GREEN AG (Liquid-Low Hazard) ANSI BLUE AB (Gas-Low Hazard) ANSI RED AR (Fire Quenching)	90° Rotation B1 90° Rotation B3 90° Rotation B5 180° Rotation B7 180° Rotation B9	Use above listing for ordering solenoid 	<ul style="list-style-type: none"> Cables • Power Supplies Gateways • Repeaters Extenders Configuration Tools Software/Diagnostics <p>Application Support</p> <ul style="list-style-type: none"> Engineering Design Integration Start-up Support Training

* Consult Factory *AS-interface: 4 inputs/4 outputs • For Namur mounting configuration suffix enclosure designation with the letter "N", Example: 7644RNABY
For Sanitary Diaphragm valves, see bulletin number 720

The future of valve automation

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